The Multiple Gaps Theory:
A Contemporary Revision of
the Science and Theology of Creation

A Thesis

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ABSTRACT

Genesis 1 contains scientifically and historically reliable information about the origin of life and the origin of the universe. It tells us that God is the Creator of the universe and life. Genesis 1 embodies a chronological outline of Divine creative activities from which it is possible to construct a cosmogony that consists of six creation periods. Each of these creation periods begins with a twenty-four-hour creation day followed by a time gap. It is called the Multiple Gaps Theory. In this model, the earth is old but life is relatively young. And the existence of the universe depends on a Creator and His special creation.

CHAPTER 1

INTRODUCTION

Where did we come from? This is one of the most common questions that is asked by every person at one time or another. The answer to this question gives meaning to our existence. It directly affects the way we view ourselves, which in turn affects our social and moral values. Many good ideas (as well as bad ideas) have been offered to answer the origin question. Yet none of the existing theories today is completely satisfying. It is justifiable to depart from traditional wisdom momentarily to seek a new way to look at an old problem.

The Problem of the Study

There are a large number of current rival theories of the origin of the universe. In the Christian tradition, there are four major rival theories to explain Genesis 1 and 2. They are Six-days Creationism, the Gap Theory, Progressive Creation and Theistic Evolution. Each theory has a number of conceptual and exegetical problems which are difficult to resolve. In my opinion, a true theory must be free from these types of defects; and every attempt at the true theory should aim to resolve any conceptual and exegetical problems. In my own estimation, I feel confident that we have not yet arrived at the ultimate theory of the origin of the universe.

The Importance of the Study

The origin of the universe is an exciting topic and very few people are not interested to know at least something about where it all came from. Our view of origin directly affects our theology, faith and ethics. The implication of a theory of origin is of tremendous theoretical and practical import. Genesis 1-2 has been an intense battle ground between the evolutionists and Christian apologists for almost a century. The study of the origin problem is critical for both believers and non-believers. For believers, it gives understanding of their own beliefs and for non-believers a door to the gospel.

The Limitation of the Study

Physicist Robert M. Wald said the following about cosmology:

> In the subject of cosmology, it is very difficult to prove theories by appealing only to observational data. We have direct contact in our lifetime or even in the lifetime of human civilization with only a negligibly small spacetime region of our universe. While our telescopes can observe objects remarkably far away by ordinary human scales, it should be recognized that in cosmic terms they report information about only a portion of our past light cone. Thus, a good deal of our input in the subject of cosmology arises from our philosophical prejudices. Observational data may confirm these prejudices, but in general they cannot be expected to definitively prove that they are correct.[1]

When we look into the origin problem, we are confronted with a subject of study which is both very large and complex, namely the universe. From a scientific point of view, it is next to impossible to survey the entire constituents of the universe. In this case, the limitations will be time and our present technology. Considering the vastness of the universe, my guess

[1]Robert M. Wald, General Relativity (Chicago: University of Chicago Press, 1984), 91.

is that this limitation will be valid for a very long time to come. There is another limitation according to the theory of general relativity that we cannot observe the part of the universe which lies outside of our horizon. These are some of the examples of the limitations of the study which are physical in nature. From a theological point of view, there are questions on how we should interpret Genesis 1-2. Although the Bible offers some critically important information on the topic of creation, it does not contain a sufficient scope of Biblical data to enable us to exhaustively reconstruct the entire creation history. Unless we suppose that God will add an appendix of Genesis 1 to the back of the Bible someday, this exegetical limitation will always apply. However, these limitations should not discourage us from making attempts to construct a coherent theory based on the data we have so far concerning our origin.

This thesis is primarily dedicated to the study of Genesis 1 only. This limitation in terms of the scope of Biblical data is inconsequential to the development of this thesis since Genesis 1 is the primary section in the Bible that contains relevant Biblical data for the purpose of reconstructing major creation scenarios. I realize the impossibility of being exhaustive on all aspects of the origin problem in a limited work such as this. So my purpose here is to construct a coherent skeletal outline of the creation scenarios rather than a complete encyclopaedia on the subject.

The Methodology of the Study

The purpose of this thesis is to construct a coherent interpretative outline of Genesis 1. In Chapter 2, we will begin by showing the reasons that support the authenticity of the Genesis 1. In chapter 3, we will construct an exegetical interpretation of Genesis 1 called the “Multiple Gaps

Theory." Lastly, in chapter 4, we will try to harmonize the Multiple Gaps Theory with current scientific data.

CHAPTER 2

AUTHENTICITY OF GENESIS 1

A Statement of Faith

The choice of a cosmogony model is a very complex issue. Those who are intellectually honest will admit that such a choice is significantly influenced by philosophical biases. In this thesis, I have personally adopted a position which I call the provisional acceptance of conservative evangelicalism. More particularly, in the context of our discussion, I believe that Genesis 1 is a historically accurate record regarding the beginning of the universe. In order to show that my claim is reasonable, I will attempt to show the reasons supporting the authenticity of Genesis 1 in this chapter.

The Creation and the Creator

One of the major characteristics of the Genesis cosmogony is that it testifies to a supreme Creator of the universe. One way to argue for the existence of such a Creator is the so-called "Kalam Cosmological Argument." The Kalam Cosmological Argument is an argument by disjunction. The argument proceeds by going through different levels of disjunction until we reach the point when we have proven our premise, i.e., a personal first cause. The proposed disjunctions are:

1. The universe has either a beginning or no beginning.
2. The beginning is either caused or uncaused.
3. The cause is either personal or impersonal.

A schematic of the Kalam Cosmological Argument is illustrated in fig. 1.

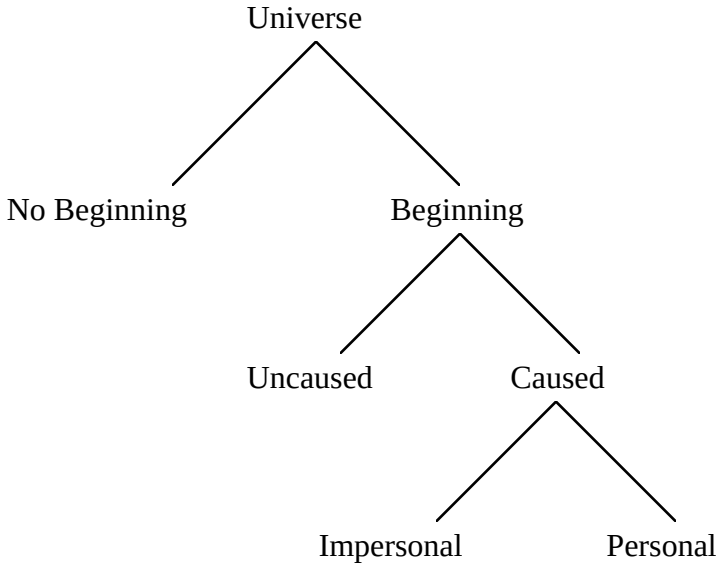

Fig. 1. A Scheme for the Kalam Cosmological Argument.

The Universe Has a Beginning

Traditionally, philosophers try to show that the universe has a beginning by applying the notion of the actual infinity, $\aleph_o$.[2] Let us think of the present as an event--a point in the time line. The present event is caused by a past event which in turn was caused by another past event and so on. If the universe has no beginning, we can go on *ad infinitum* into the past. It is impossible to traverse an actual infinite number of events. Since the present event depends on past events, the present could not have been realized in this case.

Figure 2(A) represents a case in which there is a beginning. The beginning can be reached by traversing a finite number of events from the present to the past and vice versa. Figure 2(B) represents a case in which

[1]An example of an actual infinity is the number of elements in the natural number set. See J. P. Moreland and Kai Nielsen, Does God Exist? The Great Debate (Nashville: Thomas Nelson, 1990), 37.

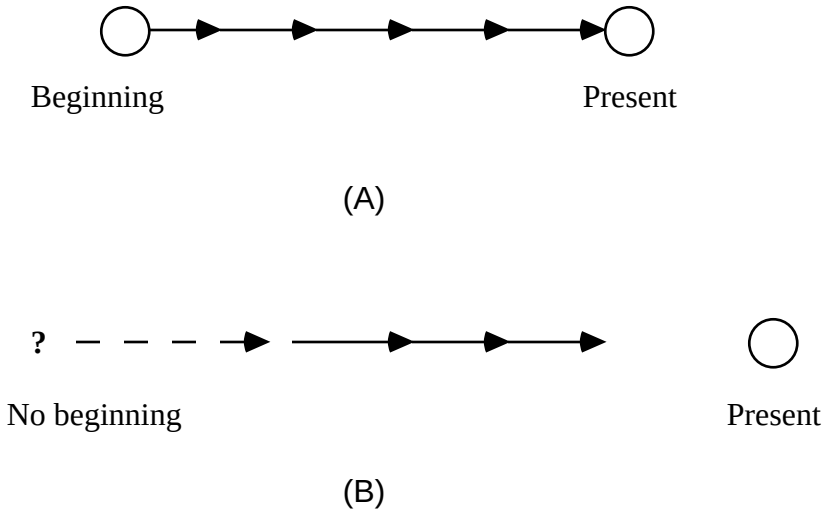

Fig. 2. Past-present Causal Relations.

there is no beginning--i.e., there is an actual infinite number of events into the past. The beginning, if any, cannot be reached because we cannot traverse an actual infinite number of events. Now we want to show that the present cannot be realized in case B: We begin at some point of time prior to the present and traverse forward until the present is reached. But we know that we can always begin at some earlier time no matter where we start. And remember that each event connects to a previous event. So, in case B, we must keep going backward in time to find the place to begin. Since we cannot exhaust the negative actual infinity, we can never find the place to start traversing forward to the present. In other words, the present cannot be realized. But the present is realized. Therefore, the universe must have a beginning.

The Beginning Is Caused

A beginning is different from a change in that a change is the modification of modes of existence of something while a beginning is the

coming of something which did not exist prior to the coming. Prior to the beginning of the universe, there was no universe nor a contingent universe which might have existed in a different mode. Otherwise, cosmogony would be a change instead of a beginning. At the beginning, non-spacetime became spacetime and non-material became material. Or more generally, ~A became A for all A's which the universe possesses. Hence to say that the beginning is uncaused implies that, for all A's, ~A became A at the beginning without cause. Suppose it is the case, then there has to be a possible world in which ~A is equivalent to A. The reason is the following: Let B + C = D be an equation of causality, where B is the inital state, C the cause and D the final state. In the case of an uncaused event, we must have C = 0 or B = D. Back to the question of an uncaused cosmogony, it implies that C = 0 and ~A = A for all A's the universe possesses. And we know that such an equivalence relation is not possible in any possible world. Thus we must conclude that "the beginning of the universe is uncaused" is false. Hence the beginning of the universe is caused.

The Cause is Personal

There are two kind of causes--personal and impersonal. Suppose I make the statement, "I will to raise my arm". The raising of my arm is the effect and my willing is the cause. It is a personal cause because "I" is a personal agent. It is an example of *agent causation*. Agent causation is final. I cannot ask the question, "What causes me to will?" I will because it is my pleasure to will. My willing is the first cause. Next, suppose someone says, "Jeff is sick from food poisoning." In this case, Jeff's sickness is the effect and food poisoning is the cause. Notice that food poisoning is an impersonal cause because no personal agent is involved. Also notice that

food poisoning is itself an event. Based on our discussion on causality before, we know that this event is again caused. In Jeff's example we can keep on asking: What caused the food poisoning?--The bacteria that infected the food. What caused the bacteria?--Their parent bacteria did. What caused their parent bacteria?--Their grandparent bacteria did; and so on and so forth. The questions stop only when we arrive at the first cause. The first cause cannot be impersonal because an impersonal cause is an event which is also caused. The only viable solution to avoid an infinite series of impersonal causes is to say that the first cause is personal. The first cause of the universe is that which causes its beginning. Therefore, the cause of the beginning of the universe is personal. In classical philosophy, this personal agent is called the Unmoved Mover. The Unmoved Mover must not have a cause to its existence or, in other words, He has to be self-existing. In Christian theology, self-existence is an attribute of God.[3] This attribute is unique to God. Thus, we conclude that the Unmoved Mover is God.

[3]L. Berkhof, Systematic Theology (Grand Rapids: Eerdmans, 1941), 58.

CHAPTER 3

THE SEARCH FOR A NEW THEORY

Many religious traditions contain stories of cosmogony. There are ancient epics on creation, such as Genesis, the Babylonian Enuma Elis and the cosmologies of Egypt and Phoenicia. But we may wonder: Are these epics history or legends?

Genesis as History

While most liberal scholars see the Genesis cosmology as a compilation of foreign mythologies, most conservative scholars would defend the historicity of the Genesis cosmology. It has been documented that the archaeological evidence of Genesis is extremely good.[4] Its historicity is recognized scholastically. Wenham commented,

> Extrabiblical creation stories from the ancient Near East are usually poetic, but Gen 1 is not typical Hebrew poetry. Indeed, some writers endeavoring to underline that Gen 1 is pure priestly theology insist that it is not poetry at all. There is no "hymnic element in the language." On the other hand, Gen 1 is not normal Hebrew prose either: its syntax is distinctively different from narrative prose. . . . It is possible that these poetic fragments go back to an earlier form of the creation account, though, as Cassuto observes, "it is simpler to suppose . . . the special impotance of the subject led to an exaltation of style approaching the level of poetry."[5]

Many New Testament authors had also alluded to the authenticity of the Genesis cosmogeny. Examples of scriptural references are John 1:3;

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[4]Josh McDowell, A Ready Defense compiled by Bill Wilson (San Bernardino: Here's Life Publishers, 1990), 92-107.

[5]Gordon J. Wendam, Genesis: Word Biblical Commentary (Waco: Word Books, 1987), 9-10.

Acts 17:24; Rom 1:25; 1 Cor 11:9; Col 1:16; Rev 4:11; 10:6.[6] Although Genesis 1 and 2 both recount the creation story, they are different from each other in character. Genesis 2 has a chiastic correspondence to Genesis 1. Genesis 2 focuses locally on the Garden of Eden while Genesis 1 the whole earth. Therefore, Genesis 1 is more appropriate as a source along with other scientific sources to reconstruct the history of the universe. The next task is to select a viable interpretive framework for Genesis 1.

A Critical Evaluation of Current Theories

Currently there are four major theistic cosmologies in the Christian tradition: (1) Theistic Evolution, (2) the Gap Theory, (3) Recent or Six-day Creationism, and (4) Progressive Creation. Examples of the representatives of Theistic Evolution today are Owen Gingerich from Harvard and Robert L. Herrmann from Gordon College. Both Gingerich and Herrmann are active members of the American Scientific Affiliation which supports Theistic Evolution. The Gap Theory was held by many famous scholars such as C. I. Scofield[7] and Donald Barnhouse.[8] Robert Saucy[9] in Talbot School of Theology also holds a similar view. Recent or Six-day Creationism is widely supported by most of the fundamental scholars. The leading figures among them are Henry Morris and John C. Whitcomb[10]. Morris is the founder of the Institute of Creation Research which actively supports the Young Earth

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[6]L. Berkhof, Systematic Theology (Grand Rapids: Eerdmans, 1941), 128.

[7]C. I. Scofield, The Scofield Reference Bible (New York: Oxford, 1917), 3.

[8]Donald Barnhouse, Genesis: A Devotional Commentary (Grand Rapids: Zondervan, 1970), 9-10.

[9]Robert Saucy, "The So-called Gap Theory," Class Notes, Talbot School of Theology, La Mirada, CA.

[10]See bibliography for books on Genesis written by Henry Morris and John C. Whitcomb.

Theory. Progressive creationism and Theistic Evolution are allies in the Old Earth Theory. Some examples of authors who have written for Progressive Creation are Robert C. Newman, Herman J. Eckelmann[11] and Davis A. Young[12]. The details of these different creation theories have been documented in many good sources.[13] Therefore, I will not reiterate the same information here. However, it suffices to say that, in my opinion, all four theories are inadequate because of the existence of unsolved internal and external conceptual problems. I will briefly explain these problems one by one as follows.

Theistic Evolution

Theistic evolution is evolutionary theory retained in full except at a few points where it appears to be incompatible with Christianity. Naturalistic evolutionary theory is a mechanistic theory of origin that does not require a Creator. Theistic Evolution on the other hand presupposes that God set the correct initial conditions to enable the universe to evolve. Theistic evolutionists attempt to harmonize Scripture with the current scientific theories. The primary objection to atheistic evolution is that the odds for evolution to succeed is practically zero.[14] In order to repair this mathematical impossibility, Theistic Evolution claims that God "guides"

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[11]Herman J. Eckelmann and Robert C. Newman, Genesis One and the Origin of the Earth (Downers Grove, IL: InterVarsity, 1977), 61-66.

[12]Davis A. Young, Creation and the Flood: An Alternative to Flood Geology and Theistic Evaluation (Grand Rapids: Baker, 1977)

[13]James M. Boice, Genesis: An Expositional Commentary, vol. 1 (Grand Rapids: Zondervan, 1982), 37-67; Henry Holloman, Class Notes of Theology I (La Mirada,CA: Talbot School of Theology, 1988), III-16 - III-27.

[14]William Craig's response to J. P. Moreland in J. P. Moreland and Kai Nielsen, Does God Exist? The Great Debate (Nashville: Thomas Nelson, 1990), 143-144.

evolution. But if evolution is guided by God, it is no longer evolution. Moreover, the idea of evolution is problematic. We know that lower life forms are much more adaptable to the environment than higher life forms. For instance, if a human being and a virus are both subject to an extremely adverse environment, it is most likely that the virus will survive and the human will not. Following this analogy, if a lower organism X evolves to become a higher organism Y, statistically Y is less likely to survive than X. Hence X tends not to evolve to Y. In other words, nature does not favor evolution. Besides a number of scientific difficulties, Theistic Evolution has the added burden of theological problems also. According to Genesis 2:1-2a, Moses[15] says, "Thus the heavens and the earth were completed, and all their hosts. And by the seventh day God completed His work which He had done" (NASV). It says explicitly here that the creation process had been completed. Evolutionary processes, on the other hand, are never completed. Thus it is difficult to harmonize the Scripture and evolution without any ambiguity. Evolution is a theory in crisis. The ontological and theological evidences against it are too numerous.

The Gap Theory

The gap theory is also called the restitution or recreation theory. Gap theorists propose a massive global destruction on the earth followed by a time gap between Genesis 1:1 and 1:2. Traditionally, gap theorists postulated a pre-Adamic race that had been corrupted by Satan and were destroyed along with the rest of the earth. The advantage of the gap theory is that one can explain the antiquity of the earth by assigning the fossil

[15]The author is assuming Mosiac authorship of Genesis.

record to the period prior to the gap. The most obvious objection to this scheme is that this gap has not shown up in the fossil record. In the fossil record, there are gaps between transitional forms of organisms. But there is no evidence by way of a universal gap in the fossil record that suggests a global destruction. Secondly, if there were indeed a pre-adamic race and a global destruction, it is doubtful that God would have left out such significant information from the Genesis account. There are also exegetical problems with the gap theory which I cannot develope here in the limited space. Those who are interested in a more thorough treatment of the subject are encouraged to consult other sources.[16]

Recent or Six-day Creationism

Recent or six-day creationism says that God created the world in six twenty-four-hour days. Many creationists still hold the view that the earth is only six thousand years old based on a literal extrapolation from biblical genealogies. One famous example is Archbishop Ussher's calculation that the earth was created in 4004 B. C. on 26 October at 9:00 a.m![17] One must be aware that the listings in biblical genealogies are not always exhaustive. It is well known that these genealogies are full of gaps.[18] The most obvious evidence of incomplete genealogies is the omission of the names of female descendants. Names of many minor male descendants are also omitted.

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[16]For a summary of the gap theory, see Robert Saucy's class notes "The So-Called Gap Theory," Talbot School of Theology, La Mirada, CA. For objections against the gap theory, see John C. Whitcomb, The Early Earth, revised ed. (Grand Rapids: Baker House, 1986), 141-54 and Henry M. Morris, Biblical Cosmology and Modern Science (Nutley, N.J.: Craig Press, 1970), 62-65.

[17]A. Hallam, Great Geological Controversies, 2d ed. (New York: Oxford Press, 1989), 105.

[18]James Oliver Buswell, A Systematic Theology of the Christian Religion, vol. 1 (Grand Rapids: Zondervan, 1962), 332-337.

Therefore, one cannot calculate the date of creation by extrapolating backward through biblical genealogies.

To argue that the earth is young, creationists must account for the apparent antiquity of the earth. For instance, we now know that the speed of light is finite. It takes about eight minutes for light to travel from the sun to the earth, and millions of years from other galaxies to the solar system. If God created the earth instantaneously six thousand years ago, we would not be able to see any galaxies in the night sky even today. In order to explain the apparent age of the universe, creationists postulate that God created a "superficial appearance of history." Arguments and counter-arguments regarding apparent history can be found in many sources[19] Here I may add my own observation as follows. Augustine argued that time is a product of the creation. In other words, time did not exist before the creation. Let us suppose that history is a collection of events since the creation at t = 0. Creation with apparent history implies that God created apparent events and apparent time beyond t = 0 in which time and events did not exist. If time is a unique property of the creation, it does not make sense to say that God created the appearance of time where time did not exist. Is it not more straight forward to create real time and real events instead of their apparent counterfeits? Paul said, "For since the creation of the world His invisible attributes, His eternal power and divine nature, have been clearly seen, being understood through what has been made, so that they are without excuse" (Rom 1:20 NASV). If the creation is supposed to

[19]John C. Whitcomb, The Early Earth, revised ed. (Grand Rapids: Baker House, 1986), 40-48.

reveal the attributes of God and truth is an attribute of God,[20] then God would not created apparent history because it is untrue.

Creationists sometimes cite examples such as the creation of Adam and Eve and Jesus' miracle of turning water into wine to argue for apparent history. But in close examination, we will discover that these arguments contain logical fallacies. In the case of Adam and Eve, although they were created as mature human beings, they had no apparent history. For instance, it is possible to question them about their past. It is obvious that they would not be able to describe their past since they had no past. So by asking the appropriate questions, we can easily show that Adam and Eve did not live to adulthood and hence they lacked the appearance of history in the strictest sense. More generally, concerning specially created living things, the appearance of maturity is not equivalent to the appearance of age. In the case of Jesus' miracle of turning water into wine, the existence of a wine-like substance does not necessarily imply apparent history. It is possible that this wine-like substance possesses certain properties that distinguish it from normal wine. If it does, it implies that the created wine is a different substance than the normal wine such that we cannot honestly assign an apparent age to it. In summary, one can argue that God could create mature and functional substances without implying apparent history. Furthermore, it can be shown that the concept of apparent history is philosophically problematic (see appendix 1).

Some creationists also postulate that the speed of light was much faster in the past than it is today. If it is the case, then we should be able to

[20]Jer 10:10; 42:5; Ps 119:160; Jn 3:33; 7:18, 28; 14:6; 17:3; Ro 3:4; 2 Cor 1:18; 1 Jn 5:20; Rev 3:7; 6:10.

detect this phenomenon through our telescopes. But this claim is simply unsubstantiated scientifically.

Another evidence of the apparent age of the earth comes from radioactive dating. Creationists have argued that the radioactive decay rates were much higher in the past than they are now. If it is true, the rocks can indeed be given a more recent dating. But in order for this theory to be possible, the nuclear force that holds the nucleons together and the Coulomb force that repels the a-particles from the nucleus had to be much smaller than what they are now. If it were true, many stable elements in the periodic table would have become radioactive. It is simply not the case in the real world. Bernard Ramm cited another example against the young earth creationists:

> In the Yellowstone Park are two thousand feet of exposed strata which reveal eighteen successive forests wiped out by lava. The individual forests had to mature, and then be covered with lava. Before another forest could appear the lava would have to be weathered to form soil for the trees to grow in. The amount of time involved is far more than the few thousand years flood geologists are able to allow. Gypsum and salt deposits are formed by the evaporation of sea water. One thousand feet of water yields 0.7 feet of gypsum. The fastest evaporating body of water known is the Dead Sea which evaporates ten feet of water a year. The fifteen hundred feet of gypsum in West Texas and New Mexico would then require 5 million feet of water evaporating over 500,000 years. Here again flood geology is refuted, as it cannot allow this much time.[21]

One may ask why God would take such as long time to create the world. Should not an intelligent and powerful God be efficient in his work? An intelligent and powerful God is indeed effective. But effectiveness does not necessarily imply efficiency. It is possible for God to be effective with or without being efficient. Secondly, if timelessness is an attribute of God, His

[21]Bernard Ramm, The Christian View of Science and Scripture (Grand Rapids: Eerdmans, 1954), 128.

work is not influenced by time. Peter said that "with the Lord one day is as a thousand years, and a thousand years as a day." (1 Pet 3:8 NASV) If God really sees everything in one eternal now, the long period of the creation process is inconsequential. Lastly, although the miracles in the Bible happened instantaneously, it does not imply that creation also happened instantaneously. We must ask the question: Is creation a single miracle or a collection of miracles? If creation is a collection of miracles, is it not possible for them to be distributed over a long period of time? My answer of course is yes. In summary, Recent Creationism consists of a number of logical flaws. Hence it cannot be the correct interpretation of Genesis.

Progressive Creation

Progressive Creationism is a compromise between evolution and creationism. Progressive creationists say that God created the universe in a crude form in the beginning which corresponds to Genesis 1:1. Beginning in Genesis 1:2, the solar system and the earth were already in existence. Then in six periods which correspond to the six days in Genesis 1, God progressively created the atmosphere, land, oceans, plants, fish, birds, mammals and finally man. Progressive Creationists support the day-age theory. They adopt the standard evolutionary framework of history, but allow God to create along the way, particularly at points where there are fossil gaps.[22] The problem with Progressive Creationism is that the sequence of created beings according to this interpretation of Genesis 1 does not fit neatly with the fossil record. For instance, plants did not appear all in the same period. Some plants appeared in the same period as some

[22]Henry M. Morris and John D. Morris, Science, Scripture and the Young Earth (El Cajon, CA: ICR, 1989), 7-9.

other animals and so on. Although Progressive Creationism contains certain attractive features, its overly simplistic approach is still inadequate.

In conclusion, none of the four theories of creation aforementioned can be considered as a candidate for the true theory. It is the reason why I want to present an alternative theory of creation which I call the Multiple Gaps Theory.

The Multiple Gaps Theory

The Multiple Gaps Theory is built on several basic premises which we will consider as follows.

Basic Premises

1. Creation is a collection of miracles. A miracle is an anomaly which would not occur when left to the forces of nature. It requires a supernatural being to explain its origin. Before the beginning of the universe, the forces of nature did not exist. There was nothing which caused the beginning of the universe except the divine will of God. Creation as a collection of events instead of one single event implies that creation occurred over a range of time instead of a punctiliar point of time.

2. Uniformity of nature applies except at the points when miracles occur. God created plants and animals which reproduce after their own kind (See Genesis 1:11, 21, 25, 28). It is an evidence that God intended a creation which is capable of regulating itself. Hence we would expect that nature behaves in a regular and uniform fashion unless God chooses to divinely intervene. Based on the assumption of the uniformity of nature, we can integrate certain scientific data to reconstruct the history of the universe.

3. The earth is old. Geology is the strongest testifier of the antiquity of the earth. Its denial is intellectually costly. The evidence for an old earth is too overwhelming. Paul said that nature reveals the "eternal" power of God (Rom 1:20). The invitation to observe the eternal power of God in nature makes sense only if the creation is sufficiently old.

4. The fossil record is a reliable index of earth's history. There is a difference between the reliability of the fossil record and the reliability of its interpretation. Both the flood geology and the evolutionary paleontology are dubious. We know for sure that the fossil record means something--namely, the long age of the earth. Therefore it is an excellent yardstick to facilitate the chronological mapping of Genesis.

5. The word "day"--*yom* (יוֹם)--in Genesis is translated as a twenty-four-hour day. In this case, the best commentary is Genesis itself. Here, a day is described as a complete rotation of the earth--a morning and an evening. A rotational period cannot be a long period of time because a prolonged exposure to the sun on one side of the earth will cause its surface to be scorched. There is also evidence showing that the earth's rotation is slowing down instead of speeding up.[23] Applying uniformity of nature, we conclude that "a day" in Genesis means a more-or-less twenty-four-hour day. In the Multiple Gaps Theory, a creation day is a literal day that commenced a creation period whose creative motif was the same as that in that same creation day. From the general motif of a particular creation day, we can infer the other extra-biblical creative activities in that corresponding period.

[23]"Time drags--it's official!," Astronomy Express, Sky & Telescope, 76, no. 6, (December 1988), 607; Correction is found in "FOR THE RECORD," Letters, Sky & Telescope, 77, no. 5, (May 1989), 462.

6. Genesis 1:1 corresponds to the beginning period of the creation history and there is a time gap between each pair of consecutive days in the creation week of Genesis 1. Genesis 1:1 says that "in the beginning, God created the heavens and the earth." It is not necessary that "the beginning" (רֵאשִׁית) used here is a punctiliar time. In Proverbs 8:22-23, "the beginning" is used in parallel with "everlasting" which means a long period of time. Therefore, it is possible that רֵאשִׁית describes a range of time instead of a point of time.

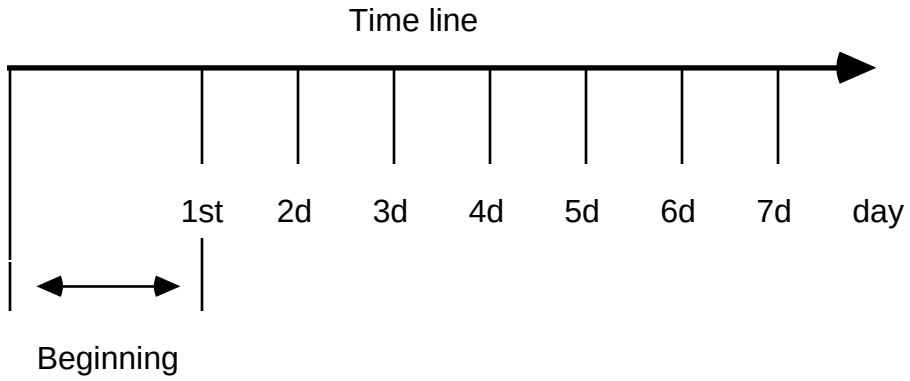

Fig. 3. The Time Scale in the Multiple Gaps Theory.

If we hold to the above premises that the earth is old and "a day" in Genesis 1 is a twenty-four-hour day, the only logical solution to reconcile these two premises is to postulate a series of gaps between consecutive creation days. This postulate is not exegetically impossible. We often observe time gaps in Old Testamont narratives and prophecies. In Daniel's vision of the seventy weeks about the tribulation period, there is a gap between the sixty-ninth and the seventieth week.[24] We also see these gaps in the genealogies. Therefore, it is not unreasonable to postulate time gaps between creation days also.

[24]Leon J. Wood, The Bible & Future Events (Grand Rapids: Academie, 1973), 58-59.

7. Creation processes continued in these time gaps. Although the Bible is silent about these time gaps, we can postulate that God is active in them. We know that the list of creation activities in Genesis is not exhaustive. And the fossil record does not show six distinct groupings of organisms. Hence it is logical to postulate that God's creative activities extended beyond the six creation days into the corresponding creation periods. This premise predicts a gradual emergence of life as indicated in the fossil record.

The Basic Outline of the Genesis Theory

In a nutshell, the Multiple Gaps Theory proposes that God created the universe in the beginning some finite time ago. The earth was initially uninhabited. At some later time, God created life on the planet. He did so progressively in six periods, each beginning with a day corresponding to that in the Genesis 1. The first period, God brought light on earth. The second, he formed the atmosphere. The third, he separated dry land and the waters and created vegetation. The fourth, he changed the atmosphere. The fifth, he created fish and birds. The sixth, he created mammals and man. The creation was completed after the sixth period.

After laying the theological foundation of the Multiple Gaps Theory, we will consider some suggested details of a possible reconstruction of the creation scenarios in the next chapter.

CHAPTER 4

THE PROPOSED THEORY OF CREATION

The Origin of the Universe (Gen. 1:1-2)

The standard theory of the origin of the universe today is the Big Bang theory which also happens to be the popular interpretation of Genesis 1:1 among many Christians in the scientific profession. According to the Big Bang theory, the universe began with a gigantic explosion about ten to twenty billion years ago. The Big Bang was a zero-size mathematical fireball of infinite temperature, curvature and entropy. The four fundamental forces of nature (gravitation, strong, nuclear and electromagnetic force) were originally unified. As the universe expanded, spontaneous symmetry-breaking occurred and the four fundamental forces were separated. Soon elementary particles were created followed by atoms and molecules. All this happened in less than a second. As the universe continued to expand, galaxies were formed. As the galaxies recede from each other in an expanding universe, spectral lines are redshifted due to the Doppler effect. The cooling of the universe gave rise to the 2.7^{o} K microwave background radiation.

What is relatively unknown is the fact that the Big Bang theory has many theoretical difficulties. Just to name a few, there are traditional problems such as (1) flatness, (2) horizon, (3) the size of the universe, (4) the large scale structure of the universe, (5) galaxy formation and (6) anisotropy of the background radiation. Flatness refers to the smoothness of the mass

distribution of the universe. If the universe started out with a gigantic explosion, why is the distribution not more lumpy? Although there are local perturbations, the metric of the universe is essentially smooth. Horizon is a paradox which is predicted by the theory of general relativity. The Big Bang is a singularity at which the light cones of the particles are curved to form hypersurfaces. Each particle on its own hypersurface cannot "see" other particles. These hypersurfaces are called horizons. The existence of particle horizons forbade photons to thermally equilibrate with the rest of the universe. If they could not thermally equilibrate, how could the background radiation be so homogeneous and isotropic? Traditionally, the standard Big Bang Theory has problems in predicting the size of the universe. Alan Guth invented the Inflationary Big Bang Theory[25] to patch some of the problems of the standard model. The Inflationary model postulates an inflationary phase in the early history of universe. The anti-gravity of the inflationary phase pushed the universe outward, which caused it to expand at a rate greater than the speed of light. The history of the universe before the phase transition is opaque to us because it lies outside of our horizon. Although the Inflationary model removes some of the problems of the standard model, it also generates a new set of problems itself. Some of these problems are corrected by the New Inflationary model by A. D. Linde[26] and the work by

[25]Alan Guth, "Inflationary Universe: A Possible Solution to the Horizon and Flatness Problem," Physics Review D, vol. 23, no. 2 (15 January 1981), 347-356.

[26]A. D. Linde, "A New Inflationary Universe Scenario: A Possible Solution of the Horizon, Flatness, Homogeneity, Isotropy and Primordial Monopole Problems," Physics Letters, vol. 108B, no. 6 (4 February 1982), 389-393.

Andreas Albrecht and Paul J. Steinhardt.[27] But the excitement of the New Inflationary model is diminishing in time. Steve Hawking wrote:

> The new inflationary model was a good attempt to explain why the universe is the way it is. However, I and several other people showed that, at least in its original form, it predicted much greater variations in the temperature of the microwave background radiation than are observed. Later work has also cast doubt on whether there could be a phase transition in the very early universe of the kind required. In my personal opinion, the new inflationary model is now as dead as a scientific theory, although a lot people do not seem to have heard of this demise and are still writing papers as if it were viable.[28]

Recently a discovery was made by astronomers Margaret J. Geller and John P. Huchra that the universe has a large-scale structure known as the "Great Wall".[29] These large-scale structures post difficulties for Big Bang cosmologists.[30] The most obvious problem is that large-scale structure and homogeneous background radiation are incompatible as mentioned before.

At the Big Bang, entropy was infinite. It means the universe was maximally disordered. Looking at the universe today, we see complexities and orders and therefore the universe is less than maximally disordered. It implies that entropy has decreased in the universe. With the universe being a closed system, it violates the Second Law of Thermodynamics which says that entropy always increases in a closed system.

The Big Bang theory also has some esoteric features that are counter-intuitive. For instance, at the Big Bang, the whole universe was contained

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[27]Andreas Albrecht and Paul J. Steinhardt, "Cosmology for Grand Unified Theories with Radiatively Induced Symmetry Breaking," Physical Review Letters, vol. 48, no. 17 (26 April 1982), 1220-1223.

[28]Steve Hawking, A Brief History of Time (New York: Bantam Books, 1988), 132.

[29]Margaret J. Geller and John P. Huchra, "Mapping the Universe", Science, 246 (17 November 1989), 897-903. and Bertram Schwarzchild, "Gigantic Structure Challenge Standard View of Cosmic Evolution," Physics Today (June 1990), 20-23.

[30]Bertram Schwarzchild, "Gigantic Structures Challenge Standard View of Cosmic Evolution," Physics Today (June 1990), 20-23.

in a mathematical point of size zero. Imagining the fast arrays of physical universe condensed into a point small enough to pass through the eye of a needle is mind-boggling.

Quasi-static Cosmology

In 1987, I began to work on an alternative theory of the origin of the universe. That year, an article was published by W. G. Tifft and W. J. Cocke called the "Quantized Galaxy Redshifts." Based on their redshift analysis, Tifft and Cocke postulated a cosmic quantum transition rule to explain the groupings of their data. The cosmic transition rule is dubious. But there is one feature in this paper that is worth noting, i.e., redshifts are quantized according to galaxy types.[31] It is not the only anomaly in the redshift data. Vesto Melvin Slipher was the first to measure the redshifts of the galaxies. In his data, five out of forty-one galaxies indicated blueshifts.[32] Blueshifts are still observed today. But nobody pays much attention to them. Astronomers try to explain them away because they want an expanding universe. But a good theory ought to be able to explain all the data naturally without too many *ad hoc* justifications. The search for such a new comprehensive theory inspired the so-called "quasi-static cosmology".

The distinctive feature of the quasi-static model is that the unverse is more or less stationary instead of expanding. Einstein originally believed that the universe was static. However the field equation in general relativity predicted an expanding universe. So he added an extra term in the field

[31]W. G. Tifft and W. J. Cocke, "Quantized Galaxy Redshifts," Sky & Telescope, 73, no. 1 (January 1987), 19-21.

[32]Barry Parker, "Discovery of the Expanding Universe," Sky & Telescope, 72, no. 3 (September 1986), 227-229.

equation with a constant L called the “cosmological constant” so that a stationary solution was possible.[33]

$$G_{ab} + \Lambda g_{ab} = 8\pi T_{ab} .$$

This stationary solution is an unstable equilibrium. It is much like balancing a pencil on its tip. After the discovery of the redshifts, Einstein was convinced that he was wrong and the subject was abandoned. The cosmological constant has been reinserted from time to time after that. I reinserted it again to guarantee a stationary solution. The good news is that a quasi-static universe is theoretically possible; the bad news is that such an equilibrium is unstable. Occasionally someone would claim to have discovered a fifth force called anti-gravity. If anti-gravity exists, it will solve the problem. But we do not want to depend on anti-gravity since it is such a dubious theory. Given an unstable static potential, pseudo-stability is possible. One analogy is a top. A top rested on its tip is in unstable equilibrium. A spinning top however is pseudo-stable as long as it is spinning. The same is true with bicycles. A bicyle does not fall as long as it is moving. In the universe, all the galaxies are spinning. These galactic angular momenta may have some interesting coupling effects on a large-scale structure. Perhaps there is an analogous correlation between a top and the equilibrium of the universe.

If the universe is static, what causes the redshifts? At first, I suspected energy loss through photon-photon scattering (or Delbrück scattering). Classical electromagnetism predicts only superposition of light waves. But quantum mechanics allows photons to be scattered by photon

[33]Robert M. Wald, General Relativity (Chicago: Chicago, 1984), 99.

with a very small cross-section[34]. No experiment has been done on photon-photon scattering yet because it will require the use of very intense light sources and extremely sensitive instruments. Hence we can only rely on theory. Calculations show that the cross-section of photon-photon scattering is too small for this theory to be feasible. The distance required for a photon-photon scattering to occur is many magnitudes greater than the diameter of the universe (see appendix 2). However, there are other ways photons can loose energy, such as scattering from interstellar media[35] and weak dielectrics. It is also possible that vacuum is frictional. Unlike classical vacuum which is absolute nothingness, quantum electrodynamics says that vacuum is the ground state of the quantum field with non-zero absolute energy.[36] Quantum field vacuum permits vacuum fluctuation. According to some theorists, vacuum fluctuation is the cause of the Big Bang. If vacuum has structure, then it is theoretically viable that there is a very weak interaction between photons and vacuum, which may result in a very small energy loss over a long distance. This theory will continue to remain speculative since the phenomenon is beyond the scope of experimen-tal verification. Our aim is to show that it is theoretically viable to explain the redshifts without the Doppler effect.

Photonic energy loss can also explain Hubble's Law which says that a linear relation exists between the galaxy distance, r, and the redshift velocity, v.[37]

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[34]"Cross-section" is a physicist's language for "probability."

[35]Theodore P. Snow, The Dynamic Universe (St. Paul: West Publishing Company, 1983), 387-401.

[36]Claude Cohen-Tannoudji, Jacques Dupont-Roc and Gilbert Grynberg, Photons & Atoms (New York: Wiley, 1989), 189-191.

[37]Martin V. Zombeck, Handbook of Space Astronomy & Astrophysics, 2d ed. (Cambridge: Cambridge, 1990), 11.

$$v = H_0 r\,, \qquad \text{where} \quad H_0 = (50-100)\,km\,s^{-1}\,Mpc^{-1}\,.$$

Hubble Law is interpreted to be caused by an expanding universe. It predicts galaxy receding velocities to approach the speed of light at about (3,000-6,000) Mpc[38]. The radius of the universe is about 2,800 Mpc. It means that the galaxies at the edge of the universe may be moving in ultra-relativistic velocities. If they do, their mass will be rapidly approaching infinity according to special relativity. We would like to avoid such an infinity because it most likely does not exist in nature.

A shortcoming of Hubble's Law is that it does not predict blueshifts. Blueshifts are typical of nearby galaxies only.[39] On the other hand, the quasi-static model can explain blueshifts naturally. It is accomplished by turning our attention to stellar structures. The temperature inside a star is around a million degrees Kelvin. Photons emitted from gases in the interior of a star are scattered a large number of times by ionized gases before they escape from the stellar surface. These photons gain thermal energy in the process and become blueshifted. If a galaxy is very nearby, the blueshifted photons coming from the galaxy would not have time to lose enough energy to become redshifted through cooling before they reach the earth. It explains why the spectra of nearby galaxies are blueshifted. For far away galaxies, there is enough time for photons to cool and become redshifted. If photonic energy loss is proportional to the distance travelled, we then recover Hubble's Law.

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[38]Mpc is a unit astronomers use to measure galactic distance. 1 Mpc is about 30,000,000,000,000,000,000,000 meters.

[39]Barry Parker, 230.

The final question is: If the universe is stationary, how did it begin? The answer I propose is an infinite collection of Small Bangs. By which I mean that, in the beginning, the universe popped into existence through Small Bangs simultaneously over all space.[40] The singularities of the Small Bangs are much less spectacular than the singularity of the Big Bang. Each Small Bang is finite in temperature, curvature and entropy. The removal of the infinities is very desirable for a well-behaved theory. The simultaneity of the Small Bangs implies that the process is highly ordered. Therefore, entropy at the beginning is finite and relatively small. The Second Law of Thermodynamics is not violated in this case.

The simultaneity of the infinite collection of Small Bangs defies the laws of physics since all physical interactions are limited by the speed of light. We should not be disturbed by its resemblance to a miracle. The Small Bangs theory is a stronger statement of theistic creation because God had to control an infinite[41] number of processes simultaneously over an infinite spatial extent.

Genesis is silent on how God created the galaxies and the solar system. The most popular theory today for the formation of the solar system is the Capture Theory.[42] It says that the raw materials that make up the planets are of foreign imports. Chunks of mass were pulled by the sun into orbits which slowly evolved into planets. If it is the case, we should expect to observe more planetary systems in the Milky Way. But

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[40]"All space" does not imply an infinite space. By definition, there is no space outside the universe. Therefore, "all space" simply refers to the spatial extent of the whole universe.

[41]"Infinite" to physicists means "very large." So "infinite" as used in this context does not compete with the infinity of God.

[42]John R. Dormand and Michael M. Woolfson, The Origin of the Solar System, the Capture Theory (Chichester: John Wiley, 1989), 84-112.

astronomers still have not discovered another solar system in our galaxy. It is possible that ours is the only solar system in the universe. When we examine the planets and their satellites, we do not see evidence of an evolutionary past. Each planet is very distinct from each other. Some have very peculiar features such as the retrograde motions. It does not seem as though the solar system could happen by accident. It is a creation of God.

The creation of the universe probably took place over a long period of time. Eventually the earth was created--in its crude form at first. "The earth was formless and void in the beginning. And darkness was over the surface of the earth." (Genesis 1:2a) This description agrees with geology concerning the primordial conditions of the earth. After God had created the universe, He allowed a great length of time for it to settle into a mechani-cal equilibrium. For millennia, the earth was given to uniformitarian processes such as folding and tectonic shifts. Rocks were weathered to become soil. The endless cycles perpetuated itself for as long as God would look upon the earth again.

The First Day (Gen. 1:3-5)

"Let there be light" (v.3) was not a command to create light. Light is nothing but a small band of electromagnetic radiation. Radiation has existed since the beginning of the universe. Therefore this command cannot be the creation of radiation. It is more probably a command for light to break through to the surface of the earth. It implies the existence of an opaque atmosphere which had blocked sunlight from illuminating the surface of the earth prior to this time. The atmosphere was probably composed of water vapor, carbon dioxide and dust particles. And the primordial earth was covered by water. Heavy volcanic activities were

frequent. In the absence of sunlight, the surface of the earth was dark and chaotic. It fits the description of "formless and void" *tohu wabohu* (וָבֹהוּ תֹהוּ) in Genesis1:2.

Once the atmosphere was in place, it was unlikely that it would change suddenly except by some catastrophic means. In this case, God cleared the clouded atmosphere. The means He employed is uncertain. It could be due to a sudden condensation of the water vapor in the primordial atmosphere which caused a giant rain storm that washed the sluggish atmosphere into the oceans. And God would be the Agent who caused the sudden drop in temperature which precipitated the rainfall. However, the exact means by which God employed to clear the primordial atmosphere is still speculative.

God separated light from darkness. The so-called "separation" is the horizon which divides the day and the night. The first day is the beginning of the first creation period. God cleared the sky in one day. But He continued to refurbish the earth for a period of many millions of years. This corresponds to the pre-Cambrian period in geology. God's creative motif is from general to specific. The major motif of the first creation period is to set up the appropriate physical conditions to support organic lives. The fact that dinosaurs lived and Adam and Eve walked around naked at first suggests that the climate was quite temperate in the beginning. A recent research through computer simulation shows that plateau uplift could be the cause of extreme climates.[43] However, extreme climates certainly did not belong to the first period.

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[43]William F. Ruddiman and John E. Kutzbach, "Plateau Uplift and Climatic Change," Scientific American (March 1991), 66-75.

At the end of the first creation period, the earth was illuminated by the sun. There was no existing atmosphere at this point. Volcanoes were quieting. The sun-earth distance was just so that the earth's surface temperature was low enough to prevent excessive evaporation from the primordial oceans. The submerged earth was calm, awaiting the next phase of its refurbishment.

The Second Day (Gen. 1:6-8)

God's second step was to create an appropriate chemical environment for life. By a chemical environment, I mean a life-supporting atmosphere. After the first creation period, the earth was still covered with water. The sun was warming the waters. But the sun-earth distance needed to be a bit smaller in order for the waters to absorb sufficient latent heat to evaporate. Between Mars and Jupiter there is an asteroid belt. In the past, some astronomers attributed these asteroids to the remnants of a shattered planet.[44] Bode's Law predicts a planet where the asteroid belt is now. Suppose that such a planet really did exist. Its destruction could alter the planetary dynamics so that the earth's orbital radius would become smaller. In this case, the earth would be drawn sufficiently close to the sun to increase the temperature of the waters. Water began to evaporate and clouds were formed. During the evaporation process, gases originally desolved in the water--oxygen, nitrogen, carbon dioxide and so on--filled the space between the clouds and the ocean. Lo and behold! We have an atmosphere.

The atmosphere is vital not just because of the air it provides for the animals. It also shields the earth from meteors, cosmic rays and ultraviolet

[44]Snow, 232.

radiation. Carbon dioxide and water vapor maintain the green house effect through which the surface of the earth is warmed. The existence of the atmosphere itself is a wonder. There must be just the right temperature gradient in the atmosphere in order for water to evaporate at sea level and condense at a high altitude. There is also the ozone layer on the outer shell which is a permanent fixture for our protection. The whole atmosphere encloses the earth like an envelope with all the intricate dynamics of weather patterns. It has the characteristics of a skillfully engineered machine. The odds of it popping into existence through blind chance is extremely minimal. Even if the sun-earth distance misses by a very small amount, the earth will either boil or freeze. Therefore we may call the atmosphere a miracle. God did not operate by chance, He carefully created it on the second day.

The second day commenced the second creation period. In this period, the emphasis is on the creation of all necessary chemical support systems for the survival of organic life--the atmosphere being the first and foremost. It was also in this period when God created bacteria, virus, algae, sea plants and marine invertebrates such as coral animals and shellfish. These organisms are responsible for the production of some of the gases in the atmosphere and in water. Also the fossil record shows that these were the first to emerge. The fossil record shows that there was a sudden appearance of an abundance of micro-organisms all at the same time. It is known as the Cambrian explosion. Coral animals predate land plants in the fossil record. It makes sense to put them here prior to the creation of vegetation in day three.

God continued to improve the chemical composition of the earth and the atmosphere and to create more types of organisms in the second period. Some of these primordial organisms might be quite sensitive to ultraviolet radiation. They needed the protection of the clouds from direct sunlight. It is possible that the sky at this point was consistently overcast so that the sun, moon and stars were hidden from the earth. This situation might have persisted until day four when God cleared the clouds.

The Third Day (Gen. 1:9-13)

On the third day, God separated sea and land. The emergence of the land can be explained by sudden uplifts. Uplifts are evident because we see fossils of marine invertebrates and sea plants hundreds of meters above sea level. Ridges of mountains were formed through tectonic action. Along with the uplifts, seabeds were sunken at the same time. This theory is justified by the abrupt changes in the contours under the oceans today. These gigantic catastrophic events could have been brought about by a series of horrid global earthquakes. The effect of earthquakes is undeniable. Islands are known to have appeared and disappeared because of them.

Also on the third day, God created land plants. God created vegetation in abundance so that they covered all the land. The language in 1:12 suggests that these plants were created full grown. Although plants were created full grown, they did not necessarily have the appearance of age. It is always interesting to argue whether the newly created trees have rings in them or not. Rings have no biological function in a tree. So it is possible that God could have created trees without rings in the beginning. In Numbers 17:8, it describes that Aaron's rod "put forth buds and produced blossoms, and it bore ripe almonds" (NASV) within the period of one day.

Similarly, God could have caused the vegetation to grow very quickly in the beginning so that it became mature before the end of the third day. Since rings indicate the age of a tree, we can argue that the first trees would not have rings in them because they had not yet experienced seasonal changes. As a corollary of the argument against apparent age in chapter 3, creation with apparent history is self-refuting because the notion of apparent history itself tends to suppress the proof of recent creation. Furthermore, if the creation is young, there is no advantage to cause it to look old.

The third day commenced the third creation period in which God created vegetation. Since flowers need insects to cross-pollenate, God probably created insects as well in this period as parts of the ecosystem. Genesis does not mention insects, but it makes sense to place them here. In the fossil record, insects and land plants fall under the same strata.[45] Therefore it seems like a natural interpretation.

At this time, the sky is still perpetually overcast. Some plants grow better in diffused sunlight. The majority of the land plants at this time belonged to this category. The global climate was probably cool and dry in order to be consistent with the perpetually overcast sky. Tropical plants do not grow well under these circumstances. Therefore God did not create them until the end of the third period just before He cleared the sky. We also know that many of the micro-organisms were light-sensitive. Therefore the third period was ideal for their survival. We do not know how long the period had lasted. But it was quite some time until the fourth day of creation came.

The Fourth Day (Gen. 1:14-19)

[45]The New Encyclopaedia Britanica, s.v. "Fossil Record", 564 and 575.

On the fourth day, God began to clear the sky. Rains began to fall and the clouds began to disappear. The sun, moon and stars now became visible to an earthly observer. When God said, "Let there be lights in the expanses" (v. 14), He had simply changed the atmosphere so that the heavenly bodies became visible.

Sometimes we still hear creationists who interpret the fourth day as the day when God created the heavenly bodies. It is impossible, because light from stars take millions of years to travel to the earth. Stars created instantaneously then would not be visible to an earthly observer immediately. Creationists may argue that God created light with a history. But such a history is no history at all but an illusion. If it is permissible for God to create illusions, there is not a need to create anything real at all since illusions are more economical. It does not make sense to believe that God created with apparent history, if apparent history means a set of illusions. Sometimes recent creationists also say that the speed of light approached infinity in the beginning. This theory is bogus because the stars would disappear from the night sky again once the speed of light became normal. The fact that the finite speed of light and the starry night sky coexist today shows that this second theory is hopeless.

The fourth day commenced the fourth creation period in which God began to create a whole new strand of plants and micro-organisms. The sudden appearance of direct sunlight killed a large number of land plants and micro-organisms. It explains the sudden mass extinction of many organisms in the fossil record. God is preparing a home for a class of more advanced life forms. The fourth period is the last stage of these preliminary

preparations on earth. Toward the end of the period, the land and the seas were ready for the emergence of vertebrates.

The Fifth Day (Gen. 1:20-23)

On the fifth day, God created fish, birds and the sea monsters. Many have debated what the sea monsters really are. The commentator of the NIV Study Bible says,

> The Hebrew word underlying this phrase was used in Canaanite mythology to name a dreaded sea monster. He is often referred to figuratively in OT poetry as one of God's most powerful opponents. In Genesis, however, the creatures of the sea are portrayed not as enemies to be feared but as part of God's good creation to be appreciated.[46]

It is possible that the so-called great sea monsters were turtles, sharks, opthalmosauruses, ichthyosaurs, elasmosaurases and other giant mosasaurs. Some commentators include insects in the category of birds in 1:20, "*winged bird*. The term denotes anything that flies, including insects (see Dt 14:19-20)."[47] Although we have placed insects under creation day three, God could still create flying insects again in day five. Categories of creation could overlap over time without any logical inconsistency. Strictly speaking, the text is silent about insects. In order to construct a consistent theory, it is more reasonable to interpret *winged birds* as just "birds".

There is no obvious reason why God had to populate the air and the waters first with living creatures. The only point of interest is that most fish and all birds lay eggs to reproduce themselves. We could postulate that God created egg-laying animals first on the fifth day. This distinction sets the fish and birds apart from the land mammals created on day six. It is not

[46]The footnote under 1:21 in the NIV Study Bible (Grand Rapids: Zondervan, 1985), 7.

[47]Ibid.

obvious why this sequence was necessary. Egg-laying animals are inferior to mammals in terms of intelligence. We observe so far that God created from general to specific and from simple to complex. Perhaps it pleases God to create the most intelligent animals in the climactic finale of the sixth day. If this is the case, we must also categorize egg-laying reptiles such as snakes, crocodiles and dinosaurs in this period. Dinosaurs are not mentioned in Genesis. They had long since become extinct before Moses had a chance to write about them. We should not expect the ancient Hebrews to have a word for something that they did not know about. Furthermore, since Genesis is not intended to be an exhaustive inventory of creation, there is no reason to believe that God has to necessarily mention dinosaurs in the Genesis account. Dinosaurs were egg-laying reptiles. They fit the agenda of the fifth creation period. The fossil record also indicates that dinosaurs predated mammals. Therefore it is reasonable to place the dinosaurs in the fifth period.

The sudden mass extinction of dinosaurs is still a mystery today. Weishampel *et al* listed twenty-two possible reasons for their extinction.[48] The two most popular theories today are (1) extra-terrestrial impact and (2) volcanic erruption.[49] Any catastrophic causes for global extinction of dinosaurs would have a magnitude comparable to that of a nuclear holocaust. It is unlikely that these extreme conditions affected only the dinosaurs. A reasonable alternative is to postulate a shortage of food supplies. By the end of the fifth period, God was preparing the earth for

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[48]David B. Weishampel, Peter Dodson and Halszka Osmólska, The Dinosauria (Berkeley: University of California Press, 1990), 57.

[49]Walter Alvarez, Frank Asaro and Vincent E. Courtillot, "Debate: What Caused the Mass Exinction?" Scientific American (October 1990), 76-92.

mammals. Such adjustment could alter the ecosystem and the food supplies. No matter how the dinosaurs became extinct, it happened long before the creation of mammals and man according to the fossil record. Judging from the sheer power of these giant reptiles, their extinction was almost necessary for mammals to survive on land. Toward the end of the fifth creation period, there were just the fish, birds and the some sea animals. The stage was set for the arrival of land animals and humans.

The Sixth Day (Gen. 1:24-31)

In the final stage of His creation, God created mammals and humans. In the fossil record, both mammals and humans are the most recent arrivals to the history of the earth. Genesis categorizes three types of land animals: (1) cattle, (2) wild beasts and (3) creeping things. The most common interpretation is that cattle are domesticable animals and creeping things are those living close to the ground. Reptiles were created in day five although they do fit the description of creeping things. But there are also other creeping things beside the reptiles, e.g., moles. God probably had created a large number of each kind of animals. But He created only two humans--Adam and Eve.

Traditionally anthropolgists tell us that primitive ape-like hominoids evolved into homo sapiens over millions of years. But the Genesis account says that man appeared suddenly as a supernatural creative act of God. Excavation of stone-age remains seem to indicate a slow evolution of primitive culture. Thus, evidences seem to contradict the biblical creation of Adam and Eve who appeared as intelligent modern human beings once created.

The Biblical view of creation is reinforced by recent research in biochemistry. An experiment was conducted by three Berkeley biochemists who traced the origin of humans through mitochondrial DNA. Mitochondria is a DNA that can only be inherited from the mother. Hence mtDNA analysis can trace the history of the evolution of humans. The three Berkeley biochemists collected mtDNA samples from 147 placentas among different geographic populations. They concluded that "all these mtDNAs stem from one woman who is postulated to have lived 200,000 years ago, probably in Africa."[50] In other words, this experiment agrees with the existence of Eve as in the Genesis account, although the chronology presents problems for the Biblical record. This mtDNA experiment has been very controversial since its first appearance. If it is true, it is one of the most solid points of evidence supporting the unity of the human race and biblical creation.

If Adam and Eve were created as full-blown homo sapiens, how should we interpret all the evidences of the palaeolithic cultures? Considering the stone-age tribal cultures that we still have today, it is not too difficult to imagine that stone-age cultures also existed in earlier days. Anthropologists reconstructed the family tree of hominids from fragments of fossils. The so-called family tree is a theoretical contruction which exists only in the minds of the evolutionists. The fossils themselves do not cry out for such an interpretation. Very often anthropologists have to reconstruct the whole hominid skeleton from a few fragments of fossils. The interpretation of these fossils is highly dependent on philosophical biases. The evolution theory is still the dominant philosophical foundation of

[50]Rebecca L. Cann, Mark Stoneking & Allan C. Wilson, "Mitochondrial DNA and Human Evolution," Nature, 325 (1 January 1987), 31.

anthropology. It is not surprising that most of anthropologists would favor an evolutionary history of humans.

If we take the literal interpretation for "day" in Genesis, we are forced to conclude that animals were created full-grown. Many young animals cannot survive without parental care. Hence, it is necessary that they were created as fully functional adults. Combining Genesis 1 and 2, we infer that Adam and Eve were also created as mature male and female. They had complete language capability and an acute spiritual awareness since they could communicate between themselves and with Satan and God. They were the first humans before any parental modelling and education became available. Yet they were fully functional physically, intellectually and spiritually when they were created.

The Seventh Day (Gen. 2:1-3)

After the six creation periods had elapsed, God completed His creation on the seventh day. This day signifies the completion of the creation process. There will be no more creation activities after the seventh day. The finished works of creation contradict the teaching of the evolutionary theory which says that trans-species evolution can still potentially occur today. "God rested" not because He was tired. It simply means that He ceased from the creation processes. The day of rest is remembered as a Jewish observance called the sabbath. In Exodus 20:8-11, Moses said,

> Remember the sabbath day, to keep it holy. Six days you shall labor and do all your work, but the seventh day is a sabbath of the Lord your God; in it you shall not do any work, you or your son or your daughter, your male or your female servant or your cattle or your sojourner who stays with you. For in six days the Lord made the heavens and the earth, the sea and all that is in them, and rested on the seventh day; therefore the Lord blessed the sabbath day and made it holy. (NASV)

The significance of the seventh day is not only that God had finished His creation, but also because it signifies the beginning of the spiritual relationship between God and humanity--the central theme of God's creation. The sabbath did not end at the close of the seventh day just as the spiritual relationship between God and man did not end after the seventh day. God established the sabbath as a religious observance only as a testimony of the true meaning of the sabbath. Jesus said, "The Sabbath was made for man, and not man for the Sabbath" (Mk 2:27, NASV). The seventh day commenced a period of holy fellowship between God and us which continues forever. After the fall, humans are no longer qualified for this relationship naturally. But God has made provision for this relationship to continue with those who believe in His Son, the Savior and Lord, Jesus Christ.

A corollary of this interpretation of the seventh day is that the sixth creation period had to be relatively short--something within the lifetime of Adam and Eve because they were the first to experience this fellowship with God. If the theory that the most important creatures were created last, the appearance of Adam and Eve would have rightfully concluded the creation of life on earth. Once the creation process was finished, God "rested" from all His works and turned His attention to Adam and Eve.

CHAPTER 5

EPILOGUE

Anyone who has studied cosmogony will somehow become a bit of an agnostic at the end concerning details about origins. There are just too many uncertainties; and too many conjectures are required to fill in the gaps. Careful research helps us to narrow the options. But none will suffice to prove certain specific details with mathematical certainty.

However, research in cosmogony is more than just an intellectual exercise. A correct understanding of our origin will ultimately affect our world view and hence the way we live. If we come from nothing and will go to nothing after we die, life is meaningless. If our lives are meaningless, we have no identity and there is no reason to live ethically. On the other hand, if we are created in the image of God, we find our identity in God and our lives also find meaning in Him (Gen. 1:26-27).

The Multiple Gaps Theory may not have a corner on the market as far as the theories of origin are concerned. It is possible that parts of the theory may need modification in the future as we understand more and more about the universe. It is unlikely that anyone will ever know enough to close the subject once and for all. Men and women will continue to be fascinated by the origin problem. Many more theories will be invented to explain our origin. Hopefully, we will get closer to the truth each day by our continuous efforts. Jesus said, “The truth shall make you free” (John 8:32, NASV) . Only true knowledge has true liberating power. One important piece of true knowledge we can know for sure from the Bible is that God is the Creator of

the universe. We are His creatures. And we owe our being to our Creator God.

APPENDIX 1

THE PROBLEM OF APPARENT HISTORY

Apparent age or apparent history implies that creation looks older than it really is. It means, for any given created thing, it must look old in every possible way. Suppose there is a way by which you can tell that something is not really old, then this thing does not have the appearance of age. Therefore, a thing has apparent age if and only if it looks old in every possible way. Or, more precisely, it possesses the properties of oldness. On the other hand, this thing is really new, not old. So it must possess the properties of newness also. There is a metaphysical problem with that, i.e., a substance cannot possess two properties which are mutually exclusive. For example, a table cannot be here and there at the same time because here-ness and there-ness are mutually exclusive. Next we may ask whether newness and oldness are indeed mutually exclusive. Newness and oldness presuppose two different temporal locations. A thing cannot be here and there temporally at the same time. Therefore newness and oldness are mutually exclusive. In other words, a substance cannot possess the properties of oldness and newness simultaneously. Hence, the concept of apparent age is philosophically problematic.

APPENDIX 2

THE PROBLEM OF PHOTON-PHOTON SCATTERING

Photon-photon scattering is not a viable theoretical option to explain the redshifts. The mathematical proof is given as follow.

Planck's density distribution r is given as[51]

$$\rho(\nu,T)=\frac{8\pi\nu^2}{c^3}\frac{h\nu}{e^{\beta h\nu}-1}.$$

The mean frequency $\langle\nu\rangle$ is

$$\langle\nu\rangle=\frac{\int\nu\rho\,d\nu}{\int\rho\,d\nu}$$

$$\int\nu\rho\,d\nu=\frac{8\pi h}{c^3}\int_0^\infty d\nu\frac{\nu^4}{e^{\beta h\nu}-1}$$

$$=\frac{8\pi^5}{15\beta^4c^3h^3}\left(\frac{4kT}{h}\right)$$

$$\int\rho\,d\nu=\frac{8\pi^5}{15\beta^4c^3h^3}$$

Therefore, $\langle\nu\rangle=\frac{4kT}{h}$

or $\langle\omega\rangle=\frac{4kT}{\hbar}$.

[51]Stephen Gasiorowicz, Quantum Mechanics (New York: John Wiley, 1974), 5.

For T = 2.7° K, $\langle\omega\rangle = 1.4139\times10^{12}\ s^{-1}$.

$$\hbar\langle\omega\rangle = 1.4911\times10^{-22}\ J\ .$$

The total radiation energy per unit volume is

$$U = aT^4\ .$$

At T = 2.7° K, $U = 4.0177\times10^{-14}\ J\,m^{-3}$. Therefore, the average number, N, of 2.7° K thermal photons per unit volume is

$$N = \frac{U}{\langle E\rangle} = 2.6945\times10^{8}\ .$$

The Photon-photon cross section at the low energy limit is[52]

$$\sigma = \frac{973}{10125}\frac{\alpha^2}{\pi^2}r_0^2\left(\frac{\omega}{m}\right)^6$$
$$= 1.4842\times10^{-88}\ m^2\ .$$

The probability of scattering per unit length is

$$N\sigma = 4\times10^{-80}\ m^{-1}\ .$$

The distance, R, required for one scattering to occur is

$$R = \frac{1}{N\sigma} \approx 2.5\times10^{79}\ m\ .$$

The diameter of the universe is about $1.8\times10^{26}\ m$.[53] Therefore, statistically, a photon has to traverse across 10^{54} universes in order for one scattering event to be possible. This conclusion is based on the cross-section calculated by Jauch and Rohrlich. If the cross-section of low-energy

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[52]J. M. Jauch and F. Rohrlich, The Theory of Photons and Electrons (New York: Springer-Verlag, 1976), 295.

[53]The volume of the universe is (9-1)x10^{11} Mpc^3 in Martin V. Zombeck, The Handbook of Space Astronomy & Astrophysics, 2d ed. (Cambridge: Cambridge, 1990), 11.

photons were more than fifty-four magnitudes larger than what it is thought to be, we could use photon-photon scattering to explain the redshifts.

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