

ARTICLE III.

THE HEBREW COSMOGONY.

A PAPER FOR SCIENTISTS.

BY CHARLES B. WARRING, PH. D.

WITHIN the last few decades, scientists have made great advances in the knowledge of the earth's history during that immeasurably long period which preceded the creation of Adam. They have destroyed the illusion, once universal outside of Judæa, that the earth was eternal, as well as the opposite belief, prevalent till recently through all Christendom, that the whole universe came into being only six thousand years ago, completely finished and peopled, as now, in six common consecutive days. They have discovered a number of important facts as to the earth's primal condition, the origin and nature of light, its poor quality at first, its progress from poverty to present richness and power, the beginning of day and night, the once vaporous state of the waters now in the seas, their deposition, the then condition of the atmosphere, the once universal ocean, the emergence of the land, the order in which life began, and that in which, millions of years later, plants, and water, air, and land animals reached their final development and culmination in present living species, man's contemporaries.

The Hebrew Cosmogony also purports to tell of occurrences and conditions before Adam, and makes many statements about the very matters in reference to which scientists have been making their discoveries. So far as these are concerned, it falls within the domain of science, and thus, for the first time since the story was written, it becomes possible

to determine its character by other testimony than its own. With this in view, I propose to compare its physical statements, one by one, with what scientists have told us. It has, it is true, another and very important side,—the theological,—but with that the present paper has nothing to do. The reader will see that this discussion extends only to the creation of Adam. The first chapter is complete in itself, has a style and character of its own, and is true or not, independently of all that comes after it.

It goes without saying, that to reach permanent results, and no others will be satisfactory, the account must be taken just as it reads,¹ without forcing the meaning of words, or changing the order of what it says, or interpolating into it anything not already there. There are many things believed to be the teachings of this story, which have no place in it. These in fairness should all be ruled out, relegated to Milton's "Creation," the great *omnium-gatherum* of mediæval errors as to how and when our world was made.² I propose to take it with the utmost literalness, neither adding to it nor taking from it, any more than an astronomer would add to or take from a photograph of a celestial phenomenon. This is severe treatment to apply to a document written so many centuries before the birth of modern science. If it stands the test, its truth will be established, and if it fails, it can easily return to the safe, but not very enviable, position assigned to it by the higher critics, and described by Dr. Cocker, as poetic, unhistorical, and unchronological, where it need no longer fear the assaults of gnostic or agnostic scientists, or of anybody else.

The history of the earth divides naturally into two parts,—the nebulous and the solid,—the former preceding, the latter coming after, the formation of the opaque crust which

¹ In a few places the reader will notice a change from the common version, but only to get closer to the original.

² *Paradise Lost*, vii.

still covers its surface. The characterizing phenomenon which marked the end of the first period, and the beginning of the second, was the commencement of the division between light and darkness which makes days and nights.

The Hebrew Cosmogony—I have omitted to say it is found in the first chapter of Genesis—readily divides in the same way.

I shall therefore style the first part of the account,

THE WORLD BEFORE DAYS AND NIGHTS.

SCIENCE'S ACCOUNT, A. D. 1895.

There exists an eternal First Cause which men call God.

The heavens and earth are not coeternal with God, but were made by him.

They did not, as was long believed, come finished into existence, but needed to be wrought through many stages of evolution to their present condition.

The earth at first was an unsegregated, and undistinguishable part of an immense nebulous mass,¹ and therefore had neither shape nor form.

The nebulous matter was inconceivably rare,—millions of times

GENESIS' ACCOUNT, B. C. 2000?

God preceded all.

"In the beginning God created the heavens and the earth."

They are not pronounced good. (Although this was the most important thing of all, Genesis clearly implies a lack of completion by not calling the heavens and earth "good," a word which when applied to them, or to light, water or land, plants or animals, has no reference to moral quality, but only to completion and fitness for its use, as when one says a good farm, a good watch, and the like.)

"And the earth was without form."

("Without form" poorly renders the Hebrew word *tohu*. This is

¹ Few will question the once gaseous condition of our earth, although there is the greatest difference of opinion as to how the solar system was formed from the great primal mass. This, however, does not concern our present inquiry, for Genesis says nothing about how it was done, and, I may add, Science to-day can say no more.

rarer than the air,—as near nothing as one can conceive.

At that time the earth was destitute of everything which it now contains, continents, islands, seas, rivers, plants, animals, and all else.

Before motion was imparted, darkness enveloped the whole mass. This measured 2,800,000,000 miles, and more, from outside to center. It was a dark and profound "deep."

The origin of motion can be explained only by referring it to the great First Cause.

The mass thus set in motion was not solid, but was mobile, a fluid, a very highly attenuated fluid.

Motion at first was only gravitational, and was far from being all that would be needed. It was only long after, when the atoms had had time to approach sufficiently near each other, that thermic, photogenic, chemical, electric, and other movements, up to the full complement of to-day, were added.

After motion had been imparted

used in the Bible twenty times, and in nearly every instance is translated "vanity," "a thing of nought," or by some similar word. As in Isaiah xxix. 21, "Turn aside the just for a thing of nought"; xl. 17, "Less than nothing and vanity." "The gods of the heathen are vanity." "Graven images are all of them vanity." We have no one word in our language that describes our earth's extreme tenuity in its primal state, as well as does that ancient word *tohu*.)

"And void."

"Darkness was upon the face of the deep,"

before

"the Spirit of God moved on the face of the waters."

(*Mahyim*, here translated "waters," is derived from a word meaning to flow, and is the exact equivalent of our word fluid. Giving it the closest translation possible, it means something non-solid, mobile, or easily made to flow.)

Genesis does not pronounce this act "good"; i.e., complete, and this, as in all other cases, indicates that the work was to be carried further.

"And there was light."

the heretofore dark mass began to give light.

This at first was poor in quality, as shown by the spectroscopic study of present nebulae. They give a spectrum with only three or four narrow bright lines indicating a very small range of colors. But as condensation went on, its quality kept improving until our planet attained the temperature of our sun, and then the light was good for all its present uses.

This completion of the evolution of good light occurred before the earth was covered with a dark crust, and, therefore, before its opaque body divided the light on the sun side from the darkness on the other.

Then day and night began.

And then was the first day.

"And God saw the light that it was good "

before

"he divided the light from the darkness."

"And the light he called Day, and the darkness he called Night."

"And the evening and the morning were the first day."

So far as I can see, I have set down every physical statement in these first five verses with the closest adherence to their literal meaning, and without any change in the order in which they stand. The reader, if he will turn to the chapter, can verify this for himself, and it is hoped he will do so. If any one imagines that what Genesis says is unimportant, he is greatly mistaken. In fact the better physicist he is, the better will he realize the serious and far-reaching effects of a successful reversal of the statements, or the order, of those few verses. It may make this more evident if I again use parallel columns.

GENESIS REVERSED.

The heavens and earth had no beginning.

THE EFFECT IF THE REVERSAL IS ESTABLISHED.

Then there cannot be any tidal friction, the sun cannot be losing

They were "good" from the start, i.e., they were complete.

The earth was never without form and void, and it never consisted of exceeding rare material, *tohu*.

And darkness did not cover the face of the deep before motion began.

The Spirit of God did not move upon it.

Light came before motion.

Light did not become good till after the division between it and darkness.

I know of no document whose successful refutation would be more important than the established reversal of what is said in those five verses. For science to deny their truth would be suicide.

Compare with it the Chaldean myths, trivial platitudes when true, and grossly absurd as to the rest. The first tablet, the one which is so often said to correspond with the first two verses of Genesis, is in substance as follows, condensed but with no item omitted:—

heat, and energy does not fall to a lower form every time work is done. The past and future finite existence of the present universe is the necessary conclusion of so many lines of reasoning that its successful denial would be the most appalling catastrophe to science one can imagine.

If so, there has been no evolution of our solar system.

Then the earth never was an unsegregated part of a great nebula and every form of nebular hypothesis is impossible.

Then light is not an effect of molecular movement, and the basal fact of optics is gone.

Then philosophy is wrong.

If so, the corpuscular, the undulatory, and the electrical theory of light must be given up. Not a vestige of either would remain.

Then the spectroscopy which has told us of the improvement in the quality of light as a nebula condenses to a liquid or gaseous form, as once in our earth, and now in the sun, is wrong.

At that time the heavens and earth were not named.
 The deep was their father; the chaos of the sea, their mother.
 Their waters flowed together in one.
 The reed was not gathered, the marsh plant was not grown.
 The great gods were not yet made, any one of them.
 Destiny was not yet established.
 Lamu and Lahamu were produced first.
 Asher and Kisher next, and then Bel and Ea, their offspring.

It seems unaccountably strange that any one should seriously talk of agreement between this and the story in Genesis, yet many have done so.

Before going farther, I would call the reader's attention to the remarkable fact that although the writer knew nothing of the nature of a nebula, he had nevertheless given a description of one which is unsurpassed. It was, he says, *tohu*, "vanity," "nothingness"; *bohu*, "void"; *tehom*, "a profound deep"; *mahyim*, "non-solid," a "fluid." Our word "nebula" is poor in comparison, for it tells us nothing more than that there is something which looks like a little wisp of cloud.

The division between light and darkness, a thing possible only in case of a world cooled down so far as to cease to emit light, was the characteristic phenomenon, and the only one conceivable, indicating the end of the nebulous and self-luminous stage. It indicated, too, the beginning of the present or true planetary condition in which our world is dependent on the sun for heat and light.

The fact is well worth the consideration of scientists, that these few verses are not only exceedingly important, but they foreshadow almost everything now known about the earth that is peculiar to the period before it ceased to give light,¹ foreshadow it so manifestly that a denial of the one is fatal to the other. Some things are plainly stated; as, for instance,

¹ The earth's revolution about the sun is not mentioned or implied, but belongs to the present, and therefore was not peculiar to that early period. Perhaps the only thing not foreshadowed was the segregation of our planet from the great nebulous mass and the primal formation of the continental plateaus.

the finite preëxistence of the heavens and earth, their unfinished condition at first, the primary state of the earth, the beginning and perfection of light, etc. Some other things are logically to be inferred. Moses says nothing, for example, about the intensely hot condition of the earth, but he does say that the light became "good," and good light requires intense heat.¹ So, too, he says nothing about the fact that the earth continued to cool, and after a time became opaque, but his account necessarily implies it when it tells us that a division was made between the light and the darkness, for this proves the existence of an opaque surface to the earth, since nothing but such a body could then, or now, separate the two.

How different this is from the once current "science" which taught that light and darkness were two substances originally mingled together, which needed to be separated, and how wrong it must have seemed to such scientists that the light was styled good before the separation took place.

"And 't was evening, and 't was morning. Day one."

A WORLD WITH DAYS AND NIGHTS.

Days and nights having begun, the once glowing earth must have so far cooled down as to cease to give light, by which we know, thanks to science, that its external temperature had fallen to close about 1000° F. Its surface, therefore, was still hot enough to keep the oceans very largely in a state of vapor-forming clouds, hundreds of miles in thickness, which totally shut out the rays of the sun. Hence the next thing to be done towards fitting the world for the support of plants and animals was to thin out the clouds by a further fall in temperature, and consequent deposition of their water, until an open space, or "expanse," separated, as now, the waters in the seas below it from the waters in the clouds above it.

¹ It is an interesting fact, that the Hebrew word for light is used also for fire, the only difference being in the vowel-points, and these did not exist till centuries after Genesis was written.

Science tells us furthermore, that the phenomenon which would have indicated to a spectator, had one been there, that the process had gone far enough to permit life to begin, was that the heavens became visible, for this proved that light reached the earth's surface, and that its temperature had by that time fallen considerably below 212° F.

Turning now to Genesis (verse 7), we read that an "expanse" was made in the midst of the waters dividing the waters below it from those above it, and that, at the close of the transaction, the writer calls the "expanse" heavens.

But this is not all. Paleochemistry tells us that the "expanse" was filled, not with our present atmosphere alone,—that formed but a small part of it,—but with a mixture of poisonous gases and vapors in which life was impossible, except perhaps for the lowest forms.

If we turn to Genesis we discover a unique omission. Every period of progress has at least one verdict of completion,—in other words, is pronounced good,—but the second period is an exception. Commentators have been at a loss how to explain why, and, where they have not ignored the fact, have offered some absurd reason for it.¹

"Expanse" does scant justice to the onomatopoeic wealth of meaning in *rakia*, the word thus translated in the Revised Version. The Greek *stercoma*, with the Latin *firmamentum*, Anglicized into "firmament," is no translation at all, but was forced into the text to make it harmonize with the science of Alexandria. If we turn to the lexicon, and examine *rakia* and all its cognates, we shall find it means primarily any process of making thin, accompanied with violence and noise, and secondarily, that which is produced by such action. It is, therefore, exquisitely applicable to the operation of reducing the thickness of those dense clouds, thinning them, accompanied, as we know it was, by the inconceivably great

¹ I think it is Luther's Commentary that says, The devils were made on that day.

and tumultuous noise of the deluge of rain falling on the hot lava crust which formed the earth's surface, and causing earthquakes and electrical disturbances of inconceivable violence.

After the *rakia* was made, the writer says, "There was evening, and there was morning. Day the second." The most obvious use of this clause is to sharply divide the preceding period from that which follows. It also compels the reader to observe that an orderly succession pervades the whole account. On the day itself, it is not said that any thing was done, and this is true of all the days. I know this is contrary to the traditional belief of all Christendom, but we are not studying our own, or anybody's belief, but only what the account itself says. I will add that the so-called creative days appear to have been ordinary days separating the periods of progress, just as July fourth, 1776, separated the Colonial from the National history of our country.

Geology tells us that at first the waters covered not merely the ocean beds, as now, but the continents also. The next step forward toward present conditions was therefore the emergence of the land.

Turning to verse 9, we find the same thing there. The waters were to be gathered "into one place" (N. B.—The different oceans, we now know, occupy but one basin, "one place"), and the dry land was to appear. Here, as in all other cases, the account gives no intimation of the length of the process. We now know that it was a very long one, reaching from Azoic time down far into the Tertiary. Geologists inform us that by that time the land and sea had attained their present outlines, and the soil, and the ocean water, their present composition, and therefore had become fit for the later forms of life.

Turning to Genesis, we note that the land and water are pronounced good, or, as we say, done, before "grasses, herbs, and fruit trees" made their appearance, and indeed before any life is spoken of. If the account here refers to the introduc-

tion of life upon our globe, i. e. to earliest paleozoic times, its description of the plants and animals is, to say the least, singularly unfortunate, for there were no grasses then nor fruit trees, nor vertebrates, and the order is equally wrong, for the first vegetation long preceded the completion of land and water. It becomes therefore important to determine what plants and animals the writer was speaking of, whether those of his own times, with which he and everybody was familiar, or whether he meant the extinct species of the earlier ages.

That the writer did not refer to the latter seems evident, for it was impossible for him to have any knowledge of them, since it is only a few decades since their discovery. True, God might have revealed them to him, but this would be to admit the account to be inspired, an admission which many of our scientific friends refuse to make, and, besides, it would not help the matter, for God knew the exact facts, and could not have committed such an error as to say that grasses, herbs, and fruit trees were the first vegetation on our globe, or that vertebrates of any kind were among the first animals. Moreover, a cursory examination of the account will suffice to show that, as to all other physical matters, the writer's themes were taken from things which he and everybody else had seen. He tells of the heavens above, the earth spread out on every side, of light and darkness, day and night, of the firmament with its stores of water in the clouds, of the dry land and of seas, of the sun, moon, and stars, of seasons and years; can it be possible that, in reference to plants and animals, he turned from the living species which surrounded him and spoke of the extinct forms which neither he, nor any other human being, had seen or heard of? And, to cap the absurdity which such a supposition involves, the names which so many insist he employed to describe paleozoic forms, are the names which he and his people had all their lives been applying to the plants and animals about them. The more I consider the matter, the more evident it seems that the writer speaks, from

the eleventh verse forward, of this end only of the earth's creative history, and that the plants and animals which he mentions were of the very kinds which were then, and are now, extant. I know that this is a novel view, but the world has seen too many once novel views afterwards accepted of all men to be disturbed by that. Scientists, therefore, have to decide only whether what he says as to the origin, order, and finality of such plants and animals, is correct as here given.

The account attributes them all to the will of God, but gives no hint as to how God did it. To this, in some sense, all will agree.

It places the appearance of the four great divisions of the present organic world, in the following order, and follows each by the announcement of completion, "good."

First. The plants.

Next. { The water creatures. } In one creative period.
 { The birds. }

Last. The land animals.

Till recently, the following would have seemed a much more reasonable arrangement:—

First. The water creatures.

Next. The land plants.

Last. The land animals and birds.

For the water creatures had no need of grasses, herbs, and fruit trees, while the birds all make their nests on the land, and most of them live there, and get their food from land plants, or devour animals that subsist on vegetation.

Fortunately for our purpose, geologists have determined the actual order of those events, and I may add that their evidence is the more valuable because they have no suspicion of its bearing on this account. Let us see what they tell us.

De la Saporla, on page 380 of his great work, "Le Monde des Plantes," says, "The vegetable kingdom attained its characteristic traits long before the animal had completed its own. Before the close of the Tertiary the vast majority of our pres-

ent florae were established in the limits which they now occupy." This sustains the Genesis order, as to the first item.

As to the second: It is true that when modern species of plants first appeared (to wit, in the Tertiary) there was a very abundant fauna of air, water, and land vertebrates, but, as they have long been extinct,¹ they do not come into the Mosaic account. When we come down a good many thousand years into the Quaternary we find living species of water creatures and birds, but none of living mammals.² There were mammals enough at that time, but Dana says that with few exceptions they are extinct, and Le Conte says: The mammals of the Quaternary have also disappeared. So they too are outside of this account.

According, then, to geology the order as to living species—our contemporaries—is as follows:—

First. The plants, in the latter part of the Tertiary.

Next. The fishes, reptiles, amphibians, and birds, in the Quaternary.

Last. The mammals in the last, or recent, period.

It goes without saying that the plants and animals now in existence are the termini toward which all geological history tended. The fact that each division is styled "good," i. e. completed, derives emphasis from the reflection that each is a finality reached through countless ages of preparatory work, and that nothing more done since in that line is known.

I submitted the above, so far as it relates to the order of life, to Professor Dana. His reply, apart from the value of his high authority, derives a melancholy interest from its being perhaps the last letter written by his hand. It was penned on Saturday, and he died on the next day.

¹ Dana (Manual of Geology, fourth ed., page 925) says: "All the fishes, reptiles, birds, and mammals of the Tertiary are extinct species."

² Nicholson (Life History of the Earth, page 345) says: "All the fishes, amphibians, and reptiles of the Quaternary, so far as found, are of living species, and the birds also, except a few moas and other wingless kinds which became extinct probably within the last few centuries."

NEW HAVEN, CONN., *April 13, 1895.*

DR. C. B. WARRING:

MY DEAR SIR:

I believe you are right in your views as to the geological succession of events.

Yours very truly,

JAMES D. DANA.

I have purposely omitted to speak of that part of the account which says "the lights in the firmament of heaven" (so in the Hebrew) were commanded to divide between the day and the night, and to be for signs, and for seasons, and for days and years, and, after announcing, in the words "and it was so," that the command had been obeyed by those "lights," adds that God made them and placed them in the firmament to do these things, and that he made the stars also. Evidently this has nothing to do with the creation of the sun and moon, for the account itself says there had long previously been days and nights. It declares that they obeyed the divine command, and then adds, parenthetically, that God was their maker, thus giving a fatal blow to every form of Sabaeism. It places this transaction between the appearance of present vegetation, and that of living air and water vertebrates, or geologically speaking in that stretch of time which includes the great glacial epoch.

In regard to this, science can tell us little more than that then occurred the greatest climatic change known in the earth's history.

The fourth period can be satisfactorily discussed only when it shall be discovered when and how the earth's axis became inclined as it now is. For similar reasons I have not said anything as to the time of man's creation. Waiving, therefore, for the present these two questions, there remain more than twenty points in the Hebrew cosmogony, nearer forty I think, in which comparison is possible with what scientists know about our world. I ask them to give judgment thereon. Are, or are not, its physical statements true? Is, or is not,

their order correct? If their verdict is in the negative, then in justice to themselves as well as to those who ask their decision, they will, I hope, not talk of the impossibility of a correct account so early in human history, but point out which statements are wrong, and wherein the order needs to be changed. Of course many important matters are not spoken of. The contrary would be impossible for lack of space; would be now for present scientists for lack of knowledge. The question is as to what the account says, not as to the things about which it is silent.

Nor can the verdict be justly affected by what Moses may, or may not, have thought. It is more than probable, if he thought anything about it, that he supposed the plants and animals then living were the only ones that had ever lived on the earth, and that he believed many other things as incorrect as Milton's story of creation. With all this we have nothing to do; it is not what Moses thought, but what he wrote, that is under consideration. Do the statements that are on record describe, by chance or otherwise, actual occurrences and conditions, and is their order correct?

If to these questions an affirmative answer is given—for a layman it is difficult to see how any other is possible—a problem of profoundest importance will remain. How was Moses able to make such statements, and to learn their proper order? His own errancy makes the inerrancy of what he wrote all the more perplexing. That he got no assistance from tradition is self-evident, for tradition could begin only where his narrative ends. It will be one of the problems of the nineteenth century, Why did learned and able men ever believe the Genesis account was derived from the Chaldean myths? but even if it was, the difficulty would only be pushed back a little, not solved.

Theologians have given two answers. The latest—that voiced by Dr. Cocker—is that the story is poetical, unhistorical, and unchronological, and hence is in no degree remark-

able save for the sublimity of its style, and the nobleness and piety of its sentiments. If what we have heard of the teachings of astronomy, optics, chemistry, and geology, is reliable, this answer may be safely set aside. The older theologians said that Moses was in some way guided—they called it inspired—by a power above man, in writing and in ordering his statements. Many think so now.

It remains for scientists to offer, if they can, a better answer, one more in accord with all the facts. In the meantime I would commend to their consideration Dr. Draper's canon in reference to a book claimed to be inspired.

“Considering the asserted origin of this book, indirectly from God Himself, we might justly expect that it would bear to be tried by any standard that man can apply, and vindicate its truth and excellence in the ordeal of human criticism. . . . As years pass on, and human science becomes more exact, more comprehensive, its conclusions must be found in unison therewith. When occasion arises, it should furnish us at least the foreshadowing of the great truths discovered by astronomy and geology, not offering for them the wild fictions of earlier ages, the inventions of the infancy of man.”¹

This requires (1) that when human science was less exact and less comprehensive, its conclusions were not in unison therewith. And such was the case, for it is only within a few decades that science has become sufficiently exact and comprehensive to permit such unison. It requires (2) that it should at least foreshadow the great truths discovered by astronomy and geology. We have seen that it more than foreshadows the following modern discoveries, basal facts whose truth is of the highest importance to science itself.

1. The non-eternity of the heavens and earth.
2. Their unfinished condition at first, and consequent cosmic development.
3. The earth's primal condition, viz., infinitely tenuous; a

¹ Dr. Draper, *The Intellectual Development of Europe*.

profound deep; a fluid; void of all things; crucial facts of its once nebulous state.

4. Motion was due to a source outside of matter, a fact vital to the very existence of inertia.

5. Light was subsequent to motion.

6. Light became good light before the earth became opaque.

7. The waters now in the seas existed first as vapor and cloud.

8. The atmosphere was foul with poisonous gases after the waters had been deposited.

9. The continents were once under the waters.

10. The various ocean basins are really only one.

11. The land and sea were essentially as now before modern vegetation appeared.

12. The appearance of the present or final species of plants before those of the animal kingdom.

13. It more than "foreshadows" the close proximity in time of land and sea completion to the first appearance of present vegetation, and its much greater distance from the first appearance of present species of birds and water animals, and still more from that of present land mammals.

14. It "foreshadows" the probability that the stars are of the same substance as the sun, and subject to the same laws.

15. It more than "foreshadows," it states that the air and water faunæ of the present day came into existence in the same period.

16. After them, and last of all the brute creation, came present species of mammals.

As for Dr. Draper's third requirement, it is hardly necessary to speak of it here, for there is nothing in this account which resembles "the wild fictions of earlier ages, the inventions of the infancy of man."

I cannot see where the Hebrew Cosmogony fails to meet the requirements of Dr. Draper's supposedly fatal canon.

The most remarkable thing in this account is not that its words describe events that really occurred, or conditions that really existed. It is the correctness of its order from first to last. A child might guess the names of a half-dozen of the kings of England, but to place them each in its order, would require actual knowledge either on his own part, or on that of some one who prompted him. His own knowledge of the pre-human history was, of necessity, nothing. It remains, then, to discover who prompted him. I leave others to draw such conclusion as the facts warrant, and to give a satisfactory explanation of the existence of this chapter.