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The following Paper was then read by the Author :—

THE BIBLE AND MODERN ASTRONOMY. By the
Rev. Canon BIRKS, M.A., Knightbridge Professor of Moral
Philosophy, Cambridge.

IN the fifth of the Seven Essays, which attracted so much notice seventeen years ago, a broad contrast is said to exist between the statements of the Bible and modern discoveries both in Astronomy and Geology. The whole account of creation in the book of Genesis is given, it is affirmed, from a different point of view from that which we now unavoidably take. The order of things, as we now know them to be, is to a great extent reversed, although here and there we may pick out some general analogies and points of resemblance. Mr. Goodwin thus resumes the subject at the close of his remarks :—

“The treatment to which the Mosaic narrative is subjected by the theological geologists is anything but respectful. The writers of this school agree in representing it as a series of elaborate equivocations, a story which palters with us in a double sense. But if we regard it as the speculation of some Hebrew Descartes or Newton, promulgated in all good faith as the best and most probable account that could be given of God’s universe, it resumes the dignity and value of which the writers in question have done their best to deprive it. It has been sometimes felt as a difficulty in taking this view of the case, that the writer asserts so solemnly that for which he must have known he had no authority. But this arises only from our modern habits of thought, and from the modesty of assertion which the spirit of true science has taught us. The early speculator was harassed by no such scruple, and asserts, as fact, what he knew only as probabilities. But we are not on that account to doubt his perfect good faith.”

2. The sacred writers, then, according to the Essayist, were as inferior to modern men of science in modesty and veracity as in scientific attainments. And the remedy he propounds for the blindness of theologians, who cannot receive this low estimate of God’s chosen messengers, is to accept frankly the principle that those things, for the discovery of which man has faculties specially provided, are not the fit objects of Divine revelation !

In chapter xv. of *The Bible and Modern Thought*, I have examined this principle, and shown it to be fatally opposed to the very existence of such a revelation. It would confine it to those

subjects only which we have no faculty to understand. It is thus, really, a simple and effectual expedient for getting rid of all revelation, by leaving it nothing within the range of the human faculties which it is permitted to reveal. The Divine Record of creation, I have said, to which the Son of God appealed with such holy reverence, is to resume the dignity and value which it had lost, while esteemed to be the word of God, by ranking as the speculation of some Hebrew sciolist, who had never learned the modesty of modern science, and made a bold but mistaken guess at the origin of the world. Men have regarded it, for ages, as the inspired word of God. It is cheering to be assured that their respect for it need not be in the least diminished, when they come to regard it as the blind conjecture of some unknown pretender to Divine communications.

3. The view of the relation between Scripture and modern science, strongly maintained by my friend Canon Titcomb in his paper read to this Institute three years ago, seems to me to differ only by a slight shade from that advanced in Mr. Goodwin's essay. As I think his premises mainly erroneous, and the conclusions drawn from them adverse and not helpful to the cause of Christian truth, it is needful briefly to examine his statements. This will clear the way for a further expansion of my views, indicated in pp. 309-315 of *The Bible and Modern Thought*, which have since ripened further in my own mind, and seem to me a topic deserving the careful attention and thought of Christian men.

4. The doctrine to be examined is briefly this. Scripture is indifferent to the duty of expressing itself with exactness on scientific questions. This is proved, it is thought, by contrasting the statements in Genesis i. with the teaching of modern geology and astronomy as to the distances of the stars and the age of the world. Still, some statements of Scripture are so exactly scientific as to be perfectly consistent with the latest modern discoveries. This is instanced in three things: the place of man as coming last in the order of creation; the physiological affinity of birds and fishes, as shown by the blood-globules; and the mention of the sweet influences of the Pleiades, which are explained by Mädler's hypothesis, that Alcyone is the centre of the whole stellar universe. The inference is drawn, that "the inspiration of the Bible in questions involving science was subordinated to the single purpose of making moral and religious truth intelligible"; that "the writing of Moses is justly to be regarded as inspired, though the form into which his language was thrown is now found to be at variance with scientific accuracy." In fine, that "Science and Revelation occupy two distinct and separate spheres, and any attempt to make one interfere with the other will only bring them into open and ruinous conflict." The purposes of God in Revelation are moral

and spiritual, not scientific, and they are to be read in that light. This is the true harmony, it is urged, between Science and Scripture, and the only view which will stand the scrutiny of severe investigation.

5. Thus the threatened conflict between Science and Revealed Religion is averted, both by the Essayist, Mr. Herbert Spencer, and Canon Titcomb, by a treaty of partition. But the line of demarcation has a very important difference. With the Essayist, all belongs to Science, which men have faculties given them to investigate and understand. If there are any subjects beyond the range of our faculties, on which they can teach us nothing, these are resigned to Supernatural Revelation. All the Intelligible belongs to Science. The portion left for a Divine message to occupy is the Unintelligible alone. In Mr. Spencer's *First Principles* the division is nearly the same. The whole range of the Knowable belongs to Science, and Religion consists only in blind emotions, of which the object is the Unknowable. Christian faith is a portionless orphan, turned adrift in the wide and pathless waste of the Unknowable, without a single footbreadth of certainty and truth which it can call its own.

The partition in Canon Titcomb's paper is different. All moral and spiritual truth is placed on one side of the line which parts the infallible from the fallible and imperfect; all outward facts, and physical, zoological, and human changes on the other.

6. But such a partition is really impossible. I do not see how my remarks on this point, in the *The Bible and Modern Thought*, are to be refuted or set aside. I have written as follows:—

“The Bible is not a message to disembodied spirits. It is addressed to man in his actual character, as a being composed of body and soul, born in the weakness of infancy, placed in the midst of this lower creation, and trained through his senses to the knowledge of himself, of nature, and of God. A revelation for such a being must include many facts, that belong to almost every field of scientific inquiry. Facts which belong to geography, chronology, botany, zoology, astronomy, and legislative and political history, meet us in almost every page of the sacred narrative. The attempt must be vain to maintain a doctrinal authority in Scripture, and still to impute to it a merely human character, wherever it touches on questions of natural science. For the two elements are blended not less intimately than body and soul are united in man himself.

7. “Let us take the leading truth of Christianity, the resurrection of our Lord. None can be more central to the revelation, or more intensely spiritual. Yet it contains points of intimate connection with a dozen different sciences. It is a geographical truth; for He rose from the tomb at Calvary, and ascended from Olivet. It is a

truth of chronology ; for He rose the third day, in the procuratorship of Pilate, and on the first of the long unbroken series of Christian sabbaths. It is a physiological truth ; for the body laid in the grave was raised on the third day, before it had seen corruption. It is connected with a truth of botany ; for that sacred body had been embalmed with myrrh and aloes. It is a truth of political history ; for crucifixion was a Roman, not a Jewish punishment, and a Jewish watch, by permission of a Roman governor, had been set over the tomb. . . . It is connected with jurisprudence and the laws of evidence ; for He ‘appeared to witnesses chosen before of God, who did eat and drink with Him after He rose from the dead.’ And hence the idea of retaining the authority of the Bible as in any sense Divine, and making an exception for the parts into which there enters some scientific element, is utterly impracticable. The doctrines and the facts, the precepts and the histories, are joined inseparably by the Spirit of God himself. Deny the authority of the facts, and you destroy the whole revelation.”

8. The doctrine of the Fifth Essay is plain. The Bible is simply the work of several Jewish writers, who had neither the knowledge, nor the modesty, nor the strict regard to truth, of modern men of science. They were harassed by no scruples, while boldly offering their own crude guesses as if they were certain facts, and messages clothed with Divine authority. But the other view is much harder to understand. The Bible is personified, and said to be indifferent to the duty of expressing itself with scientific accuracy and truth. Speaking generally, its language on these subjects is inaccurate and untrue. Still there are cases, here and there, of such consistency with the latest discoveries of science, as to indicate some higher than mere human authorship. On this ground we are to believe that the Spirit of God is their true author. But we are to concede that the Divine Spirit is usually indifferent to the duty of giving accurate statements on all questions in which natural science is involved ; and that He prefers, for some reason or other, to mix moral and spiritual messages of supreme importance to mankind with a series of statements at variance with the whole course of modern discovery, erroneous and untrue.

9. I am surprised that any thoughtful mind can find rest or satisfaction in such a theory.

The doctrine that He who inspired the Bible, while all future discoveries lay open to His prescient wisdom, forbore to reveal them supernaturally, because they lay outside the proper object of His message, is clear and simple. So is the further doctrine that whatever He has made known consists of facts and not fictions, is true and not false. But it is neither clear nor

simple, nor at all credible, that there is a duty of speaking with scientific accuracy, which has been wholly neglected and transgressed, in most cases, by the Spirit of Truth and Holiness himself; and that our faith in His Divine authorship can rest on our detecting a few marvellously correct scientific anticipations, here and there, like islets, in a wide sea of erroneous statements, visionary fictions and contradictions of the well-attested results of scientific research.

10. Three cases alone are specified. The first is that man comes last in the Bible record of creation, and also in the series of modern geology. But however weighty the fact, what can it prove, when nearly all the rest of the Mosaic narrative is affirmed to misrepresent or contradict the proved facts of geological science? Are we to argue that the book of Genesis must have a Divine inspiration, because, in its record of creation, one part in fifty turns out to be scientifically true, while all the rest is erroneous? Infidels will laugh in our face, if we venture to argue in such a way.

11. Next, the fishes and birds are said to be created on the fifth, but the beasts of the earth on the sixth day. This is compared with an alleged recent discovery, that the blood-globules in birds and fishes are alike, and differ from those of land animals. So also birds and fishes are oviparous, and beasts viviparous. But on the other hand whales are viviparous, and the creation of great whales is assigned to the fifth day. The creeping things of the earth are not viviparous, and have a nearer scientific affinity to the birds or fishes than to the beasts, and still they are included in the work of the sixth day. The contrast in Genesis does not seem to refer at all to the skeleton, or to the mode of birth, still less to the size of the blood-globules. It plainly relates to the *habitat* of these three classes alone. No details of physiology on other matters, however interesting in their own place, can thus do anything either to confute or confirm the Divine authority of the statement in the sacred text.

12. The third piece of alleged evidence is still more baseless. The words in Job, "Canst thou bind the sweet influences of the Pleiades?" are held to be an anticipation of Mädler's recent guess, that Alcyone, one of the seven, is the centre of revolution to the whole stellar universe. But there is no proof whatever that this guess is true; and if it were true, there are plain reasons why it could not possibly be what is meant by the words addressed to the patriarch.

13. First, all that Science has proved—and even that proof is not free from some doubts—is that the sun and planets are moving towards a point in or near the constellation Hercules. But there is no proof that the motion has changed its direction since first

detected, or that it is in a plane great circle, or that there is any deflection on the side towards Alcyone; least of all that it is round a fixed centre, and that centre Alcyone. But there is negative evidence the other way. If Alcyone were the physical centre, its mass and inherent splendour should be immensely great, as compared with other stars, and of this there is no sign. The natural result would be a concentric glomeration of stars, growing denser on all sides around it; and of this also there is no sign. But if it were held merely that the resulting centre of gravity of all the stars seen by our telescopes lay near Alcyone, of which there is no proof whatever, the words of the text could bear no such meaning. The influence of attraction would not then belong specially to that star, or to the other Pleiades, but must plainly be shared alike by every star in the whole firmament.

14. But in the text two questions are proposed. "Canst thou bind the sweet influences of the Pleiades, or loose the bonds of Orion?" If central attraction is meant in one case, central repulsion, its opposite, must naturally be signified in the other. But this is clearly impossible. The application of the double inquiry to the opening of all nature in the early spring, and its binding with the frosts of winter, is natural and impressive, and agrees with the whole context. It forms a simple and sublime appeal to the plain tokens of Divine power and wisdom in the yearly changes of the seasons. Any application of the words to the physical and mechanical relations of the whole stellar universe is quite foreign from the manifest design of the whole passage. The alleged agreement is that of a very improbable guess in science with a perfectly untenable interpretation of a Scriptural text.

15. These two fictitious defences once set aside, the concession itself remains to be examined. Is the Bible utterly indifferent to the duty of expressing itself with scientific accuracy and truth? The assertion, even if it were true in substance, is plainly inexact in phrase. What is really meant is neither that the human writers neglected a rule wholly beyond their unaided powers to fulfil, nor that the Spirit of God has been negligent of a duty He might have fulfilled. It is that no such duty exists. What is really affirmed is that it is lawful, wise, and expedient that God's own messages of moral and spiritual truth should be given to mankind in a vehicle of human narratives, deeply tinged with errors and misstatements, and contradictions of genuine science. The Holy Spirit is held to have kept the writers from going wrong on all moral questions, but not from any amount of mistaken assertion as to physical changes, and the facts of human history. This notion is specially applied to the record of creation in Genesis, and to all the allusions of the Bible to the physical structure of the universe.

16. My own conviction is just the reverse. The Bible is "the true sayings of God." The Scripture "cannot be broken." "It is easier for heaven and earth to pass, than for one tittle of the law to fail." It is "the Lord God of the holy prophet," by whom these messages are given to mankind. The whole, therefore, comes to us stamped with His Divine authority. And this must include all its contents, till some adequate evidence can be adduced to exempt any portion from the claim which belongs to the rest, and thus prove it to be some flaw, contracted in the transmission of God's own perfect message. It is an error to suppose that the Bible was given to supersede the patient inductions of natural philosophy, and to supply, ready-made, a complete physical theory of the universe. It is an equal error to deny that it announces, with Divine authority, many great facts, which are rightfully included among the proper materials of all true and genuine science.

17. The charges of scientific falsehood, brought against the Scriptures, have doubtless been owing, in part, to the carelessness and rashness of well-meaning but incompetent advocates of the Christian faith. Hasty impressions of what the Bible says have thus been confounded with its real statements. But they are no less due to that looseness of thought, which sets down every unproved hypothesis, started by physical philosophers, as a firm and established fact of science. The easy credulity with which some Christian men are ready to take up the newest scientific guesses, and not only sacrifice to them a considerable part of their own faith in the Bible, but exhort others to do the same, as a triumph of Christian candour over the blindness of prejudice, is a most painful and dangerous symptom of the times in which we live. It is due to the cause of genuine science itself, no less than of Christian faith, and the reverence due to the Word of God, to revise, one by one, these rapid conclusions, and sift anew the strength and solidity of some of the main assertions, on which there has been raised a vast superstructure of contempt for the authority of Scripture, and practical unbelief.

18. I propose, then, in the rest of this paper, to answer this first question—Are the statements of Scripture, when compared with the teaching of modern astronomy, guilty of habitual inaccuracy, or, in simpler words, erroneous and untrue? Or is the fact just the reverse, that while modern researches have thrown some fuller light than before on the physical relations of the universe, the statements of the Bible are physically not less true than those of modern astronomy, while they go deeper and rise higher, and throw light on the true proportions and moral purpose of the physical relations themselves?

19. The charge to be examined meets us at the opening of the fifth essay on the Mosaic Cosmogony, in these words:—

“The Ptolemaic system contemplated the whole visible universe, from the earth, as the immovable centre of things. Copernicus changed the point of view, and, placing the observer in the sun, reduced the earth to an inconspicuous globule, a merely subordinate member of a family of planets. . . . The Hebrew records, the basis of religious faith, manifestly countenanced the opinion of the earth's immobility, and other views of the universe, very incompatible with those propounded by Copernicus. It can scarcely be said that the first chapter of Genesis is not intended in part to convey some physical truth; and, taking its words in their plain sense, it manifestly gives a view of the universe adverse to that of modern science. It represents the sky as a watery vault, in which the sun, moon, and stars are set. But the discordance of this description with facts does not appear to have been so palpable to the minds of the seventeenth century. The brilliant progress of astronomical science subdued the minds of men. The doctrine of the earth's mobility found its way into children's catechisms, and the limited views of the nature of the universe in the Old Testament ceased to be felt as religious difficulties.”

Such is the first main charge of scientific error brought against the Bible. Some say that our proper course, as honest Christians, is frankly to concede its truth. The Bible espouses the Ptolemaic doctrine of the earth's immobility. But the Copernican doctrine, which makes the sun, and not the earth, the immovable centre of our system, is alone true. So the Bible has adopted and endorsed popular errors, instead of scientific truth.

20. Now, first of all, the competing varieties of conception are four at least, and not two only; and may be named after Ptolemy, Copernicus, Newton, and Herschel. In the first the earth is taken as a fixed centre; in the second the sun; in the third the centre of gravity of the solar system; in the fourth, resulting from Herschel's discovery of the solar motion, no fixed point is clearly defined, but one is assumed to lie in some distant part of infinite space. On this Mädler has grafted his conjecture, that it may perhaps be Alcyone, one of the Pleiades. The only fact, however, even probably ascertained, is a motion of our whole system, at the rate of about 150 millions of miles yearly, or five miles a second, towards a point not far from the bright star of Lyra. But whether there be any fixed centre of this wider stellar system, and if there be, in what direction it lies, and at what distance, remains, in the Herschellian theory, wholly vague and uncertain. Astronomy, as a science of observation and exact inference, can at present give these questions no answer whatever.

21. Let us, then, condemn the Bible as erroneous, and revolutionize all customary speech, to satisfy the alleged claims of scientific accuracy and truth, and what result will follow? We shall have ceased to be intelligible to the common people, and nearly all

mankind. But we shall be left just as unscientific as before. In our search for something real and absolute, we are to abandon all terms which express only relative motion. But the rainbow recedes before us. The sun rises and sets no longer, and the earth revolves on its own axis, and in its orbit round the sun as a fixed centre. But of this fixed centre it has to be said in its turn, "And yet it moves." Neither the earth is now to revolve round the sun, nor the sun round the earth, but both alike around a fixed invisible point between them. Here again we find no rest. Herschel's discovery alters and disturbs our last conclusion. The earth and planets no longer move in ellipses around a common invisible centre, but travel in complicated corkscrews, or spirals, through empty space. And we have no assurance that this stage is final, and that all the stars, from which the sun's motion has been inferred, may not be travelling together towards some more distant point or centre in the depths of infinite vacuity.

22. These changes all assume that there is some absolute motion, which alone is scientifically true. But is this certain? May we not be sacrificing what is certain and real to a mere shadow, instead of exchanging a series of fictions for reality? Is there, after all, such a thing as absolute motion? The common impressions are given by Newton in his scholium in these words:—

"Absolute space in its own nature, without regard to anything external, remains always similar and immovable. Relative space is some movable dimension or measure of the absolute space, which our senses determine by its positions to bodies, and which is vulgarly taken for immovable space. Absolute and relative space are the same in figure and magnitude, but they do not remain always immovably the same. For if the earth, for instance, moves, a space of our air which, relatively in respect of the earth remains always the same, will at one time be one part of absolute space, at another time it will be another part. . . Absolute motion is the translation of a body from one absolute place into another, and relative motion from one relative place into another. Thus, in a ship under sail, the relative place is that part of the ship which the body possesses. Relative rest is the continuance in the same part of the ship, or its cavity. But real, absolute rest, is the continuance of the body in the same part of the immovable space, in which the ship and all that it contains is moved."

23. Newton then proceeds to put the case of a sailor, walking on a ship's deck from west to east, while the ship sails ten times as fast westward, and the earth 10,000 times as fast from west to east. In Mr. Spencer's *First Principles* an exactly similar case is proposed, to prove that absolute space and motion are inconceivable. The conclusion drawn is in these words:—

“That which seems moving proves to be stationary, that which seems stationary proves to be moving ; while that which we conclude to be going rapidly in one direction turns out to be going much more rapidly in the opposite way. What we are conscious of is not the real motion of any object, but merely its motion as measured from some assigned position. We take for granted that there are fixed points in space, with respect to which all motions are absolute, and we find it impossible to rid ourselves of the idea. Nevertheless, absolute motion cannot even be imagined, much less known. All we can assert is that space is a relative reality, that our consciousness of this unchanging relative reality implies an absolute reality, equally unchanging, as far as we are concerned, and the relative reality may be unhesitatingly accepted in thought as a valid basis of our reasonings.”

24. The doctrine of Newton is plain and simple, that there is an absolute space and motion, though we have never seen or known one, or witnessed the other. Mr. Spencer's is ambiguous. Space and motion, he says, are relative realities, and absolute space and motion cannot even be imagined, and still we cannot help believing in their reality. They are forms of the Unknowable. Yet we may know, without any doubt, that they are truly represented by relative space and motion. These, however, are all that experience presents to us, or our imagination can conceive.

25. The Bible statements and popular language are thus to be condemned as unscientific and erroneous on this ground. We must take for granted an idea, of which, Mr. Spencer says, we cannot rid ourselves, but which, he further says, cannot be imagined, much less known. This seems a very precarious basis for an indictment of systematic error against the Word of God, and the customary speech of all mankind. Is it not worth while to look at the matter more closely, and see whether, after all, the mistake and illusion may not be on the other side ?

26. The idea of relative place and motion is simple and easy. Let us conceive a thousand material objects, each having a distinct place. There will then be nearly half a million distances and directions. If one of these bodies be moved, its distance from all the rest and their distances from it will be changed, but all the other distances will be unchanged. The relative changes are plainly mutual. If A recede from the rest, they must at the same time recede from it also. If four hundred keep their place relative of each other, and recede from the other six hundred, the idea is almost forced upon us that both sets are in motion, receding from the centre of gravity of the entire group of a thousand bodies.

27. How, then, are we to define absolute motion ? It must be change of place with regard to no one real object, nor any number

of real objects, but with reference to empty space alone. But is this possible? If a body were quite alone in the universe, could it move? Move it in thought as you please, will it not be just the same as before, alone with an infinite void on all sides? In this vast solitude there are no landmarks, nothing to which motion could be referred. But a motion which changes nothing, and alters no relation of distance, must be the same with absolute rest. I cannot conceive a motion when there is nothing to approach to, or from which to move further away. Newton writes on this subject as follows :—

28. "All things are placed in space as to order of situation. It is from their essence or nature that they are placed, and that the primary places of things should be movable is absurd. These then are the absolute places, and translations out of these are the absolute motions. But because the parts of space cannot be seen or distinguished by our senses, in their stead we use sensible measures of them. From the positions and distances of things from some body, considered as immovable, we define all places, and with respect to such places we estimate all motions. So, instead of absolute places and motions we use relative ones, and that without inconvenience in common affairs. But in philosophical disquisitions we ought to abstract from our senses, and consider things in themselves. For it may be that there is no body really at rest, to which the places and motions of others may be referred. It is possible that in the remote regions of the fixed stars, or perhaps far beyond them, there may be some body absolutely at rest; but it is impossible to know, from the position of bodies one to another in our regions, whether any of these do keep their positions to that remote body. Thus absolute rest cannot be determined from the positions of bodies in our regions. . . . All motions from places in motion are no other than parts of the entire and absolute motions. Entire and absolute motions are not otherwise to be determined than by immovable places. Now no other places are immovable but those that from infinity to infinity do always retain the same given positions one to another, and on this account must remain unmoved, and thereby constitute what I call immovable space."

29. Thus, Newton holds it doubtful whether any body be really at rest, though he thinks such a body may, perhaps, exist in some remote part of the universe. If it exist, absolute motions will be those relative to this unknown body. In other words, they are relative still, but the relation is to a hypothetical body, of which we cannot know where it is to be found, or whether it really exists.

We must revert, then, to another conception. Absolute motions are those which are referred to no real body at all, but to the points, assumed to be immovable, of empty space. Is this a true and valid conception! Do we not really, in our thoughts,

when we speak of these fixed points of empty space, introduce an immense number of hypothetical or imaginary atoms, not perceived by the senses, to fill up the intervals between the bodies we can see, or occupy the spaces beyond them? Thus, if the solar system is moving in a known direction, we may conceive the whole of the ether within the orbit of Neptune either to move or not to move along with it. In the latter case the visible parts of our system are moving with reference to the invisible, and as the bulk of these last is immensely superior, they become the natural standard of reference. But if all be conceived to move together, our notions of immovable space will be drawn from these interstices, now supposed to be ever changing, of our own system. And if our whole system, visible and invisible, including all from which our notions of space are borrowed, is to be reckoned in motion, it must be in relation to some equal or larger visible and invisible system, far away. And this is plainly a new relation, or set of almost infinite relations.

30. Absolute Space and Motion is thus a rainbow, receding ever before us. The moment we strive to grasp it, it eludes us and disappears. If some one body somewhere were absolutely at rest, we could never be sure of the fact, or learn where it could be found.

31. Newton remarks further :

“There is only one real circular motion of any one revolving body, corresponding to one power of endeavouring to recede from the axe of motion, as its proper and adequate effect. But relative motions in one and the same body are innumerable, according to the various relations it bears to external bodies. Relative quantities are not the quantities themselves, whose names they bear, but sensible measures of them, which are commonly used instead of the measured quantities themselves. And if the meaning of words is to be determined by their use, then, by the names space, place and motion, their measures are properly to be understood, and the expressions will be unusual and purely mathematical, if the measured quantities themselves are meant; upon which account they strain the sacred writings, who there interpret the words for the measured quantities. Nor do these less defile the purity of philosophical truths, who confound the real quantities themselves with their relations and vulgar measures. It is, indeed a matter of great difficulty to discover and distinguish the true motions of particular bodies from the apparent, because the parts of that immovable space in which the motions are performed, do by no means come under our senses. Yet it is not altogether desperate. For we have some arguments to guide us, partly from the apparent motions, which are the differences of the true, and partly from the forces which are the causes and effects of the true motions.”

32. Here Newton repels and refutes that charge of scientific
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inaccuracy and falsehood, which has often been brought against the sacred writings, because they do not speak of absolute, but of relative motions only. The meaning of words, he says, "is determined by their use," and Scripture employs them in their usual meaning. But I doubt whether the rest of his remarks are equally well-founded and just. Let us examine them a little further.

33. And first, relative motions can with no propriety be called measures of the absolute motions. Let us suppose a number of bodies from A to Z, all moving with different velocities, and in different directions. Taking A for a standard, as if it were fixed, there will be twenty-five relative motions of the other bodies from B to Z. The motion of C relative to B, or N relative to M, will be the difference of the second and first, of the thirteenth and twelfth, of these twenty-five motions. There will be three hundred such relative motions, depending on the first twenty-five, and their differences. What, now, is the relation of all these to the absolute motions? These will be nothing else than the first twenty-five motions, increased by the absolute motion of A with reference to empty space, supposed immovable. This one quantity remains unknown. Hence the relative motions cannot measure the absolute, nor the absolute the relative. For the relatives, plus x , an unknown and unknowable quantity, are themselves the absolute motions, and measures of the one must be measures of the other also.

34. Again, the two helps suggested for learning the true from the apparent motions, cannot really avail us. The first is that the apparent motions are the differences of the true, and thus may help to determine them. But what is wanted is this very difference, the unknown x , which must be added to all the relative motions, to make them absolute. Let this be given for one body, and it will be given for all. But the differences plainly supply no help whatever for its discovery.

35. The other help is sought in "the forces, which are causes and effects of the true motions," as thus explained. "If two globes kept at a given distance one from another by means of a cord were revolved around their common centre of gravity, we might, from the tension of the cord, discover the endeavour of the globes to recede from each other, and the axis of their motion, and thence compute the quantity of their circular motions."

Here, however, all that would be proved is a relation between a tangential velocity at right angles to the joining line, and a centripetal force, acting in the direction of that line. Both of these are definite relations between the two globes, and not of either globe to points fixed absolutely in empty space. Circular motion implies two bodies at least, an actual distance between them, and a line of junction. If we conceive a relative movement of each, at right angles to that joining line, and in opposite direc-

tions, the result, if there be no deflecting force, must be a growing divergence, and a motion becoming more and more obtuse to the new line of junction. A force tending towards the other body will be required, to hinder this divergence, and transform the momentary lateral into a permanently circular or elliptical motion. But all this is clearly relative. It involves the relation of one body to the other, and of both to their centre of gravity. Any number of bodies in one plane, at the corners of a regular polygon, might thus revolve in their own plane with a circular motion. There would need only a definite relation between the angular velocity and the central force, or deflecting power. But if all moved also in parallel directions towards some distant body with a common velocity, the first relative motions would be unaffected, and the circularity retained. Thus any additional absolute motion, common to all the bodies, could not affect their relative motions, or the amount of force needed to counteract a tangential divergence. The second method, then, must fail, no less than the first, to bridge over the impassable gulf between relative and so-called absolute motions.

36. The result of these reasonings may be summed up, I conceive, in the following axioms:—

1. All the motions, of which we have or can have any experience, are relative motions only.

2. Relative motions might be turned into absolute, if the absolute motion of any one body with reference to mere empty space, could be ascertained. But this discovery is impossible.

3. Absolute motions are thus a mental illusion, and nothing more. We first invent or mentally conceive an immense number of points, having fixed place-relations to each other, and then, still conceiving these as without motion, think of known visible bodies as moving with reference to them.

4. Real motion is a change of place with reference to really existing bodies.

5. Imaginary motion is a change of place with reference to points or bodies only *conceived* to exist.

6. The language of relative motion is equally true, and scientifically faultless, whatever plane of vision or point of sight we assume, to which the changes are referred.

37. These axioms, if true, will help to clear away a mist which has rested on this whole subject from the time of Copernicus down to the present day. The remarks in the Fifth Essay are one signal example of an error and misconception, which has very widely prevailed. Professing to be wiser than common speech and the language of the Bible, Modern Science has overleapt the bounds of truth, and become guilty of unscientific error. This same error, which imputes inaccuracy and falsehood, not only to the language of Scripture, but to the daily speech of all mankind, has

beguiled men of science into vain pursuit of a phantom which can never be found. Relative motions have been set aside as unscientific, and replaced by others, called absolute. But these in turn, when examined, have proved to be only relative. The chase after the absolute has then been resumed in a second stage. Five of such changes may be noted. The basis or fixed standard has been taken, successively, at the earth's surface, the earth's centre, the sun's centre, the centre of the solar system, and some point far away in the depths of the starry universe. Out of these successive points of sight, the Ptolemaic, Tyconic, Copernican, Newtonian, and Herschellian systems have arisen. The last of these, with Mädler's unproved and most improbable conjecture, offers Alcyone as the unmoved centre for all the twelve hundred stars, on which the calculations of the solar motion depend. But in this fifth stage we are just as far from having attained absolute motions as when our journey began. Utter emptiness and nothingness is a wholly unsafe anchorage, either in the neighbourhood of the Pleiades, or of our own system, and no grappling-irons can possibly be found.

38. On the other hand, when we frankly accept the truth, that the only motions we can know, measure, or experience, are relative, that is, of one or more real bodies with reference to other bodies equally real, our perplexity will disappear. It is true that the earth turns on its axis daily with respect to the heavenly bodies. It is no less true that all the heavenly bodies revolve daily with reference to each of the many surface-planes of the earth. It is true that the earth, every year, revolves in the ecliptic plane around the sun. It is no less true that, with reference to the earth's centre and in that same ecliptic plane, the sun circles once in the year around the earth. With reference to the sun's centre, all the planets move approximately in ellipses, with the sun's centre in the near focus. But with reference to the earth's centre, it is true that all the planets, though not the sun or the moon, move in cycloids of a very complex form. Each of these sets of relations is equally relative, equally scientific, and equally true. No absolutely fixed point has been, or can ever be found, so as to set aside one or all of these relative motions, and convict the language which embodies them of scientific falsehood.

39. The rising, culmination, and setting of the sun, moon, and stars, the transit of Venus across the sun's disc, the travelling of the moon over the sun in an eclipse, the occultation of stars, the entrance of stars into the field of a telescope, the preceding and following parts of the heavens, the immersion and emersion of Jupiter's satellites, are all phrases scientifically true. They are not mistakes or falsehoods, but facts of relative motion, strictly and rightly expressed. Other statements, which give the motions

in each case from other points of sight, may be equally true, and also needful for some purposes of science. But it is sciolism, and not science, which offers us the motions relative to some distant, inaccessible point of sight as the absolute motions, and denounces all the rest as unscientific and untrue.

40. All known and experienced motions are relative. Absolute motions, even if they did exist, could never be discovered or known. The question that remains is the comparative use and importance of the different sets of relations. Something or other must be assumed to be at rest, and we may adopt either a mechanical, sensible, or moral standard of the relative value.

If we take a mechanical standard, we must deal with the material atoms alone. Here equal force or mass is the one test of value. The whole earth thus exceeds immensely the mass of any mountain or plain on its own surface. The mass of the sun is far greater than that of the earth, and the sum total of all the stars in the firmament is some thousand times, possibly some millions of times, greater still. There will thus be a clear gradation in the importance of the relative motions, tried by a mechanical standard, from those which have reference to some one locality of the earth's surface, to those which relate to an unknown dynamical centre of the whole stellar universe.

41. When we consider motion with reference to the senses and faculties of living creatures, a wholly different order of importance is revealed. Our earth, on its surface, is peopled with countless forms of life. These are wholly absent from the void places of the system, and all but the surfaces of the other planets; and of their presence even there we have no assurance. And thus the relative motions, as viewed from all places on the earth's surface, have an importance shared by few, and possibly by none, of the countless varieties of sets of such motions, as viewed from other points of sight, in their bearing on the sensations and activities of the whole world of animated existence.

42. Again, the mechanical or solid proportion of things, and the visual, are not the same. The universe is twofold, as present to the eyes of every known living creature. One half belongs to the skies above, the other to the earth below. The celestial hemisphere presents only a few objects, dispersed over its blue vault, and these are accessible by one sense alone. But the terrestrial half, the earth's surface, is filled in every part with objects that come within the range of all the senses, and affect most intimately, in various ways, the safety and welfare of every living creature. Thus the relative importance of the two visual hemispheres reverses that of their absolute dimension or size; and the ratio of masses and momenta, for all the uses of life, has to be displaced and superseded by another of a wholly different, and almost opposite

kind. The earth's surface supplies, every moment, myriads on myriads of points of sight, and determinants of visual place and motion, for immense multitudes of creatures, while we have no certain assurance that such points of sight exist elsewhere in any part of the solar system or stellar universe.

43. Our earth, however, is not simply the home of animal life, but of reasonable and moral agents. It is "given to the sons of men." Animal life is higher and nobler than lifeless matter. But reason is far higher and nobler than animal sensation and life alone. Yet man is so wonderfully formed of body and soul, that for these creatures endued with reason, as well as for irrational animals, the only real points of sight and centres of experience and observation are on the surface of the earth. The importance of the relative motions, estimated from all the planes of the earth's surface, is thus still further intensified and increased. Men can indeed project themselves in thought beyond their actual place on the earth's surface, and contemplate the universe from ideal positions, never really attained. But these mental excursions belong to a small number only, and even in their case must be rare, compared with the hourly experiences of human life. For millions on millions of mankind, the constant point of sight, by which all motions are estimated, and to which they are referred, is some part of the surface of the earth. To each and all of them the earth is seen to be at rest, all its visible parts keeping a fixed and settled relation to each other, and the lights of heaven are seen to travel in daily circuit around it. Thus the relative rest of all the different parts of the earth's surface, and the daily revolution of the heavens, are the two main facts of constant experience, which need to be embodied in the language, and minister to the wants and uses, of daily life. The same language, thus used instinctively by every nation under heaven, is alone suitable and appropriate to be used in every Divine message; which, through facts of earlier or later history, addressed to the senses of men, would appeal to their conscience and reason, and reveal to them great moral and spiritual truths. If the Most High God speaks to men upon earth, He must speak to them as being what they are, and where they are. The point of sight, from which motions, changes, and facts of history are set before them, must be real, not fantastic, ideal, and remote. It is through their senses and daily experience, and not in spite of them, that the All-wise God must appeal to the heart and conscience of all mankind.

44. The charge, then, in the Fifth Essay, that to understand and interpret the Bible optically, or with reference to motions and changes, as seen from the earth's surface, is to make it equivocate and "palter with us in a double sense," is preposterous and absurd. It is the only course, which is consistent alike with plain common

sense, and the gravity and simplicity of a Divine message. Sunrise and sunset, and the daily circuit of the stars through the sky, are not blunders and falsehoods, to be excused in the common people on the ground of their ignorance of science, and fatal to the inspiration and authority of writings that claim to be the words of the living God. It is the accusers who are unscientific, and not the popular speech which they censure, or the Bible which they would deprive, on such grounds, of its claim to be "the true sayings of God." The first main count in the indictment, which would degrade the Word of God to a merely human level, because it is said to espouse the Ptolemaic, and not the Copernican theory, is frivolous and vexatious. Newton rejects and disclaims it, and the ground of that rejection is clear and simple. If the meaning of words is fixed by usage, the Bible in this case merely conforms to the usage of all mankind. But I believe that he is quite mistaken when he adds the remark that they "no less defile the purity of philosophical truths, who confound real quantities, that is absolute motions, with their vulgar measures, that is, the relative motions." For absolute motions are not measured at all: by the relative, but are the very same, increased or lessened by some unknown difference. All the relative places and motions of the parts or atoms of a real universe, however vast, may be known and compared at least in thought. But who can fix and anchor that universe in mere empty space, or bind and fasten the whole to infinite nothingness and negation of all being? Relative places and motions may be, and have been, measured, and one actual distance of two bodies may serve as a measure and standard to all the rest. But the so-called absolute places and absolute motions have no possible point of departure from which the measurement can begin. They are merely an unknown, unmeasurable pathway from nothing to real being, and from real being to nothing.

45. These remarks, if true, will clear away a mist of deep prejudice which has gathered in these days around the statements of the Bible, and tends to obscure and impair, even among sincere Christians, the full sense of their Divine authority. They will serve to prepare the way for a further discussion of the errors, in detail, which have been laid to its charge, and especially in the Mosaic record of creation. Those who believe that Jesus is the Christ, the Son of God, the Word by whom all things were made, and in whom lie hid all the treasures of wisdom and knowledge, will find it impossible to believe further that the words He quoted with such deep reverence, and to which he referred the Pharisees in order to decide a moral question of high importance, are, after all, full of scientific errors, and contain simply the guesses of some unripe Hebrew speculator, who had not learned the modesty of modern science, and had no scruple in offering his own fancies as

the words of God. But they will find it not much easier to believe that either the Bible or its Divine Author is indifferent to the duty of scientific accuracy, and has offered to mankind the most precious and weighty spiritual truths in a setting very mainly composed of physical errors and falsehoods.

46. Man is composed of body and soul. God's messages to man are also twofold, containing facts that appeal to the bodily senses of mankind, and truths that speak more directly to their heart and conscience. And these two elements are as closely conjoined in the message, as soul and body in the person to whom the messages are given. It is a strange and groundless fancy, that we can reject the facts of the Bible, and stab to the heart its historical veracity, and still retain the authority of its truths unimpaired. The words of St. John apply here by a very close analogy. "He who loveth not his brother whom he hath seen, how can he love God whom he hath not seen?" He who believes that the Bible is mistaken in all its notions of the physical universe,—that in Astronomy it follows vulgar errors, in its Cosmogony contradicts the clear teachings of science, and in its history of man's origin is wrong both in time and place, and in almost every other particular,—how can he possibly believe that it is an inspired message from Heaven, on which we may rest our souls for time and for eternity?

I believe all such concessions to be as baseless in point of science as they are mischievous and delusive in their moral aspect. Whether they are held by sincere Christians or open unbelievers, I think they ought to be resisted and opposed with all that depth of conviction which springs from a firm reliance on the teaching of our Lord and Master, the incarnate Son of the Most High. Science, and especially Geology, is now passing through an imperfect and transitional stage. The time will come when all recent discoveries, freed from spurious additions, which have no ground but the rashness of premature guess-work, will be lit up with clear sunlight, and open out a wider and better defined landscape; and, while we gaze upon it, the truth, wisdom, and harmony of the Divine message will stand revealed to us with a completeness and grandeur never known before.

The CHAIRMAN.—It is now my pleasurable duty to convey our thanks to the Rev. Canon Birks for his admirable paper.

The HON. SECRETARY.—Professor Birks has asked me to lay before you the following letter, which he has received from Professor J. Clerk-Maxwell, F.R.S., Professor of Experimental Physics in the University of Cambridge.

11, *Scroope Terrace*, 21st March, 1877.

DEAR PROFESSOR BIRKS,—I have read your lecture again, but am unable to say more than to thank you for the clear way in which you have set forth the proper use of language with respect to motion. Whenever we begin to subject the primitive phraseology about natural events to scientific analysis, our language becomes stiff, and cramped, and unpoetical, because it is built upon a framework of new and rough scientific hypotheses which have not yet been settled into their proper places even by experts, and which to the mass of mankind are nothing but jargon. In this state of things, poetry and science are supposed to be in opposition to each other; and if science is admitted deficient in grace, poetry is suspected to be indifferent to truth.

But as soon as the scientific analysis has been made in a satisfactory manner in any particular subject, it becomes evident that the primitive phraseology which stood the test of experience for so many thousand years is really the most scientific as well as the most elegant, and that it does not convey any false impressions to those who have studied the matter, any more than to those who have not.

Thus, our phraseology about the thermal phenomena was put into confusion last century by those who said there was no heat in the fire, nor anywhere else, except in our minds.

We now agree in language better with our remoter ancestors when we measure the quantity of heat given out by a pound of coal, and we never think of confounding what we are measuring with a sensation.

Yours, very truly,

J. CLERK-MAXWELL.

I have also received the following letter from the Plumian Professor Astronomy at Cambridge :—

March 31, 1877.

I THANK you for sending me a copy of Professor Birks's paper "On the Bible and Modern Astronomy." I have read it through, and can say of it generally that I consider it to be an able contribution towards settling the question of the mutual relation between the revelations of Scripture and the discoveries of modern physical science. The only particular remark it occurs to me to make is, that I cordially agree with what Professor Birks has said in art. 17 of the essay, where he speaks of "the looseness of thought which sets down every unproved hypothesis started by physical philosophers as a firm and established fact of science," and condemns "the easy credulity with which some Christian men are ready to take up the newest scientific guesses, and not only sacrifice to them a considerable part of their own faith in the Bible, but exhort others to do the same, as a triumph of Christian candour over the blindness of prejudice." I think, too, that Professor Birks has well exposed the inappropriateness of the view taken by Canon Titcomb (in art. 24 of his paper "On Certain Magnitudes in Nature") as to the bearing of Mädler's unproved conclusion, that the star Alcyone of the Pleiades is at the centre of gravity of the stellar system, upon the interpretation of Job xxxviii. 31.

J. CHALLIS.

The Rev. Prebendary IRONS writes :—

I am sorry Professor Birks directed his arguments against one of the "Essays and Reviews" of the last generation of thinkers, as they may be called. What would have met the object of Prof. Birks's paper would have been a brief statement, which he is so competent to make, of, first, certain outlines of the modern astronomy; next, the indications in the Old Testament of the truth of those outlines, together with the admission of the popular language of some passages, not more inconsistent with the latent truths in other places, that is, our own popular language, *e.g.* as to the sun's "rising and setting," with the scientific acknowledgment of the "Copernican system," as it is termed. The language is sometimes popular, sometimes poetical, sometimes scientifically true. "The sun goeth forth" to the uttermost parts of the heavens is popular; God "callesth the stars by name" is poetry; "He hangeth the round earth upon nothing" is science.

I would point out that almost all the graver questions (and they are but few) raised on this subject are, and will long continue to be, questions of exegesis, and not capable of being judged by ordinary Bible readers, who must be content to use their Old Testament for spiritual edification, and satisfy themselves with the assurance that neither men of science who can read Hebrew, nor Hebrew scholars who read science, have yet found any instance in the Sacred Scripture of a statement opposed clearly to known facts of science. But I would go further, and add that, were it otherwise for the present, yet ordinary Christians, and the Bible too, can afford to wait till men of science make themselves a little more clear and a little more certain.

Meanwhile our scientific doubters or critics seem to be bound to be more explicit. They should place side by side, in columns if they will, the facts of astronomy, or any other certain science, and the texts which deny them. There has been a great deal of loose talk on this subject, and not a little desire to look candid and knowing and liberal on the one side, and look devout and orthodox on the other.

Rev. Canon TRICOMB.—I am sincerely thankful to Canon Birks for having again brought forward this subject, because, however greatly our views may differ, I am satisfied that good only can result from its free and full discussion. Yet with regard to the paper which has just been read, I cannot but complain of its injustice; for there seems to me to be a spirit in it which seats itself in a chair of dogmatic and infallible authority, and demands that all dissent from its utterances should be relegated to the empire of religious unbelief. Now, sir, I lay no stress upon the fact that this is rather hard upon a man who has all his life long been preaching and speaking and writing in defence of God's Holy Word, and who has taken an active and public part in endeavouring to stem the progress of infidelity. I say I lay no stress upon that fact. But I *do* lay great stress upon the next fact which I mark in connection with this paper, *viz.*, its mischievous confusion of thought, in bracketing the opinions of Mr. Herbert Spencer, who denies revelation altogether, and of Mr. Goodwin, "the fifth Essayist," who acknowledges it only in part, with any one like myself, who believes in Divine Revelation as tenaciously as Canon Birks. I venture to submit, sir, that this sort of criticism radically fails to distinguish between things "which differ," and that while it may serve the purposes of controversy it

can never serve the interests of truth. In any such hasty generalization as this you may be sure there lies some mistaken judgment, some sort of hidden misrepresentation. It is so here. Of course I do not for a moment accuse my brother of intentionally misrepresenting me, yet he certainly has done so. Hurried along by that rapidity of thought which so often belongs to acute but impulsive minds, he has come to the conclusion that because I am contending for theology and philosophy as occupying two distinct spheres of thought, and as having two separate missions in the world, I therefore exclude from Divine teaching all facts in Scripture which bear upon the natural sciences. If you look to the conclusion of his 5th paragraph, you will see the following words:—"The partition in Canon Titcomb's paper is different. All moral and spiritual truth is placed on one side; all outward facts, and physical, zoological, and human changes on the other." Now, sir, I protest, in the first place, against this artificial summary of my views, because the words are not my own. I never once used the terms, "outward facts," "physical, zoological, and human changes"; nor, indeed, anything like them. In appropriating them, therefore, to myself and saying that I have separated them from the teaching of Divine Truth, my friend has simply set up a hobgoblin and hunted it down for his own intellectual gratification. I no less object, however, to the ambiguity of this language. "*All moral and spiritual truth is placed on one side.*" "On one side"—of what? Again, "*all outward facts, &c., on the other side.*" On the other side—of what? The whole statement is loose and undefined. It is true that the sentence begins with an acknowledgment of my views being different from those of the two other writers before named; nevertheless, the difference is expressed so vaguely that no one can tell what it means. The plain sense of the words, when taken in connection with the general scope of the paragraph, undoubtedly implies that I place "moral and spiritual truth" within the scope of Divine Revelation; but "all outward facts and physical changes" on the outside of it. I cannot but believe that I am right in this assertion; for the paper just read states that my attempt is to maintain the doctrinal authority of Scripture, and yet to impute to it a merely human authority (§ 6). Now, sir, if that be the intended sense of the passage, I not only repudiate it as false; but I defy any careful reader of my paper to find in it one single word for its justification. Take, for example, the interpretation which I gave of the first chapter of Genesis. Is not that chapter full of "outward facts and physical changes"? Yet, the very basis of the whole reasoning upon it was, that Moses received it from God under the form of a Divine vision. Canon Birks may object very fairly to my belief in this series of facts and changes as having been communicated to Moses under a vision. That I allow. Although why he should object, I know not; seeing that Balaam's and Micaiah's revelations were given by vision, and that when Isaiah described the mountain of the Lord's House, established in the tops of the mountains, and all nations flowing into it," he distinctly declared it to

have been the word which he saw. And how could he have seen it except by vision? Still, I say, my friend Canon Birks may very fairly differ from me in that line of thought. But it is impossible for him to say that I have separated the facts and changes recorded in the first chapter of Genesis from the limits of Divine Revelation, when I have expressly declared them to have been supernaturally communicated. It may be, however, that my friend will fall back upon another meaning to his words. He may contend that while I place the whole of this chapter within the compass of a Divine Revelation, I nevertheless separate its "outward facts and physical changes" from "all moral and spiritual truth." But, even were this his meaning, I no less repudiate the charge as unfounded. For those who take the trouble to read paragraph 27 of my paper, will distinctly see that I treat the very *facts* communicated to Moses as the basis of moral and spiritual teaching. For example, I describe the six epochal alternations of evening and morning in Genesis i., with all their successive changes, as having been revealed by God under the form of natural days, for the express purpose of introducing to man the institution of the Sabbath. How, then, can it be affirmed that I separate those "outward facts" from the teaching of moral truth? On the contrary, I deal with them as having been an ordained vehicle for the communication of that truth. Thus, the charge of Canon Birks, in its second form, no less than in its first, bursts, under this analysis, like an empty bubble. Nor is there anything else in my paper which justifies the charge. There cannot be found a line in it which separates the teaching of spiritual truth from the record of physical facts. How could such an opinion be held, or such a statement be made by any sincere believer, when facts of that nature are inextricably inseparable from parts of Scripture, like the "History of the Deluge," "The Birth and Resurrection of our Lord," and, indeed, the whole series of "Miracles," from one end of the Bible to the other? The truth is, that this partition between the "outward facts and changes" related in Scripture, and its "moral and spiritual teaching" is a wholly gratuitous assumption of Canon Birks, and one which I repel as demonstrably and utterly false. What I did say in my paper was (and here I nail my colours to the mast, and intend to hold them against all comers), that it formed no part of the purposes, either of inspiration or of Revelation, to express facts bearing upon questions of science with scientific accuracy; the sacred writers being left to clothe them in the popular phraseology of the times in which they lived, on the ground that they were not intended to teach science, but solely to convey moral and spiritual instruction. The question, therefore, between myself and Canon Birks, is not one which affects the truth of any facts or physical changes recorded in Scripture; nor is it one which affects those facts as having been made use of for the conveyance of moral and spiritual teaching. On those points, as I have now clearly shown him, we are agreed; notwithstanding that by too superficial a study of my paper, Canon Birks has been pleased to think otherwise. The real point of difference between us, is whether it be possible

for the Scripture record of outward facts and physical changes in nature to contain any infallible communication of moral and religious truth, when from a scientific point of view the language employed in such records may not always be infallibly exact. Canon Birks thinks that if *any* portion of Divine Revelation be scientifically correct, all is of necessity bound to be so. But is not this an unwarranted assumption? For *how* can any man tell, that, in matters upon which it was no part of Revelation to instruct us scientifically, God should not have been pleased to be more exact in one part of His Word than in another? How can Canon Birks, or I, or any one else transfer our ideas to the mind of the Infinite, and say what God ought to have done, or ought not to have done? The question is what He has done? But, then, it is said that an admission of the least inaccuracy of expression, even as to a scientific fact, must necessarily deteriorate the moral and spiritual teaching of the Bible. But why? For if it formed no part of the Divine purpose to teach science in Scripture, then the scientific accuracy of its language may well have been subordinated to its real purpose, viz., its moral and spiritual teaching. Why should this view weaken the authority of inspiration? Is the authority of inspiration weakened because Old Testament Scripture represents God under the form of a Being who has human parts and passions when we know that He has not? And when this is done, moreover, not only in poetic books, but even in the historical? Is it not evident that God was pleased in the early education of His Church to deal with it as a teacher does with children, stating facts somewhat immaturely for the purpose of suiting its imperfect powers of comprehension? If God did this, in a manner which cannot be gainsaid, with reference to His Person, why should it be thought incredible for Him to have done the same in relation to His Creative works? How can this latter view weaken the authority of inspiration? It may do so among those who have been nursed in the belief that any other view of inspiration is wrong. But among men of science who are drifting into a sea of doubt and uncertainty, and who are disposed to reject the Bible because they have been told that its inspiration must necessarily involve as much infallibility in scientific matters as in things relating to everlasting life—among such persons this view of the question is most helpful and reassuring; and so far from weakening the authority of God's Holy Word, strengthens it. I am aware that such an appeal to consequences is no test of truth, neither do I use it as such. I only mean that it is as much to be considered on my side as on the side of my opponent; and that if he is right in appealing to his views on the ground of their being necessary to sustain the faith of those who believe, as I think, too much, I am no less justified in appealing to my views on the ground of their being necessary to help forward the faith of those who believe too little. In reality, however, the investigations of truth ought to be quite independent of any consideration of results; for whatever consequences may flow from its discovery, truth will always take care of itself: it can never perish. In the course of

this search after truth, however, I must beg to remark, as I did in my paper, that we ought never to attempt to force the doctrine of Bible inspiration "along preconceived and self-determined lines of our own making"; but to take it "just as it stands, interpreting it according to those necessary laws of sequence which accompany the discovery of actual facts." If we go beyond that I am convinced we shall "weaken the evidences of Divine Revelation instead of strengthening them; and in our vain attempt to uphold the Word of God by insecure props we shall bring it down with a crash." Feeling this most conscientiously, I will only end my reply by observing of Canon Birks's paper, as he has done of mine, that I consider it to be "adverse and not helpful to the cause of Christian truth."

Rev. A. I. MACCAUL (Lecturer in Hebrew at King's College).—I have listened with great regret to what has fallen from Canon Titcomb. My belief in regard to this matter is, that in the first chapter of Genesis we have neither visions nor pictures; but a narrative of the same kind as we have in any other portion of the Scripture. Where there are visions in other portions of Scripture we are always told that they are visions.* Nor is there any trace of a poetical origin, although some urge that the description may be regarded as poetical. It contains no evidence of the rhythmical arrangement that is found in poetry; but is all prose—straightforward, natural prose, and before I give it up I shall require that some mistake or error is not only alleged, but proved against it. Many objections have been brought against the Scripture; but let them be brought in detail, and we will consider them in detail. (Hear, hear.) We are told by some that those portions of the Scripture which are in apparent opposition to facts have been falsely translated; but let those who make this assertion bring forward the instances, and we will consider them. I am not aware of such cases, and think that the paper read by Canon Birks is a gratifying and satisfactory one. (Hear, hear.) It is a gratifying explanation and justification of the language of Scripture. Why, we have at the present moment even scientific men talking of the sun rising and setting, and crossing the line. Indeed, scientific men are in the habit of applying popular forms of speech and phraseology to scientific facts that can scarcely be realized, except by scientific men who have very closely studied the subjects to which this language is applied. It is, therefore, no argument at all against the credibility of the Scripture, that popular language is used upon scientific subjects.

The Rev. Canon TITCOMB.—No one has said anything against the credibility of Scripture.

Mr. MACCAUL.—I think it a sad thing to allege that there are inaccuracies in Scripture in a broad way; indeed, I regard it as a very grave and serious offence. I do not hesitate to use the word "offence" (hear, hear), and I repeat that if there are any of these inaccuracies, let them be brought forward

* If a vision is something presented to the sight, physical or mental, the account of Michaiah does not conflict with this statement.—[A. I. MACC.]

in detail, and we will consider them. I cannot at this moment go back to the paper read by Canon Titcomb some years ago, but I gave my attention to it at the time, and what struck me particularly was that there were one or two reasonings in the paper based on erroneous translations of the first chapter of Genesis. First, with reference to the two ways in which the 20th verse is translated—a matter to which Canon Birks has referred in his paper—the translations as to the birds and the water. The passage as it is given in the Bible, is,—“And God said, Let the waters bring forth abundantly the moving creature that hath life, and fowl that may fly above the earth in the open firmament of heaven.” In the original Hebrew version there are two co-ordinate clauses : the Versions mostly have the verse as it is in the English version ; but in the Syriac and the Samaritan it is the same as in the Hebrew ; and Dachselt, in his *Biblia Hebr. Accent.*, gives his attention to this verse as well as to many other passages in the Old Testament, and shows that it is not correct to translate the verse as it is given in the English version. The Hebrew verse is divided into two portions—not necessarily of equal length—and in this verse the primary division comes after the word which corresponds to the English “that hath life.” The primary division is, “And God said, Let the waters bring forth abundantly the moving creature that hath life,” and it is urged, and I have no doubt correctly, that the second clause of the verse should be not subordinate to the first, but co-ordinate with it. There are two co-ordinate clauses standing side by side, and not necessarily having any connection with each other. There is one other point on which I desire to say a word, and that is as to the statement sometimes made that Biblical students are indebted to the students of science for the notions now generally held with respect to the antiquity of the earth. I think I am right in supposing that the opinions now held with reference to the antiquity of the earth are of comparatively recent date ; whereas Dathe, who was appointed Professor of Oriental Languages at Leipsic in the year 1762, says : “Jam pergit (v. 2) de terrâ, eam, *incertum quo tempore, insignem subiisse mutationem.*” And Schultz, in his *Scholia in Vetus Testamentum* (Norimbergæ, 1783, page 9) says : “Probabilior fit eorum interpretatio, qui Mosen h. l. de telluris nostræ *ante innumera sæcula create, insecutâ post varias revolutiones vastatione sive destructione loqui putant.*” I pointed out in a paper that I once read here, that we are limited in our interpretations and explanations by the original ; and if it cannot be proved that the original language contains what is contrary to modern science, we are in a position to grapple with the matter ; but until that is done we have no reason to be afraid. I beg to express my thanks to Canon Birks for his exceedingly instructive statement.

Rev. G. CURREY, D.D.—There have been many statements made with very great force by speakers on both sides, and I shall not attempt to enter fully into all the points that have been touched upon, some of them at considerable length. I will only say, with regard to Canon Titcomb, that I cannot but sympathize with him in a great degree, because, in the paper he

has read, Professor Birks, although probably he did not see the full force of some of the expressions he has used, seems to have somewhat severely attacked Canon Titcomb, whose statements have certainly been misinterpreted. (Hear, hear.) And I must be allowed to say, without any wish to use the language of indiscriminate censure, that Professor Birks has, in my opinion, laid himself open to the charge of representing the statements of his opponents not as they themselves mean them to be understood, unintentionally, of course. I formed this opinion in reading the paper calmly at home, before hearing the rather warm discussion of this evening; and I must plainly express my opinion that this fault runs throughout the paper, in which Professor Birks attacks opinions which are inferences from, not statements in, the books which he takes in hand. There is an instance of this in his treatment of the Fifth Essayist. The Essayist says (*Essays and Reviews*, p. 209), "It would have been well if theologians had made up their minds to accept frankly the principle that those things for the discovery of which man has faculties specially provided, are not fit objects of Divine Revelation." This is all he says. Now, I will ask you to look at the mode in which Professor Birks, in sec. 5 of his paper, represents or paraphrases this expression of the Essayist before he proceeds to refute it. Professor Birks says:—

"Thus the threatened conflict between Science and Revealed Religion is averted, both by the Essayist, Mr. Herbert Spencer, and Canon Titcomb, by a treaty of partition. But the line of demarcation has a very important difference. With the Essayist, all belongs to Science, which men have faculties given them to investigate and understand. If there are any subjects beyond the range of our faculties, on which they can teach us nothing, these are resigned to Supernatural Revelation."

Now, I ask Professor Birks to consider whether this is a fair paraphrase of the statement of the Essayist? (Hear.) The Essayist merely says that he can receive frankly the principle that those subjects for which man has faculties specially provided, are not fit objects of Divine Revelation; and then, when this has to be refuted, it is represented that the Essayist says, that all subjects of knowledge for the consideration of which man has faculties provided, are to be excluded from the domain of supernatural revelation. Is that the same thing as the statement of the Essayist? Professor Birks has also made large use of the *argumentum ad invidiam*. Is it possible, he asks, to believe that the all-wise God should make His revelation in language which is unscientific, erroneous, and untrue? Now the word "unscientific" is ambiguous. It may mean that the scientific element is absent, or that the language is contradictory to Science. These two meanings differ from each other. The opponent uses it in one sense, and Professor Birks argues as if it had been used in the other. It may be allowed that some who have propounded novel theories have made use of startling expressions; but if any Christian apologist ever applied the epithets "erroneous and untrue" to any words of Scripture, the exact words of the author should be quoted, and the exact sense in which they are used should be clearly shown,

before the opponent proceeds to refute them. But one would fancy, from Professor Birks's paper, that this proposition was actually maintained without qualification. The answer to this fancied assertion is contained in a very elaborate, and I will also say a very interesting, discussion with regard to the nature of absolute and relative motion.—A member has termed it a hard metaphysical discussion. Now, I do not regard it as metaphysical, for I think it a little physical. (Laughter.)—It is, indeed, interesting to have Newton's opinions quoted, and although it requires a good deal of study to make it all out, if you do succeed, you have arrived at something worth considering. But, after all, what does it come to? It comes simply to this, that when we speak of the sun going round the earth, this may be, in connection with the idea of relative motion, as scientifically true as if we spoke of the earth going round the sun. But this does not bear on the question of the accuracy of the statements contained in the Scriptures. I do not know that the Scripture ever said anything about the sun going round the earth; certainly not in the sense in which we use the phrase Scripture. It never recognizes any antipodes, and therefore the motion that takes place, whether of the earth round the sun, or *vice versa*, was utterly unknown to the writer of Holy Scripture. And here I would say that we must not separate Scripture from the writers of Scripture. It is stated in the paper we have heard read, that "Scripture says this," and "Scripture says that," that "Scripture uses such and such language." No; Scripture does not use language; but men who were guided by the Spirit of God use the language found in Scripture. In thus employing men to write the Scriptures, God did not guide them as to the language they used with reference to matters connected with science in any other sense than what was in accordance with the popular theories of the day. I have little doubt that those Hebrew writers, when speaking about the earth and the sun or any physical subject, had much the same notion of the nature of their motions as the rest of their countrymen; nor can I conceive that revelation was conveyed to man in such a way that the reader would gather one meaning while the language he read meant another. If the words of Holy Scripture were written by different men, according to the conceptions God had granted them, and in the popular language of the day in which they usually expressed the same conceptions, we may fairly suppose, without derogation to divine revelation, that God, when He reveals moral and spiritual truths to man, has made use of intelligent men as the instruments of His revelation, and that they have understood these things in the way in which they have represented them. Of course, this does not affect the question with regard to prophetic utterances; but we are not discussing prophetic utterances, we are discussing the meaning of the ordinary language of Scripture, and that I think is plainly the popular language applied to the theories of the day in which the writers of that language lived. So far from this being a derogation from the divine authority of Scripture, it is to me the most fitting way in which I

can conceive divine revelation should be made. The discussion entered upon in this paper as to relative motion might seem to show that inasmuch as when we speak of the sun rising we are speaking only in a popular and not in an accurate way, so, upon close investigation, it may be said that it is not accurate to speak of the sun as being stationary. But this merely amounts to saying that, so long as knowledge is imperfect, all language on such subjects is, in a certain sense, "unscientific," and that therefore it is not really derogatory to Holy Scripture to call its language "unscientific." In the main part of his paper, Professor Birks departs from the proposition with which he started, namely, the revelation of the Mosaic cosmogony made in the first chapter of Genesis. Upon this question the Professor leaves us where we were. He assumes that there must be a cosmogony in that chapter, but throws little light upon its nature. It is easy to say, generally, "It must be true, because God has spoken it." Of course, it must; but in what sense is it true? If you say it must be true in its natural sense and in the sense in which I understand it, that settles the question. But we do not know the way in which it is true. And if we strive to discover it, we must advance our theories with modesty, and accept those of others with toleration, even if they should maintain, as some have maintained, that the chapter in question does not contain any system of cosmogony at all. We owe our thanks to Professor Birks for the great pains he has taken in composing this paper. A great part of it is to me very interesting, especially that portion which refers to the Pleiades, and the fishes and the birds, for it confirms the view in which I ventured to differ from Canon Titcomb when his paper was read; namely, that we should not attach much importance to the alleged discovery of recondite truths by accidental and casual remarks that are made in the Scriptures. (Hear, hear.) It impresses upon us the importance of remembering that the endeavours which are sometimes made to fix the discovery of some recondite truth by reference to some merely casual remark in the Scriptures are very dangerous. (Hear, hear.) I have frequently heard it said that a remarkable proof of a recondite truth is to be found in some such casual remark; but when we come to examine the so-called recondite truth, we find that it is no truth at all. In that case those who have made a weapon of this discovery have it turned against themselves. After all I believe that Professor Birks and myself are not so much at issue, for in one part of his paper he speaks a good deal about the manner in which revelation is understood by man. You must speak of a thing as you see it. Although you may speak of absolute motion, you can only observe relative motion. That is all I contend. I say that the language of Scripture is according to the observation of those who wrote it; and in saying this I in no way detract from the Scripture. Professor Birks has, perhaps in the warmth of controversy, expressed himself rather hastily, and he has attributed to his adversaries statements which I am sure he would not have imputed to them on further consideration: in fact, begging of the question. Professor Birks has shown that observations and

descriptions must be made of phenomena according to the way in which they appear to the observers ; and if an infidel objects to the Scripture as erroneous and untrue because the scientific descriptions are according to the phenomena as popularly understood, I should reply by saying, not that the language used is the word of God, and must be true, but that the statements are made in the natural and the only way in which such revelations could be made. (Hear.) The statements of Scripture may not be in accordance with the definitions of abstract science, but may be simply agreeable to the appearance of things around us ; but this would not make them "erroneous" or "untrue." If any one calls them so, he uses improper and irreverent language, and renders himself justly liable to censure for such an improper way of speaking. But we must not imagine that we have disproved the theory, because we suppose that it involves the supposition that the statements of Scripture are "erroneous or untrue." This is, in fact, to beg the question. It is enough to answer that the epithets are improperly applied, whether by those who maintain, or by those who deny the theory ; and if, by improper use of terms, the maintainers damage their cause, the opponents do not establish theirs by *assuming* that such terms are properly applied. I am sure Professor Birks will agree with me in saying that he does not wish to attribute to Canon Titcomb anything like disbelief in the authority of Holy Scripture ; and I may add that perhaps Canon Titcomb was a little warm in replying to the paper, and imagined a more serious kind of attack than that which was really made upon him. I think that this discussion has been a very interesting one, although at the same time it has evolved a little more of the antagonistic element than we generally experience.

Captain F. PETRIE.—It has been stated by a leading member of one of our universities, who saw the proof of the paper just read, that *the astronomy and geology of the Bible are not considered by some men of science to be those of fact*. Now, although such an expression is variously understood, yet, accepting it in what I know to be its popularly received sense, I venture to make the following remarks. Some years ago, when the *Essays and Reviews* were published, a number of our most learned men were selected to give "replies." Amongst those selected to write were the *Radcliffe Observer*, and the late Mr. Phillips, Professor of Geology at Oxford. The former, in his reply, alluding to the Creation as given in Gen. i. 2, 3, said,

"Nothing can exceed in truth and grandeur these words of the inspired historian. Like the bold touches of a great artist, they create a picture which no after-addition or refinement can improve. The only passage besides these which concerns me as an astronomer, is that which describes with equal majesty the works of the Creator beyond the earth" (Gen. i. 14—18). "The most keen-eyed hypercriticism should see nothing to object to, as unworthy of an inspired pen, in this grand assertion of God's creation of the sun, and moon, and stars, and of the provision which He made by them for the necessities of His creatures."

Professor Phillips in his statement, speaking of his work as a geologist, says—

“There has never been produced in my own mind . . . the slightest impression that we” (he, and those who studied under him) “were considering facts and laws in any way opposed to Christian Faith, to the inferences from Natural Theology, or the deductions from Scripture.”

I now turn to a paper by Professor Challis, F.R.S., Plumian Professor of Astronomy at Cambridge (*Transactions*, vol. ix. p. 140). He says,

“The language of Scripture neither is nor can be unscientific, that is, it cannot be *contradictory* to the language of Science.”

I again turn to a paper by Professor Dawson, F.R.S., one of our geological authorities (*Transactions*, vol. ix. p. 173) :—

“The Bible abounds in illustrative references to natural objects and phenomena ; I think it is the conclusion of all competent naturalists who have carefully studied these, that they are remarkable for their precise truth to Nature and for the absence of all theoretical or hypothetical views.”

These opinions, recently given, and coming, some from laymen, others from clergymen, are of some weight, and I may add that the roll of those who discover no contradictions between Science and Revelation contains many a great name in the scientific world ; amongst these we find one who is called “the father of the physical science school of our day,”—Professor Stokes (see prefaces, vols. v. and x.) ; two more have been specially prominent of late ; need I say I allude to Professors Balfour Stewart and P. G. Tait ?

The CHAIRMAN.—I will not detain you two minutes by the remarks I think it desirable to make. I merely wish to say that I think Professor Birks’s paper throws a little unnecessary fog over the relations of absolute and relative motion. In sec. 23 he thus quotes from Spencer :—“Nevertheless, absolute motion cannot even be imagined, much less known.” I perfectly agree with him that absolute motion cannot be known, but I do not agree with his statement that it cannot even be imagined. (Hear, hear.) It is quite as easy to imagine a point in infinite space to be at rest, as it is to suppose this table to be absolutely at rest upon the floor of this room ; that is, relatively to the floor of this room it is at rest. It appears to me quite as easy to imagine that a point in space may be absolutely at rest, and that the absolute motion of any other point or body in space would be its change of position with regard to the point which is at rest. It is perfectly true that we never can know anything of absolute motion or rest, because we never have the means of knowing what point in space is absolutely at rest. All that we know about motion is by measuring change of distance or of place by the relative distances of one point or object from another ; but it appears to me that it is perfectly easy to conceive, although you cannot measure, relative motion. The author of the paper says—

“Newton holds it doubtful whether any body is really at rest, though he thinks such a body may perhaps exist in some remote part of the universe.”

Whether any body in the universe is absolutely at rest or not, appears to me to be foreign to the question of conception. The writer goes on to say—

“We must revert, then, to another conception. Absolute motions are those which are referred to no real body at all, but to the point assumed to be immovable, of empty space.—Is this a true and valid conception? Do we really, in our thoughts, when we speak of these fixed points of empty space, introduce an immense number of hypothetical or imaginary atoms?”

Not at all. All we have to do with is a point presumed to be absolutely at rest, and the absolute motion of any body would be referred to that. There are several other passages in which there seems to be a confusion between absolute and relative motion, which appears to me to be unnecessary. (Hear, hear.)

PROFESSOR BIRKS'S REPLY.

As three speakers have made serious objections to my paper, and only a few minutes were left at the time for explanation or answer, perhaps I may reasonably claim, in the printed report, some space for a rather fuller reply.

And, first, I regret deeply that Canon Titcomb should have charged me with a misreport of his opinions, and almost with having classed him among adversaries of the Bible, when he has written and laboured in its defence for so many years. I have known and esteemed him for twenty years. He has been by my choice and his kind consent a mission preacher in my parish. I have called him in my paper, and thought of him as a friend. This would have been quite impossible, had I meant to imply the charge he supposes me to have made. I said that the essayist, Mr. Spencer, and himself, agreed in one point, that Science and Religion could be reconciled by a treaty of partition. But I added at once that the partition was quite different, and that while theirs really left no room or place for Supernatural Revelation, he reserved to it the whole range of moral and spiritual truth. My true meaning, I think, is quite plain. Had I dreamed he could so have mistaken it, I would have striven to make it plainer still; and in stating the partial agreement and difference, would have avoided putting the three names, even for a moment, in apposition; though it was only to show, within a dozen lines, the great difference between them.

The real divergence between us may be explained most clearly, from my

point of view, by a brief historical parable. Two officers, let us suppose, before Waterloo, are consulted by the Duke, on the line of defence to be occupied next day by the British army. The first says, "Beware, my Lord, that you do not occupy Hougoumont; it lies much too forward, out of your true line of defence. It will be the first point attacked, and cannot be held. The troops placed in it will be slaughtered, the rest will be demoralized, and the battle will be lost." The second says, "Be sure, my Lord, that you *do* occupy Hougoumont. Man it with some of your best troops, and hold it firmly. It lies forward, it is true, but it is an essential part of the position. If you give it up to the enemy, and only place your troops on the ridge behind, their first step will be to seize it. They will have a secure fortress, from which their artillery will enfilade the whole position. Whole regiments will be swept away by the raking fire, and the battle will be lost almost as soon as it is begun. But it has a strong wall that can never be forced. The strife will be hot and fierce. The enemy will swarm round it, and may occupy the orchard for a moment, but they can never make good their entrance within the building itself. We *can* hold it, we ought to hold it, we must hold it to the last, and the battle will be won." Both officers might be equally sincere in their advice, and fight with equal bravery in the field. And still, if the Duke had listened to the first, the result would have been just as disastrous as if the advice had been given by a secret enemy.

In these opening pages of my paper I am not really the assailant, as Canon Titcomb seems to think, but the defendant, and one who has been first assailed. In *The Bible and Modern Thought*, perhaps the most widely circulated of my works, I have given a hundred pages to this very subject. My friend, in his paper, lays down the law that his line of defence of Scripture is the only one tenable, and that mine is mischievous and unsound. He condemns it in the strongest terms. Now my present object was to carry one part of my previous argument a step further than I had done before, as to the harmony between the words of the Bible and the facts of modern astronomy. How could I do this, with his paper full in my face in the recent Transactions of the Institute, unless I first showed briefly some reasons for my entire dissent from the law he sought to impose on every future champion of the Bible and Divine Revelation? I had every reason for wishing to avoid the necessity. He is a friend whom I have known for twenty years, a member of the Council, and I am only an associate, and he has written papers before, which I think valuable, and helpful to the cause of Bible truth. Public disagreement, in defenders of that cause, is always a stumbling-block to the weak, and involves a loss of moral power. To answer the paper fully would have needed a second, at least as long, and even a very brief reply robbed me of one-third of the space I needed for my own main subject. But there was no help for it. Till my main principle had been vindicated from the vehement onset he had made on it, I could not, honestly or logically, take a step further

in its application. And yet I believe, in the present stage of the great conflict with scientific unbelief, that the step I have desired to take is one really of high importance.

My friend has linked me with his argument in two opposite ways; and these illustrate, I think, what an unsafe quicksand has been mistaken for a solid foundation. First, he quotes me by name as his authority for a so-called scientific fact, that many of the nebulae are distant from us not less than sixty trillions of miles, or ten millions of the years of light. This is one main premise, from which he infers that the Bible pays no respect to scientific exactness, and is utterly indifferent to the duty of expressing itself with exactness on scientific themes. Now the quotation is from a sixpenny work written more than thirty years ago. The statement was taken on trust from others, and was then a current and usual opinion. Soon after I was led to examine it closely, in connection with an essay of Struve, and became convinced of the entire fallacy of the ground on which it was conceived to rest. I had abandoned the view for thirty years, as one of the many mistaken guesses of science, and recent spectroscopic researches all tend to confirm the truth of my later view.

Much later I published a work of five hundred pages, in which I gave my most careful and mature convictions on the true nature of the relations between the Bible and Modern Science. After quoting me as adequate authority for the truth of a scientific guess I had long ceased to believe, how does my friend's paper describe my ripest conclusions and teaching in this later work? In these words, that it is "a latent source of mischief, and spreads the very evil we deplore." The danger of it is immense, and the mischief is already working widely. A view the reverse of mine is "the only view by which we can be loyal to our Bible, and loyal to Science also." It is "impossible to doubt," what I have laboured at some length to disprove, and do more than doubt, and utterly disbelieve. We are bound, in all honesty, to admit, as the meaning of the Hebrew text, what Mr. MacCaul says Hebrew grammar disproves, and Dr. MacCaul, a first-rate Hebraist, employed three pages in refuting at length, namely, that all Genesis i., including the first and second verses, is included by the writer within the limit of the six days. My friend's inference is, that the language of Scripture "makes no pretensions to scientific accuracy"—a very strange euphemism for a narrative which shuts up within six natural days a series of changes which really occupied far more than ten million years.* Again, we are bound, as honest inquirers, to concede the utter contrast between the only natural sense of the Mosaic record and the certain discoveries of modern science. To deny this as I have done, and still do with all my heart, is to have the mind occupied with self-willed preconceptions. Its source is a self-assumed authority, which

* See preface, vol. x.

proudly prejudices the case. If we hold that account, with Dr. MacCaul, to be a real history, and not a series of unreal visions, wholly unlike what actually occurred, we make a vain attempt to uphold Revelation by insecure proofs, and shall bring it down with a crash. This Institute, if it defends the Bible on the footing on which I have defended it, in common with nearly all divines of past ages, that it is true in its statements of facts, as well as its moral precepts, "instead of being a foster-mother of religion, will become unconsciously one of its worst and deadliest foes."

After these strong censures and dogmatic statements of my friend, the words of Horace, "*Quis tulerit Gracchos*," apply fully to his warm complaints against me for censoriousness and dogmatism in the four or five pages of defensive reply. I am conscious that I forbore to say much that I was tempted to say, simply because the Canon had long been an acquaintance and personal friend. But truth is no respecter of persons. The paper professed to lay down a code or rule directly for the guidance of all future champions of the faith. Indirectly it was a strong condemnation of my own previous works. I was bound either to abandon the task of writing my paper or to offer some reasons why I believe the proposed law to be wholly untrue, and its adoption fatal to the object it is meant to secure, and that the paper answers to its own description of the Bible, and is "utterly indifferent to the duty of expressing itself with exactness on scientific theories."

I cannot, of course, reply in detail to all the objections to my paper from different sources—Dr. Currey, Canon Titcomb, and the Chairman. The last of these offered the only remark "on the main thesis, which formed two-thirds of the whole, and I think I can easily show that the stricture was groundless. He said that it was perfectly easy to conceive the motion or rest of a mathematical point of empty space. But this is a mental illusion. What can be conceived as moving is an unextended monad, and not a mere point of empty space. So Newton has remarked, "that the primary places of things should be movable is absurd." Whatever is moved, by the very conception ceases to be a mere position, and has acquired some degree or measure of real, actual being.

To the other objections, all on the first pages, which clear the way to my main object, I must content myself with a very few words of reply. I respect my opponents, but cannot honestly accept the truth of any one stricture they have made. I cannot admit to Dr. Currey that I have hastily misrepresented the maxim of the Fifth Essay. I have given it the only meaning it can bear, unless we make it refer to faculties which do not exist, and thus turn it into mere nonsense, and reduce it to ashes. The remarks are not hasty, for they merely condense ten pages on this same topic in *The Bible and Modern Thought*, written sixteen years ago. Dr. Currey has a perfect right to refute them, if he is able, but not to charge me with having written in thoughtless haste. I cannot admit to my friend that I have misstated his opinions. On the contrary, I have taken pains to extract his true

meaning from a very careless phrase, which, taken strictly, would bring the charge of neglect of duty against the Holy Spirit of God. Confirmatory of the remarks of one speaker, what higher testimony can there be to the dignity, truth, and authority of all the Old Testament Scriptures, the Law and the Prophets, than that the Son of God appeals to them as the great defining landmarks in the history of mankind?

Modern science is a growing, thriving infant. But it is merely an infant still. The knowledge of the works of nature, in the wisest of its students, is but as a drop to the ocean, compared with His knowledge who is the Word and Wisdom of God, Who weighs the mountains in scales and the hills in a balance. It is He who appeals to the words of Gen. ii. 24 as a voice and message of His Heavenly Father, wherein is contained a law and message of Divine authority for every later generation of mankind. Let us not add to His words by rash and hasty misinterpretation, lest He reprove us, and we be found liars. But neither let us take away from them, by weak and hasty concessions to the premature guesses of those who mistake inch-deep knowledge of the mysteries of nature, for full and perfect insight, or we may at last fall under His sentence of **grave rebuke**, and be called "least in the kingdom of heaven."