

THE ORIGIN OF THE UNIVERSE

AUGUSTINE WALLACE, O.P., AND MARK JOSEPH DAVIS, O.P.

PART II—THE BIBLICAL ACCOUNT



IN PART I of this article, we saw how the advances of modern physical science have produced a new interpretation of the account of the universe's origin in Genesis. As far as we can ascertain, this interpretation has not as yet been subjected to critical examination by exegetes, but in the interests of a preliminary evaluation, we introduce here some of the general teachings of Scriptural scholars regarding the opening verses of this Sacred Book. Before doing this, however, it would be well to realize that the modern Biblical exegete is every bit as much a savant as the modern theoretical physicist. His work proceeds along different lines, it is true, since he is concerned primarily with correctly interpreting the sense of ancient writings, and not with practico-speculative knowledge of the world of nature. Yet when he goes to work with his allied sciences of archaeology, philology, history, geography, astronomy, etc., he is in a much better position than is the theoretical physicist to decide what interpretation is to be placed on an ancient document written for primitive peoples.

Now, just as the centuries have seen a revision of opinion among scientists regarding the origin of the universe, so also has there been a diversity of opinion among exegetes regarding the interpretation of the first chapter of the Book of Genesis. During the past few decades greater proficiency in the knowledge of the Hebrew language, new discoveries regarding the customs and concepts of ancient peoples, etc., have necessitated the revision of opinions previously held. No one, of course, denies the *fact* related: the one true God created the universe from nothing. There is no diversity of opinion among Catholic exegetes on that score. There is, however, and always has been, great diversity of opinion regarding the manner of interpreting the whole first chapter. Should we take each word and verse in its strictly literal sense? Does the word *day* in this chapter always mean a period of twenty-four hours? Or a period of many years? Perhaps the whole chapter is an allegory? And how did Moses come to know the facts he relates in the Book of Genesis—by oral tradition, by written documents, or by a vision from God? These and many other theories have

had their proponents among Catholic exegetes in the course of the Christian centuries.

EARLY EXEGESIS

Almost from the very beginning of the Christian era there were two contrary opinions, one allegorical and the other literal, and each had its adherents down through the Middle Ages. Clement of Alexandria and Origen, of the allegorical school, aimed at reconciling Christian doctrines with Greek philosophy. They held that God created all things simultaneously, and the use of the six days is merely a figure to teach the gradation of created beings. They went so far as to interpret the upper firmament as meaning the angels, the abyss as the devils, the sun as Christ, and the moon, the Church. On the other hand, many of the Fathers, especially the Cappadocians, in their zeal to reject this excessive allegorism, tended to interpret everything in a strictly literal sense. Each day, for them, meant a period of twenty-four hours. As St. Basil said, "I take all things just as they are stated."

St. Augustine investigated and decided that neither of these interpretations could be admitted in its entirety, for two reasons. First of all, it was against the conclusions of science to say that each "day" was of twenty-four hours' duration; and since God is the author of all truth, there can be no disagreement between science and His inspired word. Truth is one. Secondly, he read in a Latin text of the Book of Ecclesiasticus (18,1), that God created all visible things simultaneously in a single omnipotent act (though the Hebrew text reads: God created all things without exception). We owe this much to St. Augustine, that he pointed up the apparent discrepancies between the Bible and science, and tried to reconcile them. Since his time many theological and physical scientists have been interested in an interpretation which will reconcile the seeming contradictions between the words of the sacred writer and those of the scientist.

Not many medieval theologians held for the opinion of St. Augustine, that God created all things simultaneously (v. 1) but the disposition and succession of the works are to be understood in an allegorical sense. Because of his great reputation, however, no one dared to reject his opinion as a possible explanation. Certainly it is not unreasonable to believe that God *could* have created all things at once. St. Thomas said it was a more subtle and more reasonable explanation, and the one which would best answer the objections of critics. St. Thomas himself seems to hold for an explanation which appears more in line with this recent scientific theory: God created all things simultaneously as to their substance, which was somewhat formless. But as regards the formation which was accomplished by distinction and

ornamentation, He did not create all things simultaneously. Thus Eccles. 18,1, significantly uses the word *creation* as applied to the unformed substance (I q. 74, a. 2, ad 2).

With regard to the interpretation of St. Thomas, we should note that in his treatment of the work of the six days of Genesis (*Summa Theol.* I, qq. 65-74), he seems rarely to put forth any opinion that could properly be called his own. He divides the tract into the work of creation, distinction and ornamentation. In most of the articles that deal directly with the text of Genesis, he seems content to show that there are in general two schools of thought on the interpretation, and that each school's interpretation is consistent with its principles. On the one side we have St. Augustine, and on the other side we have "others" such as St. Basil, St. Ambrose, and St. John Chrysostom. The very last article (q. 74, a.3), especially, is devoted to a recapitulation, wherein the Angelic Doctor shows the consistency of the interpretations made by the various schools.

St. Thomas gives his reason for this method of procedure in q. 68, art. 1, where he quotes St. Augustine: "In questions such as these, there are two things to be observed. First of all, that the truth of the Scripture be firmly maintained. Secondly, since the Holy Scripture can be explained in many ways, that one should adhere to no explanation so completely that, if certain reason shall prove it to be false, one should dare to assert that it is the sense of the Scripture. . . ."

RATIONALIST DIFFICULTIES

After the thirteenth century there were still many explanations and interpretations of the first chapter of Genesis. Some, like the progression of scientific theories already noted, were developed from others. Most of them were—and are—attempts at reconciling the Scriptural account with scientific theories. And, to tell the truth, Catholics were sometimes hard pressed for a satisfactory solution or explanation. In the eighteenth century Rationalism, the logical offspring of Protestantism, started to work on the Bible. Rationalists seemed to delight in finding errors, inconsistencies, contradictions in the Bible. They did not believe in the supernatural, and they took the Bible as a merely human work, conveniently dropping from the Bible whatever could not be explained on purely natural grounds. In this first chapter of Genesis they confronted the faithful with verse three: *Light was made*, and then pointed to verse sixteen: *God made the sun and the stars*. Now, everybody knows that the sun and the stars are the only sources of light, so how could there be light before its sources were

created? And Catholics were at a loss for a satisfactory answer for many years.¹

Then the Rationalists discovered accounts of the origin of the universe in the pagan mythical literature of the neighboring Oriental nations surrounding the Hebrews. They concluded that if Catholics are going to insist on holding the Book of Genesis as divinely inspired then they must also say that the pagan accounts are inspired, for both say the same thing. Or else, Catholics must admit that the Bible is no more from God than are the pagan accounts. It is undeniably true that in some places these accounts do agree with the Bible even in the very words and phrases used. But the Rationalists carried this similarity too far, to include ideas. The six tablets of the Babylonians are the same as the six days of Genesis, they said. The god Mot of the Phoenicians is the same as the watery mass in Genesis. In the literature of the Egyptians we read that the god Toth created divinities who in turn were to establish order in the universe; he did this by a *single word*, just as God created the universe. These and many other similarities in the Oriental literature, however, have long since proved to be similarities in word only. None of them refers to the creation of the universe as we know it. Besides, the Rationalists have already been well refuted, and it is not our intention here to do it again. However, we shall consider the objection of the light preceding the sun later in this development.

Coming down to modern times, there are several diverse theories which find favor among exegetes. They have been classified in various ways, according to their relation to science (strictly scientific, partially scientific, etc.), according to the nature of the scriptural account, and so forth. Father Prado, C.S.S.R., groups them under three headings: historical, artistic, and historico-artistic.

HISTORICAL SYSTEMS

The proponents of the so-called historical systems seek primarily to show a conformity between the account in Genesis and objective reality. Perhaps the best known of these systems is that which holds to a strictly literal interpretation. It had many adherents, not only in the early centuries, but even in the thirteenth century. They maintained that God created the world in six days of twenty-four hours each, and in the order as given by Moses. This opinion is now rejected by almost all students as obsolete and anti-scientific. Even though the conclusions

¹ Here, as has frequently happened, St. Thomas anticipated the argument of the Rationalists. He presents substantially the same difficulty in the second objection to Q. 67, a. 4, in the *Prima Pars*.

of science are not certain, this much is very probable: a) our earth passed through various stages, which are called epochs; b) the heavenly bodies arrived only gradually at their ultimate perfection; c) before the appearance of man on earth organic life already existed for many centuries.

The Restitutionalists say that the universe was made waste and void by the bad angels, and the account in Genesis tells of the restoration to the original state. This theory has no scientific foundation, and there is no proof for it in the Book of Genesis itself.

The Periodists or Concordists hold that the word *day* in this context means a period of uncertain duration. There is certainly nothing contrary to faith in this, although even greater difficulty is encountered in giving a satisfactory explanation for the expression *evening and morning* which is always used in connection with the days.

The Interperiodists return to the very literal interpretation, but they say that in between each day there was a period of development. This, however, remains to be proved.

ARTISTIC SYSTEMS

Artistic systems generally abstract from the objective truth of the Biblical narrative and explain Genesis either a) from the way in which the author obtained his knowledge, or b) by the art which he used in proposing the religious truths. In the first class belong those who say that Moses received his knowledge of the creation of the universe in a vision or series of visions, and the account as given in Genesis is a retelling of the visions. This is quite possible, but possibility does not make for fact; what is freely asserted can be freely denied. Others say that Moses got his knowledge from the pagan myths of the neighboring peoples. This, however, must be understood properly. In *Humani Generis* we read (no. 38): "If . . . the ancient sacred writers have taken anything from popular narrations (and this may be conceded), it must never be forgotten that they did so with the help of divine inspiration, through which they were rendered immune from any error in selecting and evaluating those documents." Others, however, deny inspiration or deny the historical character of the first three chapters of Genesis, calling the whole thing a myth taken from pagan accounts; this was rejected by the Pontifical Commission in 1909.² Note that these points of Catholic doctrine are in no way contradictory, for they are speaking about two specifically distinct theories, as the contexts show.

² Cf. Denz. 2122 (EB 333).

To the second class belong those who hold that Moses did not intend to propose completely true and exact history, but embellished the fact—God created all things—with a few concepts which would make it more easily understandable to the minds of his readers. Such a theory certainly has one advantage—it removes all difficulties between the Bible and science, for they are thus speaking of two totally distinct things.

HISTORICO-ARTISTIC SYSTEMS

The amalgamations known as historico-artistic systems are considered as the "more probable" explanation by modern exegetes. They are called *historical* since the creation of each and every thing pertains to true history; they are called *artistic* because the order in which the individual creative acts is proposed belongs to the literary art of the sacred writer. This seems quite evident not only from the expressions and concepts used, but also from the order and disposition of the works. The "ideal historical" theory, foremost among these systems, maintains that it is a matter of history that:

- 1) God created the whole world at the beginning of time by a mere command of His will.
- 2) God exists before the world; the world has a beginning and does not proceed from itself.
- 3) All God's works are good in so far as they correspond to the divine idea and will.
- 4) The stars, plants, beasts, etc., were created by God for man.
- 5) God proceeded most wisely in the production of things, and He ordained all things to the end proposed by Himself.
- 6) The time by which God perfected the creation of the world is an example of the days in which man should labor, just as God's cessation from the work of creation is an exemplar of the Sabbath rest.

The remaining details belong to the literary form used by the sacred writer, e.g.:

- 1) The images which represent God anthropomorphically as speaking or acting.
- 2) The descriptions of the heavens, earth, sea, plants, animals, etc., which are not given with scientific exactness, but rather according to the ideas of the time, and as such things appeared to the senses of the people.

3) The order of the narrative. Thus, the six days are six periods of significant change in the production of the universe as we know it.

We must not forget that the ideas of the world progress from age to age. If there were many who thought the world was flat in the

time of Christopher Columbus, it stands to reason that we should not expect modern scientific accuracy in the concepts of a people who lived over thirty centuries ago. The sacred writer wanted to show his contemporaries that the one true God created all visible things out of nothing. How could he best get this idea across to simple minds? He had to write in a language they could understand. Technical language would have been meaningless. We need only consider the different modes of presentation of the scientific theory under discussion, as it first appeared in *The Physical Review* and then later in *Coronet* magazine, to recognize the practical application of a principle: the writing should be accommodated to the minds of its readers. That is why the Pontifical Biblical Commission has stated that we should not expect to find scientific accuracy in the first chapter of Genesis.³ It was not the intention of the sacred writer to teach the innermost constitution of visible things and the complete order of creation in a scientific manner. St. Thomas says the same thing: Moses describes what is obvious to sense, out of condescension to popular ignorance (I, q. 70, a. 1, ad 3). And St. Augustine gives an additional reason: the Holy Spirit did not want to teach men things which would not be profitable for their salvation.⁴

The "popular" and non-scientific character of the Biblical account is shown particularly in a) the expressions and concepts used by the author; b) the order according to which the various works are disposed; and c) the duration of the work of creation. Each of these will be discussed briefly in the following paragraphs.

Moses had to use ideas which would be known to his readers, as has already been shown. Since they considered light and sun as two distinct substances, he wrote of their creation as such. So also did he write of the upper and lower firmament.

As for the ordering of the works of creation, we have already stated the principle of St. Thomas: Moses describes what is obvious to sense, out of condescension to popular ignorance. That is one of the reasons why there is no mention made of the creation of the angels; another is that possibly the people might have tended to give them the adoration due only to God, as superior beings. The disposition of the works, then, is logical rather than chronological. Obviously this rules out any opposition between the Scriptural account and science.

With regard to the duration of the work of creation, note that our guide in this matter, the Pontifical Biblical Commission, has stated

³ Cf. Denz. 2127 (EB 338).

⁴ *De Genesi ad litteram*, PL, 34, p. 270, col. B.

that in this chapter the word *day* may be taken either in its strict sense as the natural day, or in a less strict sense as signifying a certain space of time, and the Commission permits free discussion on this matter.⁵ Certainly, on the face of it, the text seems to favor the natural day of twenty-four hours, for the words are always the same: *And there was evening and morning, the (first, second, etc.) day*. The evidence of modern science enjoys high probability, however, and this seems against the natural day interpretation. Now, strictly speaking, God does not "need" six days in which to perform the works of creation and distinction. He could do the whole thing in a single act. So it is quite possible that the use of the six days is a literary device to teach the people that the Sabbath rest is of divine institution, which in no way indicates any real succession or duration of God's works.

INTERPRETATION OF PARTICULAR WORDS

Having seen what exegetes hold today regarding the interpretation of the whole first chapter of Genesis, we can now look at the common interpretation of some of the words and phrases. These will be most significant in any attempted reconciliation of the recent scientific theory with the scriptural account, as will become evident in the exposition.

In the beginning (v. 1). This is not to be taken in the same sense as the words with which St. John begins his Gospel, implying that the world existed already when the earth was waste and void. This would not be creation, but rather ornamentation. Rather it is to be taken in a temporal sense: in the beginning of all the things which God did during the six days, He created heaven and earth. In other words, before God began the distinction (vv. 3-10) and ornamentation (vv. 11-31) of the world, He created it. It is therefore not simultaneously eternal with God, for every beginning, according to the proper sense, is temporal.

The heavens and the earth (v. 1). This is the object of creation. In the past this has been held to be: (1) the primordial matter which God created from nothing; (2) the spiritual world (the angels) and the visible world. The expression *heaven and earth* was used by the Hebrews to signify the entire visible world, the organized world as we see it. It was, in fact, the only term they had. Verse one, then, is the inscription or title of the whole periscope.

The earth was waste and void (v. 2). Exegetes, independently of physical science, hold that this phrase describes the state of confu-

⁵ Cf. Denz. 2128 (EB 339).

sion or chaos: it was waste when it was created first by God, i.e., without any adornment or distinction. And this is the state referred to in verse nine: *Then God said, "Let the waters below the heavens be gathered into one place and let the dry land appear."* The phrase *waste and void* is merely a Hebrew repetition, of which several examples can be found elsewhere in the same Book of Genesis. It means entirely unformed, no delineation of paths, no limits, but still and quiet and devoid of any order. There was nothing found on the "earth," only chaos. Indeed, as we learn from verse nine, it was submerged under "water." It was, then, a chaotic and watery mass.

Darkness covered the abyss (v. 2). Darkness, say the exegetes, was considered by the ancients to be a substantial being like light, and so the sacred writer goes along with that concept. The word for *abyss* in Hebrew literature means the ocean or seas. Here in the context of Genesis it means a chaotic mass, a limitless, watery mass which totally submerged and surrounded the earth. When the waters were disturbed, going back and forth, the earth was also rolled from one spot to another by the waters. This is all according to the ancient concept of a chaotic and unordered mass. It is from this formless matter, as we learn from the Book of Wisdom (11, 18), that God produces all other beings.

Let there be light (v. 3). This has posed a very difficult problem for exegetes, though there was no difficulty for the ancient Hebrews, who considered light as a substance independent of the sun. This would be quite natural, since they saw the light come up every day before the sun. But regardless of that, we know now that the sun is the main source of our light. How, then, could there be light for three "days" before the sun was even created? If, as has already been proposed, light is taken to be radiation, then the problem is solved for this verse. Nor is this too farfetched a solution. Exegetes, even before the promulgation of the recent physical theory, noted that God *made* the firmament (v. 7), the light of the firmament (16), the reptiles and birds (21), beasts of the earth and man (25-26); but where the question occurs regarding the light of the first day, it is not said that it was *made* or *created* by God. It seems to appear by the command of God, just as the dry land (9) and the plants (12) appeared. Perhaps, the exegetes say, it already existed, like the earth submerged in the waters and the seeds of the plants in the earth. Perhaps, then, light had already been created from the beginning of the world, at the same time as the chaotic mass. The darkness was very dense, so that the light could not appear immediately. Now God wills that it appear, and so it is done; light came into being.

Let there be a firmament in the midst of the waters to divide the waters (v. 6). This is the second day. The term *firmament* certainly does not mean clouds. At the time the Book of Genesis was written, the firmament was considered to be at the ends of the earth upon columns or very high mountains, and retained the higher waters—rain, snow, hail, etc. This firmament distinguished the waters from one another—some above, some below. It is clear from this that the sacred writer is describing the creation of things according to Hebrew popular concepts. No mention is made of the material from which the firmament was constituted. Whether it was made from water or created from nothing, we do not know. Since the text does not say, it would be unwise for the exegete to propose any theory.

Let the waters below the heavens be gathered into one place and let the dry land appear . . . God called the dry land earth and the assembled waters seas (vv. 9-10). The third day. The waters were under and around the earth, not on it or above it. When they were gathered together, the earth necessarily appeared. *Seas* in the Hebrew text is in the plural, in the "intensive" form, which here denotes a very great sea, extended over a great space.

We have, then, at the end of the third day, (1) the firmament (2) seas and (3) dry land—all more or less prepared to receive their various forms of living inhabitants.

The fourth day (vv. 14-19). Here we must note again the discrepancy in the order proposed by the recent scientific theory and the order given in Genesis. If the theory were to be applied as it now stands, verses 14-18 would have to come before verses 9-12. Now, it is interesting to note that exegetes, again independently of this theory, have offered a possible explanation: the heavenly bodies are placed between plants and animals because, just like plants, they lack sense life, and so are inferior to animals, but they are superior to plants by reason of their mechanical motion. This, however, seems to be more Aristotelian than Mosaic on the face of it, though we have no way of knowing just how much Moses really did know of the manner of the production of the universe. According to the sacred writer these heavenly bodies were to serve three functions: divide night and day; serve as signs for fixing seasons, days and years; and serve as lights.

Several things are to be noted in this section. One is that the use of the term *two great lights* is another example of the popular character of the whole narrative. Moses is describing according to external appearances, and so he calls them greater and smaller. Secondly, note that no mention is made of the material of which these lights were composed. Not useful for salvation, St. Augustine would say. Thirdly,

note that the term *to rule* does not mean that these lights had life, or were gods. It is only a poetic metaphor, a synonym for "to distinguish." According to some exegetes, as we have already stated, if these lights had life, the author would have mentioned them after the treatise on animals.

This brief presentation hardly scratches the surface of exegetical thought on the first few verses of Genesis. But it is sufficiently adequate to show the meaning of some of the key words, and to dispel mistaken impressions that would follow on accepting the literal English account as if it were written for people of our own times. It also shows to some extent that the teaching of exegetes does not explicitly conflict with the scientific interpretation, and that this new scientific interpretation might even be welcomed by some of them as a clarification of a few words of the sacred text.

With all this as a background, then, we are finally prepared to reflect on what we now know of the origin of the universe, and to crystallize our knowledge in the form of certain conclusions.

CONCLUSIONS

To re-direct our thought to the obvious, it should be noticed that throughout this paper we have not been concerned with creation as such, nor with its status as an article of faith. Our point of departure has been the origin of the universe as an historical event, and we have been attempting to find out how much the mind of man has learned about the details of this event. Assuming that the theories of modern science and the account of Sacred Scripture both have reference to the same thing, we have examined the details of both to see whether they are susceptible of integration as a complete picture, or whether they must necessarily remain conflicting accounts.

Now, from what has been written, it will be seen immediately that in one sense, the theories of science and the account in Genesis must ever be conflicting accounts: the end to which they are directed. The theories of modern physics are, without doubt, ordered to obtaining a complete knowledge of the universe; the account in Sacred Scripture is not ordered to this end at all. As St. Augustine points out, God's purpose in inspiring the sacred writer is only to teach us the truths necessary for our salvation. Therefore there is no essential ordination of Sacred Scripture to the teaching of scientific and historical matter, except in so far as it pertains to the work of salvation. Yet this does not militate against the Bible's containing true history or factual descriptions.

Then, at the other extreme, there is a sense in which there can be

no possible conflict between the conclusions of true science and the teachings of Scripture, as Augustine again points out: because God, Who is Supreme Truth, is the author of both. But before this can be invoked, it must be established in the particular case that we have a conclusion of true science, and that the teaching of Sacred Scripture can be accorded no other interpretation.

Now, in the scientific theory we have elaborated, we have not a conclusion of true science. The reader will surely have noticed that the entire theory rests on assumptions, hypotheses, pre-suppositions that in themselves demand no assent of the intellect; in fact, the entire argument is tenuous, a teetering edifice built on the precarious word, "if." A more exact physico-mathematical analysis than would be possible to give in this semi-popular description shows that at least seven major postulates underlie the theory of the origin of the elements: many of these are known to be inaccurate in one detail or another, and have been used only because other postulates would so complicate the mathematics as to stymie the reasoning altogether; others are generalizations based on as yet inadequate data. In all frankness, a theoretical physicist could only say, with regard to the entire theory as it has been proposed in Part I of this paper, that it *might be possible*. Its probability is not nearly as good as those physico-mathematical theories that have given physicists such prestige in the present era. Even though it does give us the best picture that modern science can offer of the beginnings of things, it is not a certain picture; at best, it is only opinion.

As to the interpretation of Sacred Scripture in this matter, it is again sufficiently obvious that this also is far from certain. The best view of contemporary exegetes seems to be that very few of the details in the account in Genesis are to be taken literally and completely, as true history; much of it can be attributed to the literary form of the sacred writer accommodated to the common opinions of an ancient people who were mostly concerned with the sensible appearances of things. But this is not unanimously received, nor does it seem to be susceptible of rigorous proof. Moreover, the Pontifical Biblical Commission thus far has spoken on only the most general issues. Hence we have no certitude as to the precise details of the origin of the universe from the account in Sacred Scripture. Here, too, we have a great deal of opinion.

For the Catholic scientist, all this boils down to a very convenient, though perhaps not so satisfying, conclusion: at the present time, all that anybody can have in this matter is opinion. Now, where opinions are involved, there is much truth in the old adage that one is as good as another. So, as far as the details of the origin of the universe are

concerned, privately he may think practically anything he please from a scientific point of view, provided he accepts on faith that God *created* the whole world at the beginning of time by a mere command of His will, that God exists before the world, etc.—in a word, that he believe truths pertaining to the deposit of faith.

When it comes to seeing in the Bible a *confirmation* of any scientific theory, however, he should proceed very cautiously, bearing in mind that modern scholarship in the field of exegetical research is not directed towards an explicit concordance between science and Sacred Scripture. He should, it goes without saying, guard against the latent heresy contained in all this and reflected in the title of the *Coronet* article, viz., that science can ever *prove* the story of creation. As to the relations between Sacred Scripture and the scientific theories sketched in this paper, it would seem that he could take either of two positions. The first would be to maintain the likelihood of an historical event in accordance with modern scientific theories, and to hold that the account in Genesis can be interpreted adequately without rejecting such an event. The second would be to maintain the likelihood of an historical event according to these theories, and to hold that the *details* of this event as described by modern science are actually indicated in the *particular words and descriptions* used by the inspired writer of Genesis. Of these, the first position is safer at the present state of the question, since the exegesis of verses is not tied down to particular scientific theories. As to the second, there is no inherent repugnance in God's inspiring Moses to describe "the beginning" anthropomorphically, and at the same time to give an accurate description of events as they did happen. In fact, from an *a priori* point of view, this would seem most proper, and in accord with the mind of the Church on the historicity of Genesis. But at the present time, neither physical nor exegetical science seem to be able to justify the second position with any degree of certitude. It is possible, but possibility does not make for fact. *A posse ad esse non valet illatio*. Thus, we would favor the first position, at the same time keeping an open mind on the question, because this field of knowledge is one that is alive. As the Holy Father has recently stated in *Humani Generis*, there *can* be discussion in this field; still, the sovereign Pontiff cautioned that research and discussion should be on the part of men experienced in science and exegesis, and that great care must be exercised where there is a question of hypotheses—which is obviously the case here.

Under the impetus of *Humani Generis*, the coming years will probably see a greater clarification of the teachings of the first eleven chapters of Genesis. For the present, it would be foolish to read into

the sacred writings any more than the Church's scholars have traditionally seen in them.

Ed. Note: Since this article was submitted, the Holy Father, in an address to the Pontifical Academy of Science, on November 22, 1951, praised the work of modern science as confirmatory of traditional teachings on the origin of the universe. His Holiness said, in part: "In fact, it would seem that present day science, with one sweeping step back across millions of centuries, has succeeded in bearing witness to that primordial *fiat lux* (let there be light) uttered at a moment when, along with matter, there burst forth from nothing a sea of light and radiation, while particles of chemical elements split and formed into millions of galaxies." Thus the Holy Father added the weight of his authority to the preliminary scientific studies presented in the first part of this paper, and possibly keynoted the trend of future studies on this problem.

BIBLIOGRAPHY

General:

- Pius XII, Pope, *Humani Generis*, Eng. tr. Washington, D. C., N.C.W.C., August 12, 1950, pp. 15-18.
- Smith, Msgr. Matthew, "Latest Science Doesn't Jar Genesis," *The Register*, Denver, Feb. 13, 1949, pp. 1, 6.
- Carlisle, N., "Science Proves 'The Story of Creation,'" *Coronet*, XXVII, 2, December, 1949, p. 48. Reprinted in *Catholic Digest*, February, 1950.
- Jones, Alexander, *Unless Some Man Show Me*, N. Y., Sheed and Ward, 1951, pp. 69-108.
- Page, Thornton L., "The Origin of the Earth," *Physics Today*, I, No. 5 (1948), p. 12.
- Spitzer, L., "The Formation of Stars," *Physics Today*, I, No. 6 (1948), p. 7.

Scriptural:

- Ceuppens, F. L., O.P., *Questiones Selectae ex Historia Primaeva*, ed. II, Taurini, Marietti, 1948, pp. 1-84.
- , *De Hexaemeron*, Romae, Collegio Angelico, 1931.
- Höpfel, H., O.S.B., *Introductio Generalis in Sacram Scripturam*, Romae, Arnoldo, 1950, p. 435 et passim.
- Lagrange, M. J., O.P., "Hexaméron," *Revue Biblique*, V (1896), pp. 381-407.
- Moriarty, F. L., S.J., and Guindon, W. G., S.J., "Genesis and Scientific Studies on the Origin of the World," *The Catholic Biblical Quarterly*, XII (1950), No. 4, p. 428 ff.
- Simon, H., C.S.S.R., et Prado, J., C.S.S.R., *Praelectiones Biblicae*, V. T., I, Taurini, Marietti, 1949, pp. 11-47.

Scientific:

- Alpher, R. A., Bethe, H., and Gamow, G., "The Origin of the Chemical Elements," *Physical Review*, Vol. 73 (April 1, 1948), No. 7, p. 803.
- Alpher, R. A., "A Neutron-Capture Theory of the Formation and Relative

Abundance of the Elements," *Physical Review*, Vol. 74 (Dec. 1, 1948), No. 11, p. 1577.

Alpher, R. A. and Herman, R. C., "On the Relative Abundance of the Elements," *Physical Review*, Vol. 74 (Dec. 15, 1948), No. 12, p. 1737.

Gamow, G., "The Origin of Elements and the Separation of Galaxies," *Physical Review*, Vol. 74 (Aug. 15, 1948), No. 4, p. 505.

_____, "On Relativistic Cosmogony," *Reviews of Modern Physics*, Vol. 21, No. 3 (1949), p. 367.

Smith, Vincent Edward, *Philosophical Physics*, N. Y., Harper, 1950, pp. 90-93.