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EDITED BY

REV. PHILIP SCHAFF, D.D.,

AND

REV. S. IRENÆUS PRIME, D.D.

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COSMOGONY AND THE BIBLE;

OR,

THE BIBLICAL ACCOUNT OF CREATION IN THE LIGHT OF MODERN SCIENCE.

By Professor ARNOLD HENRY GUYOT, LL.D., Princeton, N. J.

The sacred volume containing the revelations that God, in his wisdom, chooses to give to man, fitly opens with a short account of the creation of the material world, animated nature, and of man himself. On this great question of Creation, which implies the relation of God to his creatures, of the finite to the infinite—a question insoluble for human philosophy—man had to be taught from on high. By its simplicity, its chaste, positive, historical character, the Bible narrative is in perfect contrast with the fanciful, allegorical cosmogonies of all heathen religions, whether born in the highly civilized communities of the Orient, Greece, or Rome, or among the savage tribes which still occupy a large portion of our planet. By its sublime grandeur, by its symmetrical plan, by the profoundly philosophical disposition of its parts, and, perhaps, quite as much by its wonderful caution in the statement of facts, it betrays the supreme guidance which led the pen of the writer and kept it throughout within the limits of truth.

Side by side another manifestation of the same divine mind, the book of Nature, God's work itself, is open to our curious gaze. To man alone, among all created beings, has been granted the privilege of reading in it, by patient and intelligent research, the innumerable proofs of the almighty power and infinite wisdom of its Author; for man's mind alone is akin to the mind which devised the wonderful plan unfolded in that great cosmos which we call Nature.

Both these books, the Bible and Nature, are legitimate sources of knowledge; but to read them aright we must remember the object and true character of their respective teachings, which are by no means the same.

The sole object of the Bible, throughout the sacred volume, is to give us light upon the great spiritual truths needed for our spiritual life; all the rest serves only as a means to that end, and is merely incidental.

In the first chapter of Genesis, when describing in simple outlines the great phases of existence through which the universe and the earth have passed, the Bible does not intend to teach us the processes which it is the province of astronomy and geology to discover; but, by a few authoritative statements, to put in a strong light the relations of this finite, visible world to the supernatural, invisible world above—to God himself. Its teachings are essentially of a *spiritual, religious character.* Destined for men of all times and of all degrees of culture, its instructions are clothed in a simple, popular language, which renders them accessible alike to the unlearned, to the cultivated man, or to the devotee of science.

Nature's teachings reach us only by our senses. A faithful study of God's visible works, sound deductions from the facts carefully ascertained—these are the foundations on which the science of nature rests. But from these finite premises no logical process can derive the great truths of the infinite, supernatural world which are given in the Biblical narrative. Nature's teachings, grand as they are, belong to the world finite; they are of material and intellectual order, and can not transcend their sphere.

Let us not, therefore, hope, much less ask from science the knowledge which it can never give, nor seek from the Bible the science which it does not intend to teach. Let us receive from the Bible, on trust, the fundamental truths to which human science can not attain, and let the results of scientific inquiry be as a running commentary to help us rightly to understand the comprehensive statements of the Biblical account which refer to God's work during the grand week of creation. Thus we shall be convinced, if I do not greatly err, that the two books, coming from the same Author, do not oppose, but complete one another, forming together the whole revelation of God to man.

To cling to an interpretation disproved by God's works, is to refuse the light which has been placed before us by God himself. To refuse, *a priori*, to believe in the possibility of this antique document agreeing in its teachings with modern science, because its author could not have had, it is supposed, such knowledge, instead of submitting this question to an impartial examination, as a question of fact, is unscientific.

If we do neither, we may hope to see dispelled forever the clouds which have obscured the majestic simplicity of that noble record.

Taking this view of the Biblical account of creation, and of the method of its interpretation, let us consider:

1. The plan of the narrative.
2. What it teaches.
3. What help modern science, by its best results, can give us in understanding aright the statements of the Bible which relate to the method of the creation.

This last investigation will tell us whether or no, or in what measure, the two records differ or agree.

The necessity of being short may be the excuse of the writer for confining himself to a simple exposition of the views which he has expressed on this subject during the last twenty-five years or more, in many courses of public lectures, already partially published, without attempting critical references to the numerous explanations which have been offered by others.

The document before us for examination begins with the first chapter of Genesis and ends with the third verse of the second chapter. It is complete in itself, forming an organic whole which unfolds the history of the creation of the material universe and of living beings, including man as a part of nature. By the symmetrical regularity of its arrangement, by the tone of its language, and the specific use of certain words, it is stamped with an individuality not to be mistaken. In this the name of God is Elohim, the Triune God of the universe, the Father, the Word, and the Spirit, who all appear in the work of creation. In the second narrative, beginning with the fourth verse of the second chapter, which takes up, under another aspect, the creation of man as the head of humanity, God's name is Jehovah.

1. *The plan* is made clear by the following diagram:

PLAN OF THE BIBLICAL ACCOUNT OF CREATION.

ERA OF MATTER.	INTRODUCTION.	ERA OF LIFE.
	Primordial Creation. In the beginning God created the Heaven and the Earth (ver. 1).	*Primitive State of Matter.* And the Earth was without form, and void; and darkness, etc. (ver. 2).
First Work. *First Activity of Matter—Cosmic Light.* Let there be light, and there was light. And God divided the light from the darkness. And God saw that it was good. **First Day.**		**Fourth Work.** *Solar Light.* Let there be lights to divide the day from the night, and let them be for seasons, and for days, and for years. And God saw that it was good. **Fourth Day.**
Second Work. *Organization of the Heavens.* Let there be an expanse in the midst of the waters, and let it divide the waters from the waters. And God called the expanse heaven. And it was so. **Second Day.**		**Fifth Work.** *Creation of Lower Animals, in Water and Air.* Let the waters bring forth the moving creature that has life, and fowl that may fly in the open expanse of heaven. And God saw that it was good. **Fifth Day.**
Third Work. *a. Formation of the Earth.* Let the waters be gathered together, and let the dry land appear. God saw that it was good. *b. The Plant.* Let the Earth bring forth grass and trees. And God saw that it was good. **Third Day.**		**Sixth Work.** *a. Creation of Higher Animals, on Land.* Let the Earth bring forth the living creature, cattle, beast of the earth, after his kind. And God saw that it was good. *b. Creation of Man.* Let us make man in our image. And God created man. And God saw every thing he had made, and it was VERY GOOD. **Sixth Day.**
	CONCLUSION. **No Work.** **The Sabbath.** And God rested on the seventh day (ch. ii., ver. 1–3). **Seventh Day.** **No Evening.**	
These are the Generations of the Heavens and of the Earth (ch. ii., ver. 4).		

The history of creation is given here in the form of a great cosmogonic week, with six working days, preceded by an introduction, and closing with a day of rest — the

Sabbath of God as Creator. Each day is marked by a special work, and begins with an evening followed by a morning. These six days are subdivided into two symmetrical series of three days each. Both series begin with Light—the diffused cosmic light in the first, the concentrated solar light in the second. In both series the third day has two works, while the others contain but one. The first series describes the arrangement of the material world—it is the *era of matter;* the second, the creation of organized beings, animals and man—it is the *era of life:* two trilogies in this great drama of creation, corresponding to the two spheres of existence, which precede the historical age of man. Such symmetry of plan can not be accidental; it reveals a deeply philosophical idea, which it is for us to attempt to develop.

2. *What does this record teach?* The great spiritual truths emphatically taught by the narrative are obvious to all. A *personal* God, calling into existence by his *free, almighty will,* manifested by his *word,* executed by his *spirit,* things which had *no being;* a Creator *distinct* from his creation; a universe, *not eternal,* but which had a beginning in time; a creation *successive*—the six days; and *progressive*—beginning with the lowest element, matter, continuing by the plant and animal life, terminating by man, made in God's image; thus marking the great steps through which God, in the course of ages, has gradually realized the vast organic plan of the cosmos we now behold in its completeness, and which he declared to be *very good:* these are the fundamental spiritual truths which have enlightened men of all ages on the true relations of God to his creation and to man. To understand them fully, to be comforted by them, requires no astronomy nor geology. To depart from them is to relapse into the cold, unintelligent fatalism of the old pantheistic religions and modern philosophies, or to fall from the upper regions of light and love infinite into the dark abysses of an unavoidable skepticism.

But thinking men, as well as men of science, crave still another view of this narrative: an intellectual view, we may call it. They wish fully to understand the meaning of the text when it describes the physical phenomena of creation. Are the statements relating to them a sort of parable to convey the spiritual truths just mentioned, or are they facts which correspond to the results of scientific inquiry? The answer to this question brings us to our third point.

3. *What help can modern science give us in understanding aright the statements of the Bible, and how do the two records compare?*

The difficulties at first sight are not few: the light before the sun; days with an evening and morning before our great luminary could give a measure of time for them; a firmament which divides the waters from the waters; the earth, with its continents and seas, preceding the sun and moon; plants growing without the sunlight necessary to their existence—these are problems which require a solution. Many have given up the narrative in despair; some have disowned its historical character, by supposing a gap between the act of primordial creation and the work of the first day—a vast gulf, into which they sink all the astronomy and geology of the past ages, thus making of the account a sham history. We have no right to treat such a document lightly. When the holy writer declares that, "*Thus* the heavens and the earth were finished, and all the host of them" (Gen. ii., 1); and again, "*These* are the generations of the heavens and of the earth" (Gen. ii., 4), we must accept this solemn declaration, and believe that he intends to give us a true history.

Guided by this view, we shall consider the six cosmogonic days as the organic phases of creation, or the great periods of its history, and look for the special work done in each in the order indicated by Moses: creation of matter first, organization of the heavens next, of the earth and organic life last. Thus we shall avoid many a mistake which has caused a sad distortion of the narrative.

The introduction to the work of the six days is comprised in the first and second verses, in which we have the primordial creation of the matter of the universe, and a description of its original state. In the first verse we are taught that this universe had a beginning; that it was created—that is, called into existence—and that God was its creator. The central idea is *creation.* The Hebrew word is *bará,* translated by *create.* It has been doubted whether the word meant a creation, in the sense that the world was not derived from any pre-existing material, nor from the substance of God himself; but the manner in which it is here used does not seem to justify such an interpretation. For whatever be the use of the word *bará* in other parts of the Bible, it is employed in this chapter in a discriminating way, which is very remarkable. It occurs only on three occasions, the *first* creation of matter in the first verse, the *first* introduction of life in the fifth day, and the *creation* of man in the sixth day. Elsewhere, when only transformations are meant, as in the second and fourth days, or a continuation of the same kind of creation, as in the land animals of the fifth day, the word *asáh* (make) is used. *Bará* is thus reserved for marking the first introduction of each of the three great spheres of existence—the world of matter, the world of life, and the world spiritual, represented by man in this visible economy—all three of which, though profoundly distinct in essence,

are intimately associated, and together constitute all the universe known to us.

What have science and philosophy to say about it? Nothing. Creation is a fact beyond their pale; it is the miracle of miracles. Both science and philosophy must start from existing premises, and *nothing* is no premise. Their universal, logical conclusion, therefore, is that what *is* always *was*, in some form; and what is called here creation is but transformation, and, if so, that the universe is of God's substance.

Whether we conceive, with the Brahmin, that the material universe is an emanation from the Deity; or, with the old Egyptians, that it is itself a developing God; or, with modern materialism, that it is the sole existing substance, and the source of all the phenomena ever observed in nature and in man, pantheism and materialism are at the door, with all their internal impossibilities, and with all the contradictions they engender in the bosom of the free, moral, spiritual being, in the heart of humanity.

We have therefore to accept on trust the truth of creation, as an ultimate fact, not to be reached by any reasoning process, but which, being accepted, makes clear to mind and heart the relations of the universe, and of man to God. Thus Paul's declaration remains forever true: "Through faith we understand that the worlds were framed by the word of God."

The primitive state of matter when first created is described in the second verse: "*And the earth was without form, and void; and darkness was upon the face of the deep; and the Spirit of God moved upon the face of the waters.*" Two words here—the *earth* and the *waters*—have to be rightly interpreted before we can proceed with safety. Does the earth (*aarets*) mean our terrestrial globe, with its continents and seas, the organization of which is the special work of the third day? and are the *waters* here mentioned the seas which are especially called by name as belonging to the work of that day? We think not; for the invariable rule of the narrative is never again to introduce a work already mentioned. Nor is this the order of creation announced by Moses, which is always the heavens first, the earth after. We take, therefore, the word "earth" to be in this verse an equivalent to matter in general. The use of the concrete word "earth," instead of the generic or abstract word "matter," is common to most languages, and was here a necessity, as such a word as "matter" does not exist in the Hebrew language. We feel then justified in understanding *aarets*, in this early stage of the history of the universe, as meaning the primordial cosmic material out of which God was going to organize the heavens and the earth.

The same reasoning applies to the *waters* of the second verse. The Hebrew word *maïm* does not necessarily mean waters, but applies as well to the fluid atmosphere; it is simply descriptive of the state of cosmic matter comprised in the word earth. These waters are the subtle fluid which, in the cosmogony of the ancient Egyptians, was supposed to extend beyond the boundaries of the visible universe, whose material had been drawn from that vast reservoir of all existence. The Bible itself gives us, in the Book of Job, in the Prophets, and in the Psalms, ample proofs of the familiarity of their authors with that grand conception which, being accepted by them, teaches us the true interpretation of the Genesiac account. One example may suffice:

In the 148th Psalm David calls upon all creatures to praise the Lord, naming them in the order of their rank. "Praise ye the Lord from the heavens: praise ye him, sun and moon: praise ye him, all ye stars of light;" and, going still higher, "praise him, ye heavens of heavens;" and, last and highest, "ye waters that be above the heavens." These evidently are the waters of Genesis which precede the light, the firmament of heaven, and the earth and the seas. Reading a few lines further, we have the proof that the Psalmist does not confound these waters above the heavens with the terrestrial waters, for, calling upon the things of earth to praise the Lord, he names the dragons, and all deeps—the seas—fire, hail, vapors, and winds.

The sense of these two words being thus settled, every word of the second verse becomes clear and natural. The matter just created was gaseous; it was without form, for the property of gas is to expand indefinitely. It was void, because homogeneous and invisible. It was dark, because as yet inactive, light being the result of physical or chemical action. It was a deep, for its expansion in space, though indefinite, was not infinite, and it had dimensions. And the Spirit of God moved upon the face (outside, and not inside, as the pantheist would have it) of that vast gaseous mass, ready to act upon it, and to direct all its subsequent activity, according to a plan revealed by the great works which follow.

The central idea of the second verse is the state of matter when created. The Spirit of God, moving upon it, announces and prepares the work of the six coming days. The description applies, therefore, to the matter of the universe and the earth, and not to the earth alone as a globe already made, which would be no beginning. The distortions and forced interpretations which have obscured the Mosaic account, nearly all arise from the fundamental error which is here corrected. There is no gap between the first and second verses, no more than in any other part of the narrative. The Genesiac account is throughout a consistent history of constant, regular, and uninterrupted progress. It is not an

aimless rehash of the astronomical and geological phenomena during six times twenty-four hours before the creation of man, which would teach us nothing; which is disproved by the well-established results of careful scientific investigation, and still more by the emphatic declaration of Moses himself that "these are the generations of the heavens and of the earth."

Such are the statements of Moses. And science does not tell another story. Minerals, plants, animals—all bodies of nature—are compound results of processes which speak of a previous condition. By decomposing them, and undoing what has been done before, we finally arrive at the simple chemical elements which are the common substratum of all bodies. The same again can be said of the three forms of matter—solid, liquid, and gaseous. The least defined—the one in which the atoms are the most free—is the gas. All bodies in nature can be reduced to this, the simplest of all forms of matter. Herschel, Arago, and Alexander, therefore, among astronomers; Ampère, among physicists; Becquerel and Thénard, among chemists; Cuvier and Humboldt, among geologists, all have arrived at the same conclusion—that this incomposed, homogeneous, gaseous condition of matter must have been the beginning of the universe.

The First Day.—We now have a starting-point, but yet no activity, no progress. All beginnings are in darkness. The era of progress opens with the first day's work, which was the production of light. "*And God said, Let there be light, and there was light.*" At God's command movement begins. This is no creation, but a simple manifestation of the activity of matter. Are matter and force one and the same? or is matter a substratum and an instrument for force, as the body is for the mind? This vexed metaphysical question is not likely ever to be solved. If we incline to the last view, we may conceive that God then endowed inert matter with the forces which we find always associated with it—gravity, the general quantitative force, and the specific, qualitative, chemical forces, and their correlatives. Under the action of gravity that immeasurable body of gaseous matter contracts; atoms conglomerate into molecules; nearer approach begets continual chemical combinations on a multitude of points; in the more concentrated part light and heat are produced, and the result is the appearance in the dark space of heaven of a large luminous mass, the primitive grand nebula, the prototype of those thousands of luminous clouds observed by the astronomer floating in the empty wastes beyond our starry heavens.

Though most of the nebulæ viewed through the powerful telescopes of this scientific age have been found to be clusters of distant or small stars, because far advanced in their development, the luminous gas forming the transparent body of many comets—the Zodiacal light, perhaps—and other gaseous heavenly bodies, may serve to illustrate the condition of that primitive nebula.

Thus God *divided the light from the darkness*—that is, the light of the nebula from the dark outside matter, as yet inactive, and from the empty space around. And God called the light *day*, and the darkness he called *night*—both specific names—without reference to any period of time. And *the evening* (the dark chaotic time preceding) and the *morning* (the glorious light of that vast luminous mass) were the *first* day—the first great period of development, under God's guidance, of that world of matter just created; a day measured, not by the sun which did not exist, nor by any definite length of time, but by the work assigned to it.

The idea that these six days can possibly be days of twenty-four hours, seems only to prove the force of first impressions; for its correctness is disproved in the most absolute manner by the text and the whole tenor of the Biblical record, as well as by the study of nature. The reference, in the Decalogue, to the seventh cosmogonic day as a foundation for the Sabbath of man, which, at first sight, seems to suggest a complete similarity of these two Sabbaths, will be considered hereafter.

The Hebrew word *yom* (day) is used in this chapter in five different senses, just as we use the word *day* in common language: 1. The day, meaning light as above, without reference to time or succession. 2. The cosmogonic day, the nature of which is to be determined. 3. The day of twenty-four hours in the fourth cosmogonic day, where it is said of the sun and moon, "Let them be for days and for seasons and for years." 4. The light part of the same day of twenty-four hours, as opposed to the night. 5. In Genesis ii., 4, in the *day* that the Lord God made the heavens and the earth, embracing the week of creation, or an indefinite period of time.

The days of twenty-four and twelve hours, which require the presence of the sun, are excluded from the first three cosmogonic days, since the sun made its appearance only on the fourth day. No reason is apparent in the text why the last two days should be of a different nature from the others, while the geological history of the creation of animals and man demonstrates that they are periods of indefinite time. The word day, as light opposed to darkness, in the first day, and again as used in the fifth sense, have no application here. The cosmogonic day, therefore, only remains, and its special sense is to be determined by its nature.

We have seen already that each of these days is marked by a work, and each work is one of the great steps in the realization of

God's plan—one of the great changes which constitute the organic phases of that history. Time is here without importance. It is given, long or short, as needed; and God's works, which are done by means and processes which we can study, tell us that for every one of these great works of the six days, their Author—before whom a thousand years are as one day—has chosen to employ ages to bring them to perfection.

As in the growth of the plant we distinguish the germinating, the leafing, the flowering, and the seeding processes, as so many organic phases, which might be called the days of the plant's history, without reference to the length of time allotted to each, so we have here the day of the cosmic light, the day of the heavens, the day of the earth, the day of solar light, the day of the lower animals, and the day of the mammals and man; which are really the great phases of God's creation.

The Second Day.—The work of this day is the organization of the heavens. "*And God said, Let there be an expanse* (firmament) *in the midst of the waters, and let it divide the waters from the waters; and God called the expanse heaven.*" It is to be regretted that the English version has translated the Hebrew word *rakiah* (expanse) by the word *firmament*. This is due to the influence of the Latin Vulgate, which has *firmamentum* as the equivalent of the inexact στερέωμα of the Septuagint. This last word refers to the current Egyptian conception of a solid vault of heaven separating the lower visible world from the upper world of subtle, invisible matter beyond. This view was held by the Greek translators, but is not warranted by the Hebrew text, and renders it unintelligible. If it were correct, how could it be said that God called that solid vault "heaven?" and further, verse 20, that God created the fowl to fly in the open "firmament" of heaven? In both cases *expanse* is evidently the fitting word.

The central idea of this day's work is *division* or *separation*. The vast primitive nebula of the first day breaks up into a multitude of gaseous masses, and these are concentrated into stars. Motion is everywhere. Gravitation and the chemical forces tend to concentrate matter around various centres, and thus to isolate them from each other; centrifugal force tends to disperse them. Under the laws of the forces of matter and motion—established by God himself, and under his guidance—these numberless bodies, of all forms and sizes, which fill the space and adorn our heavens, combine into those worlds and groups of worlds whose wonderful organization it is the province of astronomy to discover. It is premature to say that this noble science has as yet furnished us a satisfactory history of the generations of the starry heavens, and of their real structure. But much has been done toward it. In the genesis of our solar system—as explained by the genius of Laplace, and submitted by Alexander to exhaustive calculations, the result of which amounts to a demonstration of its truth—we see one of the processes by which has taken place the separation of individual planets from a vast central body, holding them in bondage, in their orbits, by the power of its mass. In the twin stars, revolving around a common centre of gravity, we perceive the effect produced when the masses are more nearly equal. In the nebulous stars of all grades we follow the gradual concentration from a gaseous state to a compact and well-defined body. In the great spiral nebulæ discovered by Lord Rosse, we behold the actual breaking up of a world of stars of all sizes and brilliancy, and we witness the very process of their dispersion through space, by centrifugal force, along paths that they will never retrace.

But the text speaks of *waters above the* heavens, and of *waters under the heavens.* The latter are determined by the work of the third day, by which it appears that they are the matter out of which our globe was made, the waters above being the matter which formed the heavenly bodies.

We may ask ourselves, however, whether the matter of our globe is the whole, or only a part, of the waters under the heavens. If we accept the grand conception of the structure of the heavens proposed by Herschel, all our visible heavens are but an immense cluster of self-luminous stars, of which our sun, with its retinue of planets, is but one, situated not far from its centre. The form of this vast cluster is that of a disc, whose outer boundary is the Milky Way. In this the stars seem ready to break up, and assume the shape of the branches of a spiral nebula. Beyond extends, in immeasurable distance, the dark abyss of space. In this, again, are thousands of nebulous masses, each of which may be a starry heaven like ours. Here, we may fancy, we recognize—in the clusters of visible stars, to which our sun, moon, and the earth itself belong—the waters below the heavens, followed by the vast expanse beyond, containing the world of the nebulæ—the heaven of heavens, and the waters above the heavens, of which the Psalmist speaks. But, whether we receive the views of Herschel, of Maedler, or of Alexander concerning the structure and formation of the heavens, one fact recognized by all is the work of separation, of individualization, which must have preceded the present combination of the heavenly bodies, and is indicated as the special work of the second cosmogonic day.

The Third Day.—This day has two works, which must be considered separately. The first is the formation of the material globe

of the earth. "*Let the waters under the heavens be gathered together unto one place, and let the dry land appear.* And God called the dry land *earth;* and the gathering together of the waters called he *seas.*" The main idea is condensation of matter into the solid globe, its liquid covering and gaseous envelope. Here, as usual, Moses gives us the final result of the work, and not the process by which it was produced. For that we must ask geology.

The structure of the hard mantle of rock which covers the unknown interior of the globe, and the nature of its strata, together with their ever-increasing temperature downward, will bear witness to the eventful history of the past ages of our earth; astronomy and chemistry will carry us still higher, up to the very birth of our planet.

The materials of that part of the earth crust accessible to our investigation—from the alluvial surface sands and pebbles, through the sandstones, conglomerates, slates, and limestones, down to the crystalline bottom rocks—show themselves to be the débris of pre-existing rocks, rearranged at the bottom of the ocean; or due, as most of the limestones, to the secreting power of the polyps, or most minute animals of the sea. The temperature of the waters of this ocean was no higher than that of our tropical seas; for these rocks contain innumerable relics of marine animals similar, though not identical, to those of the present day. Lower down, the crystalline rocks, mostly stratified—the so-called metamorphic rocks—still bear the mark of an aqueous origin, but also indicate a high degree of temperature in the waters, which explains both their crystalline character and the almost entire absence of traces of life in these early seas. Coming from deeper sources still, but filling perpendicular fissures or chimneys, as in volcanoes, crystalline masses of porphyry, compact trap, basalt, and volcanic substances cross the regular strata up to the surface, and by their igneous nature reveal the existence of an internal temperature sufficient to keep rocks in a melted condition.

Guided by these general facts, and aided by the light derived from chemistry, physics, and astronomy, we may distinguish, in the gradual formation of the physical globe, before the introduction of life, four periods: 1. The nebulous. 2. The mineral incandescent. 3. The period of the hot oceans. 4. The period of the cold oceans.

In the first the matter of the earth was a part of the hot atmosphere of the sun. In the slow process of contraction, consequent upon its cooling, the sun left it behind in the form of a gaseous ring. The ring breaks in several places, and is rolled up into a globular mass, which, according to the laws of motion, rotates upon itself, and revolves around its parent body nearly in the plane of its equator, and with the velocity imparted to it by the sun itself. The new globe, born from the old matter of the sun, now enters, as a *gaseous mass*, into the first period of its separate existence.

Loss of heat by radiation causes further concentration. The molecules, brought nearer together and to the proper temperature for chemical action, now combine. A vast, long-continued, and ever-renewed conflagration, with an enormous development of heat, takes place, and the result is an incandescent melted mineral body, surrounded by a vast luminous atmosphere. The earth is a *sun.* This is the second period of its history.

The cooling continues: a hard crust is formed on the surface of the melted body of the globe, and, when the temperature becomes low enough to admit of the formation of water, the ocean—which was before a part of the atmosphere in the shape of vapor—is deposited on the solid surface of the globe. The temperature of this first ocean must have been very high, owing to the immense weight of the atmosphere resting upon it. It has been calculated that when the deposition began, the temperature of the first waters could not have been less than 600° Fahr. This geological phase, though it is one through which a cooling globe must have necessarily passed, has not, thus far, received the attention it deserves. Let us try to see what this state of things implies, for it is important for the explanation of the fourth day. The oceans were not only very warm, but must have been highly acidulated; for all the acids, which form a large part of the thousands upon thousands of feet of rocks deposited since, must have been then in the atmosphere. These hot and acid waters, resting upon the old mineral crust, must have decomposed it, and a new series of chemical combinations have been formed, to which, perhaps, we may refer the deposition of the lowermost crystalline rocks which are at the base of the new terrestrial crust—the only one we actually know. By these powerful chemical actions the earth was transformed into a vast galvanic pile, emitting constant streams of electricity, which, reaching the ethereal space at the boundary of the thick atmosphere, became luminous. According to Herschel, the photosphere of the sun may be due to a similar cause, and if we accept the most plausible explanation of the aurora borealis, it is but the last vestige of that electrical condition of our globe. During this third period the earth was still surrounded by a photosphere of subdued brilliancy: it was a *nebulous star.*

The process goes on; the physical and chemical forces, thus far so active, subside and enter into a state of quiescence; the photosphere disappears; the globe becomes an extinct body; the ocean cools down to the mild temperature of our tropical seas, and

is ready for the introduction of living beings. The age of matter is over; the age of life is at hand. The fourth period was that of *the dark planet and the cool oceans.*

This fourth period, and perhaps the latter part of the third, are represented in the geological strata by the so-called azoic rocks, which are found in all continents. Here also we have evidence of the appearance of the first land above the waters of the ocean. Considerable surfaces and low mountain chains, both in the Old and New World, belong to this age. Geology explains very plausibly the sinking of the large surfaces — now containing the oceans—and the rising between them of the continents and mountains, by the gradual shrinkage of the cooling interior, forcing the hard external crust — now too large — to mould itself on the smaller sphere by folding into mighty wrinkles. This process could not be better described than by the words of Moses: "Let the waters be gathered together in one place, and let the dry land appear" — implying that the land was formed already under the surface of the ocean, and was subsequently raised above it.

The first work of the third day closes the age of matter; for, if science is right in its view of the origin of our solar system, the sun, moon, and stars of the fourth day were then in existence, but invisible to the earth. The three great steps indicated by the works of the first three days are the same that we observe in the beginning and growth of organized beings. All originate in darkness, in a homogeneous fluid, which soon forms into an egg; the next stage is a differentiation, and a gradual formation of individual organs; the last is a combining together of all these parts into an organic body, exhibiting unity in variety. This is the universal law of development, both for individuals and collections of individuals.

But in this third day there is a second work, entirely unlike the first, belonging to the age of organic life—the creation of the plant—a creation, indeed, of a new principle, though it is not designated in the text by *bará*, because it is but the peristyle of the temple of true life, the condition of its existence. We say that it is a creation; for in it matter is controlled by an immaterial principle, directing its forces so as to make it assume new forms unknown to the mineral. In the plant, as in every organized being, there is an inward principle of individuality not possessed by the crystal; a variety of functions and organs working together toward a common aim for the benefit of the individual; an inward growth, with a beginning and a definite end, and a reproduction which perpetuates the species—phenomena which are all absolutely foreign to inorganic matter. These characteristics are admirably summed up in the words, "And God said, *Let the earth bring forth grass, the herb yielding seed, and the fruit-tree yielding fruit after his kind, whose seed is in itself.*"

The words, "Let the earth bring forth," may seem to favor the idea of a combination of material elements without the introduction of a new principle. But the same phrase is used in verse 20, when a true creation (*bará*)—that of the first animals—was meant and took place. And again, in Gen. ii., 4, 5, we find that "in the day the Lord God made every plant of the field *before it was in the earth*, and every herb of the field *before it grew.*" This declaration distinguishes the plant, as a principle, from the matter which it moulds into the form necessary for its functions.

This view must be held as the most rational; for all experiments—even the very latest and apparently most successful—made during the last hundred years to prove the so-called spontaneous generation of organized beings from dead matter, have failed to convince the majority of thinking men of its reality. Matter, unaided, can never rise above its own level.

The most important function of the plant in the economy of nature is, with the aid of the sun's light, to turn inorganic into organic matter, and thus prepare food for the animal. Nothing else in nature does this important work. The animal can not do it, and starves in the midst of an abundance of the materials needed for the building up of its body. The plant stores up force which it is not called upon to use; the animal takes it ready made as food, and expends it in activity. The plant, therefore, is the indispensable basis of all animal life; for, though animals partially feed upon each other, ultimately the organic matter they need must come from the plant.

The manner in which Moses introduces the creation of the plant, as a work distinct in its nature from the first work of the third day, and the position he assigns to it at the end of this day, and before the creation of living beings, are highly philosophical. This order is required by the law of progress, according to which the inferior appears before the superior, because the first is the condition of the phenomenal existence of the latter.

Does geology confirm this position of the plant in the order of creation? If we should understand the text as meaning that the whole plant kingdom, from the lowest infusorial form to the highest dicotyledon, was created at this early day, geology would assuredly disprove it. But the author, as we have remarked above, mentions every order of facts but once, and he does it at the time of its first introduction. Here, therefore, the whole system of plants is described in full outline, as it has been developed, from the lowest to the most perfect, in the succession

of ages; for it will never again be spoken of in the remainder of the narrative. What plants actually existed at this period geology has to find out. The possibility of infusorial plants living in warm, nay, in hot water, is proved by their being found in the geysers of Iceland, and in hot, acidulated springs. The latest geological investigations tell us that abundant traces of carbonaceous matter and old silicious deposits among the so-called azoic rocks seem to indicate the presence of a large number of infusorial protophytes filling those early seas. Whether they furnished food for the primitive protozoans of a similar grade is still a matter of doubt; but the presence of limestone strata in the azoic age seems to speak in the affirmative.

The striking fact that Moses, though fully recognizing the great difference between the two works of the third day, and the importance of the vegetable kingdom, did not assign to it a special day, but left it in the age of matter, is not less full of meaning. The plant is not yet life, but the bridge between matter and life—the link between the two ages. Placed within the material age of creation, it is the harbinger and promise of a more noble and better time to come. It is the root of the living tree planted in the inorganic globe, and destined to flourish in the age of life.

The fourth day opens the age of life, with the appearance of the sun, moon, and stars in the heavens visible from the earth — a work which apparently still belongs to the physical order, but whose object is to benefit life. *"Let there be lights in the firmament of the heaven, to give light upon the earth; and to divide the day from the night; and for seasons, and for days, and for years."*

The sun and moon are not created, they existed before, but now enter into new relations with the earth. During the age of matter the intensity of chemical action was a source of permanent light—the earth was self-luminous—the light of the sun, moon, and stars being merged in the stronger light of its photosphere, and therefore invisible to it. But after the disappearance of its luminous envelope, our glorious heavens, with sun, moon, and stars, become visible, and the earth depends upon this outside source for light and heat. Its spherical form causes the unequal distribution of both which establishes the differences of climate from the pole to the equator. Its rotation gives, for the first time, a succession of day and night, which breaks the permanent light of the preceding age. Its revolution round the sun brings, in their turn, the seasons and the years. Thus are prepared the physical conditions necessary to the existence of living beings, the periods of activity and rest, of summer and winter, and that variety of temperature and moisture which fosters the almost infinite richness of the organic forms of plants and animals displayed in our world of life.

In the third day the earth was ready for life; in the fourth the heavens are ready to help in the work. The fourth day is, as it were, a reminiscence of the inorganic period, and forms another connection between the two principal stages of the globe.

The fifth and sixth days offer no difficulties, for they unfold the successive creation of the various tribes of animals which people the water, the air, and the land, in the precise order indicated by geology.

This history is introduced by the solemn word *bará*, which occurs here for the second time, and gives us to understand that, with the creation of the animal, another great and entirely new order of existence begins.

Matter, indeed, is in it, but controlled and shaped into new forms, foreign to its own nature, to suit the wants of the immaterial being within. Vegetative life is in it, but subservient to higher functions, which the plant could never perform by itself. A conscious perception of the outer world by *sensation*, however, and a *will* to react upon it, are powers which place the animal on a higher platform, and make it a being which, by its nature and its functions, is entirely distinct from the lower grades of existence.

Let us cast a glance at the geological history of the life system, such as present science enables us to read it, and the admirable correctness of the Mosaic account will be evident.

Geology informs us that the terrestrial crust, down to its lowest attainable depths, is composed of layers placed upon each other, different in mineralogical character and structure, and evidently deposited at the bottom of the ocean. The order of their superposition furnishes the great chronological table of the events which took place during their formation; the lowermost stratum—the first deposited—being the oldest; the surface layers—the last formed—being the most recent.

These strata preserve in their folds the archives of the creation of organized beings, plants, and animals, whose remains innumerable fill these rocky shelves, and reveal to the geologist the mysteries of the by-gone ages.

Five great ages of life may be distinguished, each of them characterized by the predominance of a certain class of animals, and marking the great steps of gradual progress in the vast system of the living forms of the past:

1. The age of invertebrated animals, contained in the Silurian series of rocks.

2. The age of fishes, in the Devonian series.

3. The age of the first land plants, in the Carboniferous rocks.

4. The age of the reptiles, in the Mesozoic rocks—triassic, jurassic, and cretaceous.

5. The age of the mammals, in the Tertiary rocks.

These are preceded, as a preface, by an age of protophytes and protozoans in the so-called azoic or archaic rocks, and closed by the age of man, in the quaternary and present age.

In the first, the primordial fauna makes its appearance in the lowermost Silurian strata, and is represented by marine forms of the three great archetypes of invertebrated animals—the radiates, mollusks, and the articulates. They appear all at once on the same level, and not successively. During untold ages, represented by successive deposits of rocks amounting to over 15,000 feet in thickness, corals and plant-like radiates, mollusks of all grades—some of gigantic size—numberless crustaceans of embryonic form, swarm in the tepid waters of the ocean; but not a fish is found, save a few at the very end of this long period of existence, as forerunners heralding the coming of higher forms. This is the reign of the lower animal life—the involuntary life—typified by the invertebrates.

In the second age, the Devonian strata contain in abundance remains of the fish tribe, which is added to the riches of the sea, and takes the lead among the tenants of the ocean; for, though the lowest grade in the archetype of vertebrates, it belongs to the higher level of animal life, in which sensation and will predominate. The strange forms of these first fishes—their reptilian character, their powerful organization—make them the scavengers and the kings of the seas.

This is the reign of fishes.

In the third—the Carboniferous age—the continents, which were slowly growing under the water, reach the surface. These newly emerged, still swampy lands, cover themselves with a mantle of verdure. In the warm and moist atmosphere of this day, charged with carbonic acid gas, humble cryptogams grow to stately forest trees, and a luxuriant growth of ferns and allied plants furnish the material for the vast beds of coal so precious to civilized man. This is the reign of the lower land plants, purifying the atmosphere of its noxious gases, and preparing it for air-breathing animals.

In the fourth age, monstrous reptiles, first amphibious, together with tall birds, then huge marine saurians and gigantic land reptiles, fill the oceans and inland seas, which teem with an extraordinary abundance of lower marine life. The reptiles are the kings of creation, they reign supreme.

The fifth age was heralded, in the preceding age, by a few small, mostly marsupial mammals.

But now the Tertiary opens with a magnificent array of large mammals, which people the new-formed continents and the seas, from the huge whale to the portly form of the elephant and the powerful organization of the lordly lion, the king of the brute creation. The mammal—the *typical vertebrate*, the perfect animal—now reigns in his turn, but will soon also have to yield its sceptre to man.

The facts just mentioned speak a strong language. They tell us that *creation* is a *reality*. The archetypes of the Silurian are not derived from one another, for they appear all simultaneously. Science fails to discover traces of a direct descent of the vertebrate from the invertebrate, whose plan of structure is entirely unlike; of the large fishes of the Devonian from any preceding animal form; of the huge reptiles of the middle ages of life from the fishes of the Devonian. The gigantic pachyderms, which appear suddenly at the tertiary epoch, are not the offspring of the reptiles of the age preceding. The bond which unites them is of an immaterial nature; the marvelous unity which we observe is in the plan of the Creator. We should then acknowledge a *plan* admirable in conception, admirable in execution. There is a *wisdom* which devises, a *free will*, and a *power*, which executes and creates in succession, at the appointed time, when it is fitting, and not a single great unconscious whole which is developed by itself.

In the order of time there is progress. The inferior being always precedes the superior; the imperfect the perfect. Inorganic nature precedes organization. The watery element reigns before terrestrial; the aquatic and inferior animals before the terrestrial and superior. In the series of the vertebrated animals, we see fishes, reptiles, birds, and mammifers appearing in the ages of the globe in the order of their perfection.

The accordance of these results of geology with the Mosaic account is so evident that no further explanation is necessary.

Fifth Day.—The work of this day is the creation of the lower animals, up to the birds. "*And God created great whales, and every creature which moveth, which the waters brought forth abundantly, and every winged fowl.*" The order of their appearance is that discovered by geology: the water animals first, together with the large amphibians, the great whales (marine monsters), and other reptiles, and then the birds. This corresponds with the first geological ages, the paleozoic and the mesozoic, up to the tertiary epoch.

Sixth Day.—The sixth day, which is the third of the era of life, contains two works, as did the third day of the era of matter: first, the creation of the higher animals especially living on the dry land, or the mammalia—it corresponds with the tertiary age; and, second, the creation of man in the quarternary age.

The First Work.—"*And God made the beast of the earth and cattle, after their kind, and every thing that creepeth upon the earth.*" For this

creation the word *made* is used, not *create*, for it is not the first introduction, but the continuation of the life system. The creeping animals of the sixth day are not reptiles, but, according to Gesenius, the smaller mammalia — rats, mice, etc. The greatest changes in the mineral and organic creation, according to geology, took place between the cretaceous and tertiary epochs. And there, also, Moses places the beginning of a new day. For not only are the land animals a new set of beings, they are also the highest, and the family to which man belongs as a member of the life-system of nature.

The second work of the sixth day is of a vastly different nature. The creation of man is a fact of such great importance that it could not be mentioned otherwise than separately. Here, again, and for the third time, the word *bará* announces not a simple continuation of the animal, but the creation of a new order of existence, the most exalted of all. Three times the sacramental word is repeated: "*So God created man in his own image, in the image of God created he him; male and female created he them.*" That being, made by the Creator in his own image, upon the creation of whom Moses put so much stress, to enforce, as it were, the idea of his dignity, could not be confounded with the animals. But why does he place this creation, not in a separate day, but with the mammalia in the sixth day? Man is the crowning act of the Creator. He is the summary of all perfections scattered through the animal kingdom, of which he is the keystone. He is the end and aim of the whole development of our planet, and as such belongs to this physical earth. But he is also a being of a new and superior order, and, therefore, must be kept distinct. The appearance of the physical man is the prophecy and the promise of a future and more perfect age of development which begins with him — the moral age, that of the historical world. This second work of the sixth day is thus the link between the age of the physical creation and that of the moral development of mankind, as the plant was the link between the material and the world of life. It is the moral world planted in the material world, in order to make it subservient to a higher and better aim.

Here end the working days of the Creator. All his other works God had declared to be *good;* but on the sixth day "*God saw every thing that he had made, and, behold, it was* VERY GOOD." The work of the whole week is now finished, and perfect as God will have it for his purpose—the education of man.

Now begins the *seventh day*, the day of rest, or the *Sabbath* of the earth, when the globe and its inhabitants are completed. Since the beginning of this day no new creation has taken place. God rests as the Creator of the visible universe. The forces of nature are in that admirable equilibrium which we now behold, and which is necessary to our existence. No more mountains or continents are formed, no new species of plants or animals are created. Nature goes on steadily in its wonted path. All movement, all progress has passed into the realm of mankind, which is now accomplishing its task. The seventh day is, then, the present age of our globe; the age in which we live, and which was prepared for the development of mankind. The narrative of Moses seems to indicate this fact; for at the end of each of the six working days of creation we find an *evening*. But the morning of the seventh is not followed by any *evening*. The day is still open. When the evening shall come the last hour of humanity will strike.

This view of the Sabbath of creation has been objected to on account of the form of the command in the Decalogue relating to the observance of the Sabbath. But those who object confound God's Sabbath with man's Sabbath, and forget the word of Christ that our Sabbath was made for man, who needs it, and not for God. God rests as a Creator of the material world only to become active, nay, Creator, in the spiritual world. His Sabbath work is one of love to man — the redemption; his creation is that of the new man, born anew of the Spirit, in the heart of the natural man. So man is commanded to imitate God in leaving once in seven days the work of this material world, to turn all his attention and devote his powers to the things of heaven.

There are, therefore, three Sabbaths: first, God's Sabbath after the material creation; second, the Sabbath of humanity, the promised millennium, after the toil and struggle of the six working days of history; third, the Sabbath of the individual, short-lived man, the day of rest of twenty-four hours, made for him according to his measure. The length of the days in each is of no account. The plan, in all, is the same, and contains the same idea—six days of work and struggle in the material world, followed by a day of peace, of rest from the daily toil, and of activity in the higher world of the spirit. For the Sabbath is not only a day of rest, it is the day of the Lord.

Such is the grand cosmogonic week described by Moses. To a sincere and unprejudiced mind it must be evident that these grand outlines are the same as those which modern science enables us to trace, however imperfect and unsettled the details furnished by scientific inquiries may appear on many points. Whatever modifications in our present view of the development of the universe and of the globe may be expected from new discoveries, the prominent features of this vast picture will remain. And these only are delineated in this admirable account of

Genesis. These outlines were sufficient for the moral purposes of the book; the scientific details are for us patiently to investigate. They were, no doubt, unknown to Moses; as the details of the life and of the work of the Saviour were unknown to the great prophets who announced his coming, and traced out with master-hand his character and objects centuries before his appearance on earth. But the same divine hand which lifted up before the eyes of Daniel and of Isaiah the veil which covered the tableau of the time to come, unveiled before the eyes of the author of Genesis the earliest ages of the creation And Moses was the prophet of the past, as Daniel and Isaiah and many others were the prophets of the future.

The following diagram, which sums up the results of the preceding discussion, may be found of service in making clear the correspondence of the two records:

The Bible.	Science.
ERA OF MATTER.	
In the beginning God created the Heavens and the Earth. And the Earth was without form, and void; and darkness was upon the face of the deep.	*Matter is not self-existent.* Primitive state of matter. Gas indefinitely diffused.
First Day. And God said, Let there be light: and there was light. And God divided the light from the darkness.	*First Activity of Matter.* Gravity. Chemical action. Concentration of diffused matter into one or more nebulæ, appearing as luminous spots in the dark space of heaven.
Second Day. And God said, Let there be a firmament in the midst of the waters, and let it divide the waters from the waters.	*Division.* The primitive nebula is divided into smaller nebulous masses. One of them forms the solar system, which separates into sun and planets.
Third Day. *a* And God said, Let the waters under the heavens be gathered together, and let the dry land appear.	*Concentration.* The nebulous masses concentrate into stars. Formation of the mineral mass of the earth by chemical combination of the solid crust, the ocean and atmosphere. The earth self-luminous. First appearance of land. Azoic rocks.
And God said, Let the earth bring forth grass.	First infusorial plants and protophytes.
ERA OF LIFE.	
Fourth Day. And God said, Let there be lights in the firmament of the heavens, and let them be for signs, for seasons, for days, and for years.	Chemical actions subside. The earth loses its photosphere: sun and moon become visible. First succession of day and night, of seasons and years. Differences of climate begin. Archaic rocks. Protozoans.
Fifth Day. And God created great whales, and every living creature which moveth, which the waters brought forth abundantly, and every winged fowl.	Plants and animals appear successively in the order of their rank — marine animals, fishes, reptiles, and birds. First great display of land plants. Coal beds. Paleozoic and mesozoic ages.
Sixth Day. *a* And God made the beasts of the earth, and cattle after their kind.	Predominance of mammals; the highest animals. Tertiary age.
b And God created man in his own image.	Creation of man. Quaternary age.
Seventh Day. And God saw every thing that he had made, and, behold, it was *very good*. And God rested on the seventh day.	No material creation. Introduction of the moral world. Age of man.