

Chapter 1

INTRODUCTION

“In the beginning, God created the heavens and the earth.” Most know this as the opening line of the Bible. It is commonly learned in church, in Sunday School, or perhaps at home. What follows is the narrative of God and the actions He took in setting out the stars, sun, moon and planet earth. The story of God creating our universe has long captivated man’s interest. We are all aware, however, that there are differing interpretations of the creation story. Is Genesis 1 a literal report of what God did, or is it a metaphor? Did Creation take place in several twenty-four-hour days or over billions of years? Do ideas involving science and evolution in the creation account undermine or support the sovereignty of God?

There have been very heated debates over this topic and it has divided people. Hostile “Creation versus Evolution” articles have appeared in the media. Attempts by religious groups to promote in public schools a creation stemming from the hand of God have led to national laws preventing this. Indeed, casual conversations can suddenly become uncomfortable when the subject of Evolution comes up. A person may question whether to avoid discussing it altogether in hopes of not getting into an argument. Even among Christians, conflicts can result between those who are firm believers in a literal reading of Genesis 1 and those who hold to a more metaphorical view.

Several years ago, I was asked to give a Sunday School presentation on the subject of Creation and Evolution. I was probably asked to do this because of the broad background in science that my education gave me. The truth is, I did not know much about what evolution had to say at the time. Evolution had never been discussed in the days when I was in school. I had gone to a Christian school from kindergarten to high school, and then to a Christian university. Evolution in those settings and at that time was largely a forbidden subject. I knew nothing

about it. So, I began to study. I did know about the literal interpretation of Genesis 1 as those ideas have been around the church for a long time, so by default, I had considered myself a believer in the literal Genesis. This evolution was a new area for me, and it required research.

My preconceived idea was that evolution was a Godless theory. As I began to pour over the significant points of evolution, my first concern was that its ideas would try to destroy my faith. Is the Bible true? Is science true? For me, there is no doubt that the Bible is true. I have found it to be a reliable guidebook for life, I have experienced its truths, and I have felt the spirit of God lifting my spirit when reading its words. I have also studied the sciences and found it does a pretty good job of explaining most physical phenomena. If I did not believe Genesis 1, what implications did that have for my faith? I certainly wasn't considering giving up on the Bible, but neither was I ready to abandon science.

Some have said the world is made up of two realms, the physical and the spiritual. Science can address the physical while the Bible can address the spiritual. Science cannot address theological matters any more than the Bible can address physics. Yet it is hard to deny that in the creation story there is potential overlap of the two worlds.

I looked for middle ground. Can both the Bible and science be true? This is what St. Augustine, the Christian church's first and one of its greatest theologians advocated already in 430 A.D. Was it not God who created the natural world, why then should science be viewed with mistrust? "*When they (men) are able, from reliable evidence to prove some fact of physical science, we shall show that it is not contrary to our Scripture.*"¹ Should not the discoveries of science declare the glory of God, because the Bible says that observing nature will do exactly that (Ps. 19:1; Rom. 1:20)? St. Augustine urged followers to reassess their ideas as new science information was brought in. "*We should not rush in headlong and so firmly take our*

¹ The Literal Meaning of Genesis, Vol. 1, St. Augustine, translated by John Hammond Taylor, S.J., Paulist Press, New York, 1982, page 45.

*stand on one side that, if further progress in the search of truth justly undermines this position, we too fall with it.*²

If the Bible says that God created the natural world and if God saw all that He created, and it was good, is it possible that one can understand the beginnings of the universe in the terms of modern science and yet see God manifest in it?

Gradually, the more I studied, the more I began to look on Genesis 1 as a metaphor. There are many places in the Bible that use this genre. How can we adequately describe the magnitude of what God has done except in metaphor? Straightforward words cannot capture it. Furthermore, the Bible was originally written for people who had no concept of the sciences. How else could it be stated to them. The twentieth century has brought a flood of new scientific information, providing us with more detail about our world than we have ever had, and which has given us new insights into how the creation progressed. Regardless of whether the first chapter of Genesis is literal or whether it is metaphor, the spiritual message is the same: God created the heavens and the earth.

Getting my mind to comprehend spans of time in the billions of years was another effort. The human experience is typically only in decades, and our ancestry can be traced back maybe hundreds of years or even several thousands of years if we include the Biblical stories. Billions of years are significantly longer lengths of time. But then I reasoned that the study of tiny subatomic particles involves times needed to accomplish changes in microseconds or even much smaller. Whereas the size of the universe reveals enormous distances, not just in thousands of miles, but in multitudes of light-years. It began to make sense to me that the scale of time would match the scale of distance. Billions of years did fit this logic. God would certainly be capable of managing His work over billions of years.

Reading the modern science version of the early universe involved recalling many of the science principles I had learned in university. The principles were the same I had applied to

² Ibid, page 41

other natural phenomena. There was no modification of the science required. The math and the logic matched. Science has put forth a fantastic creation story, and I could follow the details from step to step, it was all laid out rationally from one thing to the next. I liked it.

One thing was missing however: the story of how God was involved. But as I studied, I began to see the workings of God in so many places. It was a revelation to me. I sat in awe at the descriptions of what God has done using the natural laws that He created. It is an amazing account. What I thought would try to lead me away from God, instead brought me closer. To me, God showed Himself to be even more powerful and magnificent than I had realized before. Surely God needed to be included in the description of this scientific picture of creation.

Further, the numbers impressed me. Events had occurred in which the probabilities of them happening were often incredibly low. Atheist scientists have casually remarked that we just got lucky. I cannot accept that. The numbers are simply too low, many in the impossible range. And it was not just one event with a low probability but many. This said to me that someone was interfering with the process to make sure it happened, and that someone could only be God.

It was about this same time when I first saw the statistics on young people who were leaving the church. I had seen a local newspaper that had published a front page with the headline: "Mass Exodus". Following was an article stating that 70% of the church's youth were exiting. Now about half of these eventually came back, but still there was a net loss of about 35%. One in three rejected the teachings of God and of the church.³

There are several reasons for this, but one significant trigger for leaving is the perception that the church is anti-science. Young people learn the laws of physics and chemistry in school and learn what science says about the early universe and how things developed. They learn about the traditional seven-day creation that many in the church hold to and cannot put the two

³ Annette Maxwell, "Mass Exodus", Holland Sentinel, Holland, MI, July 8, 2013. Nearly the same statistics were obtained in a survey by Barner Christian Research Group, barner.com, 2019, and by Creation Ministries International, creation.com, 2025.

together. There is conflict. Unfortunately, the story of creation becomes a stumbling block for many, and they walk away from the church.

This disturbed me, and I questioned if such a tragedy could be avoided. What if it could be shown that science has given us a wonderful explanation of the beginning of the universe and of our existence, one that holds God up as the originator and creator of it all?

My studies have shown me that evolution is a series of fascinating narratives about our universe, narratives that can follow the lines of what mainstream science is presenting. It is not necessary to discard the principles that have been learned in school. But know that God can indeed be seen in this science. To me, science has shown the mastery of detail and engineering that God has put into His work. It has shown me the immense power that He has, and yet He cares enough about His creation that He continually interacts with it.

I began to take notes to prepare my Sunday School lessons. Those notes ultimately resulted in the writing of this book. It is my attempt to explain the science behind a more contemporary creation story, one that has emerged as a result of the scientific discoveries of the last several decades. For those who know a little science but who have may not have thought to apply it to this subject before, it may bring new light. Perhaps some may find science to be a bit intimidating, but they may still wish to know if science can really be consistent with what God has done. I have made an effort to minimize the technicalities of science in this book while keeping just enough science to provide sufficient explanations and I have tried to keep the discussion in layman's terms as much as possible. I have also attempted to make the descriptions short, giving only a broad outline of events.

I realized that just as I had no idea what science had to offer, there may be others to whom what is presented is new information. It may be what was needed for some to put the pieces together in the effort to grasp what took place in the distant past. For some, it may cause a reconsideration of previous thoughts about creation and evolution. Others may just be curious

what science has to say. Throughout, I hope to show that science and religion can indeed be complementary and not in opposition. That science can, in fact, increase one's understanding of the magnitude of God's creativity and genius, and it is not necessary to reject God if the science is to be trusted. Science is part of God's handiwork and by appreciating that science we can honor the One who made it all.

I undertook this book not to dismantle anyone's faith. In my writing, it is not my intent to persuade everyone to believe exactly as I believe, but instead to provide an understanding what science says about the creation process and where God's presence can be seen coming through. Not all people will change their present beliefs as many hold dearly to their long-held opinions and are reluctant to revise them. I understand that. If you believe that God is the author of the universe, you are my brothers and sisters in faith. Your stance on science does not determine your salvation and I do not want to diminish the fact that we are all one body. If you have doubts about God's involvement, I think the scientific version of the creation story is one of the strongest evidences for God Himself. The probabilities of various events happening by chance are so phenomenally low that chance does not provide a good explanation and the universe is so ordered that it argues for an origin arising from the mind of an intelligent being.

I am eager to show you the whole story. I want to take you from the very beginning of the universe to the present day, pointing out how God directed the process and where His presence is most prominent. Evolution is not a Godless theory, it's just that people have left God's part out when discussing it. In the following chapters I will first speak about how Genesis 1 was understood in the distant past, and after that, the traditional view will be looked at, along with a few brief comments. Then the modern scientific picture will be presented. As there are many more details to consider, the scientific perspective will take a little longer. It is a great story, and I hope you will be utterly impressed at the brilliance and creative power of God. Do not look on science as an obstacle to your understanding of God, but as a tool to gain a deeper realization

of who He is. God is the one who gave us science so that we could explore His works. When we do that, we honor Him who made all things.

Chapter 2

ANCIENT VIEWS OF GODS AND CREATION

My hands have made both heaven and earth, they and everything in them are mine. –Isaiah 66 :2

It was Jesus Christ who opened the opportunity for all peoples of the world to have a relationship with God. Prior to the time of Jesus on earth, it was largely only the Hebrews that had the benefit of this God interaction. Ancient Hebrews lived in the Middle East. There they were surrounded by other peoples who had very different cultural understandings of their world and God did not wish His people to take on many of the beliefs of their neighbors. He wanted the Hebrews to understand who their God is and where they truly came from. For that purpose God gave them Genesis 1. With the story in Genesis, not only would the truth of the one and only God be established, but it laid out some of the details of His character, and that all goodness flowed to them from the hand of God.

Besides the Hebrews, all other ancient peoples did not yet have the benefit of knowing God. But just as today we have a need to know how it all started, so have people of ages past had a similar need. And for this purpose, most ancients developed creation myths. The details of these myths were different for various people groups, but they frequently followed common themes.

Typically, ancient religions involved many gods, each with its own sphere of authority—a god for this and a god for that. Often, gods looked and acted remarkably like humans; they could have their good sides, but none were thoroughly good. They had tendencies to lie, cheat, steal, maim, and kill; and at times, they were simply out of control. Violence, power, and sex were recurring issues.

Sometimes the spirit of a god would inhabit natural objects, or maybe the natural objects would be seen as gods themselves. Humans needed to take care not to misuse such objects to

avoid offending the gods in any way, or else they would be doomed. For ancient peoples, the gods were not nice beings.

Further we note in ancient societies, the more prominent gods would be attached to certain cities, with these cities claiming a particular god to be their designated protector and patron. A city would elevate their chosen god to a high status and give him or her the most prominent temple to gain favor from the god for that city. At Memphis in Egypt, the selected patron god was the god Ptah. At Hermopolis it was Thoth, and at Heliopolis it was Atum. If you were a resident of Memphis, Ptah would protect that city, and you were privy to special favors from Ptah because you were from his city. If, however, you traveled to Heliopolis, you might prefer to pray to Atum if you desired protection there, as Ptah was not the one who held influence in Heliopolis.

We can get an idea of the nature of ancient gods in the Babylonian creation myth. For example, it describes how it all started with Apsu, the god of fresh waters, and Tiamat, sea monster and goddess of salt waters. These two produce a variety of other gods, but soon the gods begin to annoy each other and seek to kill one another. After a terrible battle, the god Marduk defeats and kills Tiamat, cuts her body in half, and uses it to form the dome of the heavens. This victory gives Marduk the power over the other gods which he had sought and explains how the heavens came into being. From the blood of Tiamat's army general, Marduk then makes human beings. Wow, is *that* what the gods are like?

Greek creation myths are similar. There is the initial chaos of material substances, then Gaia, the earth goddess, somehow arises. She has an immaculate conception and produces a son Uranus, the sky god. The violent and unpredictable Uranus then has sexual relations with his mother. Together, they give birth to a series of monster-like gods who are violent with each other. The son of one of these monsters is Zeus, who then engages in savage battles and is able to establish himself as the chief god. Later, the god Prometheus fashions a human from

mud and presents that human to other gods who, in turn, give humans a variety of attributes. Unfortunately, gods who did not get along with Prometheus gave humans some undesirable characteristics, and that is why humans have had so much trouble in the world.

In almost all early creation myths, the creation develops out of conflict. There is struggle as the gods war against each other, and they frequently use deceit and seduction to achieve their own selfish ends. It was nearly the same for the ancient civilizations of Rome, Egypt, India, and even the civilizations of the Americas. The characters were different in each of the myths for these peoples, but their characteristics and deeds were not all that different.

The gods expected people on earth to give them continual honor and tribute. Often one of the primary human functions was to show respect to gods with their sacrifices. Humans in creation myths were also sometimes created as servants to perform the dirty work for the gods. Gods demanded homage but cared little about humans or their plights. They could reward humans with favors if they so desired, or they could destroy humans by sending a variety of catastrophes their way. The gods were fickle and acted on whims, or to boost their own egos. In life, humans were commonly looking over their shoulders in fear that the gods would harm them by some frightful means

Genesis 1 says, "No, it's not that way!" It gives a completely different picture; there is no other ancient creation story like it. In Genesis there is one God—and only one God. He has no rival; there is no one who can challenge Him. This one God reigns supreme. He is not from a particular city or shrine. He lives in eternity and rules over every location in the entire universe. This one God has unbelievable power and is incredibly ingenious.

By Him, all things were created: Earth, the heavens, the sun, the moon, the stars, air, water, land, wind, thunder, lightning, rain, plants, animals, fish, birds . . . everything. None of these things have any divine spirit in themselves, they are all nonspiritual objects created by God. Genesis emphasizes this by referring to the sun as the great light, and the moon as the small light. By describing them in this way, the Bible reduces them to the status of mere physical

objects. They are simply things made by God. God made the stars. They are not divine and have no powers; they are just other objects that were fashioned by the one Creator God. Genesis totally rejects the idea that spirits could inhabit natural objects.

This Creator God is a God of order. He stands for all that is good and right and perfect. He does not produce chaos or the indiscriminate destruction of humans, He is a benevolent God, bringing peace and orderliness, and He supplies all that His creatures need. All that He does is done with intent and purpose, with careful planning, bringing organization to what had been random. All that He created was made in logical sequence; and it all works, one thing with the other, so as to produce a beautiful, harmonious existence for the most significant part of His magnificent work: man.

Humans are made in the image of God Himself; they are established as lower than God, but highly important. Humans are the crown of God's creation. And humans are given a most consequential task: to act as stewards of the creation God has made, to use and to enjoy what He has given. They are not God's slaves. God does not harm His people but provides for them, and in return expects their gratitude and longs for them to relate to Him as their heavenly Father. God saw what He had made, and behold, it was very good.

The message of Genesis 1 then is to tell the world of the one true God, and of His plan for mankind. Time will not change this message. Whether in the years before Christ, the early Christian period or in the twenty-first century, the message is the same. And whether Genesis 1 is taken literally or whether it is seen as a metaphor, the message remains the same.

THE MESSAGE OF GENESIS 1

- a) There is only one God.

Only God is performing all the work.

- b) All things are objects created by God.

Genesis 1:1 says that God created the heavens and the earth, and all

subsequent objects mentioned are components of the heavens and the earth that He made.

- c) God is a God of order, and all that He does is good.

God created things in sequence, and they are described as good.

- d) Humans are God's creatures; they are gifted with all that God has made and are given stewardship of God's creation.

Genesis 1:27-29 says that God has given mankind to use what is on earth and mankind should have rule over it.

- e) Creation's purpose is God's pleasure.

Genesis 1:31 says that God saw all He had made as very good.

THE CREATION ACCOUNT AS A TEMPLE DEDICATION

Genesis 1 was originally addressed to the Jews of the distant past, a people who lived in the Middle East. Not only would the message of the Genesis account have been understood by these ancient peoples, but the format of Genesis 1 would have been recognizable to them as well.⁴ Scholars of Middle Eastern thought and literature have noted the similarities to texts describing the establishment of a temple for a god in the ancient world. To emphasize to readers of the story that God is claiming earth as His temple, He gave them a picture that they would have related to.

Most people in the distant past thought that gods often lived in temples. This is why temples were built—so that a god would come to live there, allowing the local people access to the power of that god, and hopefully to the favors that the god could provide for them. Genesis 1

⁴ See *The Lost World of Genesis One*, John H. Walton (Downers Grove, IL: Intervarsity Press, 2009).

is about the establishment of Earth as God's temple in the universe. God is no ordinary god; He is the one supreme God. Nor is His temple an ordinary temple; the entire planet Earth is to be God's temple.

Genesis 1 describes the temple dedication ceremonies in which the temple is declared to have been built and is now ready to function, and the ceremonies surrounding the dedication last for the customary length of time. Just as ancient temple dedications commonly, and indeed, even Solomon's temple dedication⁵, were seven-day affairs, so too does the dedication of God's temple occur over seven days.

At the dedication, the purpose of the temple is identified. Who the temple will serve and why it is placed where it is are declared. Then the roles of those who have duties in the temple are defined, and the ones who will perform these duties are installed into office. Finally, when all these items are completed, the god moves in and begins the oversight and guidance of what will take place in the temple on a day-to-day basis.

In Genesis 1, the first three days involve the assigning of functions to the temple, with Day 1 referring to the ordering of time (days, nights, etc.), Day 2 to the ordering of the environment, and Day 3 to places to stay and things to eat. The next three days assign duties to those who will carry out temple functions: on Day 4, the celestial bodies are assigned to provide light and to govern the days and seasons; on Day 5, God installs the birds in the sky and the fish in the sea, giving to them the duties to populate the air and the waters, to do what birds and fish do, calling on them to function as part of God's ordered system; and on Day 6, God installs the animals to also multiply, to fill the land, doing what animals do. Humans are given a similar assignment, but they are given the position of supervisor and caretaker of what God has created. They are to be God's representatives on Earth. Finally, on Day 7, the last day of the temple dedication, God moves into His temple. All ceremonies and celebrations are completed,

⁵ 1 Kings 8:65, seven days for Solomon's temple followed by the seven-day annual festival.

and now God rests as He takes over His position as the head who will guide and sustain those who are carrying out their various functions.

Within this ancient Middle Eastern concept, we do not see anything about materials with which the universe was constructed or how it was all put into place. It is assumed that the construction of the temple has already taken place. All the pieces had been gathered and assembled before this, and now the functioning of the universe can begin. It appears that ancient peoples did not focus on what their world was made of but rather how it functioned. Genesis 1 was originally directed to ancient peoples, so it concerns the workings of God's creation, how it needed to run, but nothing really about the mechanics of how He went about creating it.

Thus, it would seem that Genesis 1 may have originally been written to explain the "why" of creation. It explains that the earth is God's temple and that it was made for God's pleasure. We, however—the people who live in the developed world of the twenty-first century—live in a place and time in which there are very different concerns than those that were found in the ancient past. Today we tend to focus on "how" creation was put together, and on the material aspects of the creation process. Yet, seeing how the people to whom the story was originally addressed viewed Genesis 1, it calls into question whether we are really looking in the right place for answers about the "how" of the construction of our world.

Can Genesis 1 really tell us the "how" of creation? Does it tell us the mechanics by which God built the universe and put everything into place? That is a question that arose in later times.

Chapter 3

TRADITIONAL CREATION

The Lord merely spoke and the heavens were created, He breathed the word, and all the stars were born.

—*Psalm 33:6*

Over time, worldviews changed. Ancient Middle Eastern peoples had handed down to later generations the creation story by applying what has been termed as Eastern Thought. Such thought was characterized by the communication of ideas using experiences and word pictures. Religion was a truth, truth had to be unfolded by telling stories. Poetry and symbolism, including symbolic numbers, were often used.

Then along came the Greeks who introduced new ways of thinking which have been referred to as Western Thought. The Greeks used more words and ideas that were abstract, and they encouraged reasoning and the use of logic. Religion involved an intellectual agreement with its truths, truths which had to be laid out and defined. Prose was the preferred method of communication and symbolic numbers were no longer used but numbers now represented actual quantity.

This change in thinking can be seen in the Bible itself. The Old Testament was written using Eastern Thought, while the New Testament more reflects Western Thought. In the Old Testament we see stories to present the message, there is frequent use of poetry and numbers are often symbolic. The New Testament, in contrast, is largely written by the Greek-trained Apostle Paul who primarily uses prose for his words and many of his ideas use abstract concepts. For example, to tell the reader to stay away from sexual sin and adultery, 2 Samuel 11 gives the story of David and Bathsheba. Compare that to 2 Timothy 2:22 which has Paul's

advice to Timothy, “Run from anything that stimulates youthful lusts, instead pursue righteous living, faithfulness, love and peace.”

Along with the Greek change in thought came a new interpretation of the creation story. Reasoning raised the question of how our world was constructed, and out of the attempt to answer this question, arose the traditional creation account as we know it. Science at that time was just in its beginning stages and not well developed yet. So, people turned to the best information they had: Genesis 1.

How was the universe actually created? Ask that question today, and you will get different answers from different people. Those who say it was a short time take their main information from the creation account in Genesis 1 of the Bible. There, it says there were seven one-day periods, and it outlines the types of creative activities that were performed on each day. Those who say creation occurred over billions of years take their information from science. Using the laws of physics that God has made, and experimental observations, science has outlined the maturing of the universe from the moment of inception to the world that surrounds us today.

To gain a better understanding of the difference between the two major present-day creation accounts, I will use this chapter to review the traditional creation story from Genesis, making a few comments along the way. Then in the next chapter, I will lay out the story as proposed by science. Interestingly, there do appear to be several faint similarities with the sequence of events in the two creation narratives, yet they are very different in how the details of the events unfold.

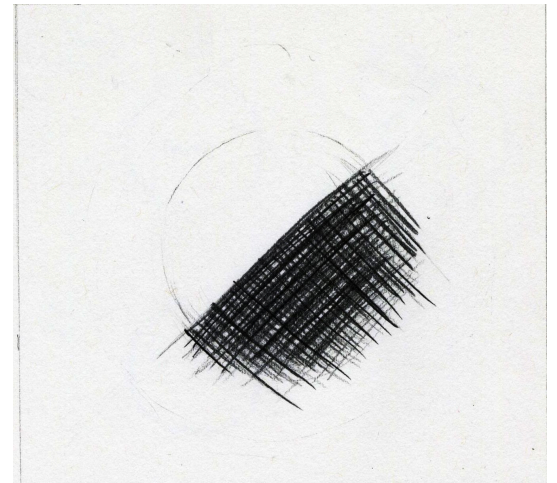
The traditional teaching is derived from a very literal reading of Genesis 1. Following is the creation account as it was understood by all Jews and Christians for at least the last thousand years of history, until very recent times when new ideas about the creation began to form.

Genesis 1

Verse 1: “In the beginning God created the heavens and the earth.” This states that there *was* a beginning. The universe did not always exist. Before this, we assume there was nothing of material substance, when out of God’s power and ingenuity came all that is now in the heavens and on the earth. Since God is mentioned as already being present, this implies that God is separate from creation and existed prior to it. While creation was not always there, God was.

Verse 2: The Bible now mentions a formless earth, deep waters and darkness. Many people think of light as the first thing God created, but according to Genesis, it looks as though there had possibly been some creation activity occurring before light appears.

Verses 3–5: Day 1. And God said, “Let there be light, and there was light.” Light was at least among the first things that was created. Was it a momentary burst of light, or a continuous light that persisted thereafter? That light and dark were subsequently separated might argue that the light stayed around. Persistent light usually needs a source. But there were no stars, nor a sun to produce any light yet.

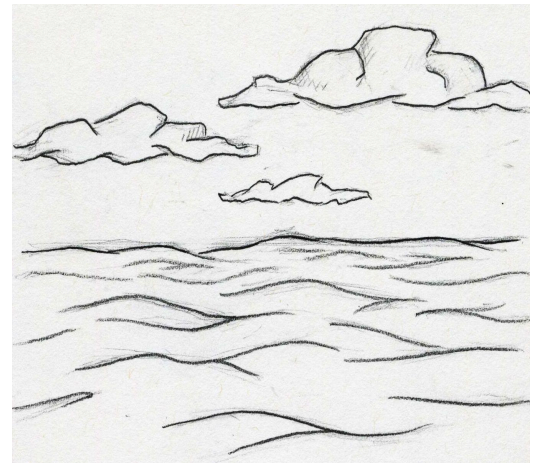


Some people think that somehow God may have caused a kind of glow to shine light around the empty universe. Such a phenomenon, however, would be difficult to explain scientifically. Where the light was, God called day, and where light was not, He called night. We do not know the source of the light at this point, but if we look to the source of our light, the sun, we note that it never stops shining its light to the entire solar system. The light never goes out. Part of the earth faces the sun for a while, and it is day; then part of the earth gets hidden from the sun as it rotates away from the light and it becomes dark, and it is night. Because of the light

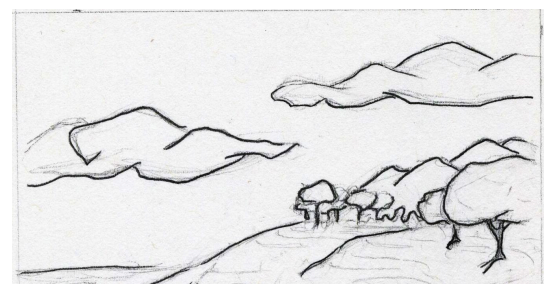
and dark issue, there are some traditional creationists who think the sun was created on the first day, but it is not mentioned until the fourth day.

The Bible does not tell us that Earth had actually formed yet on Day 1 either. Thus, it would be difficult to say that there could be a day and a night if there were no Earth or any other structure in the universe to block the rays of light to produce darkness. And what would determine the twenty-four-hour time period if there is no Earth to rotate on its axis? This has led some to say that planet Earth must have come together in a primitive form already on Day 1, because the verses here mention day and night, and the subsequent verses make more sense if God is beginning now to give more characteristics to the primitive Earth as the various days progress.

Verses 6–8. Day 2. God separates the waters, some water went high, and some went low; and in between there was just air. Ancient peoples had the belief that there was a whole layer of water above the sky. They believed the sky was somehow able to keep the waters above the earth separated from those below. Whenever it rained, however, it did so because the waters that existed high up were leaking through the atmosphere.



While these verses sound a little like the ancient idea, modern peoples interpret this to possibly mean that God now created clouds above the earth and the seas on the surface of the earth. Again, in this case, it would seem that the earth is already in existence, and that it becomes covered by one big ocean, a concept that we will see again when we discuss the science version of creation.



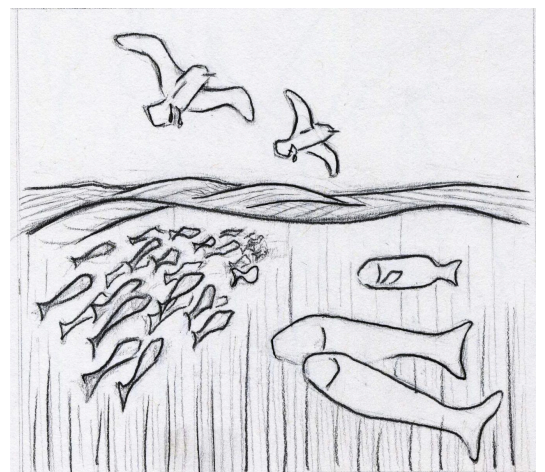
Verses 9–13. Day 3. God creates dry land. Land divides the one giant ocean into somewhat smaller sections or seas. And onto this land, He creates his first lifeforms: plants. These plants are of a great variety. God gives the plants the capability to reproduce themselves, and they are spread all across the land.

Verses 14–19. Day 4. It is here that God creates the rest of the universe to surround planet Earth. He makes the sun to be the great light for the earth, the moon to be a lesser light at night, and all the stars are put into their respective places.

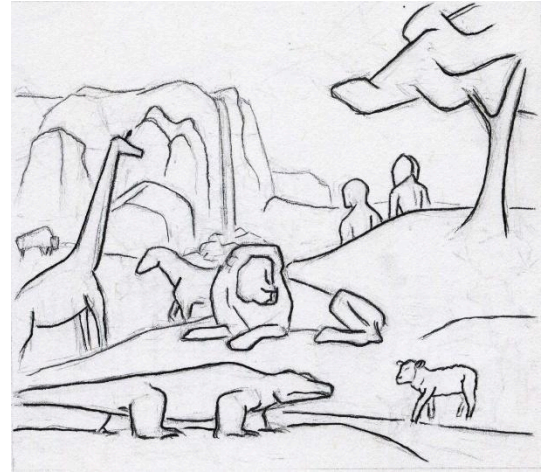
This is a difficult area for those who question the traditional view. How could it be, they ask, that Earth, along with all the planets, was not circling the sun before this? How is it that the tiny, tiny speck of dust we call Earth, was suspended in empty space all by itself, and now has the entire, incredibly huge, massive universe built around it? This order of Creation does not make sense to everyone.

What about all that vegetation that God created on Day 3? There was no sunlight to nourish those plants, as there was no sun until Day 4. But as has been proposed, there was possibly a glow present in the universe since Day 1. Was it a bright enough light for plants? In any case, the plants only have to survive twenty-four hours before they begin receiving sunlight.

Verses 20–23. Day 5. God creates birds to fill the sky and fish to fill the seas. And He makes them all capable of reproducing themselves.



Verses 24–31. Day 6. God makes animals to fill the land. And as His final act of creation, He produces His highest functioning, most sophisticated creatures on Earth—humans. To these special beings, He gives some of the characteristics of God Himself. They are provided with an intellect of a much higher degree than all the animals. It appears that God also implants within them a sense of morality, and most importantly, a sense that there is a higher power. And to man, God gives stewardship of all else He has created.



Genesis 2

Verses 1–3. Day 7. God rested on the seventh day, and made it a holy day—a practice that is still honored today by those who set aside their work on the seventh day to comply with God’s command to do this (Deuteronomy 5:12).

Take note that there is an interesting symmetry in this creation story:

Day 1 Light.....Day 4 Sources of light

Day 2 Sky, Waters.....Day 5 Birds, Fish

Day 3 Land.....Day 6 Animals, Man

Similarly, there is a symmetry that occurs in each of the five major stories of the book of Genesis—creation, the flood, Abraham, Jacob, and Joseph. Some feel that this symmetry appears to be evidence that the stories were passed on by ancient storytellers. Before any writing ever existed, societies would have designated storytellers to relate an event to an eager listening audience. Such storytellers were likely found among all ancient peoples and were

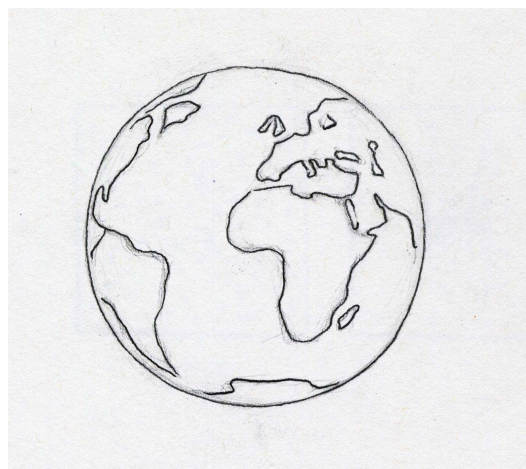
certainly present in Hebrew societies of the distant past. By verbally telling and retelling the stories, generations passed the information along through the ages, until they eventually were passed onto people who wrote the stories down. Symmetry served as a memory tool for both those who were to tell the stories and for those who would hear them. Symmetry also introduces a poetic satisfaction to the story. In the case of the creation story, it emphasizes that there was an order to creation, and that the God of Genesis is a God of order.

So, the creation process is now finished. According to the literal reading, in seven days, God created everything that is and was. Everything that was created was made in its present-day form. There was no evolution. The sun and planets of our solar system were put into their present orbits amongst the stars of the Milky Way galaxy. The dry land continents were arranged on the face of the earth as they are today. All birds, fish, and animals were made just as they can be seen today. There were no intermediate stages of development from more primitive species. All systems and intricacies of nature, God created in that short time span of one week—an awesome achievement for an awesome God.

It is a wonderful story. Why then do so many object to having Genesis 1 be the definitive description of how creation took place? Well, Genesis really doesn't give many details about the process, it can seem incomplete, and the narrative raises a number of questions about how the process proceeded. There are places in the story where science can explain what is happening, but there are other places that present difficulty in giving the science behind it, and science will sometimes give different information than is found in the Genesis account. And as said before, the sequence of events does not always seem to follow logically.

Also finally, it is recognized that Genesis 1 was written using Eastern Thought, making it more likely that it can be viewed as a poetic chapter rather than as a technical report. As metaphor, it works very well. In any case, the Biblical creation story taken literally does hold value as it presents the same message as understood by the ancient peoples described in the

previous chapter of this book. And that message is foundational to comprehending our existence.



Chapter 4

PRE-CREATION

Where were you when I laid the foundations of the earth? Who determined its dimensions and stretched out the surveying line? —Job 38:4–5

This chapter introduces the creation story based on modern scientific concepts. For advanced-level scientists, the discussion will seem rather simplistic, while for those who never did well in school science classes, trying to understand what is being presented is likely to produce a throbbing headache. For those in the latter group, I would suggest that you not try to fully grasp the details of each idea, but rather to marvel at the complexity of each stage and stand in awe of a God who made all of it come to pass. It may help if only a small part is read at a time to allow the ideas to settle in the mind.

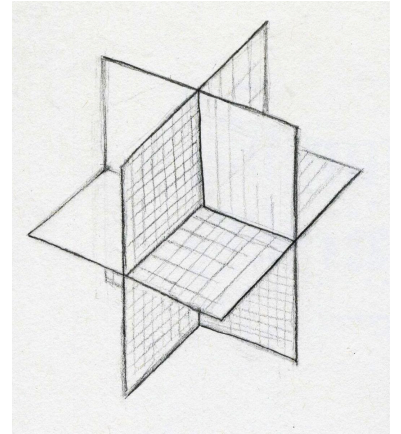
How is it that the laws of nature exist? Where did they come from? How is it that the natural laws as they function have been able to produce a universe that demonstrates amazing order and beauty? There are those that say that the natural laws just happen to be and that we have been incredibly lucky that they work as they do. Really? Take a serious look at the world around you. Does all you see appear to be a product of haphazardness or instead does it carry hallmarks of detailed design and of intellectual input?

In the beginning, it was God who created these natural laws of physics and chemistry. His universe was to be a spectacular work of art and engineering. God's laws were painstakingly planned ahead of the creation itself. He put them into place, and to have all of

them to work together, the details were to be just right. There are so many details that we will mention only a few highlights.

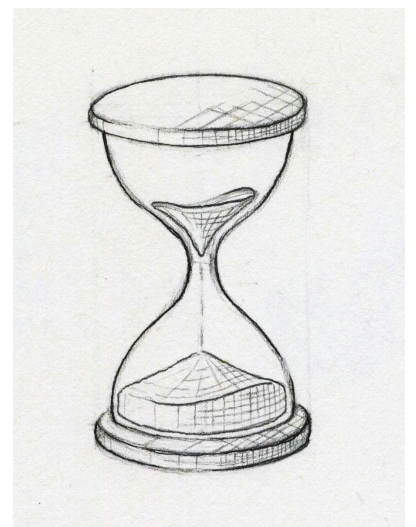
SPACE AND TIME

The concept of space needed consideration. Why choose three dimensions? Certainly, one-dimensional or two-dimensional space isn't very interesting; it's just too limiting. It gets much more interesting in 3-D. Shapes could be made that have thickness and depth. Travel could occur up, down, sideways, or front to back. God could show His creativity more in three dimensions.



Why not four dimensions? It seems that this level of space, and the physics of 5-D and 6-D result in some difficulties involving gravity, planet sizes, and their orbits. Three-dimensional space is simpler, more elegant, yet allows for a vast variety of options within it. Three dimensions seems to have been a good choice, one that has made possible a stable, long-lasting universe which has supported creatures like us.

Along with the three dimensions of space, God created time. Time does not exist in eternity where God lives, but it was conceived in God's own mind. Time is as much a created thing as a star, a tree, or a droplet of water. Humans tend to think of eternity in terms of many years, but time is irrelevant to eternity. Time was constructed by God as a functional part of the universe that He created, and someday time will disappear when the universe is no more. By having 3-D space move through time, a sequence of events could occur. One step could be built upon the next, and time would allow such a thing as history.



THE FUNDAMENTAL FORCES

God laid down the laws of physics and chemistry that were to operate within the references of time and space. These natural laws do not happen to exist by mere blind luck, but they were deliberately instituted by God Himself. Chief among these natural laws are the four fundamental forces. All the physical forces in our world boil down to these four forces.

Both the strong nuclear force and the weak nuclear force were to operate only in the tiny realm of the nucleus of the atom. The strong nuclear force is the most powerful of all the four fundamental forces, but its influence does not extend beyond the atom's nucleus. The nuclear forces would be crucial in holding together the particles that make up the nuclei and in allowing each atom to function properly.

Electromagnetic forces were to interact with electrically charged particles. So, anything made up of materials containing electrons and protons, which are both charged particles, and which are found in almost everything in the daily lives of humans, would be influenced by this force. Let me give an example. God made it so that electric fields and magnetic fields travel through space together as a wave. When visible light, which is a type of electromagnetic wave, exerts its force on the electrons in the retina of your eye, it causes you to see.

And then there would be gravitational force. Gravity would exert its force on every material thing. It would be the weakest of all the forces, but it would act over enormous distances. It was to be the dominant force regulating placement and movement of the large bodies of the universe. Gravity would help in the formation of stars and would be key to Earth's

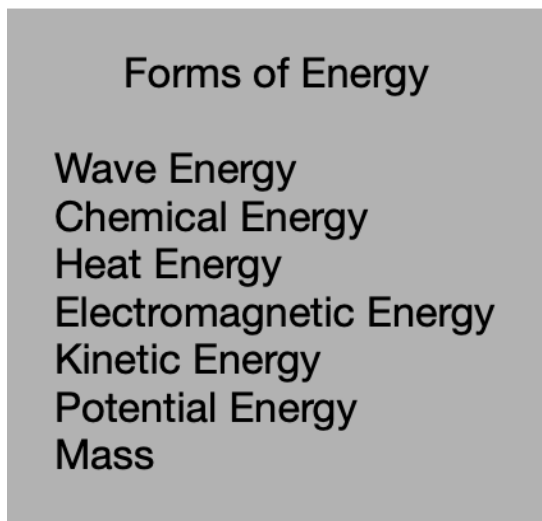
The Four Fundamental Forces

- 1) Strong Nuclear Force
- 2) Weak Nuclear Force
- 3) Electromagnetic Force
- 4) Gravity

continued orbiting around the sun. Each of these four fundamental forces is extremely and finely balanced, one against the other, so that the universe functions with exceedingly great precision.

FORMS OF ENERGY

Before creation, God drew up several forms of energy.



To regulate these forms of energy, He thought up the laws of thermodynamics. For example, the first law of thermodynamics says that the total amount of energy in the universe never changes, it always remains at the same level it started with, but the forms of this energy can change from one form to another. That means mass energy can be changed to heat energy and also to light energy (another name for electromagnetic energy), like the energy conversion that happens in a wood fire on a cold night, where the mass of the wood is converted to warmth and firelight.⁶

⁶ Mass is the amount of matter in an object, usually expressed as weight.

The Laws of Thermodynamics

- 1) The total amount of energy in the universe always stays the same, but energy can convert from one form to another.
- 2) Systems tend to go from a higher energy state to a lower energy state. Over time, the energy available to a system decreases as heat energy does not convert efficiently to other forms of energy.
- 3) At the coldest temperature possible, no chemical reactions will take place.

THE ATOM

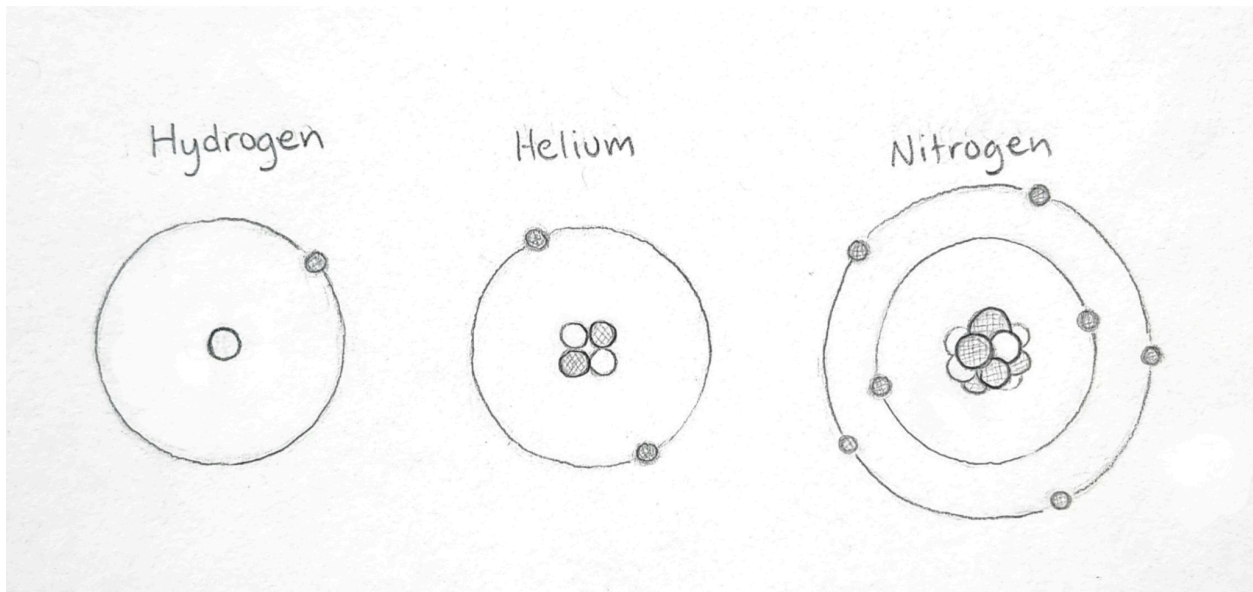
How is it that atoms occur? It was God who designed the atom—an ingenious engineering concept. The atom would be the building block that could be used to construct a vast multitude of structures. To fashion an atom, a nucleus would be made up of primarily neutrons and protons. While the neutrons have no electrical charge, the protons would contain a positive electric charge; and the nucleus would be orbited by electrons having a negative electric charge.

Each proton in the atom was to be exactly 1,836 times heavier than each electron. (Don't worry, you don't have to memorize this, there will be no test.) It turns out that this number is essential to the formation of molecules. If the number were only slightly larger or slightly smaller,

it would significantly interfere with the building of molecules using atoms. God knew this and chose precisely the right number.

He decreed the rules for quantum physics. One of its major rules states that electrons are allowed only in certain orbits around the nucleus, and in no others. If this were not the case, electrons would steadily spiral into the nucleus, leaving no electrons in any orbit, and no interactions with other atoms could take place. God had this all planned out.

THE ELEMENTS



God decreed that there would be a large group of different kinds of atoms, each with different numbers of protons and neutrons in their respective nuclei, all associated with the proper number of electrons—we know these as elements. Each element has slightly different properties, and therefore each could be used to make a huge variety of materials, each useful for a variety of functions.

The exactness God used in setting up the natural laws is astounding. What if the charge of the electron were only slightly different? Any extremely miniscule change in the charge of the very tiny electron would change the balance between the electromagnetic force and gravitational force. Such a change would have an effect in bodies as big as stars; it would change how they function and what their importance to us would be. Stars might not be able to burn hydrogen as fuel, in which case we would not see them even on a dark night, nor would they become the factories that produce most of the chemical elements that are crucial for us. (More about this later.) Again, the number is precisely right.⁷

Another force that affects stars is the strong nuclear force. The God of Genesis set the strength of the strong nuclear force, the one which controls the binding of protons and neutrons, at just the right strength. If the strong nuclear force, for example, were only slightly stronger, stars would not burn; or if only slightly weaker, stars would burn up far too fast. The strong nuclear force could not vary by more than one part in one trillion trillion trillion if it were to function in such a way that would allow all the things to happen that are needed ultimately for us to exist.⁸ Amazing!

When God set down the laws of physics, He made it so these laws could be expressed mathematically. After all, He is a God of order. These mathematical equations include quantities such as mass, distance, velocity, temperature and others. But often, in such equations, it is necessary to include something which is referred to as a constant, which is just a number. This numerical constant must be in the equation to make the answer come out right. For example, when describing gravity, we use the equation:

$$F = Gm_1m_2$$

⁷ Grant R. Jeffrey, *Creation: Remarkable Evidence of God's Design* (Toronto: Frontier Research Publications, 2003), 129

⁸ Sir Martin Rees, *Just Six Numbers: The Deep Forces That Shape the Universe* (London: Phoenix, 2000), 2.

universe farther out into space. If the expansion were even the tiniest, most minuscule bit faster, no stars or galaxies would have been able to form, and our solar system would not have been constructed. However, if the rate of expansion were only slightly less, the universe would have already collapsed upon itself and passed out of existence. If the rate of expansion had been smaller by even one part in 10^{18} , the universe would have collapsed before it ever reached its present state, so finely tuned did God make it.¹⁰

Why is the speed of light 186,282 miles per second? It is the speed limit of the universe. This value becomes another crucial number in any interactions involving electromagnetic waves. This number is just right.

There are lots of additional factors and mathematical constants that are just as precise as the ones above and that hold our universe together, and that ultimately allow us to exist and to function. These factors and constants were all put into place before the moment of creation by God Himself. If He had not done so, the universe would never have been able to exist.

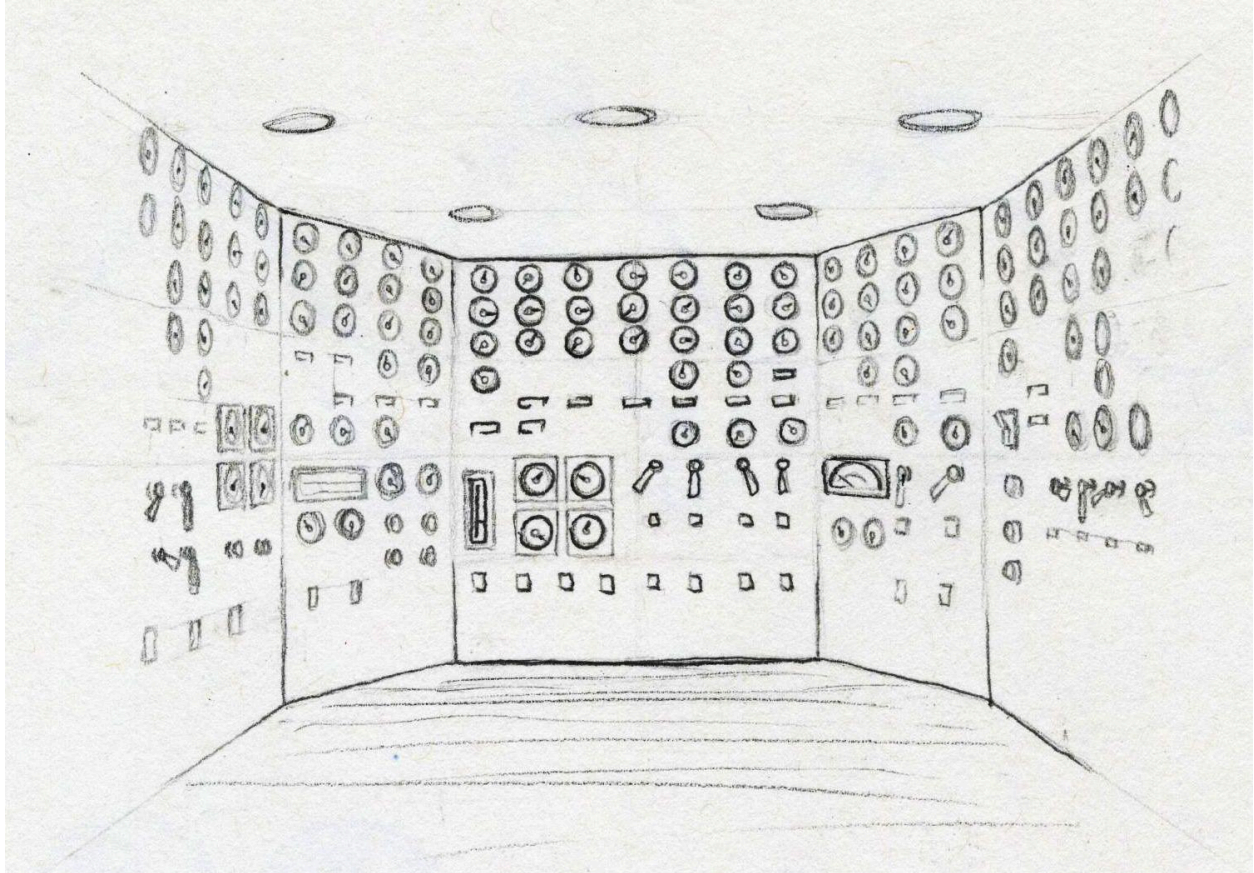
One scientist described it this way: "Consider a control panel with about a hundred knobs that control parameters in our universe. Each knob is precisely set to a value that allows life in our universe. If I were to turn any knob just a few percentage points to the left or to the right, the result would be either a universe that could not support life, or in many cases, no universe at all."¹¹

There is so much precision in the design of physics and chemistry that the idea of the universe coming into being without intelligent input has to be called into question. This is a compelling argument for creation happening by intent rather than by chance. Even physicist and atheist Steven Hawking has remarked that it almost seemed as though someone made the

¹⁰ Paul C. W. Davies, *The Cosmic Blueprint: New Discoveries in Nature's Creative Ability to Order the Universe* (New York: Simon and Schuster, 1988), 203

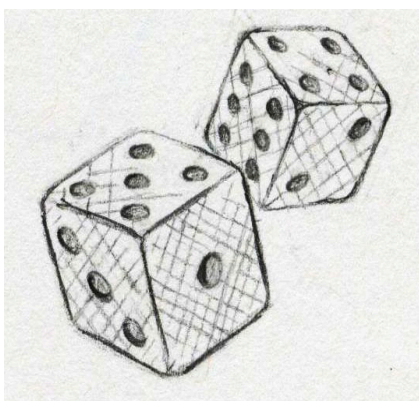
¹¹ Michael G. Strauss, *The Creator Revealed* (Bloomington, IN: Westbow Press, 2018), 31.

universe on purpose and that he knew humans were going to arrive.¹²



LAWS OF PROBABILITY

In addition to all the above, God made the laws of probability. Most people are already familiar with the main concepts of these laws, as we experience them daily. Similar



circumstances often produce different results because what is involved is an element of chance. What is the probability that it will rain today? The weather is decided by a number of variables such that it does not always rain every day. For

f Time (New York: Bantam Dell, 1998), 144.

some outcomes, God could see that it would be helpful if there would be a variety of results.

What about the mixing of genes when male and female are joined together? The laws of probability ensure that the offspring occur with a variety of characteristics, different from those of the parents. Having a variety of individuals ensures that some offspring will have the needed traits to meet a variety of circumstances.

Heat produced by the decay of radioactive elements is essential for keeping the core of the earth at a relatively warm temperature. If all the radioactive elements deep in the center of the earth released their radioactive energies at the same time, it would result in a sudden flare of immense heat, followed by rapid cooling of the earth, and life would not be able to survive. With the laws of probability, radioactive decay takes place slowly, over a prolonged and continuous period. The time over which this takes place is so enormous that we will never notice that radioactive elements are slowly being used up; humans could be kept warm by the radioactivity that is going on in Earth's interior for thousands of generations.

FINALIZATION OF PLANS

God drew up His plans for organic chemistry, and for physical chemistry, for mineralogy, geology, microbiology, physiology, and how the weather would function. Furthermore, God planned the broad outlines of history. He was to make the universe, including a special planet where He would create life. Ultimately, He would make His most exquisite form of life, humankind, a creation that would reflect the nature of God Himself (Gen 1:26–27). And He would enter into a relationship with these human creations; in turn, they would give Him their hearts as they lived in many and varied ways there on that special planet.

To allow life, the laws of physics and chemistry were to work in such a way that they would permit an environment where life would thrive. If biological organisms were to be possible, the basic properties of the necessary chemical elements and all the physical laws

used by them had to be such as to make organisms possible. Had God not given the individual laws of the universe the precise values that they have, we would never have known Him—as we would never have existed. His universe is so meticulously and intricately put together.

So, God now had His plans made, His grand design. The laws of physics and chemistry were in place, and the boundaries of space-time were chosen. The natural laws which did not come about by a gradual process of natural selection, but were instituted by God beforehand, were prepared to yield a most wondrous work. And God looked it over and noted that it was good. Very good. Things were now ready for the great moment, the actual moment of creation.

Chapter 5

EVOLUTION AS CREATION

Part 1: The Heavens

Look up into the heavens, who created all the stars? He brings them out like an army, one after another, calling each by name. —Isaiah 40:26

The model of creation being presented in this book is similar to the model presently being taught in public schools and universities. In those places, however, it is not labeled as creation but as evolution. So, we should start by saying a few things about evolution. With respect to the beginning of the universe, the word “evolution” means that the universe was not produced instantaneously in its final form, but that it was first one way, then something happened, and it became a little different. There were a number of stages that it went through before it became the universe of today. The traditional creation story taken from Genesis 1 is an evolution in the sense that God started with just light on Day 1, and by Day 6 it was very different and much more developed. When presented in that context, there is likely to be little disagreement that the universe “evolved.”

Where the disagreement occurs in the public mind, is that the word “evolution” often implies a theory that leaves God completely out of the picture. I find this an unfortunate circumstance. It is one of those instances where a perfectly good word has been hijacked, and I don’t think it needs to be. I think the words “evolution” and “God” are not only compatible, but that God is to be implied when speaking of the evolution that took place in His creation. Evolution can be described as a beautiful process by which God created the universe and life on Earth.

God created science. He created the laws of mathematics, physics, chemistry and biology. And the grand processes that we can describe using these laws are therefore His processes. It was God who made this marvelous universe; and using the tools that He gave us; we can gain insight into the manner in which He did His creating.

In this chapter, we will discuss the scientific views about how the universe and our world came to be. As these views are presented, please know that some form of evolution is believed by many God-fearing scientists, and for that matter, by an increasing number of Bible-believing people in general who have come to realize that science and religion can actually support one another.

THEORY OF THE UNIVERSE CHANGES

It was in the 1920s and 1930s that astronomers first came to the conclusion that the universe is expanding. Their observations of light emitted from stars showed an unexpected shift in the wavelengths and frequencies of the light. To illustrate, we can compare this to the shift in sound emitted from a vehicle that passes you on the road. When it is coming toward you, the pitch is higher, but when it passes you and travels farther away the pitch drops. Light does this too. Light coming toward you has a slightly faster frequency than light traveling away from you. By measuring the light frequency from distant stars, we can actually determine the speed at which stars are traveling away from us. These observations led to the new idea that the universe is not stationary as had always been thought before, but that it is expanding outward.

Prior to the twentieth century scientists believed that everything in the universe had always been as it is now, every star in its present position and all the planets moving in the same orbits as we see them today. All in the same state forever and ever. The discovery that the universe is expanding took scientists by surprise.

Knowing then that the universe is expanding brings up the question, what happens if we run the movie backward? Using the laws of physics, can we see what the universe looked like at an earlier time? Can we take it back all the way? What happens if we try to take the universe to the extreme, where it is in a very small volume? Was there a beginning to the universe, and can it be described in terms of math and physics?

The answers to all these questions are yes. Physics has a lot to say about how the universe likely began. Astronomers have been studying the universe for many years and have come to learn that certain events and processes are repeated over and over in the cosmos. By taking the last few centuries of observations and measurements done by astronomers, applying the laws of physics, and doing the math, a picture of how the universe formed in the beginning emerges. It is not total guesswork. It is not a wild proposal and an attempt to eliminate God. Rather, it is based on the known natural laws that can be seen occurring in our universe today—laws instituted by God.

Note that here, we are discussing only the structure of the universe: the stars, the planets, the asteroids, etc. We cannot use the structural equations to say anything about life, and how this occurred. The origin of life will be discussed later. We will want to start with how the structure which supports life came into being.

Scientists are unable to say what existed before creation. Most likely there was nothing, at least, as far as we can tell. There really is no way to know, no experiment can be done as there is no way to reach outside our universe to test for any such thing. Many accept that pre-creation, there was no matter or any physical form of energy that existed. There was simply nothing at all. Nothing of the material world, keeping in mind science is unable to detect or measure anything of the spiritual world.

MULTI-UNIVERSE THEORIES

Before we begin discussing how the universe developed, we should note that there are theories that multiple universes have come into being—not just our universe, but one following from the one before it.

There is the cyclic universe theory. Usually, this theory has it that a universe appears, evolves, then collapses on itself and is destroyed, providing the energy to start a new universe all over again. So, a series of universes occurs. Each subsequent universe is thought to have different values for those constant numbers described in the chapter on Pre-Creation, and the theory presumes that it was only by random chance that we ended up in a universe that had a workable set of constants, that we just got lucky.

There are problems with this theory. One problem is that it does not answer the question of how the first universe in a series of universes might originate. How was it that the first universe appeared? Where did the energy for that come from?

Further, the second law of thermodynamics says that there would be a decreasing amount of order in each subsequent universe. In a series of universes then, it would be necessary to start with an initial universe that was highly ordered. This would mean formation of the initial universe had to be an exceedingly organized event, not chaotic. The question is however then raised, how could it happen that randomness could produce anything that was so highly ordered? A beginning, then multiple subsequent universes, each would have decreasing amounts of available energy and organization. But if we live in one of the subsequent universes, how is it that our universe still appears to be so highly ordered? Because of the problems that the theory brings up, the cyclic universe theory seems to have fallen out of favor in recent years.

There is another multiple universe theory: the eternal inflation theory. This theory holds that there are multiple smaller universes within a giant mother universe, in which conditions in all the smaller universes are each different. In each of the daughter universes, the constants of the physical laws are not the same as those we have in our universe. Each of the constants seem to have been chosen by random chance. Most of these daughter universes fail quickly, as

their constants do not allow for things to work well together, and the daughter universes basically self-destruct. However, we got incredibly lucky that the constants are as we find them in our universe today as they seem to have worked out very well for us. Our universe is just one in a very long series of “trial” universes, and it happens to be exceptionally successful.

This theory is not without problems either. In the universe that we live in today, the laws of physics, as we know them, appear to be unchanging throughout all time and space. Yet, in the multiple universe theories, each universe is thought to use a different set of values for all the physical constants as described before. Again, many believe these constants were chosen by random chance and different constants would make all the natural laws different from those we experience. How could we ever know that this actually happens? Proposing a variety of natural laws is a theoretical conjecture, a guess.

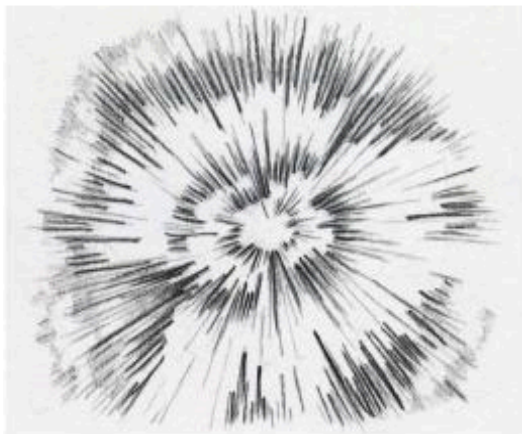
Atheist scientists are aware of the incredible precision of our natural laws and have struggled to arrive at an explanation that does not involve acknowledging God. A multiple universe theory is an attempt to provide that explanation. Many prefer to believe in such a theory despite there being no conceivable way of observing any universe other than our own. Now there are some mathematical equations that perhaps lend a little support for the eternal inflation theory. While there are those who accept this theory, there are also scientists who feel the theory is based on incorrect assumptions and who see it as a strained attempt to explain away God’s selection of nature’s constants prior to creation.

Even if the eternal inflation theory had merit, it does not totally eliminate the involvement of God. If God created a multiverse, He would have known that one of the daughter universes would have the necessary and precise parameters for life, and that is the one that He chose to put us in. And finally, it is noted that the eternal inflation theory still requires an ultimate beginning for the mother universe, which would have its own requirements for precision in order to form.

THE BIG BANG

Something I find interesting about the generally accepted modern scientific concept is the belief that there was a beginning. By observing that the universe is expanding, it is implied that it expanded from a much smaller universe—and ultimately, that there was actually a beginning. This is consistent with what the Bible says, “In the beginning . . .”, and science here seems to confirm this aspect of creation.

So, if we run the movie backward in time and instead of expanding, we see the universe as smaller and smaller. How small can it get before the mass of all the stars, all the planets and all the other matter gets squeezed down so far that it cannot get crammed into any smaller package? Science says that the universe in the beginning was smaller than a period at the end of a sentence. *What?* How can that be? The earth itself could not get down to that size, let alone the rest of the planets of the solar system, the sun, all the 300 billion stars of the Milky Way galaxy, and the countless stars of the 100 billion other galaxies in the universe. Well, the catch is that it appears likely that there was no mass in the initial universe—no stars, no planets, no molecules, no atoms.



The Big Bang

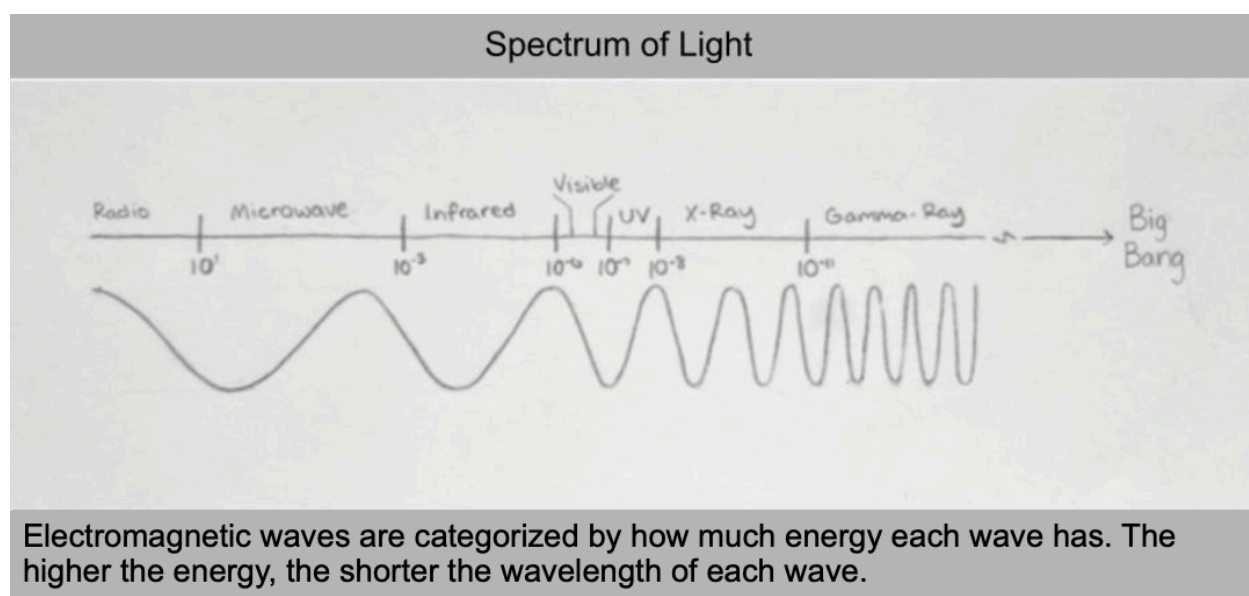
Science says that at the point of creation, there suddenly appeared a burst of energy that was of an unfathomable, gigantic, humongous, stupendous proportion. *All* the energy that ever existed in the past, present, and that will ever exist in the future—*all* the total energy in our great and grand universe—*all* suddenly appeared at once. It is a most profound and amazing idea. Where this energy came from, science cannot say. Nor can science say

why it appeared. But the fact is believed that it did just suddenly appear. This phenomenon is

referred to as The Big Bang. The Big Bang was not an explosion, explosions produce chaos and randomness. It was more like someone had turned on the switch to produce one of the most precise and complex developments that ever existed. It was God who caused the Big Bang!! An incredible event, a dramatic demonstration of the absolute power God possesses, revealing His phenomenal capabilities. If He could do this, what can He not do?

While there were other forms of energy when this event occurred, it is thought that much of that energy at the initial moment appeared in the form of electromagnetic energy and in the form of heat.

Is this what the Bible describes? In the beginning, God said, "Let there be light." And



what is light in terms of science? It is electromagnetic waves. Now to be sure, the energy of these waves at creation was way off the scale of the known electromagnetic spectrum and would not technically be the same as familiar visible light, but it would be a similar type of light wave, only with much, much more energy. How else could it be explained to peoples who lived several thousand years ago, and who had no idea about the sciences or the electromagnetic spectrum? "Let there be light." And even if Genesis 1 were entirely a metaphor for what God did, it is interesting that light is the first thing listed as having been created.

So, how many electromagnetic waves can fit into a volume the size of a sentence period?

Answer: as many as one wishes. How strong can the light be that can be inserted into such a small space? As strong as it can be made. There is no limit. There are no size restrictions to light waves, there are no restrictions on the strength of the light beam, no restrictions on how many waves can be packed into a given volume.

Let me give an illustration. Suppose you shine a flashlight onto a spot. The light waves from the flashlight will light up that spot. Now give a flashlight to everyone you have ever known and have all of them shine their lights on the same spot. There is no restriction on how many flashlights you can do this with and no restriction on how strong the light shining on the spot can be. That is how the universe could have started out so small.

APPEARANCE OF ELEMENTARY PARTICLES

Did you ever watch any YouTube videos showing the workings of Rube Goldberg machines? These machines can be quite ingenious. For example, to feed a dog, an alarm clock goes off. The alarm clock pulls a string, which starts a golf ball rolling down a ramp and the ball finally tips over a food can which gives the dog his food. What these videos show are a series of complicated actions by a variety of components that ultimately perform a simple task. To accomplish the final result, each component must be perfectly constructed to perform a specific activity, the action must be designed such that it affects the next component in a specific way, and the actions must be perfectly timed. Great care and amounts of effort are spent setting such machines up so that everything works together flawlessly.

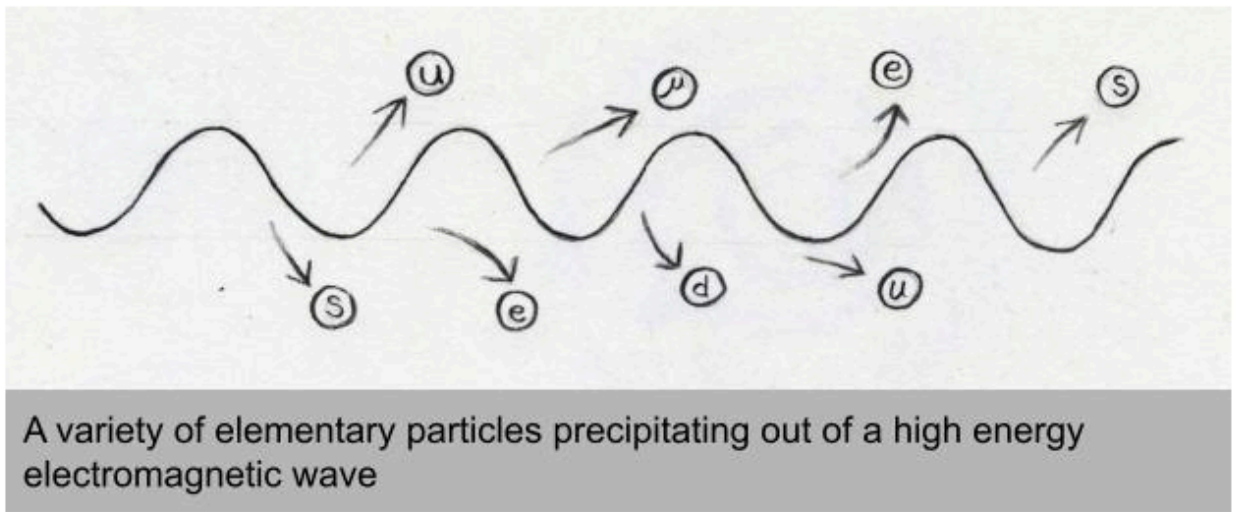
The creation of the heavens is a little bit like this, only the outcome is not so simple. After the initial action of the Big Bang, there is a series of subsequent actions that take place, one after the other, ultimately leading to the universe in which we find ourselves today. Before creation, God designed each component of the universe such that it would perform a specific

task, then each component would interact with the next so that a new thing would be constructed, and the timing of each action was perfect.

As the evolution of the early universe progresses, we will see the following sequence:

- 1) Light and Heat
- 2) Elementary Particles
- 3) Neutrons and Protons
- 4) Atoms of Hydrogen and Helium
- 5) Hydrogen Gas Clouds
- 6) Stars
- 7) Production of All Other Elements

The initial electromagnetic waves at the Big Bang were far from ordinary. The universe



has never again seen electromagnetic waves that were as strong and powerful as these. And suddenly there was a burst of these fabulously energetic waves, along with heat and other forms of energy. And because this burst contained energy in such gigantic amounts, there occurred a process that can only occur at these really high energy levels. There began to appear what are known as elementary particles. Trillions and trillions upon trillions of elementary

particles began to immediately precipitate out from those electromagnetic waves that had burst into space.

There are over a dozen different types of elementary particles, but for our purposes, we will mention the subsequent action of only a few of them, two types of quarks and the electron. What happens to the other elementary particles is not fully known, likely many of them will go on to form part of what is known as dark matter. There are still some things about our universe that haven't been completely worked out yet.

The first law of thermodynamics says that energy can transform from one form of energy to another form, and with the huge energy burst at the Big Bang we have such an occurrence. Electromagnetic wave energy and other energies begin transforming into mass energy. Quarks and electrons have mass. This is the exact opposite of what happens in an atomic bomb, where a small amount of mass energy gets converted to a giant amount of energy of other forms. As each elementary particle is formed, the amount of energy of the burst is reduced by the amount of energy it took to make the elementary particle. Eventually, the burst loses more and more energy until it reaches a point where it becomes unable to make more particles.

Heat, which is involved in this process, helps in the transformation of light into elementary particles. As far as science has been able to calculate, the temperature at roughly the point of creation was about 10^{32} degrees¹³. That is a 1 with 32 zeros degrees!! That is *really* hot! The temperature at the center of our sun is only about 10 million degrees, or 10^7 degrees. Physics says that you need temperatures far hotter than the center of our sun to get elementary

¹³ Degrees here are in the Kelvin temperature scale. Kelvin is a way of expressing temperature in which zero degrees Kelvin is the absolute coldest that anything can possibly get in the universe. Zero degrees Kelvin is the same as minus 459 degrees Fahrenheit or minus 273 degrees Celsius.

particles to form from electromagnetic waves. It is so hot initially, however, that this reaction readily takes place.

Within the first millionth of a second, a massive and dense sea of elementary particles forms, and this sea expands every tiny fraction of a second. The universe gets bigger and bigger, as the particles spread out. The particle sea, however, does not expand at the speed of light like the electromagnetic waves do. The particles have mass, whereas electromagnetic waves do not. Because these particles have mass, they cannot go as fast as light.¹⁴

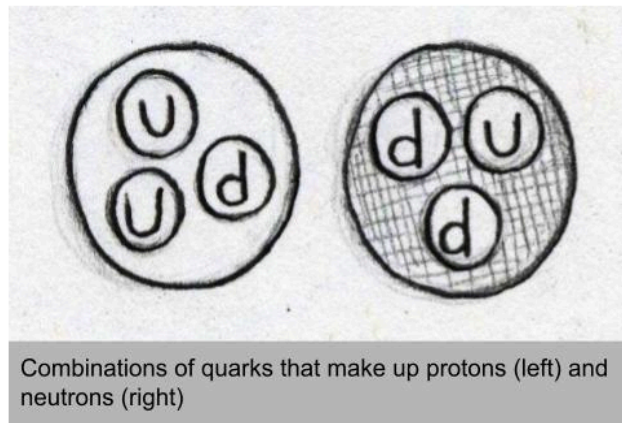
As the universe expands, the temperature drops. There is only so much heat, and as that heat has to fill a greater and greater volume, the temperature goes down. Ultimately, the universe gets big enough, and the temperature low enough, that more elementary particles can no longer be formed. Once the temperature drops below 10 billion degrees, all the elementary particles that were going to be formed are present; there will be no more by this process. This occurs within several seconds of the moment of creation. By this time, the universe is a more than a million miles in diameter.

So now there is a very dense and really big sea of elementary particles. Initially they are packed quite tightly. It is still so hot that they exist as separate and individual elementary particles; they are not able to interact with one another because of the intense heat. Many of these particles are quarks. Among the most common quarks are the ones that are called, “up quarks” and “down quarks”. (Scientists showed a strange sense of humor in naming the different quarks.)

¹⁴ There is one exception to this statement. Extremely early in the first second of creation, the universe goes from the size of a point to the size of a grapefruit at greater than the speed of light for reasons that are not well understood. This is referred to as inflation. Thereafter, nothing exceeds the speed of light.

FORMATION OF NEUTRONS

As the
with universe
nuclear force,
forces in the
to glue these



PROTONS AND

temperature decreases
expansion, the strong
one of the four major
universe, can now begin
quarks together. Two up

quarks and one down quark combine to form a proton. One up quark and two down quarks combine to form a neutron. At first, there are about equal numbers of protons and neutrons, but then the weak nuclear force, another of the four major forces in the universe, causes many neutrons to split into a proton plus an electron, resulting in more protons than neutrons.

Wow, this is complicated! And we are just hitting the highlights.

About one minute after the moment of creation, the temperature has fallen to about one billion degrees. Now the temperature is cool enough that protons can begin to hang on to neutrons and soon there is a large number of neutron-proton pairings, and these are held together by the strong nuclear forces. What we are seeing is the building-up of the nuclei of future atoms. One common combination is two protons combining with two neutrons, and it is this combination that will ultimately become the nuclei of helium atoms. Protons that do not combine with neutrons, but stay as separate individual protons, will become the nuclei of hydrogen atoms.

At the end of this period of universe formation, there will be basically ten hydrogen nuclei for every one helium nucleus. So far, in our observations covering the entire universe of today, it has been found that the universe is primarily 90% hydrogen with 10% helium wherever measurements can be made.¹⁵ And this then is one of the arguments that has been given for the entire universe arising from just one origin. Parts of the universe did not come into being separately. It all appears to have been cut from just one cloth as the concentrations of helium versus hydrogen are identical throughout the whole universe.

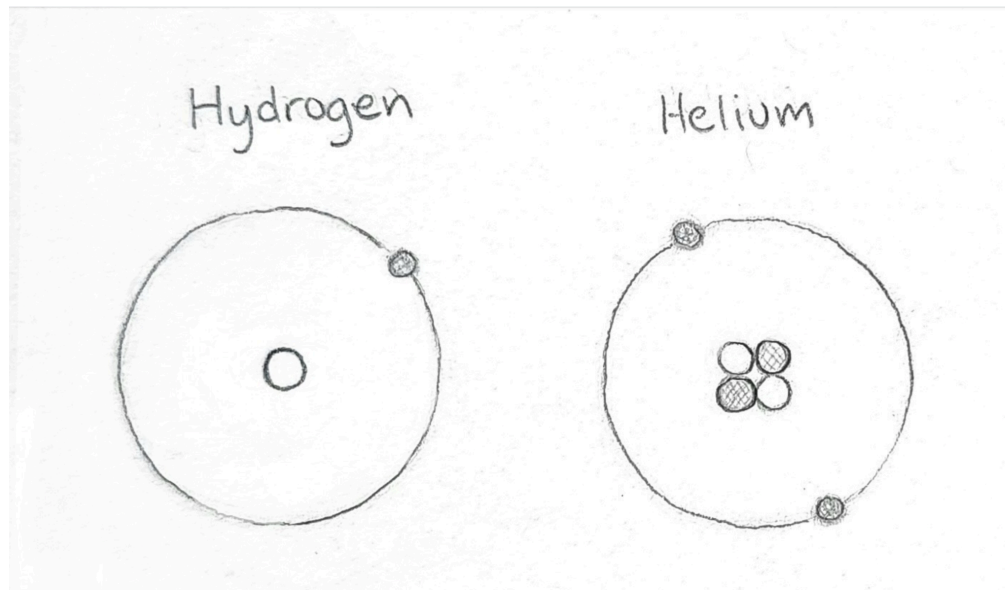
Thus, only a few minutes after the moment of creation, the development of nuclei is finished. Everything up to this point has happened in a very short period; but now, nothing new happens for a long time. The universe continues to expand, and as it does, the temperature continues to drop. The rate of temperature drop was very rapid at first, but as time goes on the rate of temperature drop gets slower and slower. It is not until the temperature has decreased to

¹⁵ Note that some scientists compare the number of atoms, which is about one helium for every ten hydrogens. Some other scientists compare the weight of the atoms, which is about 24% helium, 75% hydrogen, and about 1% for all other atoms.

about four thousand degrees that the next event takes place. Calculations say that the universe does not become this cool until more than 300,000 years have passed.¹⁶

FORMATION OF ATOMS

At four thousand degrees, the positively charged protons are finally able to hang onto



negatively charged electrons. Before, there was too much heat for this to happen. But now it is cool enough that they could hold their bonds, and actual atoms come into being for the first time. One electron orbiting around a single proton becomes a hydrogen atom, and two electrons orbiting around two protons with their associated two neutrons becomes a helium atom. This action occurs across the entire universe, so that now the universe consists of an expanding sea of primarily hydrogen atoms along with some atoms of helium.

Up to now, we have seen elementary particles forming from light waves, the effects of the strong nuclear force and the weak nuclear force in transforming the elementary particles into the nuclei of atoms, then electrons joining to complete the formation of atoms. God's designs

¹⁶ Joseph Silk, *The Big Bang* (New York: W.H. Freeman and Co., 2001), 164.

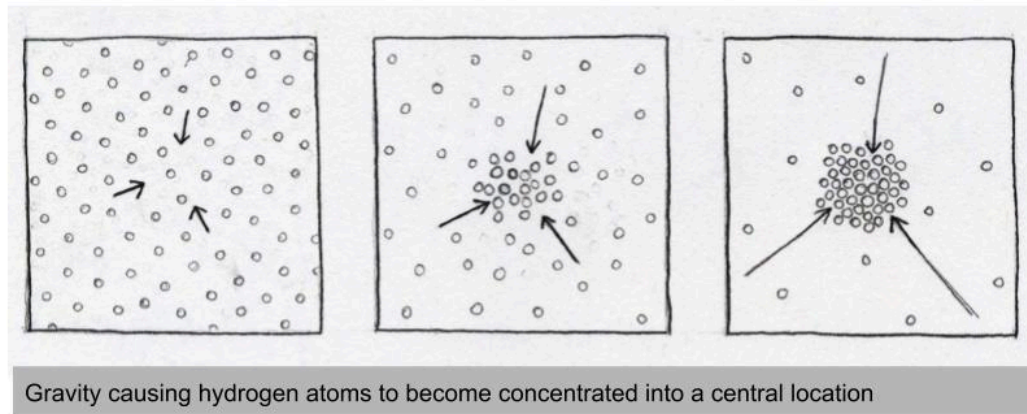
have been sequencing together beautifully. Next, we will see gravitational force, another of the four fundamental forces of physics, begin to cause changes in the structure of the universe.

HYDROGEN AND HELIUM GAS CLOUD FORMATION

In the early universe, the distribution of all the hydrogen and helium atoms was nearly homogenous. There was not much difference between any one part of the universe and another; it was all mostly the same. But it was not precisely the same; there were regions scattered throughout the universe that had ever so slightly more mass than other regions. This can be compared to pouring flour into a bowl; it is pretty much the same throughout, but there are small lumps scattered amongst the contents of the bowl. These lumps are not much more mass, but just enough to exert a slightly greater gravitational attraction on their neighbors. As atoms began to feel the gravitational pulls of their surroundings, the single nearly homogenous universe began to fragment into segments

Gravity is one of the weakest of the four fundamental forces, but it can exert its effect over incredible distances. Each atom exerts a gravitational force not just on the atoms next to it but also on atoms a long way off, to millions, even billions of atoms in a region. The gravitational force of a single atom is not much by itself, but forces from a group of atoms add together so that the gravitational forces taken together can become significant. The more atoms in an area, the more gravitational forces add up. A large group of atoms, then, can not only exert a strong gravitational force, but its effect can be felt far away.

The universe up to this point is a relatively homogeneous ball of atoms, but there are



scattered areas where the density is slightly greater. Gravity then caused the surrounding atoms to be drawn into those areas of higher density. This results in an even larger concentration of hydrogen atoms, which in turn exerts a little stronger gravitational attraction. This causes more hydrogen atoms from farther away to be drawn into the high-density centers and adds even more mass to the ever-growing hydrogen atom grouping. The process repeats itself over and over again.

The ultimate effect of all of this is that we get groupings of high concentrations of hydrogen atoms, with areas of relatively few hydrogen atoms left in the spaces between the high concentrations. The grouping effect occurs on several levels. At the first level, these concentrations of hydrogen atoms, or clouds of hydrogen gas, will form individual stars. But the effects of gravity of a whole group of stars will cause that group to break away from a group that has formed nearby, and thus these groups of stars will form separate galaxies. A group of galaxies will then exert enough gravitational force that it will break away from another group of galaxies, forming a local cluster. Similarly, local clusters will gravitationally group together, forming superclusters.

One has to develop a sense of awe regarding the force of gravity. It can work at the level of atoms, only millionths of an inch away from each other. Yet, it has the ability to extend its

reach across many light-years of distance to form structures as large as superclusters. The God of Genesis 1 made that force! How incredibly fabulous is that? Thus, gravity is why we find the stars, galaxies, local clusters, and superclusters placed where they are.

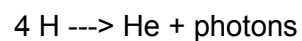
The universe continued to expand over the next thirteen-and-a-half billion years to form what we see today. As it expanded, the spaces between stars and the spaces between galaxies grew larger and larger. Meanwhile, gravity continually exerted its forces attempting, in the big picture, to draw all mass to the theoretical center of the universe. But the force of this effect is counteracted by the rate of expansion outward of the universe. As we have said before, these two effects are so balanced that the universe has neither collapsed upon itself nor flung itself into space so fast that it interfered with the development of any structures such as stars.

FORMATION OF STARS

Now let us look at what happens to form stars. Gravity causes individual hydrogen atoms in a hydrogen gas cloud to be attracted to the center of that cloud where the density is a little greater. More and more, atoms of hydrogen are drawn into this central area. And as they are drawn in, it can become sufficiently dense that a lot of heat is created by all the hydrogen atoms colliding, one with another. The temperature goes up. Meanwhile, more hydrogen atoms are attracted as the gravity of the cloud increases and the temperature goes higher. The higher temperature causes hydrogen atoms to collide with each other at an even more violent rate, and the temperature continues to increase further. Eventually, the atom collisions occur at such high speed and the temperature becomes so great that nuclear fusion begins to take place. The high temperature strips away the electrons, and the force with which two protons hit each other is so strong that it causes them to fuse together.

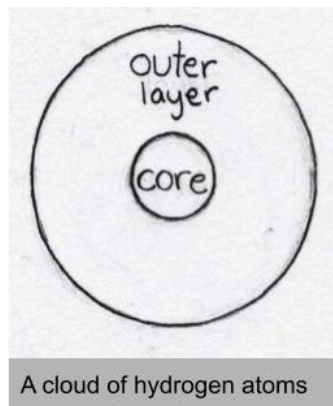
Normally, two protons would repel each other because they both have a positive charge, but the gravitational pressure and resulting high temperatures cause two hydrogen protons to

strike each other with such an impact that they overcome the electric forces that would usually repel them. With the protons now so close to each other, the strong nuclear force takes over and binds the two together. There are a couple more steps in the hydrogen fusion process, but the result is that four protons (or nuclei of hydrogen) become fused to form one nucleus of helium. This process releases energy, usually as photons. One photon is one unit or one packet of light. So, in the end, hydrogen gets converted to helium plus some photons—or in other words, helium plus light.



When this reaction occurs and light begins to be produced, a star is born.

The figure below shows the basic structure of a cloud of hydrogen atoms, which is



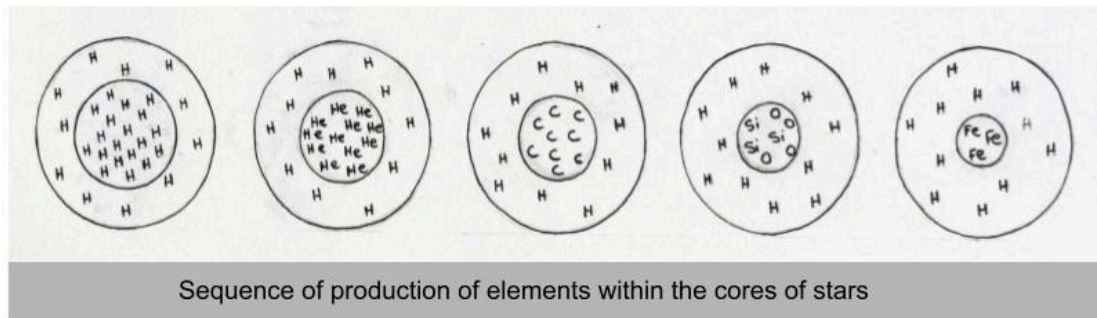
A cloud of hydrogen atoms

essentially what a star is. Only in the core is the pressure and temperature high enough that hydrogen fusion can take place. The hydrogen atoms in the outer regions of a star stay as hydrogen atoms and are not converted to helium by fusion. In the beginning, there is 90% hydrogen in the core. But gradually over time, helium begins to constitute a larger and larger percentage of the core as hydrogen there gets converted to helium through nuclear fusion. Ultimately, the core becomes mostly helium.

FORMATION OF ELEMENTS IN STARS

When all the hydrogen in the core has been converted to helium, the star's core temperature drops because the nuclear fusion of hydrogen atoms which had been producing a lot of heat is no longer happening. This drop in temperature also causes the pressure in the core to drop. But with not much pressure pushing outward, the diameter of the core of the star shrinks as gravity causes the atoms to get packed in tighter.

As the core atoms, however, get more and more compacted, it raises the temperature



again, until it again gets so hot and there is so much pressure inside the core that helium atoms start fusing with each other. There is a two-step process that next occurs resulting in the formation of carbon nuclei. This process of converting helium to carbon occurs continually, releasing more energy as photons, providing additional starlight until almost all the helium in the star's core is converted to carbon.

The carbon atom is a very special atom. It has several ways to combine with many other types of atoms. Atoms other than carbon cannot do what carbon does. It can be compared to special pieces in the tinkertoy set that I had as a kid. I always wished I had more of those special pieces because they had extra holes. And with those extra holes, it would allow me to make more kinds of things with them. Carbon will become the base for all future molecules involved in living organisms. The chemistry of carbon allows it to bond to other carbon atoms in

single, double, or even triple bonds, and allows it to bond to many other elements, creating highly complex molecules that are stable over temperature ranges typical on Earth. It is also able to form a gas which is critical for the carbon cycles that allow life, and it is the only element that can form the very long molecules required to contain the coding information necessary for life, the DNA.

When almost all the helium in the core has become carbon, the fusion of helium nuclei is finished. The core temperature drops, so does the pressure, and gravity causes the core to collapse further. We have seen this process before. The collapsing core causes an increase in the pressure once more, which then results in another increase in temperature until the heat and the pressure are high enough in the core that carbon nuclei start fusing with each other and they begin to form oxygen and silicon. Other elements are also produced, but the predominant ones are oxygen and silicon.

When the carbon nuclei are largely all converted to oxygen and silicon, the core collapses another time. This causes the temperature and pressure to rise high enough yet again to fuse oxygen, silicon and the other elements that have formed to produce iron nuclei. Other elements lighter than iron also form, but iron is the main one. Once the core elements all fuse to form primarily iron, however, no further fusion will take place. The laws of physics say that fusion of elements smaller than iron will release energy as light, but to fuse elements larger than iron requires the input of huge amounts of energy, and that level of energy is not immediately available. Therefore, the star stops shining once the core becomes dominated by iron. When the fusions inside the core basically have stopped, the temperature and pressure in the core drop and the core collapses even further.

SUPERNOVAE

A burned-out star with a collapsed core can now take one of a few different pathways. One way is for the core to just collapse until it is nothing but one intensely packed ball of atoms.

Sometimes, that is all the further activity goes, and the burned-out star simply remains as it is: a lifeless rock. Such a ball does not put out any light, but it has an incredibly strong gravity.

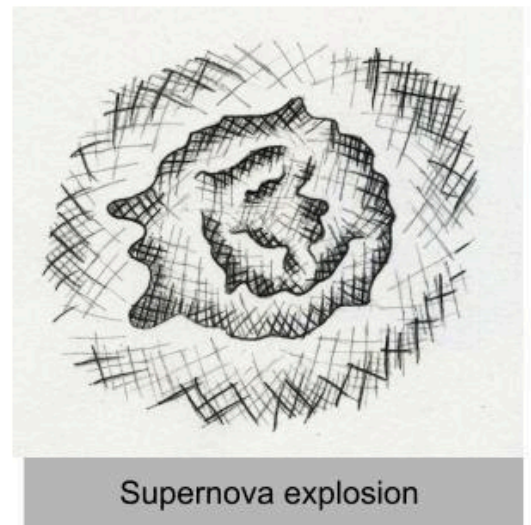
Sometimes, the gravity is so strong that even the electrons that are normally able to keep atoms separated can no longer do so, and the star collapses down to an even smaller ball. When this type of collapse happens, it forces the electrons to combine with the protons, and all the previous protons within the star now become neutrons. This is the scenario that produces neutron stars and also occurs in the development of black holes. The gravity of a neutron star is massive, and the gravity of a black hole is so intense that nothing, not even light, can escape its pull—and that is, of course, why it appears black.

Another pathway that a burned-out star can take is to collapse to a point where, in this case, the internal forces become unstable. The star explodes. The explosion is incredibly massive and not only produces an extremely bright light, but the phenomenal pressure of the explosion is so huge that it actually results in the fusion of a portion of all those elements that the star contained. The consequence of this is the production of elements that are heavier than iron. These additional fusions are how all the remaining naturally occurring heavy elements are made:

lead, silver, gold, antimony, platinum, etc. Such an explosion is known as a supernova.

The debris of an exploded supernova is then blasted through space. But the activity does not stop here. Following the explosion, the galaxy begins to recycle this dust and debris of dead stars.

Now the process of the space dust being slowly pulled toward a center of gravity begins all over, like we have seen before. From this space debris, whole new stars will begin to



develop, which will then shine their light into the universe. Ultimately, these new stars also die and explode, and even more heavy elements are added to the mixture of galaxy dust.

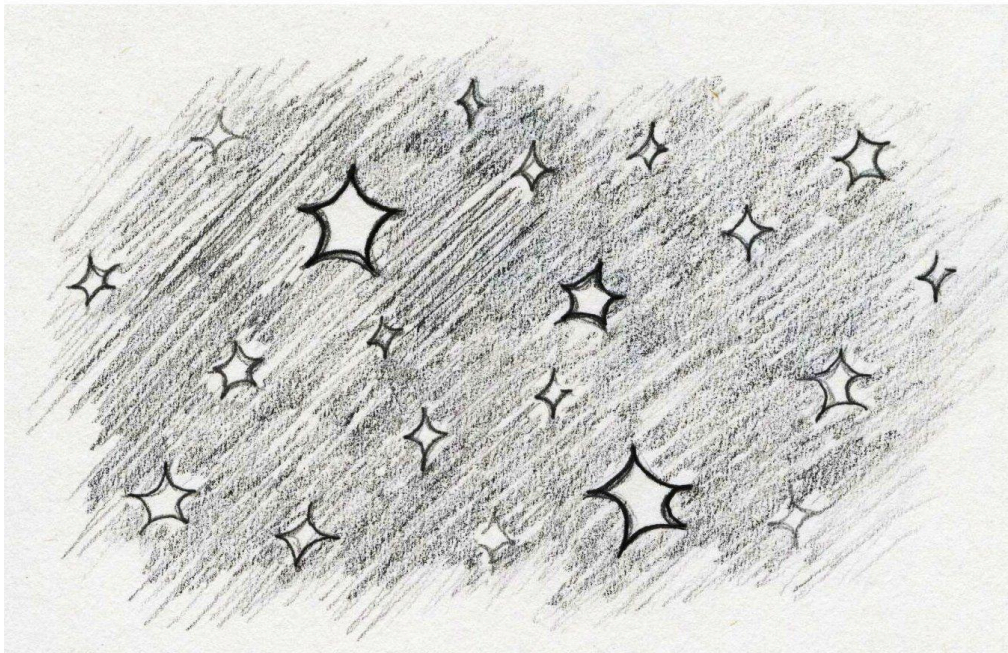
The first stars that formed in the universe were giants, made up of only hydrogen and some helium. Those were the only elements that existed at the time. Larger stars burn up at a faster rate and are more prone to explode as supernovae than smaller stars when they burn out. So not only did the early stars burn brighter, but supernovae occurred more often. The early universe, then, must have been a spectacular light show.

The debris from many supernova explosions over the eons has caused the average abundance of elements heavier than hydrogen or helium to build up to about 1% of all atoms today. The presence of heavier elements in new stars that formed from this dust not only changed the cooling characteristics of modern stars but made the newer stars smaller and longer-lived. Some were still a hundred times the size of our sun, but others ranged all the way down to one tenth the size of our sun.

Size determines how long a star will live. Our sun has a size that gives it an expected hydrogen burning lifetime of about 10 billion years, so it is now only halfway through its hydrogen-to-helium phase. It probably will not burn out before humans cease to exist.

Stars are not just pretty things up in the night sky; they are the factories that God used to build the various elements, the materials needed to produce Earth, and ultimately the materials needed to make all living creatures. The laws of physics that God laid out before creation, with its incredibly fine-tuned physical constants allowed stars to form from hydrogen and helium. And from stars, all the other elements were produced. If there had been no stars, there would have been no life. Thirteen-and-a-half billion years ago, there was only 90% hydrogen and 10% helium. There was no carbon, no nitrogen, no oxygen, no iron, none of the elements required to form planets or to sustain life. But over the first 9 billion years, God was crafting the basic building blocks He would use to put us here.

After several cycles of star formation and supernovae, the variety of elements that had come into existence were spread throughout our galaxy, ultimately allowing the development of our solar system, and putting into place the elements that would uniquely be collected together to form every individual human being that has ever lived. The next time you gaze at the dark sky, think about it, every human is a star—you are a star. That is, the majority of atoms now in your body were formed in the center of a star a very long time ago. You were a long time in the making.



Part 2: The Earth

He holds in his hands the depths of the earth and the mightiest mountains. The sea belongs to him, for he made it. His hands formed the dry land, too. —Psalm 95:4–5

It was not long after the initial burst of energy that started the process of creation, that the initial point of light and heat transformed into a massive sea of hydrogen atoms. Then under the influence of the forces of gravity, regions within that hydrogen sea began to fragment into separate entities. Many of those regions eventually became galaxies, one of them was the Milky Way. Meanwhile, within each galaxy, the gravitational coming together of hydrogen atoms was forming entities on a smaller scale, and each of these entities became individual stars. About 300 billion stars formed within the bounds of the Milky Way.

FORMATION OF THE SUN

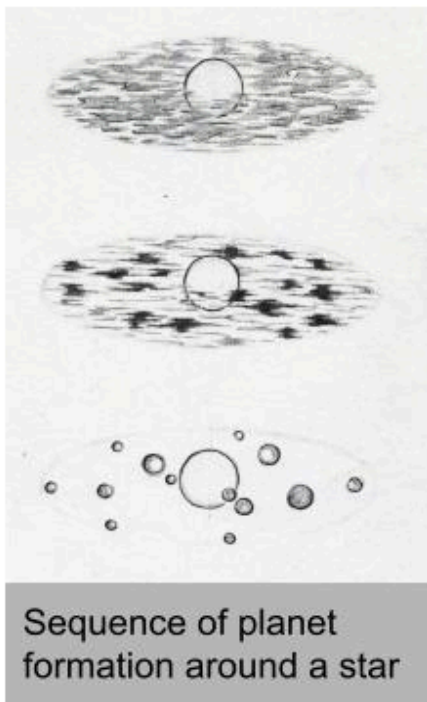
Our galaxy is a typical galaxy, in which the stars have gathered into a spiral shape, looking like a flattened pinwheel, a result of its spin in space. It has a diameter of about 100 thousand light-years across and is between one and two thousand light-years thick.¹⁷ For 9 billion years, stars in the Milky Way formed, shone their light, then burned out and exploded, making dust for new stars to form. In the course of events, the debris of old stars, containing all the elements from hydrogen to carbon and iron to tin and gold were scattered about to serve as raw materials for construction of new stars. Then 4½ billion years ago, after several cycles of star-making, God saw that the materials He needed were finally in the right proportions. In the Milky Way galaxy, about halfway between the galaxy center and its outer limit, on the edge of one of the spiral arms, He caused a new star to form: the sun.

FORMATION OF PLANETS

¹⁷ A light-year is the distance it takes for light, traveling at 186,282 miles per second, or 670,616,629 miles per hour, to go in one year.

When a star begins to form from a cluster of space dust, its gravity draws the surrounding grains of dust, particles, and rocky chunks to its center, building a bigger and bigger ball as time goes on. As the ball grows larger, the gravity increases and causes space dust from farther away to be drawn in. Given enough time, the area would be swept clean of all particles for millions of miles around. But if the forming star has a spin to it, the centripetal force of that spin might work against gravity, allowing some particles and dust to stay in orbit around the new star for a long time. The star then would first have a cloud of particles orbiting it, and this cloud would eventually flatten into an orbiting disc of particles, as demanded by the laws of rotation in physics.

Yet while the dust and particles in the star's orbiting disc have so far managed to escape getting drawn into the star itself, they are still experiencing gravitational attraction from neighboring particles within the disc. The particles respond by clustering. These clusterings grow larger and larger until the ring is no longer a disc of loose particles, but several large balls of matter that have formed from all the orbiting material. This is how



planets come into being. They are much smaller than the star around which they orbit, and the gravity inside their cores is much less than inside the core of stars, so no nuclear fusion can take place. Planets are not able to produce light and heat; their gravity is not strong enough to cause fusion reactions.

Note that all the planets around our sun are going in the same direction, and their orbits all lie in the same plane. This is because they were all formed out of the same debris cloud disc around the early sun.

We see a similar thing happening around some planets themselves. Consider the rings around the planet Saturn.

These were likely a result of a giant collision of two large bodies--asteroids, planets, or comets--that had been in the neighborhood, the dust and debris of which is now orbiting the planet. With flyby spacecraft photos, the details of the rings can be seen more clearly, and it can be noted that gravitational attraction is causing clustering within the rings as some larger rocks sweep their parts of the rings clear of other particles. Eventually, all the particles of the rings around Saturn could become combined into moons that orbit it if other forces do not prevent this.

Initially, probably thousands of little planets started forming around our sun, but steadily, smaller ones were drawn by gravity toward larger ones, merging them in the collisions that occurred. Little by little, the disc of particles around the sun concentrated into fewer and fewer enlarging planets. Today, the vast majority of particles and rocks have conglomerated into eight planets, but there is still some space debris out there. The process of gravity drawing the remaining particles to it has not stopped. Every day, even now, Earth gains several tons of dust and particles by gravitational pull from within our solar system.

Also, there remains a large belt of debris between Mars and Jupiter. Every so often, the gravity from one of these planets pulls a rock loose from its orbit in the belt, and if it travels toward Earth, it may come crashing through Earth's atmosphere as a meteor, also known as a shooting star.

In recent years, scientists have been searching the universe for planets. They know that planets should be there, because the formation process of planets is not likely unique to our solar system. And indeed, evidence of planets around other stars is beginning to appear.

EARLY EARTH IS MOLTEN

At first, when the planets around the sun were starting to form, gravity caused collisions between



minute particles in that debris disc that were quite gentle. But as smaller bodies accumulated particles to form bigger bodies, their gravitational forces increased, and the violence of the collisions from incoming particles increased. When Earth was not yet larger than a small asteroid, there was not a significant amount of heat generated by the soft impacts of particles that were pulled to Earth. But as Earth grew, it pulled in debris at higher and higher velocities. Impacts began to generate large amounts of heat, eventually enough heat to melt all the rock that made up the earth. With so much space debris still orbiting the sun, there was an almost continuous rain of high-speed rocks. Impacts melted earth's surface as fast as these rocks accumulated. Earth turned into an orbiting ball of molten rock, the heat was so great. The impact heat then dissipated not only into space, but also inwardly toward the center of the earth.

SEPARATION OF HEAVY AND LIGHT ELEMENTS WITHIN EARTH

Because Earth was now in a molten liquid state, gravity started to separate out the differing elements; heavier elements sunk toward the center of the earth. Iron, which had made up a large portion of the heaviest elements in the original debris cloud of the solar system, separated out of the molten rock and was pulled by gravity to the earth's core. The spin of the earth on its axis then resulted in the spinning of the iron in the core. This, in turn, resulted in the development of a magnetic field around the new planet and it will have significant implications later when life appears on Earth.

Lighter elements and compounds rose to the surface of the earth. The rock that will later form the earth's crust will be, therefore, lighter and lower in density than the rock in the deeper portions and will cause the crust to literally float on top of the molten rock below it.

Above the iron core, the inner rock of the earth stayed molten. There is a lot of heat stored within the earth, and Earth is big enough that even today there has not been sufficient

time for all this heat to be lost to surrounding space. Not only does the crust and atmosphere serve as a blanket to keep much of the heat in, but naturally occurring radioactivity deep within the earth produces new heat to make up for much of what is otherwise lost, so the center of the earth always stays hot.

FORMATION OF THE MOON

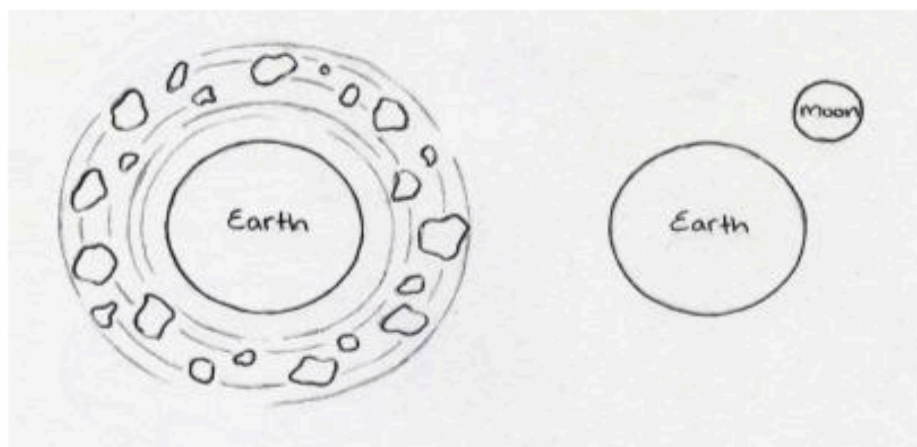
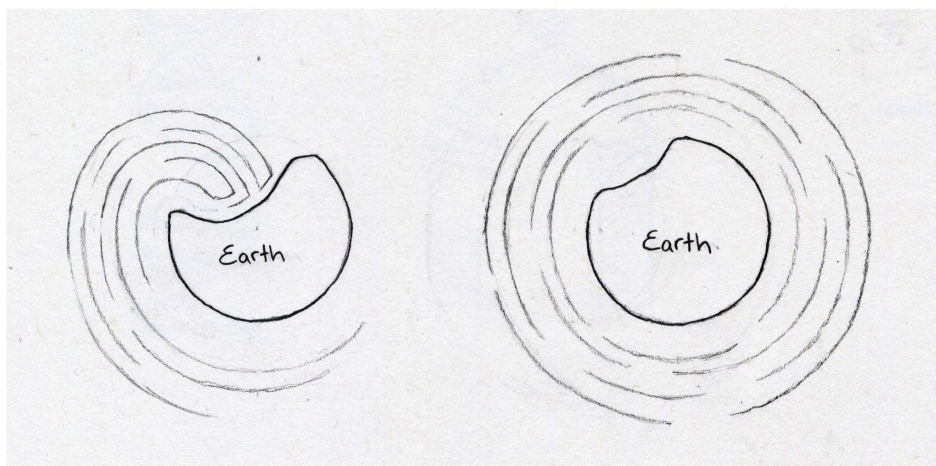
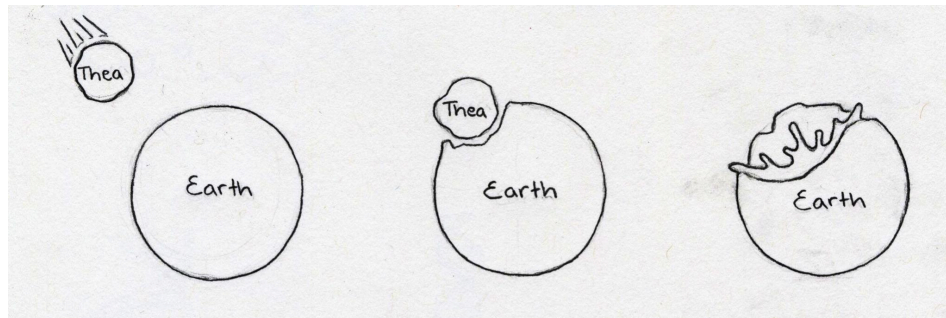
It took about 70 million years for Earth to reach its present size,¹⁸ having attracted to itself the great majority of the material within reach of its gravity. While Earth was forming, other planets were also forming. Early on, it appeared that there might be many planets around the sun. But gradually, the bigger bodies attracted the smaller bodies to themselves through gravity, and when the two collided the combined masses of the two planets formed one planet that was even larger. Only if two planets were separated by enough distance could they avoid being fatally attracted to each other.

It appears that during the period in which Earth was still in its molten state, when Earth was only around 50 million years old, another forming planet, about the size of Mars, was rocked out of its orbit by gravitational pull and headed toward Earth. There was a massive collision. While the impact appears to have been more of a glancing blow than a direct hit, a huge section of one hemisphere of Earth was torn away, and much of the other planet disintegrated.¹⁹ The debris sprayed out into space. A lot of this debris eventually fell back to Earth, but the rest of it orbited the earth for thousands of years. In time, the same process that resulted in the formation of the stars and the planets—the process of gravitational attraction—caused the debris orbiting Earth to come together as one body. And that is how God

¹⁸ William Hartmann and Ron Miller, *A History of Earth* (New York: Workman Publishing, 1991), 34.

¹⁹ *Ibid*, 44–57.

likely caused the moon to come into existence. Meanwhile, molten Earth gradually remolded itself into its prior spherical shape.



Sequence of the collision that resulted in the moon's formation

Having a moon as large and as close to Earth as our moon is thought to be highly unusual as conditions needed to form it were likely unique. It is not expected that any moon would form around a planet as close to its star as Earth is to the sun. All the space dust would more likely have been drawn into either the earth during Earth's formation or into the sun and would not have orbited the earth to allow a moon to develop. To produce such a large moon, the impacting body had to be just the right size; it had to strike Earth at just the right angle, and the impact had to occur at just the right time in Earth's growth process. But our moon formed under just the right circumstances, and it turns out that the moon plays some very important roles that affect life on Earth.

The moon actually began at only about 20 thousand miles above the earth, not the 240 thousand miles that it is today; it is slowly moving away from Earth at, presently, about one inch per year. There are laws of physics that say that the moon's gravitational forces will act as a brake, slowing down the spin of the earth. By calculation, it is estimated that just about the time the moon was ready to form, Earth's spin was much faster, with days being only about six hours long. Gradually, the spin was slowed by the moon to cause the days to be the twenty-four hours they are now. This coupling of the gravity of the two bodies has also slowed the spin of the moon, so much so that the moon spins so slowly that it always keeps the same face now toward the earth.

COOLING OF EARTH

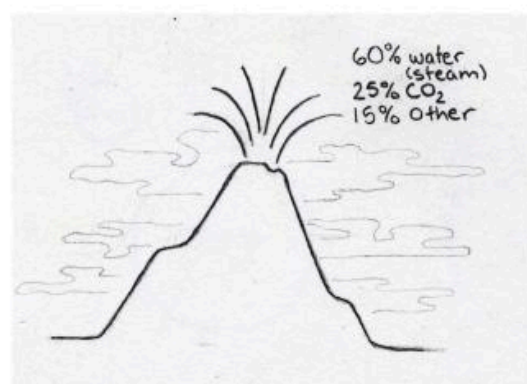
As time passed, much of the solar system space debris within Earth's gravitational pull had fallen to the earth's surface. The rate of asteroid impacts began to decrease, and with this, the heating caused by these impacts also decreased. The molten surface of Earth began to cool and solidify. First, there were just patches of solidified rock here and there, then gradually cooling caused more and more areas to become solid, until eventually the entire surface was a solid rocky crust covering up the molten rock underneath it.

INTENSE VOLCANIC ACTIVITY

Now the moon, in orbiting the earth, would exert its gravitational pull on the thin rock crust. This caused the crust to buckle and crack, allowing it to shift and slide about while it floated on top of the molten inner earth. Hot liquid rock would shoot up through some of these cracks forming volcanoes. The earth now entered a time when volcanoes were common, occurring in many places around the globe wherever the earth's crust had fractured. With the moon still relatively close to Earth, its gravitational forces were much stronger, and its ability to deform and move the earth's crust was greater. So, volcanoes were everywhere.

DEVELOPMENT OF THE ATMOSPHERE

Volcanoes greatly affected the atmosphere around the earth. Well before this volcanic period, Earth probably started with an atmosphere of



mostly hydrogen and some helium, as these were the most common gasses in the entire universe. Heat and charged particles emitted by the sun likely burned off much of this hydrogen and helium, and the intense bombardment of the earth's surface by asteroids likely blew any remaining hydrogen and helium back into space. But now a new atmosphere was developing with the abundant volcanic eruptions, one that was primarily carbon dioxide and water vapor. Even today, volcanoes emit a lot of steam and carbon dioxide, about 60% H₂O and 25% CO₂, with lesser amounts of sulfur and nitrogen.

While the earth's surface had cooled enough for rock to solidify at this point, the surface and atmosphere were still too hot for condensation of water. If any water did condense, it quickly evaporated off the hot rock back into the atmosphere causing humidity to hover around 100%.

FORMATION OF A GREAT OCEAN

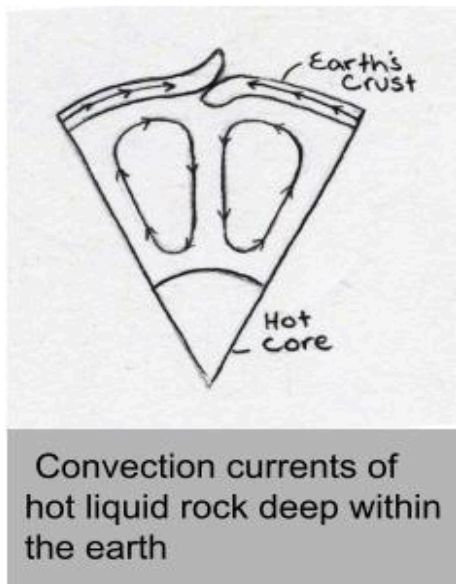
More time went by. Earth's surface cooled even more. Now the steam in the atmosphere had a chance to condense. It began to rain. First, there were only light rains, puddles and small lakes accumulated as liquid water. Further cooling of the earth, however, allowed heavier rains to occur, and it rained in torrents. It rained incessantly for a very prolonged season. Water initially accumulated in the low places, but so much rain fell that great seas began to develop. The rain did not show signs of stopping until the entire earth was under a global ocean. Incoming comets, which are mainly balls of space ice, may have added their water to the great ocean as well, making it even deeper than it would have been from just volcanic sources. Only peaks of volcanoes and rims of impact craters here and there jutted above the surface forming small bits of land.

On those bits of land, erosion was fierce. Torrential rains poured down the sides of volcanoes, wearing away at the rock. Strong tides caused by the moon, which was still relatively

close to Earth, and massive tsunamis produced by asteroids impacting the oceans broke down rocks into sand, washing it from the shores into the sea.

TECTONIC PLATE MOVEMENT

Today, Earth's surface is broken up into about seven or eight large shifting plates of crust and a couple of dozen smaller plates, all of which are referred to as tectonic plates. These plates float upon the underlying hot liquid rock and can slide in whatever direction they are pushed.



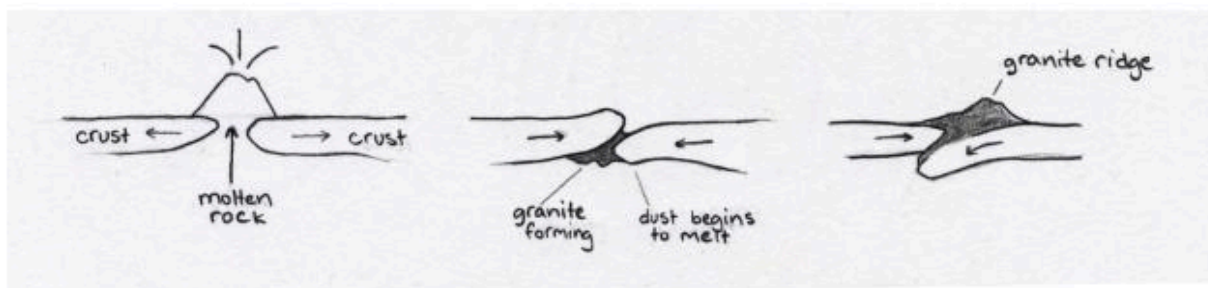
The hot liquid rock (known as magma) follows the same laws of physics that govern any liquid substance. When heated from below, the heated magma rises until it reaches the surface. It then travels along the surface horizontally, cooling down in the process. Then the cooler magma sinks until it reaches the hotter areas below, there it is heated up and starts the cycle all over again. In this way, a type of convection current of magma is established. Of course, molten rock is much denser than, say, boiling water which causes it to move at a much slower rate, but it follows the same patterns of current that might be seen in a heated pot of

water on the stove. Where a magma convection current rides horizontally at the surface of the earth, it drags the tectonic plate that is on top of it in whatever direction the current happens to be traveling. There are multiple convection currents occurring at the same time at different places around the earth, and each tectonic plate will travel in the direction of the magma current underneath it.

Not all magma convection currents are going in the same direction. When tectonic plates are moved in opposite directions, the tectonic plates will spread apart from each other allowing hot liquid magma to leak into the gap left by these two tectonic plates. This can form a volcano. Sometimes these volcanoes become quite large but often they are relatively small and sometimes magma just fills in the gap. When it cools, the magma becomes solid rock, and now forms a new part of the crust.

Where two tectonic plates are getting pushed toward one another, it gets more interesting. One plate will inevitably slip underneath the other, lifting the one on top higher, while the plate on the bottom gets pushed down deeper and into the hot molten magma below. The hot temperatures then cause a melting of the plate being pushed into it. Some of the melted plate then just becomes part of the magma and joins the convection current going downward. But the part of the tectonic plate that has not sunk very deep into the magma only partially melts and begins to react chemically with the elements in the magma.

LAND BEGINS TO FORM



Separation of two tectonic plates (left)
Collision of two tectonic plates (middle and right)

As previously stated, one aspect of magma, is the tendency for lighter chemical elements to stay closer to the surface than the heavier elements. There is then an enrichment of

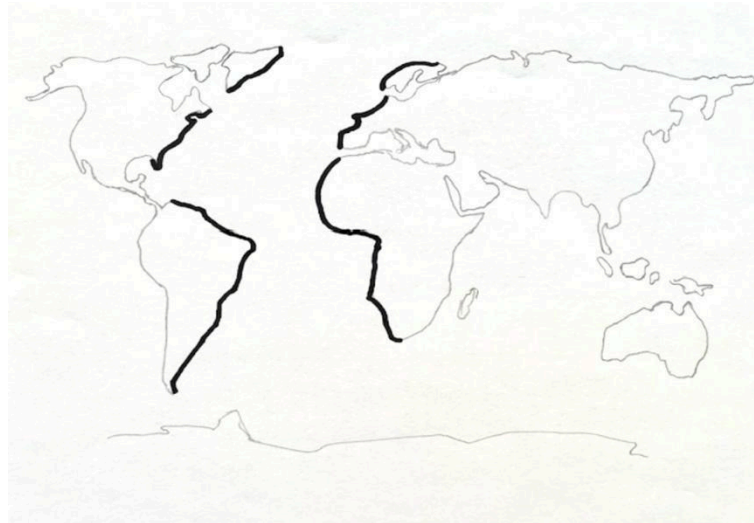
lighter elements such as magnesium, nitrogen, silicon, oxygen, sodium, potassium, calcium, aluminum, and others in the regions where the downward trending tectonic plate is being melted. Water from the ocean being carried by the tectonic plate also gets involved. The melting of the tectonic plate now allows a number of chemical reactions to take place. The result is the formation of a new type of rock which is lighter than the liquid rock down below and this new rock does not follow the magma convection current going downward but tends to float on the magma near the surface. Much of this new rock type is granite, and it eventually gets shoved into the space between the uplifted top tectonic plate and the other tectonic plate being pushed downward.

Long ridges of granite and other rock are thus formed along the zone of two colliding tectonic plates. As more granite is formed, it bunches up. It cannot sink into the magma because it is lighter, so it gets driven upward. Enough granite eventually forms that the enlarging ridges break the surface of the overlying ocean, and as even more granite is formed the ridges widen into islands.

Now, over time, the magma convection currents will shift, causing the associated tectonic plate to shift direction as well. A granite island carried by one tectonic plate may then eventually crash into another island and the two lands will fuse together, resulting in a larger area of land. And as the collision of two tectonic plates pushes the lands together it produces a buckling upward at collision points, creating hills and mountains on the new land. When the magma convection currents shift again, the land may be torn apart into two lands. Depending on circumstances, the land may not necessarily split at the same points where it had previously fused. In this way, rocky islands grow, and pieces of land drift back and forth across the surface of the globe. Fusions of islands and continued production of granite results ultimately in continents being formed.

No matter their size, however, continents and smaller land masses continually wander across the globe, first one way then another, being pulled along by the magma currents

underlying them. This continental drift is slow, on the order of one to two inches per year but given long time periods drift can cover long distances.



Many people who have stared at maps have noted the similar contours of the east coasts of North and South America, and the west coasts of Europe and Africa. Furthermore, geologists have noted numerous places where the mineral deposits and fossils of these east coasts match the mineral deposits and fossils of these west coasts. Such circumstances have led to the concept that the continents were actually joined together at one point in time but have now drifted apart. Today, we can actually witness the drifting apart, and by measuring this rate of drift can get an idea of how long ago the continents were joined one to the other.

FORMATION OF ROCK AND SOIL

Meanwhile, the surface of the land is being transformed. The forces of erosion, heat, cold, wind, and rain cause rock to break down into gravel and sand. The primary rock being formed initially is igneous rock, such as basalt from volcanoes or granite at tectonic plate subduction zones. Some metamorphic rock is also produced when heat or pressure allows chemical reactions to change the composition of the rock wherever the rock is being pushed

downward into the hot magma. The variety of elements floating in the magma, therefore, results in a great variety of rock types being formed. These rocks become eroded, forming a variety of soils. Some soils are subsequently washed to the bottom of the sea. There, the pressures of the ocean depths compress the soils, causing them to solidify and turn them into sedimentary rock. Such rocks may then be uplifted with earthquakes and movement of the tectonic plates, rise to the earth's surface and become eroded again into soils. So more and more soil is being formed as God is preparing the land for what is to come.

CHANGES IN THE ATMOSPHERE

The atmosphere is being transformed as well. The many volcanoes on Earth have been spewing their gasses into the atmosphere, and are responsible for the buildup of water, carbon dioxide, nitrogen and sulfur. Most of the water has condensed to form rain which then ran into the oceans. Much of the atmospheric carbon dioxide has interacted with the ocean surfaces, and has become dissolved into the ocean's waters, removing much of the carbon dioxide from the atmosphere. Atmospheric sulfur has combined with atmospheric water to form sulfuric acid, and when it rained this acid rain contributed to the erosion of rocks. That left an atmosphere of primarily nitrogen, with some carbon dioxide still remaining.

The earth has been under construction now for about 600 to 700 million years. The planet's surface at this stage is covered by a large ocean. There are a number of large islands of granite or other rock, and numerous volcanoes scattered around the globe which together form dry lands rising above the ocean surface. The atmosphere is mostly nitrogen and carbon dioxide. Water vapor formed some clouds, and many plumes of dirty black emissions come from the mouths of active volcanoes. Weather has resulted in the development of soil layers that are beginning to cover some of the rocks on land. Earth is now ready for its next developments. And God looked on what He had made, and saw that it was good, really good.

Part 3: Life

O LORD, what a variety of things you have made! In wisdom you have made them all. The earth is full of your creatures. —Psalm 104:24

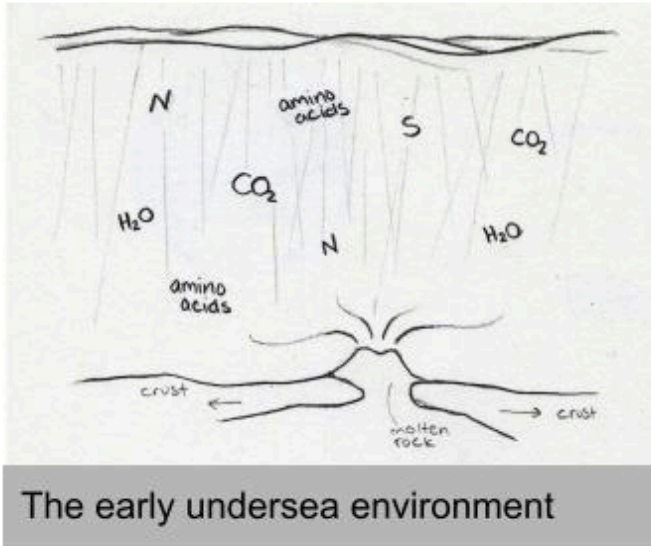
Sometime around 3.8 billion years ago, the most extraordinary event since the Big Bang occurred. God had been preparing Earth for this by all that He had done before, and now it was ready: life appeared.

There is no good scientific explanation for life to have happened, just as there is no good scientific explanation for the initial burst of energy at the moment of creation's beginning. There have been numerous attempts to explain this scientifically, but none of the explanations so far have been satisfactory. All that science can really say is that it happened.

THE FIRST LIVING CELLS

The first forms of life probably were not much to look at. It is my opinion that they were likely simple single-celled organisms, similar to bacteria and they possibly obtained energy to live from the energy that was released from chemical reactions of minerals being emitted from a volcanic vent deep under the sea. While there are other ideas about where the first organisms arose, a first cell appearing in this type of setting makes much sense. We have little proof. It is not likely that any evidence of the first organisms survived rapid decay once they died, and their tiny size would make them incredibly difficult to recognize in a fossil bed. Scientists, instead, have had to look for chemical changes in rocks that would suggest bacteria had been present. That is how they have come up with the approximate date for the first appearance of life.

While it is not known exactly where life began, it is known that the oceans contain many of the conditions needed to promote life in a very simple form. Cell structures all need carbon



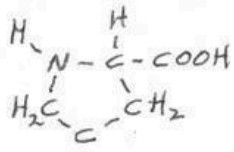
atoms. In the oceans, great quantities of carbon dioxide had become dissolved in the water, and these could supply plenty of the required carbon atoms. Also, other dissolved substances could serve as sources of hydrogen, nitrogen, oxygen and sulfur to allow the building of complex carbon-based structures. Indeed, some amino acids which are simple molecules, are known to be naturally occurring, and

would be useful in the formation of cell proteins, although there is some doubt whether naturally occurring amino acids existed originally in significant amounts.

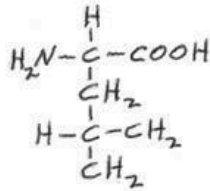
At underwater volcanic vents, many of the necessary substances would be readily available and the heat from the vent would aid in the chemical reactions required for the cell to function. The heat coming from the vent itself would be too hot, but there could be a zone around the vent where the temperature would be just right, then further away from the vent the water would be too cold.

Today, deep underwater ecosystems around volcanic vents are known to exist and are mainly populated by single-celled microscopic organisms. In modern times, there are some small animal life forms as well which feed on these microscopic organisms. Genetic studies have declared these microbes to be among the simplest and most primitive life forms on earth.²⁰

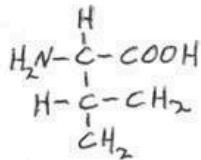
²⁰ Edmund R.R. Moody, et al., *The Last Universal Common Ancestor*, (Nature, Ecology and Evolution, Vol. 8, 12 July 2024), 1654-1666.



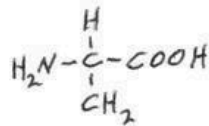
Proline



Leucine



Valine



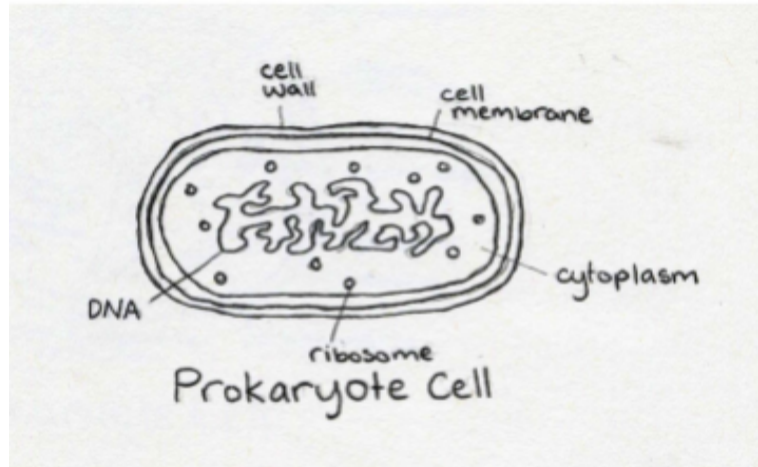
Alanine

For life to exist there, the oceans would have to be relatively stable. From about 4.5 to 3.8 billion years ago, earth experienced intense asteroid bombardment. By 3.8 billion years ago, however, the bombardment had greatly slowed as earth had cleared most of the space dust from its surrounding neighborhood. During the bombardment period, Earth would have been a terrible place for life with its intense heat and

molten rock surface. Then later, when oceans formed, giant asteroid impacts could vaporize an entire ocean, and it would rain in torrents until the ocean was replenished. Clearly, this would not be conducive to life either. But at last, the bombardment period essentially came to an end, and oceans became a stable feature on the earth. There were still intermittent asteroid impacts, but deep in the ocean there was some protection from the effects. Almost as soon as it became possible for single-celled life to survive, life appeared. It is interesting that as soon as the environment allowed, and a cell was able to persist despite any activity around it, it did. It was almost as if it was timed, as if it was planned--certainly, another God-coordinated event.

So, what is needed to build a single cell in its most simple form? First, a membrane would be needed. This is typically made up of fats and proteins. Fats are just strings of carbon, hydrogen, and oxygen. Proteins, in turn, are constructed by linking together amino acids. Amino acids can sometimes occur naturally, being small molecules of carbon, hydrogen, and nitrogen, but if the necessary amino acids are not available, the cell itself must have a way to make them. Then, there must be a chemical mechanism that can assemble long chains of amino acids to make up the proteins needed, and there must be a way that only specific sequences of amino acids are used in making specific proteins. These amino acids have to be in the right order. Next, there must be a mechanism to form this chain into a membrane which encloses the cell in

three dimensions. There must also exist certain proteins within the cell membrane that serve to transport sodium, potassium, amino acids, and whatever other supplies that the cell needs across the membrane and into the cell; and there must be proteins to excrete whatever is not needed.



Prokaryote cells are small, single-celled organisms that have a relatively simple structure.

Examples of Amino Acids

While there are about 100 different amino acids, most proteins use a combination of only 20 different amino acids.

Finally, there must be stored within the cell the software code such as DNA or RNA. It is the cell's instruction manual, telling the cell how to function and how to make all its needed proteins. In the

simplest cell, to translate the information from the DNA into protein products requires more than one hundred very specific helper proteins and more than thirty different very specific proteins are necessary to reproduce the DNA to pass DNA on to the next generation of cells.

Furthermore, there needs to be a supply of ATP (a molecule which carries energy in the cell) to provide the energy for protein synthesis to occur; and also there must be a supply of extra materials such as phosphates, lipids, sugars, vitamins and minerals.²¹

The simple cell is not so simple, and it is difficult to see how a single-celled organism could arise spontaneously, without some type of parent, even if many of the ingredients were available in ocean water. This is the mystery of life. There is no good explanation that science has put forth to explain this. The probabilities of all the necessary ingredients coming together by themselves naturally are so phenomenally low that by mathematical principles, it is

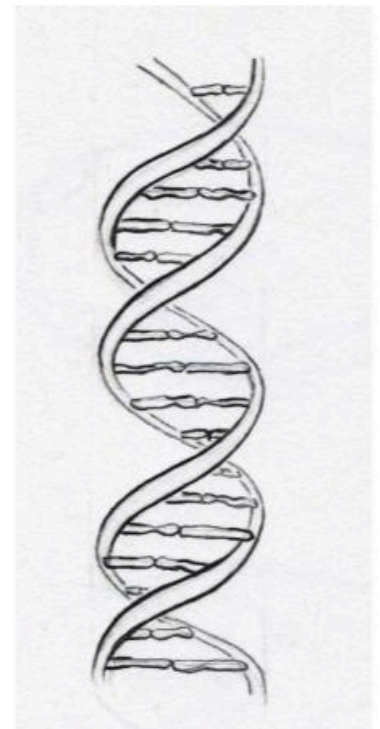
²¹ Stephen C. Meyer, *Signature in the Cell*, (New York: HarperCollins Publishers, 2009), 202.

impossible. It has been calculated that the probability that all the amino acids for the entire group of necessary proteins that are needed in a minimally complex cell would randomly arrange into the necessary specific order so that they could function as desired is about one in $10^{41,000}$, an incredibly, astoundingly, and infinitely small probability—indeed, impossible.²² There are not enough molecules in the entire galaxy, and 4½ billion years has not been near enough time, for an extremely remote possibility of a cell coming together by chance. But who designed and controls the laws of probability?

DNA FUNCTION WITHIN THE CELL

Every living cell must contain the software code to run the cell and must be able to reproduce that code so that it will be passed on to the next generation of cells. The majority of cells today use DNA, while there are some primitive cells, like viruses, that use similar RNA. The structure of DNA is like a spiral-shaped ladder. The sides of the ladder are made of long strands of a molecule chain known as DeoxyriboNucleic Acid—hence, DNA. The rungs of the ladder are amino acids. DNA uses only four kinds of amino acids for these rungs: adenosine, thiamine, cytosine, and guanine; and they are abbreviated A, T, C, G. The sequence of these amino acids is the code that is to be read in order to carry out any cell function.²³

Each cell must use the DNA for instructions when performing some task such as making another enzyme or protein. There are special proteins that are already in the cell that have the job of picking out where on the entire



The structure of DNA

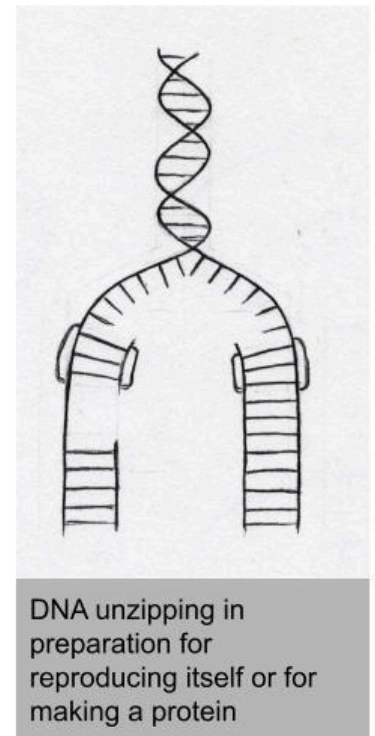
²² Ibid, 213

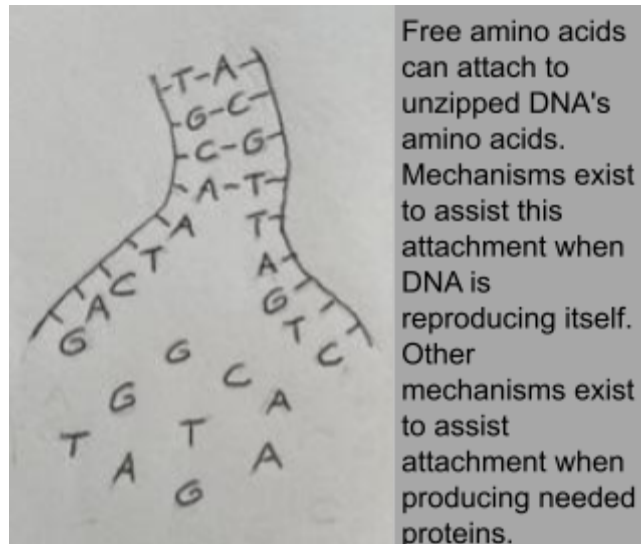
²³ For a short visual demonstration of how DNA works, see YouTube.com for “What is DNA and How Does it Work?”

DNA is the specific code for whatever the cell needs to make. One of these special proteins then unzips the DNA at just the right spot, and other proteins read that portion of the code which ultimately results in the making of the needed product.

There are many code sequences on one DNA strand. Human DNA, for example, has about 3 billion of these amino acid ladder rungs (known as base pairs) which can be used for making a multitude of proteins. These proteins can then be used to construct all the different things that are needed for a human to perform its daily activities. A sequence on the DNA that codes for one protein is called a gene. One gene is made up of hundreds or even thousands of letters of code.

It is of note that every living thing uses this same kind of system, using their own unique genes. Organisms are different from each other because they have different sequences of coding on their DNA strands, but they all use special proteins to copy their DNA in the same way. Human DNA and all other living things use the same amino acids to make up their code, they are just different sequences. Interestingly, human genes can sometimes be inserted into yeast DNA or bacteria DNA, and the correct human protein can be produced by the yeast or bacteria's copy mechanism. This is where one of the arguments comes from for the concept that all living creatures are descended from one original cell, because the same system is used in all living beings.





An interesting aspect of DNA is that not all the DNA of a particular organism is used for making proteins. Surprisingly, very little of the total DNA is actually used for this purpose. The amount of human DNA that is specifically used to code for proteins adds up to about only 1.5% of the total.²⁴ Areas that do code for proteins are often separated by long code segments that seem to do absolutely nothing. These seemingly useless segments of DNA became commonly referred to as “junk DNA,” sequences since they appeared to be basically gibberish.

There are also some code regions that do not make proteins but that provide important instructions for regulation and processing. One single gene may contribute to a number of different proteins rather than just one unique protein. During the protein-forming process, for example, these editing DNA sequences may modify the protein being made depending on present needs of the cell, causing that protein to fold into different shapes. Folding of a protein and its shape has a lot to do with how that protein functions and what its use is.

The gene and its associated editing DNA segment can then be thought of as a set of data files that can be retrieved, the products of which can be modified depending on needs,

²⁴ Francis S. Collins, *The Language of God* (New York: Free Press, 2006), 124.

much as seen in complex computer information processing systems today. This level of sophistication and complexity in DNA is not well explained by chance theory and only adds to the case for a designer.

Another interesting feature of human DNA is that a significant percentage of genes match up to the DNA of other mammals. Chimpanzee DNA sequences are 96% identical to human DNA sequences. The order of the genes of human DNA is the same over large sections of the genes of mouse DNA, and essentially all the genes on human chromosome 17 are the same on mouse chromosome 11. Even portions of the junk DNA are similar in both species. Further, there are also many genes that are the same in other animals.

This is where another of the arguments has arisen that when the first cell appeared with the first DNA (or RNA), that it would form the basis of the DNA codes for all future life forms to come later. By changing just one amino acid in a gene, the resulting protein can function in different ways than the original, it may play a different role in the cell, or cause the cell to do things in a different way. By changing several amino acids in the total DNA sequence, the resulting organism can be significantly changed from its parent.

DNA MUTATIONS

Mutations of the amino acid sequences of DNA do occur naturally. Uncommonly, there can be unexpected errors that happen during standard replication of DNA. Sometimes a virus can infect the DNA, inserting some of its own code sequence. More often, DNA alterations are caused by naturally occurring radiation, where the radiation splits chemical bonds within the DNA. Specialized proteins whose job it is to proofread the DNA, locate these areas of damage and sometimes the repair attempts result in an incorrect amino acid that replaces the old one. Such naturally occurring mutations are estimated to result in about one error in every 100 million DNA amino acid base pairs. While still pretty accurate, this means that since all humans were

produced from two DNAs of 3 billion amino acid pairs each, one from father and one from mother, each of us have potentially sixty new mutations that were not originally present in either of our parents.

Many of the mutations in organisms happen in the parts of the DNA which are not used, the junk DNA, and this carries no significance whatsoever. That is probably how junk DNA came to exist. All the mutations over many years produced amino acid sequences in the junk DNA areas that do not translate into anything useful. Neither are they harmful. They were never eliminated because that part of the DNA was never used anyway. But if the mutation happens in the sequences that are used, the change generally does not work out well for that organism. Often this results in death, it can result in miscarriage or significant disability.

But on an extremely rare occasion, a mutation may arise that offers a slight advantage, and this will get passed on to the offspring. If enough beneficial mutations would accumulate in successive generations, the organism may function differently, behave differently, or look differently than its ancestors. This is one of the pillar principles of chance evolution, and this is the science behind it.

Most Christians and Jews have no trouble with the principle of gene mutation. Everyone can see that not all humans look alike, and that there are differences in the types of medical problems that various families experience. Many can accept that there can be minor physical changes that evolve within a species, such as the length and thickness of the beak of a bird species that is forced to eat a different food substance than its predecessors. But many have trouble believing that a sufficient number of mutations can occur such that a whole new species actually arises. It seems to them that mutations are, by far, a bad thing, and serial mutations are more likely to result in death and failure to propagate.

So how do new species arise? Traditional creationists say that all species were created individually at the time of the creation week. Other creationists believe that species were created individually, but not all in the first years of creation—that God punctuated the billions of

years of earth's history by intermittently creating new species, sometimes from scratch. Still other creationists believe that God created the mechanisms for mutations to occur, and that once life appeared on earth, His way of allowing species to evolve was by chance mutation over the past billions of years, starting from the single-celled organisms, using the natural laws which God created, life could evolve to what we see today. If you are one that accepts that earth has been around for a few billion years, which is the actual way in which God created the species that populate it?

GOD'S INFLUENCE ON HIS CREATION

While pondering this question, I would like to change the subject for a moment to consider how God interacts with His creation. Some call these miracles, and since I have had difficulty finding another word to describe it, I will do the same. There are three kinds of miracles that can be identified. I label these as 1) ordinary miracles, 2) directed miracles, and 3) supernatural miracles.

With "ordinary" miracles, we find events simply following the laws of nature as God established them in the beginning. There is nothing here that would be considered unusual or anything that we would not experience in the course of ordinary life. But while ordinary miracles have expected outcomes, they can still be considered miracles, because it is a miracle that they even exist. Thirteen-and-a-half billion years ago there was nothing, but then through a long and complicated series of actions that could have produced very different results, we have now come to this, a manner of day-to-day existence that we take for granted. Contemplation of "ordinary" daily events can still produce a sense of awe at what God has accomplished. A few special examples of ordinary miracles would be the growth of a plant from a seed. The miracle of a beautiful sunset. The intricacies of design in snowflakes. The birth of a human baby.

Ordinary miracles can be an inspiration, and through recognition of these things—and of who created them to be this way—an opportunity arises to thank Him who made it all come to pass.

In comparison, directed miracles are those in which natural laws are followed, but the outcomes of these miracles can be relatively improbable, or just one of a large number of possible outcomes or perhaps the timing is not what is expected. What seems to be happening in such events is that God interferes with the laws of probability to direct the affair to follow the needed pathway, even if the probability of the desired endpoint is very small. Consider a miraculous healing of a disease that would ordinarily have caused death, or prevention of injury from an accident that was miraculously avoided when by rights it should have occurred. God's hand can be seen to have intervened in these situations.

Finally, there are supernatural miracles in which the outcomes are just not possible if the natural laws are to be followed. God does not seem to use supernatural miracles very often. He seems to use them only on very special occasions. The initial moment of creation when that gigantic burst of energy suddenly appeared out of the nothingness would fit into this category. Also, in my opinion, the category would include the appearance of life on Earth.

Sometimes God may use supernatural miracles when He desires to make an emphatic point about who He is or the power that He holds. Most of the miracles that Jesus performed while here on Earth were supernatural miracles: the turning water into wine (John 2), the feeding of the five thousand (Matt. 14), the raising from the dead (John 11). These were impossible occurrences. But they did happen and were designed to show humankind in dramatic and no uncertain terms that it was God who was doing them.

Directed miracles, then, are the primary way in which God actively interacts with His creation. Directed miracles point out the special relationship God has with the humans to whom He has given life. God can be moved to influence the natural course of events. Prayer, for example, is highly instrumental in directed miracles. The Bible teaches us to pray to God, and that He will hear our prayers and act on them (Ps. 4:1, Amos 7:1–6; Matt. 21:22; Acts 12:1–19;

1 John 5:14–15). If we did not believe this, what would be the point of bringing our needs before God when we pray? We do this not only because the Bible says we should, but because we believe that God can influence the outcomes. We believe that God can interfere with the laws of probability, so that even outcomes that are not very likely become, instead, very possible. God is the one who established the laws of probability, even before the universe was created; He holds absolute power and is able to cause highly unlikely events to be accomplished 100% of the time. God is God over the laws of probability.

When God created the universe, did He just establish the laws of physics, chemistry, and biology, and then sit back and let it all happen by itself? Did He just let everything follow the laws which He had made with no further input along the way? Many creationists would say, “Not at all!” and that this would give God too little credit. He has shown Himself to interact with us continually throughout our lives. Many of us have witnessed this ourselves. He has done this for our generation, for the generation before us, and for all the generations before those. Through such actions, He shows His character, how He operates. Many believe that God was like this before humans came along as well. He was constantly monitoring His creation, influencing probabilities where it would be beneficial, and directing the evolution of His creation as He desired.

For the most part, the universe does run along day-to-day, obeying all the natural laws. But there are events and happenings of such low probability that they might not have occurred had not the hand of God interfered with the laws of probability to make them happen. Take the establishment of Earth’s moon, for instance. What was the probability of a large heavenly body forming in the solar system that was the right size and at the right distance from the sun, being dislodged from its orbit, being propelled in a direction toward Earth, and then disintegrating not only itself but a large chunk of Earth? Yet, the angle of the blow was just right that it sent much of the debris into orbit around the Earth rather than all of it falling back to Earth or shooting out into space. Furthermore, the impact tilted Earth at just the right angle to allow seasons to occur

as we now experience them. What is the probability that all this would happen as it did?

Essentially zero. But who is the God of probabilities? God weighted the dice that day. He was very much present, and made it happen—yet, He used the natural laws in doing it. Atheists say it was just chance. It was not just chance—it was God!

Now if God can direct probability, then all the apparent random changes in the universe, in Earth, or in living organisms are not always a result of blind chance. As a general rule, God seems to allow His natural laws to continue without interference. But when the time is right, and an improbable turn of events is called for, God steps in and stops the roulette wheel of chance where He wants it to stop. What some see as random evolution could be described as a sequence of events that were brought about by God Himself as He orchestrated all the changes that occurred over time.

The first cell appeared about 3.8 billion years ago, possibly in a heated under-the-sea environment. Eventually, however, offspring of this cell found ways to other environments. And in different environments, there would have to be different functions cells would need to perform to survive. By using different proteins, different chemistries, they could find the energy needed to maintain themselves. Thus, eventually, there were a number of different species of cells. Did God create each of the species the way He created the very first cell, from scratch, or did new species develop by a series of changes that occurred at the molecular level, in the DNA of a previously existing cell? There are varying views on this, which we will touch upon later.

PHOTOSYNTHESIS

At first, life did well around deep sea volcanoes; there were whole colonies of bacteria surrounding volcanic vents, similar to what we see today. Inevitably, some of the bacteria would

get swept away in the ocean currents, and

initially they likely all died if that happened.



But eventually, mutations in the DNA of the bacteria resulted in some being able to obtain their energy where it did not involve an undersea volcano, and bacteria became more dispersed in the oceans.

Further mutations ultimately allowed bacteria to metabolize water itself and the carbon dioxide in the water by using the energy of sunlight at the water's surface. This was photosynthesis, and it revolutionized Earth. Not only was photosynthesis a more efficient means of making all the necessary carbon-based molecules the cell needed, but the waste product of these chemical reactions was oxygen. Oxygen is one of the most chemically reactive elements that exists, and it was through production of oxygen that Earth and life on it were radically changed.

The first evidence we have of photosynthesis is at about 3.4 billion years ago. Of course, there was not much oxygen right away. Bacteria that could photosynthesize had to multiply, and the oceans of Earth create a big space for microscopic bacteria to fill. These bacteria, however, had an advantage over most other bacteria. Sunlight was a ready source of energy, so these bacteria could occupy large areas where other bacteria could not survive.

So gradually all ocean surfaces around the globe became populated with bacteria that could photosynthesize, and there was so much of this going on that the upper waters of the oceans started to become saturated with oxygen. The atmosphere lies over the ocean surfaces. Just as the oceans had exchanged carbon dioxide with the atmosphere in the past, now the atmosphere began to exchange oxygen with the ocean surfaces, and oxygen began to build up in the atmosphere.

It took a long time for all of this to occur. Two billion years ago, oxygen made up only about $\frac{1}{4}$ of 1% of the total volume of gas in the atmosphere. But by a little more than a billion years later the oxygen content had nearly reached the 21% it is today. For many of the older types of cells, oxygen rise was an environmental disaster and great numbers died off, unable to survive in a world with toxic oxygen. However, other cells were given the ability to exploit the

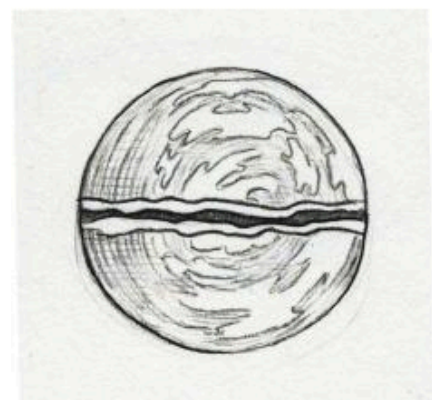
power of oxygen allowing them use of far more energy than by any previous means, and they did very well.

Early in cell history, most of the photosynthesizing cells remained as separate individual cells, each cell independent of the other. But gradually we find that in a few places, such as in shallow, warm waters, some species of cells would stick to each other, forming large mats of cells that built up on the floor of those shallow seas. We can actually see this same type of thing happening in a few places in the modern world today. Individual cells seem to continue to perform their functions independently of their neighboring cells; they just seem to stick to each other and live as a community of cells. From the beginning of photosynthesis to 1.5 billion years ago, large clumps of cells together producing large amounts of oxygen as waste was a very common phenomenon.

There were consequences for the minerals on Earth from having oxygen in the atmosphere. Rust had largely been nonexistent previously. Now any exposed rock or soil with iron in it turned reddish as oxygen combined with the iron to form rust, also known as iron oxide. Great amounts of iron had been dissolved in the oceans, but iron now precipitated out of the water as rust. In volcanic regions, oxygen combined with liquid rock before it cooled. In subduction zones where rock was being melted, oxygen dissolved in seawater now influenced the type of rock that was being formed. Anywhere that chemicals in the soil or rock surfaces could react, oxygen resulted in new mineral types, and the diversity of minerals on Earth began to grow.

SNOWBALL EARTH

About 2.4 billion years ago, a number of environmental factors combined in such a way that the surface of the earth began to cool more than in the past. The more it cooled, the more snow and ice formed at the poles.

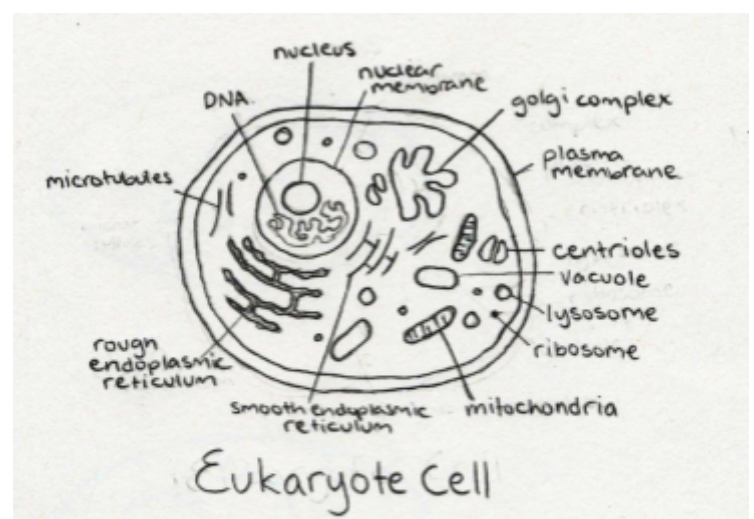


And the more snow and ice, the more the white ice crystals reflected incoming sunlight back out into space, resulting in less heat being absorbed by the earth, and so it got colder. More snow and ice formed, and the climate kept getting colder and colder as this affair repeated over and over until ultimately the earth was taken to its extreme conclusion, covering it almost entirely in snow and ice. Perhaps only at the equator was it ice-free. This occurrence is known as Snowball Earth.

Massive numbers of living cells died, unable to deal with the cold. While it looked bleak for life, not all cells died. There were survivors, most were likely in the regions around the equator, and maybe some deep under the sea. It appears, though, that even in the frozen areas, some cells did manage to acquire mechanisms that prevented them from dying. It seems that serious pressures of environmental change often lead to new ways of having to do the business of life just to exist. It was during such times that God was often at work, changing the organisms to allow life, not just to survive, but to thrive.

During Snowball Earth, there appear to have been several times when it looked like it was going to warm up, but then it would get cold again. This Snowball Earth lasted a long time, about 300 million years. At last, however, it did eventually warm up again, and temperatures returned to more favorable levels.

But the life forms that emerged from the prolonged cold event were not the same as before. It appears that during the adversity caused by Snowball Earth God had introduced some new characteristics. First of all, the new cells were bigger, anywhere from ten to a thousand times bigger than the old cells and were much more complex. There was more



Eukaryote cells are larger cells that are more developed than Prokaryote cells.

organization in the cell nucleus. DNA was also often present in multiple copies and was stored in segments known as chromosomes.

Furthermore, many cells were more organized in their interiors, having more specialized areas for performing specific tasks. These new cells also had often acquired an interior scaffolding that helped keep things in place, and provided tracks along which proteins could be moved to their proper locations elsewhere within the cell. Such cells are known as eukaryotes and are the type of cell we see in most living organisms today. These are much more sophisticated cells than the prokaryote cells that we saw before.

It is also about this time that we find that some larger cells making a habit of wrapping themselves around smaller cells, then eating them. Predators had arrived.

Another billion years go by. Further cell changes have occurred. Now we see that not only were cells of a single type often grouping together, but they were performing functions in a coordinated fashion. By forming a thicker external membrane around the group to protect the entire group from the environment, membranes around the individual cells could be thinner to allow better communication among the various inner cells. And some of the inner cells were taking on specific functions such as intake of nutrients, waste elimination, or locomotion. God must have been enjoying Himself as He steadily added complexity to the things He created.

Then it happened again. About 800 million years ago, the temperatures of Earth spiraled downward, and Snowball Earth II occurred. While there had been cycles of glaciers covering portions of continents since Snowball Earth I, the earth had not entirely frozen as before, and it would at some point warm up again, melting much of the glaciers.

When there were periods of extensive numbers of glaciers, sea levels would drop as a lot of water was being used up to form the glaciers. This would create new conditions in portions of the oceans. Smaller seas would become surrounded by dry land. Change in conditions, as before, called for changes in the way of doing things for some cells. Species types had increased.

But now, with Snowball Earth II, there were massive cell losses as the climate got out of hand a second time, and nearly the whole earth was covered by snow and ice once more. It was perhaps only at the equator where regions of open water existed. And again, Snowball Earth II lasted a long time, about 200 million years—that is, until roughly 600 million years ago. But it was during this period that God was manipulating the environment and facilitating further changes in the creatures He had made.

Land mass had been steadily increasing over all this time as more granite and volcanic rock formed, and earthquakes uplifted sedimentary rock from the sea floor pushing it above the ocean surface. By 600 million years ago, continents which had been drifting to and fro across earth's surface, had grown in size similar to the continent sizes of today.

Meanwhile, wind and rain, freezing and thawing, repeated glacier formation, crashing ocean waves, and changing chemistry of the atmosphere all worked to weather the rock that formed the land masses, turning it into soil. Development of the soil would be a necessary preparation for the greening of Earth, when plants would later make their appearance.

ORGANISMS DEVELOP

Life had now existed on the planet for more than 3 billion years, yet up to this point, life forms were basically only single-cell structures. But God had taken life from a single primitive cell to a large variety of sophisticated cells, some of which could be found in groupings. This was absolutely foundational for what was to come. Cell structure and function had to be just right before life could be taken to the next level. The advanced cell contains a wide variety of molecular machines, many performing complex tasks. It is an amazing construction.

During this prolonged time, God was also developing the carbon, nitrogen, sulfur, and phosphorus cycles that would be needed for higher forms of life.

By 635 million years ago, cells had reached their highest level of sophistication yet. God was now ready to take His creation to the next stage. There appeared life forms that resembled small flat worms, with an outer layer of cells, an inner layer of cells, and a gut. Many of these worms were quite small, anywhere from 1/32 of an inch long up to a few that were a couple of inches long. Also, there were some small primitive plant-like fronds and some creatures that resembled very tiny jellyfish.

This time period in earth history is called the Ediacaran Period, taking place from 635 million to 541 million years ago. All of earth history up to the end of this Ediacaran Period is also referred to as the Precambrian Period because things change dramatically once the next period, the Cambrian Period, is reached.

It was at 541 million years ago, that the next most significant episode in the history of creation occurred—the Cambrian Explosion. Within a time span of less than 60 million years, which is very small compared to the preceding 3½ billion years of life form development, the earth went from a place where a microscope would have been needed to see many of life forms to a place teeming with invertebrate sea life comparable in size to almost any invertebrate species today. Prior to the Cambrian Period, most life forms consisted of single cells. Species were distinguished by differences in what chemical reactions the various cell types were able to perform, but basically, they all looked similar as do many single-celled varieties of bacteria today. Their external body plans were not all that different. In the Ediacaran Period, which immediately preceded the Cambrian Period, small quite primitive plants and animals made their appearance. Then in the Cambrian Period, there was an explosion of not only the variety of life but the complexity of life.

At the beginning of the Cambrian Period, the first animals with external skeletons appeared. Within the next 20 million years, there were clams, snails, starfish, and also trilobites which resembled today's horseshoe crabs, and a multitude of others. These were complex organisms, far developed beyond the single cell. They looked nothing like the really small

worms of the preceding period. These animals had external skeletons, compound eyes, gills, jointed legs, guts, nervous systems, antennae, mouths that could be opened and closed. There was, within this relatively short geological time, the sudden appearance of creatures with representatives of every body-plan type that has ever existed. Each animal had a number of sophisticated body parts; each part performing a specific task to allow the greater organism to achieve capabilities previously unheard of. Fossils of these creatures are found fully formed with essentially no evidence of evolutionary transition. Plants too experience a similar diversification of types and function.

Such findings have been a significant problem for those who hold to some of the prevailing evolution theories. It should have taken much, much longer for the Cambrian animals to develop if they were to develop only by chance DNA mutations. How could this have happened? There have been a number of attempts to find a logical scientific explanation, but all attempts thus far have fallen short. Many creationists think it likely that this is one of those times where God sped up the process of evolution by either influencing the probabilities that all these changes would occur as He does in directed miracles; or He simply stepped in, using supernatural means, creating all these animals from scratch. There seems to be no good scientific explanation for the Big Bang, or for the appearance of life, and it seems that the Cambrian Explosion presents a similar situation.

FURTHER DEVELOPMENT THROUGH GEOLOGICAL PERIODS

Following, then, is the sequence of geological periods as pieced together by a wide variety of scientific studies.

Key to understanding why there are geological periods is the principle of continental drift. The positions of the continents on the globe play a major role in the development of life on earth. Where the continents lie will be a factor in how much heat from the sun is absorbed by

the land as the angle of the sun striking the land will be dependent on where the land is positioned. How much heat is absorbed will affect wind currents and rainfall. Ocean currents will also be affected which in turn affects the delivery of nutrients to an area, and it will cause an effect on the transfer of heat by those ocean currents from one place to another. If continents lie over polar regions, glaciers are more prone to develop, and this will affect how much of earth's surface water is tied up in producing glacial ice, thus affecting sea levels. Volcanic activity is highly dependent on the positions of the continents. There will be high volcanic activity at times and low activity at others. Volcanic output will affect earth's atmosphere as it pumps carbon dioxide and water vapor into the skies. Ultimately all the above changes affect climate, and climate will often determine what species live and what species die.

Ediacaron Period (635–541 million years ago)

In the beginning of the period, essentially all the continents that had

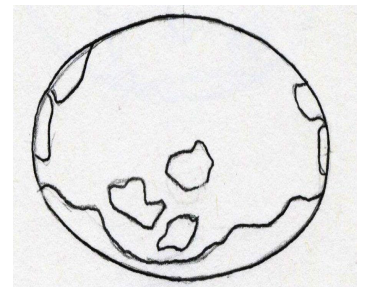


been drifting separately around the globe have fused together into one supercontinent centered around the South Pole, but now this land starts to drift northward. The glaciers of Snowball

Earth II have begun to retreat. Climate over the earth is still cold, with much ice packing the open ocean. The level of oxygen in the atmosphere is rising, as photosynthetic organisms are increasing their populations again after the cold disaster of the previous era. Animal and plant life are dominated by bacteria and green algae, but there are a number of clusters of cells that function together as single organisms, such as some very, very small creatures related to flatworms. There are also some small blobbish discs, tiny plant fronds, and minuscule jellyfish. Seabeds are covered with mats made up of communities of microbes, and the larger organisms also form communities around these mats where they feed on the microbes.

Cambrian Period (541–485 million years ago)

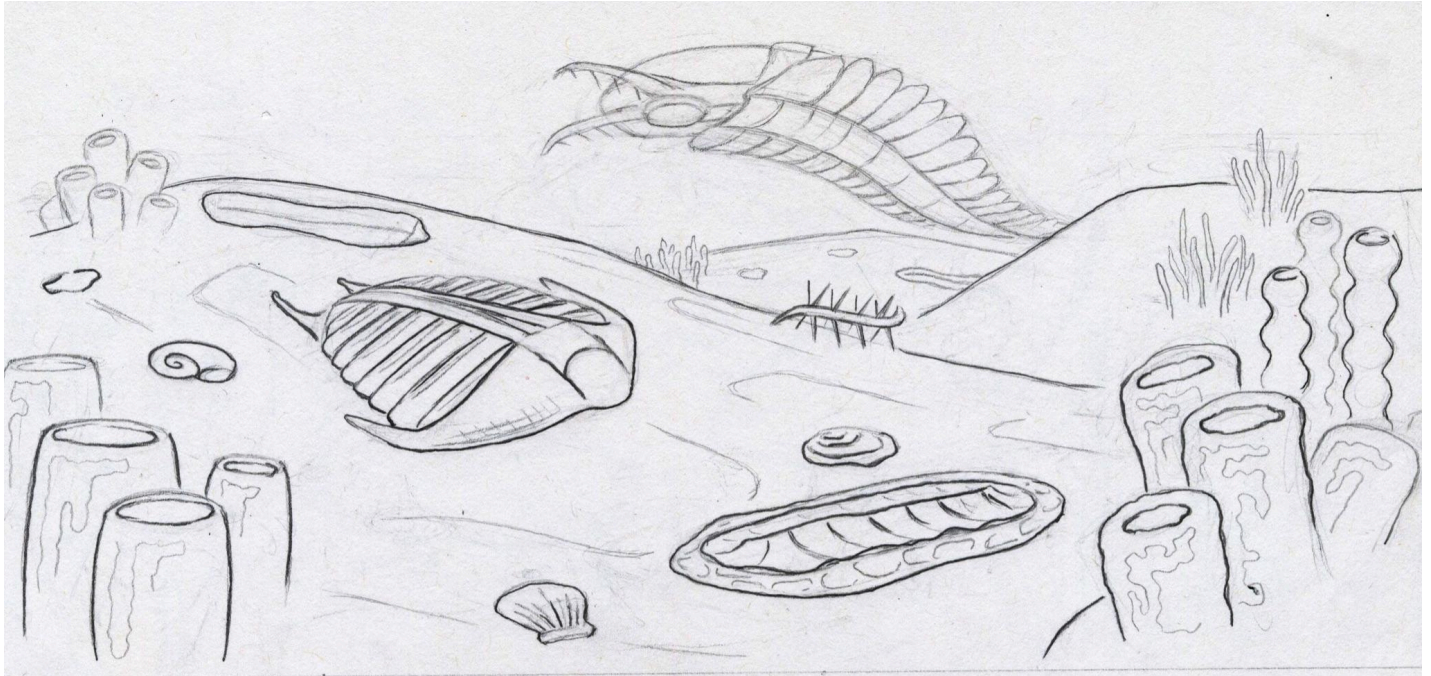
The great supercontinent of the Ediacaran Period begins to tear apart, forming one large continent known as Gondwana, and three somewhat smaller continents known as Laurentia, Baltica, and Siberia. The continents are dry and rocky, with no vegetation. Earth's temperatures are generally warmer. Much of the ice from Snowball Earth II has melted, and consequently, seas are high, leading to flooding in lower regions of the continents. This flooding causes shallow seas to form, and provides new types of habitats for animals to live in.



During this time, the fabulous Cambrian Explosion of animal and plant life occurs, and there is now a great diversity of species. Whereas before there had been creatures made of only a few cells, there is now a profusion of much larger animal and plant varieties covering the sea bottom.

At this time all of life still lives in the sea with the majority of animals living on or close to the floors of shallow oceans. There are animals with hard shells and many others with external skeletons, also sponges. There exist many organisms which do not use photosynthesis for their main energy source but get their energy by eating the organisms that do use photosynthesis.

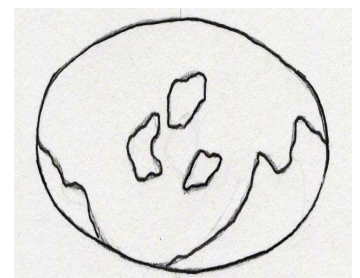
Oxygen has risen in the ocean, allowing animals to better use an oxygen-based chemistry. This allows for more rapid bursts of energy, giving animals that utilize it a significant advantage.



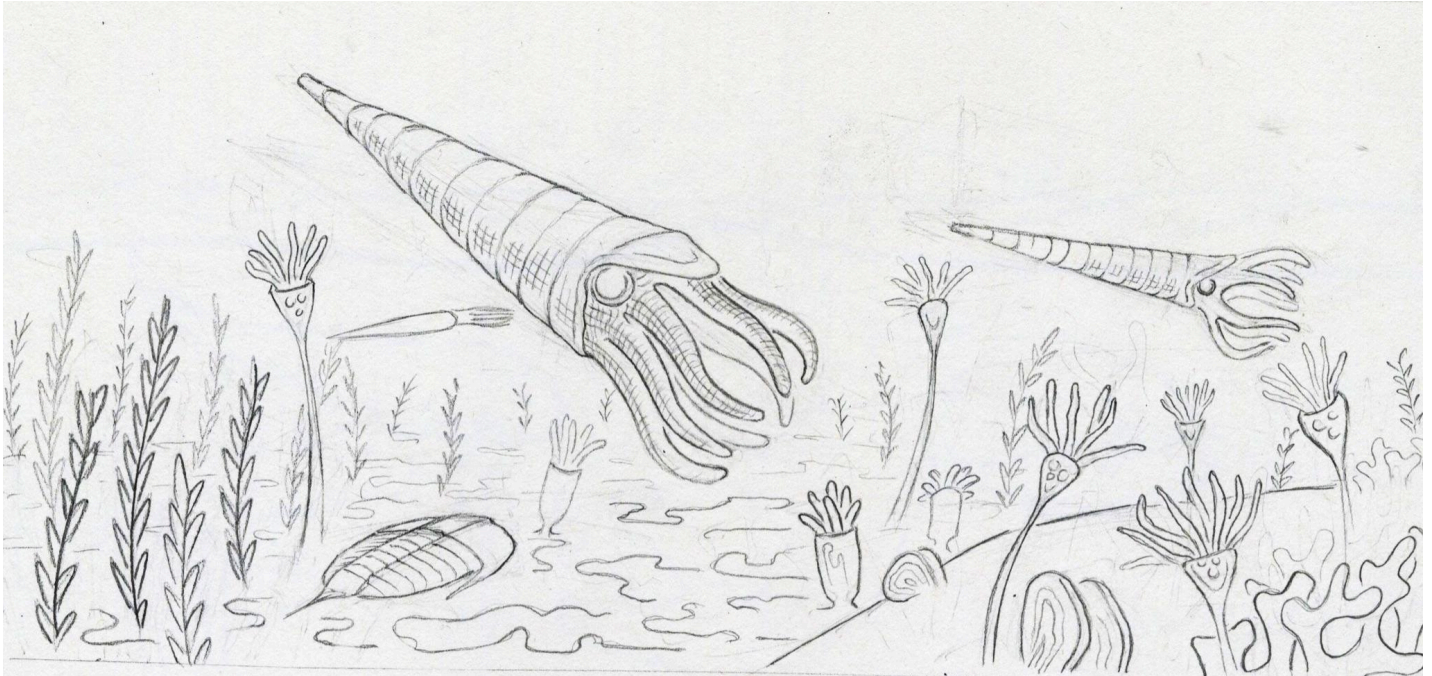
Toward the latter part of the period, there appears to be a change in sea currents, thought due to the changing positions of the continents. This leads to a drop in the oxygen content in the deeper regions of some of the ocean waters, and an increase in concentration of hydrogen sulfide from undersea volcanoes in other waters. And these conditions, being toxic to many plants and animals, result in more extinctions. Late in the Cambrian Period, the climate cools off and glaciers build up on Gondwana, causing sea levels to drop. Loss of many shallow seas and cooler overall temperatures kill off many of the warm water animals. At the end of the Cambrian, a large percentage of the animals that had lived in it have died, but some survive into the next period.

Ordovician Period (485–443 million years ago)

The movements of the continents result in much volcanic activity. A line of volcanoes develops along the edge of Laurentia, one of the smaller



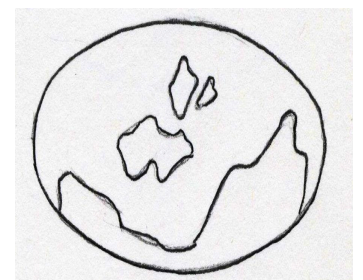
continents, and becomes the beginning of the Appalachian Mountains of the future eastern United States. Huge amounts of CO₂ and water vapor are spewed into the atmosphere. This results in global warming and melting of glaciers. Warm shallow seas form again and extend over vast sections of the continents. There is a whole new set of animals appearing in the sea, different from that of the last period.



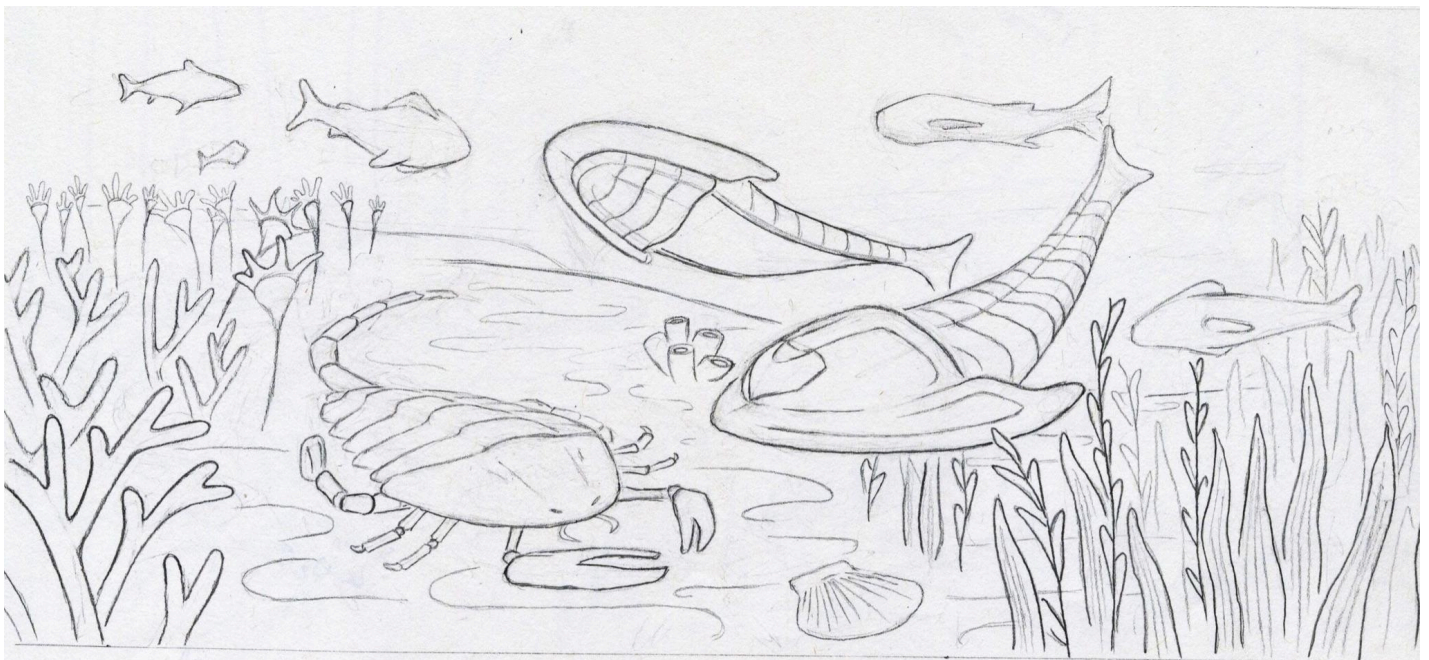
By the end of the period, volcanic emissions nearly stop. As a result, CO₂ in the atmosphere drops; the climate cools significantly. Massive glaciers develop all over again. This ties up much of earth's water in the ice, sea levels drop, and shallow seas dry up again. It becomes one of the coldest times since Snowball Earth II and the second largest extinction of Earth's history occurs when 60% of all invertebrate animals go extinct.

Silurian Period (443–419 million years ago)

The CO₂ levels steadily rise again, and so does the average temperature of Earth. The climate becomes warmer. Gondwana is still in the Southern Hemisphere, but much of its glacier cover has melted. This results



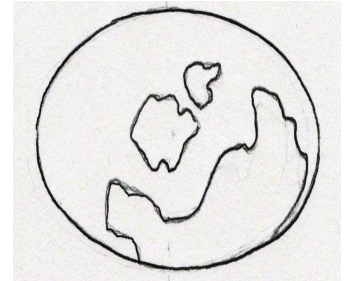
again in rising sea levels and the reappearance of shallow seas over large areas of the continents. Laurentia, Baltica, and another small continent collide with each other, forming a secondary supercontinent known as Euramerica. The positions of the northern continents result in air currents that help stabilize the climate. Sea life is once again quite diverse, and a whole new set of animals have appeared. There is a diversification of fish, some now found with jaws that can bite rather than just open and close. Fish make their way out of the sea up into rivers and freshwater lakes.



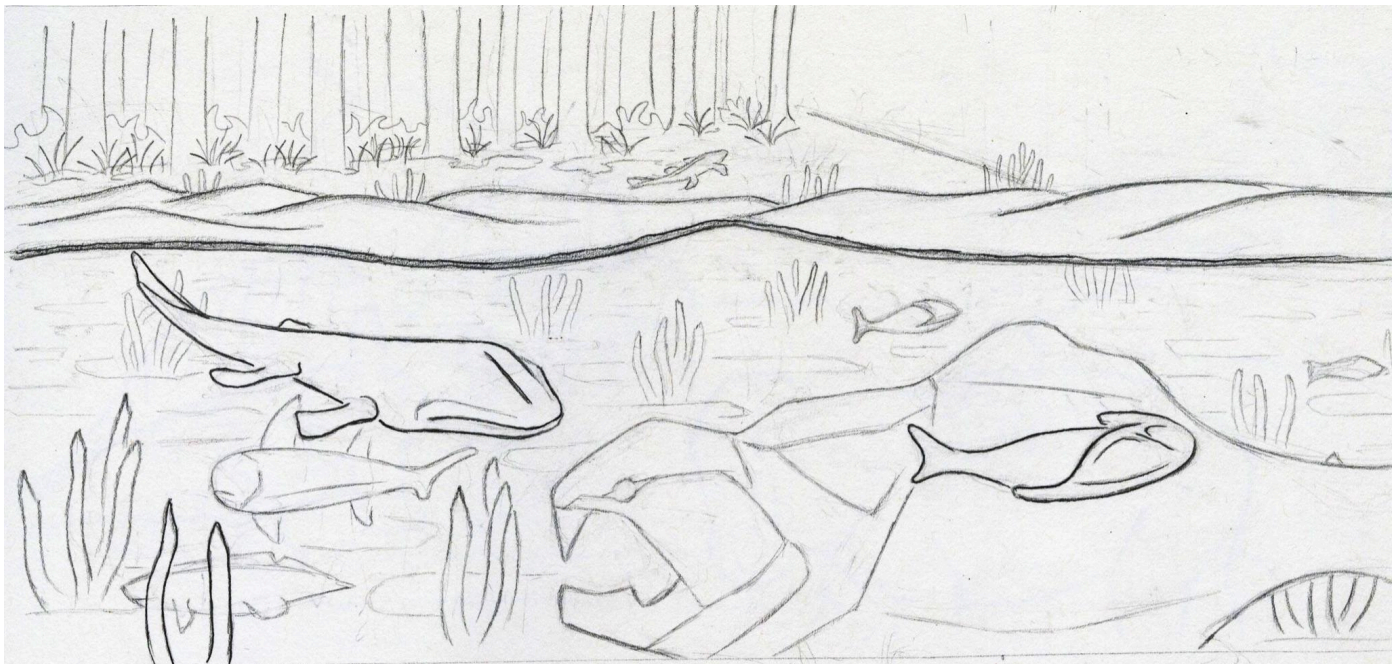
Plants are found growing alongside the edges of lakes, streams, and coastlines. These plants are somewhat small but leaving the water is a new thing. There are also a few small insects, spiders, and crustaceans that are venturing onto land along the water's edge. With the rise of oxygen levels, the protective ozone layer in the atmosphere has developed. This makes it safer for plants and creatures to spend time out of the water as they now have protection from damaging ultraviolet light given off by the sun. Climate change takes place near the end of the period. Cooler temperatures and lowering sea levels ultimately result in extinctions, but altogether these extinctions are not as severe as in other periods.

Devonian Period (419–359 million years ago)

The continents are shifting, with much tectonic activity at the beginning of the period. The CO₂ and water vapor released into the atmosphere by volcanoes results in the climate warming up. Along with this, sea levels rise once more, much land lies under shallow seas.



The weathering of rock over the past several periods has resulted in increasing soil depth allowing the spread of plant life further into the interior of the land. There are some large forested areas. By the middle of the period, there are horsetail grasses and ferns, as well as early woody plants.



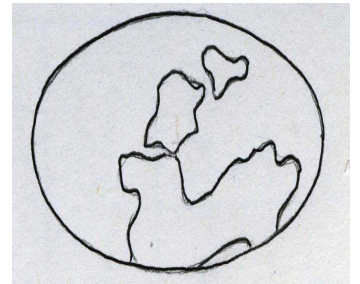
In the oceans, some fish now have fins, improving their maneuverability. Early in the period, many fish have bony armor plating on their front sections as they have no jaw to allow them to bite, but as the period progresses, these armored fish decline, while jawed fish that can

bite but who do not have bony armor increase. There are primitive sharks, some as long as thirty feet. It is in this period that we see the first amphibians.

But at the end of the Devonian Period, there is a major extinction, the causes of which are not clear. It is thought perhaps that the extensive forests may have drawn excessive quantities of CO₂ out of the atmosphere. Decreased greenhouse gases may have led to cooling of the climate, increased ice formation near the poles, and dropping sea levels. Sea life appears to be harder hit with extinctions than land-based species.

Carboniferous Period (359–299 million years ago)

Continental drift in the Carboniferous Period ultimately results in all the continents becoming fused into one supercontinent, known as Pangaea. Now that all the continents are connected, plant and animal species are allowed to spread out everywhere across the land and it gives rise to a similarity of land species over much of the existing world.



All the associated tectonic activity causes another increase in CO₂ in the atmosphere, and global warming. Flooding occurs as the glaciers melt and the shallow seas develop once again. Vast forests cover much of the land and in many areas that are shallow seas, the vegetation explosion results in extensive swamps. All the vegetation, producing so much waste oxygen, leads to atmospheric O₂ levels reaching 35% (compared to modern 21%).

New animals appear on the scene. Wings are now found on some insects. Insects have no lungs or gills but absorb oxygen through their bodies. As the oxygen levels are quite high, this allows some insects to reach quite large sizes. There are giant dragonflies with wingspans of up to thirty inches. There is a scorpion that is twenty-eight inches long, and a millipede that reaches more than eight feet. Even the amphibians, which are now the dominant animal type, can be as long as twenty feet. Reptiles are seen for the first time.

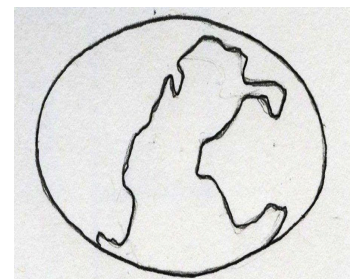


About mid-period in the Carboniferous, world temperatures begin to drop again. The climate cools down, glaciers form, sea levels drop, swamps dry up. This is disastrous for many of the plants and animals. There is a massive die-off of many forests, and with this, oxygen levels in the atmosphere decrease. The large sizes of the giant insects can no longer be sustained in the lower oxygen conditions, and they go extinct. Many amphibians also go extinct, but reptiles are better equipped to deal with the changes and continue to do well.

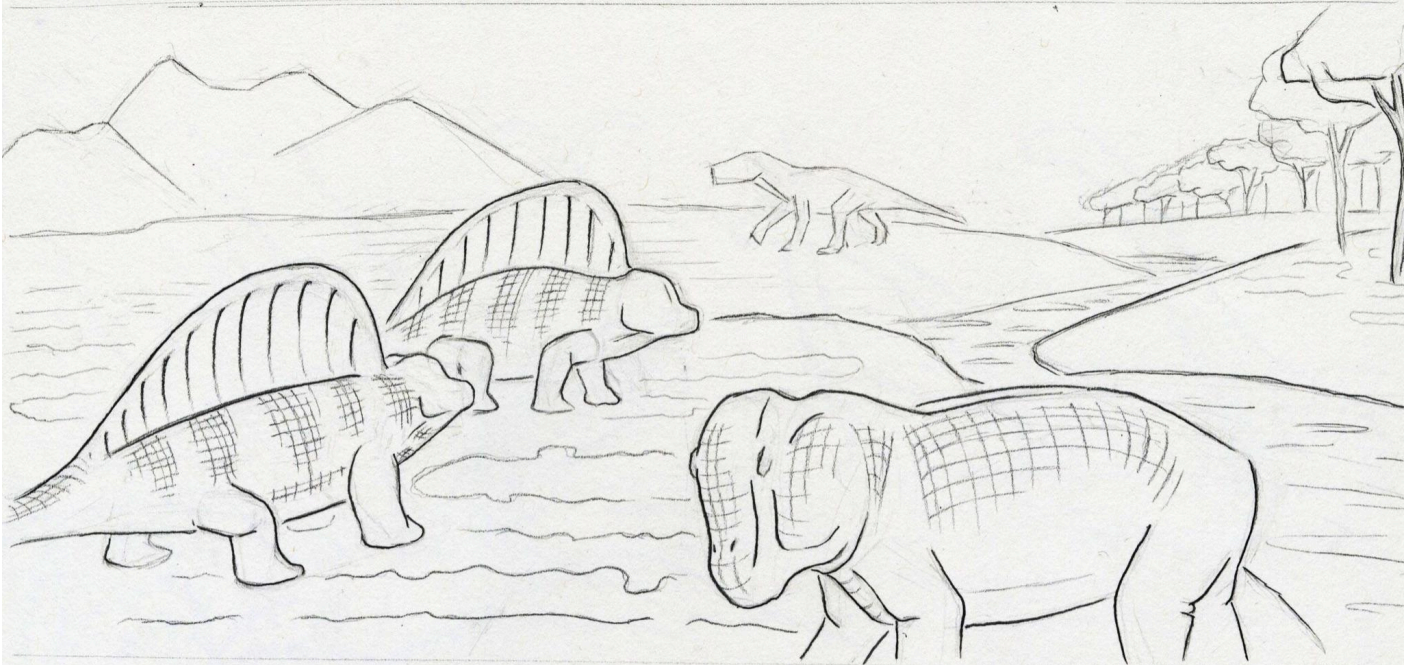
Bacteria have not yet developed the enzymes to decompose wood fibers. Consequently, millions and millions of dead trees and bushes become buried without fully decaying. Areas that were heavily forested in the Carboniferous Period are later known as deposits of coal.

Permian Period (299–252 million years ago)

It is still cold after the last period, much of the southern portion of the supercontinent is under glaciers while the northern portion is somewhat warmer but desert-like. Sea levels are low.



Plants that produce cones seem to do better under these conditions and conifers greatly increase in number. Insect diversity is great, with many species being related to cockroaches which seem to tolerate the climate. While there are several amphibian species, it is the reptiles that have thicker moisture-retaining skin and can lay eggs even in areas lacking water that do really well. The first mammals appear, and marine species achieve a great diversity.



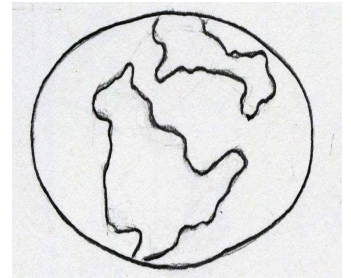
But just when species diversity has increased to a significant level, the greatest extinction that the earth has ever experienced takes place. There is a great deal of uncertainty about what caused the Permian Extinction. Many think it was due to a combination of factors. There was likely heavy volcanic activity that released massive amounts of CO_2 into the atmosphere. High levels of CO_2 dissolved into sea water makes carbonic acid which erodes seashells, wiping out a large number of life-forms in the sea. High atmospheric CO_2 would also cause a greenhouse effect, raising temperatures to levels not tolerated by numerous species. In addition, it is thought that the heavy clouds of volcanic dust in the air prevented photosynthesis, resulting in low oxygen levels, stressing both land and ocean species. And decreased oxygen in the atmosphere would have decreased the amount of ozone in the atmosphere, thereby

allowing more ultraviolet radiation to reach Earth's surface, killing off additional species.

Altogether, 90% of marine species, and 70% of land species go extinct.

Triassic Period (252–201 million years ago)

When the Triassic Period begins, the climate is mostly hot and dry due to all the CO₂ still in the atmosphere from the end of the Permian Period. The cooler parts of the supercontinent are at the north and south ends of the continent and is where most forests and animals are. The center is mainly desert. Some plants have survived the Permian Extinction and serve as a foundation for new plants. The Permian Extinction severely decreased the animal diversity, and it takes about half of the Triassic Period to begin to see significant diversity once again as new species appear on the scene.



In the oceans, there appear a number of marine reptiles, some of which become quite large in size. On land, reptiles are the predominant group of animals. Flying pterodactyls first appear. Some reptiles become very large, and it is for this reason that mammals at this time remain small, living as insect eaters, being forced to come out at night to avoid predators.

Around the middle of the Triassic, Pangaea begins to pull apart into two separate

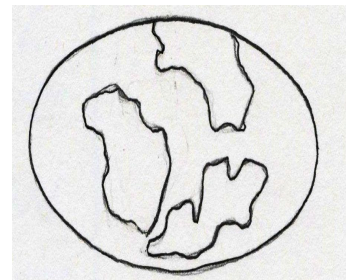


continents: Laurasia to the north, and Gondwana to the south. The climate begins to cool off and becomes less arid in general.

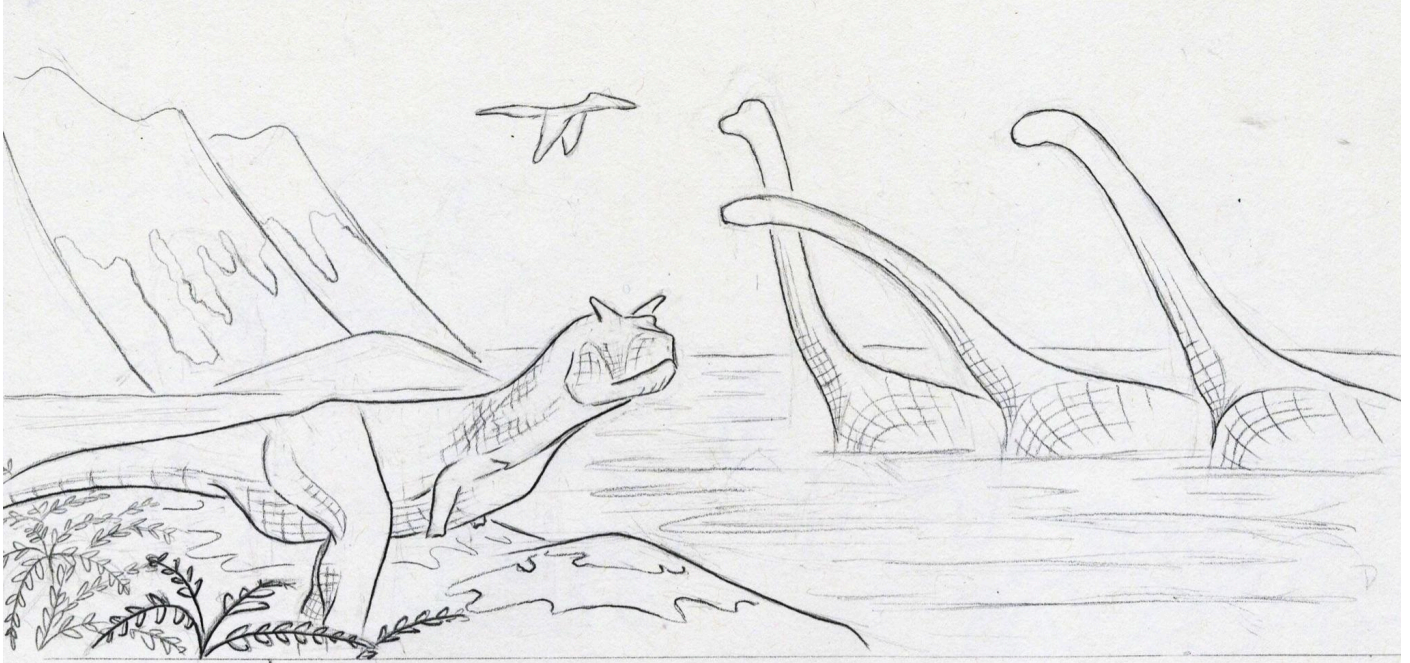
Another severe extinction ends the Triassic. The causes of this extinction are uncertain. Some think the cool climate change was exacerbated by an asteroid striking the earth near Quebec, Canada. About half of the species in the oceans disappear. On land, a number of species of amphibians and reptiles are eliminated, but the extinction is not as severe as in the sea.

Jurassic Period (201–145 million years ago)

The southern continent, Gondwana, begins to fragment into a western part (South America, Africa, and Arabia) and an eastern part (Antarctica, Madagascar, India, and Australia). There is an increase in volcanic activity again and the climate becomes relatively warm. There is no land over the poles, so there is no large buildup of ice. Sea levels are



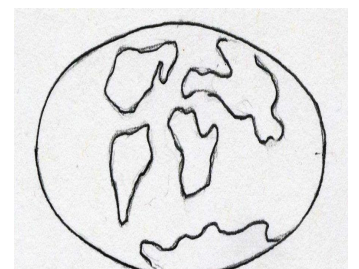
therefore high; much of Europe is under water. Many of the areas that were arid desert in the Triassic now become lush rainforest.



New animals appear that are able to take advantage of the new conditions, and diversity increases. On land, dinosaurs dominate, some are small; some are very large. Mammals remain small, avoiding predators; the first mammals that use a placenta to give birth are seen. The first birds appear, while there are still pterodactyls that ply the airways.

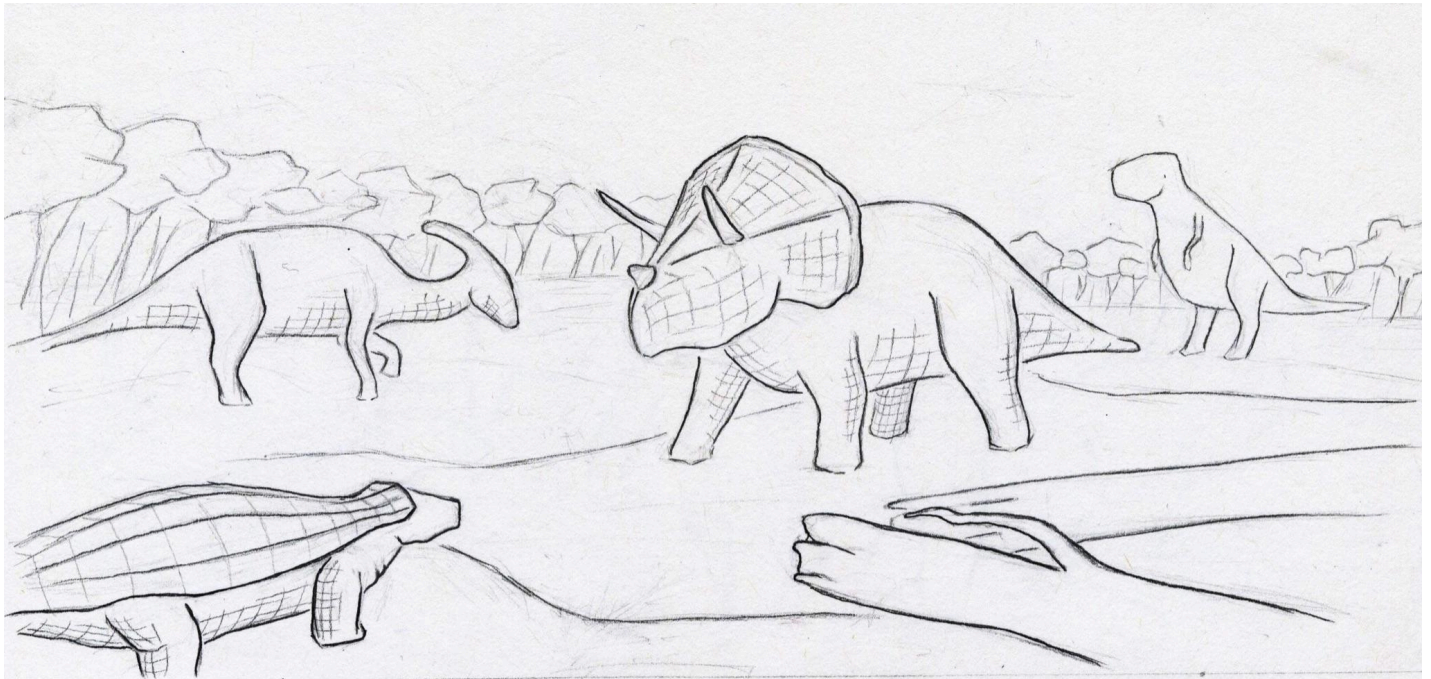
Two extinction events occur in the Jurassic—one early on in the period, the other at the end when temperatures drop—but neither comes close to the great mass extinctions seen in previous periods.

Cretaceous Period (145–66 million years ago)



The northern continent of Laurasia begins to split apart, separating the western part (North America) from the eastern part (Eurasia). In the south, Gondwana has completed its breakup into several continents. There is much volcanic activity, resulting in high CO₂ levels again and a warmer climate. Seas remain high, as there are not many glaciers to tie up the excess water, and for a time, nearly a third of the land on Earth is under water.

The positions of the lands on the globe cause more even temperatures over the earth and result in weaker winds. Weaker winds lead to weaker ocean currents, which in turn lead to decreased mixing of the water and loss of oxygen in some of the deeper ocean regions. When dead organic matter sinks to the ocean bottom it does not decompose well without oxygen. Because the organic material is not broken down, it eventually is transformed into petroleum. Large deposits of petroleum occur in a number of world regions, including the Persian Gulf and the Gulf of Mexico.



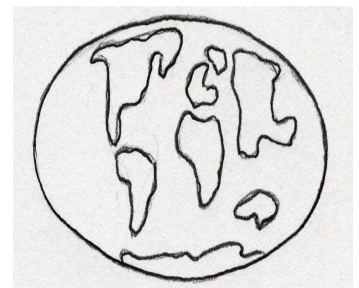
Flowering plants appear in the early Cretaceous, and spread throughout the period, though they never become dominant. Pollinating insects, including bees, are new, and help to spread flowering plants. The first deciduous trees are seen, but conifers remain more common.

Dinosaurs still dominate the land, and there are some new species of dinosaur. There are also new groups of mammals and of birds.

The Cretaceous Period comes to a sudden and dramatic end when an asteroid about six miles in diameter crashes to Earth at the Yucatan Peninsula of Mexico. This major catastrophe sets off a chain of environmental problems around the world. Three-fourths of all plants and animals on Earth are wiped out. All dinosaurs, pterodactyls, and large marine reptiles die off. So much debris is blasted into the atmosphere that the sun is blocked out over most of the planet for a long time. Plants that depend on sunlight for photosynthesis struggle to survive. Plankton and algae at sea have the same problem. This event disrupts the entire food chain. All animals that depended on plants or on plankton starve, and any animals that depended on hunting those plant-eating animals also starve. Furthermore, temperatures plummet as the debris in the atmosphere blocks out the warmth of the sun. The animals that do survive are those that depend primarily on eating insects, worms, and snails, which in turn feed on dead plants or animal tissue.

Tertiary Period / Paleogene Period (66–23 million years ago)

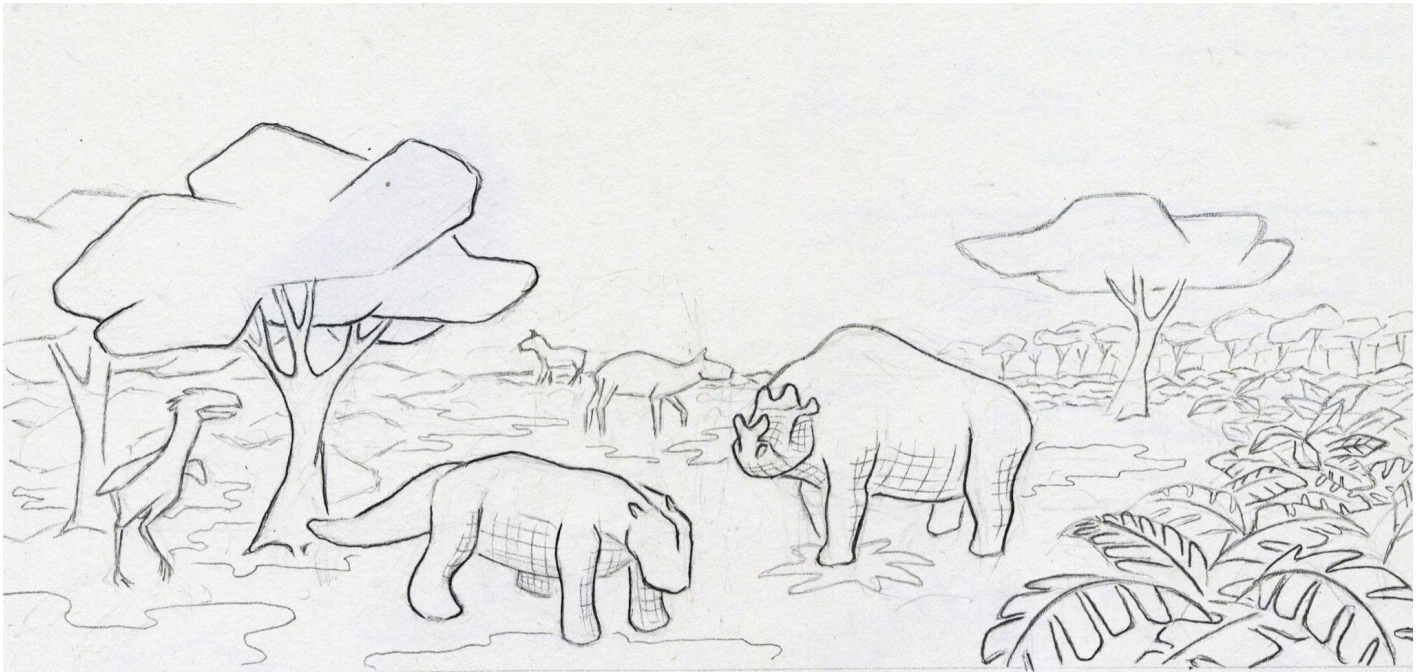
The continents are now drifting closer to their modern positions. Africa is moving toward Europe, enclosing the Mediterranean Sea. South America is moving closer to North America. India has begun to collide with Asia, forming the Himalayan Mountains. Australia has broken away from Antarctica and is headed toward southeast Asia. The new positions of the continents create an Antarctic Ocean current, which results in a lowering of temperatures for large portions of the world's oceans. The new continent positions also allow more ice to form on lands that are nearer to the poles, resulting in a drop in sea levels. Tropical vegetation which needs warmth



then is replaced by deciduous plants and trees, and by grasslands which are more adapted to the seasons in the colder parts of the continents.

Fish diversify in the oceans; sharks take the place of top predator now that the large marine reptiles are gone. Whales and dolphins appear for the first time in the seas. At the beginning of the period, land mammals are still small, but by the end of the period a large diversity of mammals has developed, and some become sizable. Great mammal herds form on the grasslands and in the open woodlands. Birds also diversify, filling the niches left vacant by the now extinct flying reptiles.

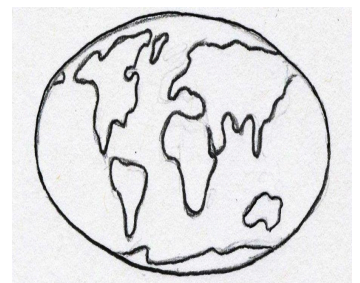
There is another extinction episode which brings this period to a close, thought to be



caused by the radiation emitted by a supernova in a nearby cluster of stars.

Tertiary Period / Neogene Period (23–2.4 million years ago)

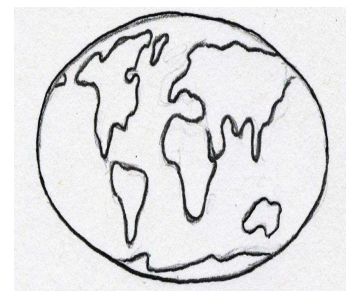
South America now connects with North America at the Isthmus of Panama. This again changes ocean currents, as water can no longer flow



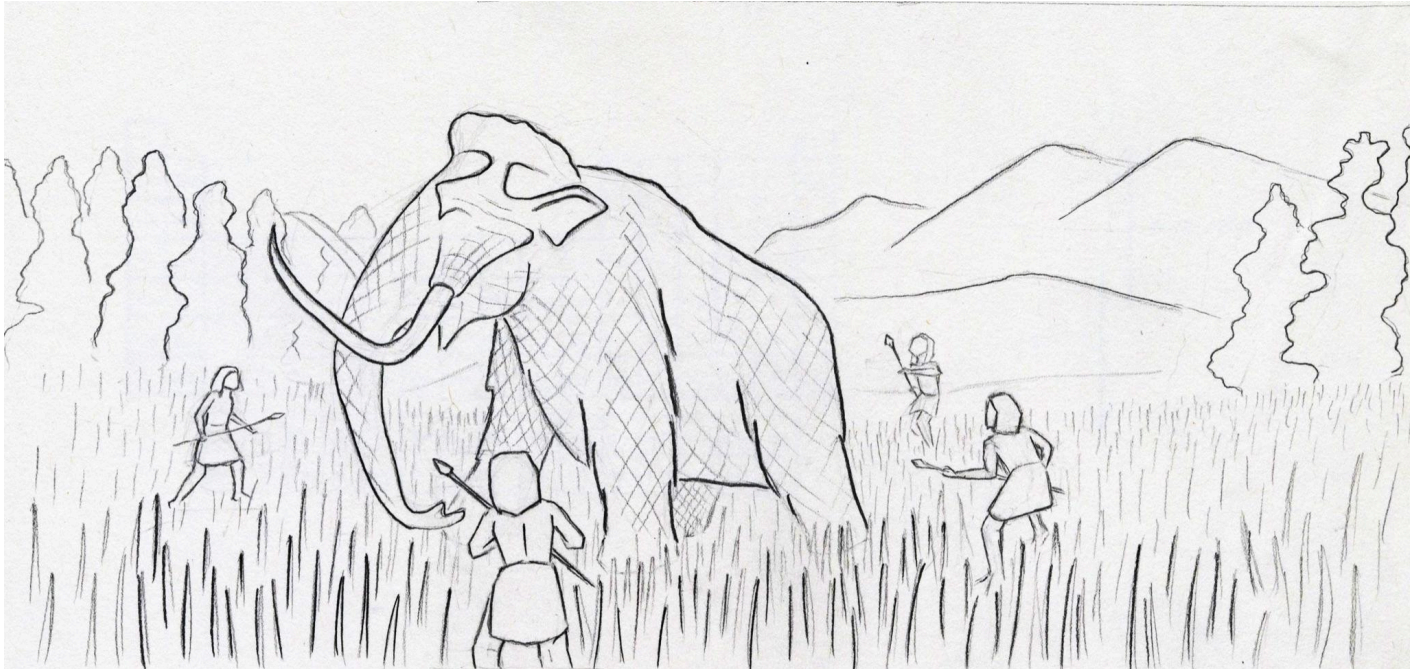


west to east at the connection. Italy pushes into Europe, giving rise to the Alps, Spain butts into France causing the Pyrenees mountains, and continued tectonic activity in North America and South America has given rise to many of their western mountains. Yet the amount of tectonic activity is not high at this time and there are growing ice caps at the poles. Dropping sea levels form land bridges between eastern Eurasia and western North America, allowing some plants and animals to migrate to new places. Mammals and birds are looking much like the ones we see today. In the latter half of the period, apes appear in Africa.

Quaternary Period (2.4 million years ago to present)



This is the period in which we now live. So far, there have not been significant changes



in the positions of the continents as the time has been short, though they continue to move an inch or so every year. Climate in the Quaternary cycles through a series of ice ages; and these climate changes, occurring about once every 21,000 years, appear to be primarily influenced by the normal wobble of earth's axis. As the earth spins like a top around its axis, this axis wobbles like a top. Wobble changes the angle at which the sun's rays strike the earth and changes the distance of the earth's surface to the sun, and these two things affect the amount of heat transmitted from the sun to the earth. Wobble brings the earth's axis back to the same position about every 21,000 years. Note that the last ice age ended about 11,700 years ago, so we are in the warmer part of the wobble cycle now.

The earth had been in the making for a long time. As soon as conditions on Earth allowed, God breathed life onto the earth, starting with a single cell. Over the next few billion years, He made changes in the cell, making multiple cell species types, each with its own

capabilities, and spreading them over the entire world. These cells then would serve as the foundation for all the higher life-forms that were to follow. He crafted the multitude of plants and animals that appeared on the earth at the Cambrian Explosion. Then, following that spectacular period, God took life on Earth through a dozen or so geological periods over the next half billion years in which He was molding the environment, as well as shaping, changing life, making it ever more sophisticated and versatile.

To meet the challenges brought on by environmental and climate changes, God made revisions in organisms to allow them to take advantage of new food supplies, new places of shelter, or some other new opportunity. These revisions often resulted in new species, perhaps related to the original species, but behaving in a different way, having different tolerances, and many times sporting a different appearance. When conditions were good for an organism, it expanded its range, and its numbers greatly increased.

When conditions changed for the worse and life became difficult, creatures sometimes died out. But God did not allow life to be totally extinguished. Rather, He changed it again, modifying life to give it new capabilities to allow it to meet the new challenges. Past catastrophes on Earth resulted in reductions in living species, and sometimes the reductions were severe, but these catastrophes also resulted in an opening up of ecological niches for new species to occupy. Each new species tended to show an added level of complexity over the species that it replaced. Each stage in evolution depended on the stage that came before it. In each geological time period, life forms were progressively introduced, then later removed and replaced.

Scientific studies suggest that it was the DNA of preceding animals that was altered to result in new creatures. Much of the time, God appears to have let natural processes make small changes in the DNA. There are other times when large changes were called for, especially if God desired to place whole new types of creatures on His special planet. This might require multiple simultaneous DNA changes if the new creatures were to survive and function well. The

probability of multiple DNA changes occurring at the same time and occurring naturally, however, would be so exceedingly small that it would essentially be impossible for this to happen. In these cases, many believe that God influenced the laws of probability directly so that the necessary changes all occurred at the same time. This is how rodent-like mammals can be the ancestors of elephants, whales and llamas—because God made it happen.

Does this mean that God had to keep coming up with new ideas when he saw His creation getting into trouble? No, I think He knew where He was going from the beginning. He knew that there would be a vast number of possible directions that His creation could take as it evolved. He had given creation that ability. With His hand, He would steer development along the path that He desired. As He slowly built up and aligned the necessary environmental conditions, He continued to increase the sophistication of the creatures that inhabited His world, and all was done with intent. The direction of events that ultimately occurred suggest the involvement of a mind that understood what requirements were needed to ensure that creation proceeded toward the desired ultimate outcome.

Throughout the history of the universe and of Earth, God appears to have continually interacted with His creation to make precisely the right things happen, and at precisely the right times, making sure that Earth and life successfully reached the next stage. He used the natural laws He had made the vast majority of time, but sometimes He directly influenced the probabilities of what took place, and on rare occasion He overruled the natural laws to make something very special come to pass. This is how God works. He works this way in science, He works this way in the history of mankind, and He works this way in our daily lives.

Why did God not simply make everything from the start as we see it now? He certainly could have. Those who believe that Earth is only several thousand years old believe that God made things as we see them today. Why would He take all those billions of years to bring us to the present? I think the answer is threefold.

First, God is orderly. He makes everything in an orderly fashion. Genesis 1 teaches that He took His creation through steps. He made the natural laws, intending that His creation would be run by them. If He used the natural laws most of the time, mathematical calculations tell us that developments can take very long periods of time to complete.

Second, He knew that He would create mankind one day. That was His plan even before the world was made, so He wanted a home where humans could live and thrive. Earth was not ready when it was a ball of molten rock. Earth was not ready when there was no oxygen in the atmosphere. God knew that humans would one day need coal, and that one day humans would need petroleum. He knew that humans would not be compatible with dinosaurs, so they were erased from the earth before humans were placed there. God manipulated His creation until finally it had all that humans needed. It was only then that He placed humans on a beautiful garden planet filled with a great variety of foods and sources of water, building materials for shelters, and many other things in which humans could take interest. All the rest of the planets and stars in the entire universe are just rocks, gas, or balls of fire. There is no place like this home planet He has gifted to us, a place teeming with life.

And finally, I think that God simply enjoyed the process of building Earth and the universe that contains it. Time is not an obstacle for God. He created it. The Bible says that a thousand years are as one day to Him (2 Pet. 3:8); I think a billion years does not cause Him to tire either. He was in no hurry. I believe that God delighted in forming the earth from stardust. He took great pleasure in establishing life in this place He had made. All along the way, it gave Him great joy in making all the changes in the DNA, producing new creatures that would function and carry out their lives in each geological period. I can just hear God say "Cool!" whenever He made a new animal or plant. And I think that He was specially delighted when He made Adam and Eve, the firstborn of His ultimate creations, with whom He would develop personal relationships.

HUMANS APPEAR

The major event that separates the Tertiary/Neogene and the Quaternary Periods is not an extinction occurrence as in most other periods, but the appearance of humanlike creatures. There is fossil evidence that shows that beings existed many thousands of years ago that had features similar to us. They were not all exactly like us, but many were closer to us than to any other creature that had come before, including the apes. How do we explain this in terms of biblical understanding? The species *Homo habilis* first appeared 2.4 million years ago and was distinctly different from all the apelike beings. It was the first of the genus *Homo*; this genus includes us who belong to the species *Homo sapiens*. Several different *Homo* species occurred as the Quaternary Period progressed. Fossil evidence for our species, *Homo sapiens*, first occurred around 200,000 years ago. There is not only geological evidence but also DNA evidence that points to the original *Homo sapiens* individuals as having first occurred between 200,000 and 250,000 years ago.

So, is this Adam? No, not likely. While there are those who believe that the appearance of *Homo sapiens* on earth occurred when God created Adam and Eve, the Bible's description of the world in which Adam and his offspring lived suggests that Adam lived at a much later time. We read about agriculture and animal raising by Cain and Abel. These activities did not appear in human society until about 10,000 BC and were not fully established among most peoples until about 6000 BC. Prior to that time, humans lived primarily as hunters of game animals and gatherers of whatever edible vegetation they could find. After Cain had murdered Abel, Cain worried to God that anyone who found him would kill him. If there were basically no other people on the earth yet, it should not have been difficult for Cain to find a safe place to live. Cain founded a city later. It takes a number of people to do this. Cities were not a concept until people gave up the nomadic hunter-gatherer lifestyle, instead taking up an agricultural and livestock lifestyle that allowed them to settle in one place. Could not some individuals discover

how to grow crops before they came into more widespread use? Certainly, but it seems unlikely this would have happened as far back as 200,000 BC. So, by the evidence gathered by archaeology and paleontology, it would appear that people had been on the earth for many thousands of years before Adam.

The Bible says that God made Adam and Eve as the first people. Does this mean that the Bible and science are in conflict? Probably not. Adam and Eve were the first people to enter into a personal relationship with God. Before that, this kind of relationship did not exist; it was not available to humans yet. Adam and Eve were humans of a new order, the first of their kind. And as all humans now have this same opportunity to enter into a relationship with God, Adam and Eve are the spiritual ancestors of all of us who live today.

If there were humans before Adam and Eve, did they have earthly parents? The Bible says that God created Adam from the dust of the earth. Some believe that Adam and Eve did have earthly parents but were selected by God to be the first to have a spiritual relationship with Him. But because this was such a momentous development in the history of Earth, it is believed by others that this was one of those times where God used supernatural means to create Adam and Eve, without using the usual natural laws. By doing so, Adam and Eve would have the advantage of learning everything directly from God—not from parents, family, or other acquaintances who could teach them wrong concepts. But after they disobeyed God, they were driven out of the garden of Eden, where they likely came into contact with other peoples.

That there were other peoples is also hinted at by the verses Genesis 6:1–4, which speaks of the sons of God marrying the daughters of men. It was intended that Adam and his descendants would be followers of God, but the passage implies that the people who were supposed to be with God (sons of God) joined themselves with people who were not followers of God (daughters of men), and that bad things resulted. Again, Genesis 6 suggests that it was not only Adam's family that populated the earth at that time but that there were already other people in existence.

Why would God put people on the earth before Adam? Because He was preparing the way for putting His own special people there. Adam and Eve were given a large garden territory that was their own. Had they not disobeyed God, they would have had everything they needed right there; resources were plentiful. But there was a backup plan. God had given Adam and Eve the ability to make their own choices, and God knew that they could fail by choosing not to listen to God. When they chose not to listen, they were made to leave the garden and make their way in the world elsewhere. Yet God still loved and cared for them. It would have been much more difficult to survive on their own if there were no other humans around.

If society had not developed beyond the hunter-gatherer stage, Adam and Eve would have had to live like hunters and gatherers. Life is harder in a society of hunter-gatherers than in a society where agriculture and livestock raising are the main occupations. This can be seen in the average lifespans of people who lived in these respective circumstances. Hunter-gatherers could expect to live to an average age of 25, while agriculture-livestock humans could expect an average lifespan of 47 years. Obtaining food was not as dangerous an undertaking, and food supplies were more reliable in the latter lifestyle. God was good to Adam in that He put him into an era where life was not as harsh.

Furthermore, human society offers benefits. There is safety in numbers when there are threats from wild animals or from other peoples. Neighbors can help out when big tasks need to be performed. There is less chance of starvation when crops in an individual field fail or disease strikes the animals on someone's farm; neighbors can share, or traders can bring supplies from more distant places. Quality of life could be improved by benefitting from skills a neighbor had that Adam might not have had. It was better that humans had become well established on Earth before God made the first of Adam's kind.

It was God's intent from the beginning to make creatures in His likeness, and that He would one day enter into a personal relationship with those creatures. Everything that God had

done in building His creation led up to this point. And God saw all that He had done, and it was very good.

Chapter 6

EARTH IS A SPECIAL PLANET

Mountains rose and valleys sank to the levels you decreed. . . . You made the moon to mark the seasons and the sun knows when to set.—Psalm 104:8,19

Earth is a beautiful planet with grand mountains, lush valleys, sparkling oceans, and sweeping savannas. There are animals, birds, and fish, as well as forests, flowers, and aquatic plants. Earth has all the natural resources humans need. Our kind has lived here for a long time, and if we do not spoil it too badly, humans can continue to live here for some time to come. God has gifted us with an incredible home. But surely there must be other planets in the universe that are just like Earth.

It is difficult to count, but it is estimated that there are roughly 100 billion galaxies in the universe. Assuming that the average galaxy has about 100 billion stars each, that means the universe holds about 10 billion trillion (1×10^{22}) stars. Even if each star has only one planet on the average, that's a lot of planets. Could there be at least one other planet in the universe where we could find life?

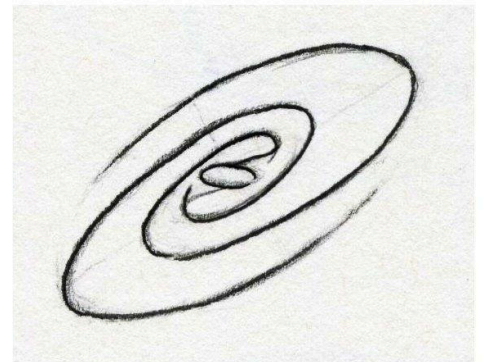
To answer that question, it may be helpful to take a closer look at our planet. God chose to put us on Earth, a planet orbiting the sun, our star. Why? Why did He choose to place us here on this planet out of all the possible places in the universe? The short answer is: we don't know all the reasons. There is still much to learn about the universe, and someday it may become clearer why Earth is the particular spot. And what factors did God have in mind when fashioning our planet? Again, we may never know them all, but following are some important considerations:

Quiet Galaxy Cluster

We do know that in many groupings of galaxies, or galaxy clusters, the galaxies are relatively close to each other and that brings the danger of the galaxies colliding with one another, a potential colossal disaster. But in our galaxy cluster, we live in a less crowded neighborhood where the galaxies are separated far enough from each other that there will not likely be any adverse interactions amongst them for a very long time.

Spiral Galaxy

We know that the Milky Way is a spiral galaxy, and this appears to be a necessary qualification.²⁵ About one-third of all galaxies are elliptically shaped galaxies. In these elliptical galaxies, most of the stars are old, and there is very little new star formation. This means that there are not many elements



heavier than hydrogen or helium being produced, as heavier elements are made when stars repeatedly are born and then die. Low amounts of heavy elements means that rocky planets are not likely to form; there is not enough material to make all the needed rocks. An elliptical galaxy, then, is not an ideal place to try to establish life.

Two-thirds of all galaxies in the universe, however, are spiral galaxies. That still leaves 70 billion such galaxies God could have chosen from. Yet we also note, spiral galaxies have a tendency to fray for several reasons. Instead of a well-defined pinwheel shape, stars in the arms of many spiral galaxies have strayed into the spaces between the arms. Fraying can increase the undesirable interactions between stars, threatening any life that has developed on a planet within a star's system. But the characteristics of the Milky Way are such that fraying is minimal, resulting in a more stable environment for our solar system. Our sun then lies in a quiet place where other stars will not interfere with it. This phenomenon of the fraying of the arms of a

²⁵ Peter D. Ward and Donald Brownlee, *Rare Earth* (New York: Copernicus, 2000), xxv.

galaxy spiral is so common that it almost eliminates most other galaxies in the universe as places where life could survive for prolonged periods.

Position in the Galaxy

The density of stars varies throughout a spiral galaxy. In the central regions, the density is high. There is a lot of star activity in the center, and it would not be good for Earth to be put in this location. With stars so packed in, far too much heat is produced. Not only that, but there are high levels of dangerous UV light, x-rays, and huge doses of charged particles. Putting all of that in the vicinity of Earth would be lethal to life. A large number of stars in the center also increases the likelihood of being near a supernova, which when the star exploded would put life at risk from just the shock wave associated with the explosion or the blast of associated radiation.

There are other phenomena that would be disadvantageous at this location, such as undesirable disturbances of the planet's orbit due to gravitational attraction of multiple nearby stars. This would cause irregularities in the orbits and result in unstable heating. Also collapsing stars could destroy the Earth if it were in the path of the gamma ray beam that can occur with the collapse. There would be many more asteroids. And in the very center of the Milky Way, there is a super-massive black hole, just as there is in many spiral galaxies. Black holes generate an enormous amount of gravity that could pull any planet or star into it if it is close enough. So being near the center of the galaxy would carry severe challenges for maintaining life.

It is better to be out in the spiral arms where the density of stars is lower—but not too far out. In the outer regions of the arms of the galaxy, not enough star activity has occurred there, again leading to the problem of too few heavy elements with which to form rocks and planets. There is not much out there besides hydrogen and helium.

Our sun is located along the edge of one of the spiral arms of the Milky Way, about halfway from the galaxy center to the outer tip. It is in what is known as a Goldilocks position: not too close to the center of the galaxy, not too far out to the edge. The sun's position is just right. Here, rocks of various compositions can form, and the elements that allow life to exist are present.

High Percent of Heavy Elements

Actually, the percentage of heavy elements at the sun's position in our arm of the Milky Way happens to be a little higher than typically found at similar positions in the other arms, or in most galaxies. One unusual feature of our sun, and therefore, of all the planets that were formed of the same space dust, is that it has about 25% more heavy elements than nearby stars of similar mass. So even before the sun was formed, as one theory has it, there must have been a higher than usual number of stars that had previously exploded in this area of the Milky Way, leaving behind the high amounts of heavy elements. This would suggest that God was at work even before the sun was formed, getting Earth's spot ready.

There is another theory that the sun may have formed closer to the center of the galaxy where higher amounts of heavy elements already exist in that place. But the sun was pulled out of its position by the gravitational pull of multiple stars around it and it drifted into its present location. If this theory were the true case, would it represent pure chance? I seriously doubt it.

Having a higher percentage of heavy elements has huge implications for the formation of Earth and what will ultimately take place on it. This higher percentage allowed more rocks to form, which means the size of Earth and the other rocky planets are larger than they would otherwise have been. Earth, for example, is large enough to still have a molten core, its large size tending to retain heat longer than smaller planets. Mars is not as big as Earth, and it has long since cooled off. It no longer has a molten core and is therefore not able to have any

tectonic activity. As we have seen, tectonic activity is essential in controlling the makeup of the planet's atmosphere, and in the formation of continents and mountains.

Size of Our Sun

While the Milky Way is in some ways an average galaxy, our sun does seem to have some special properties that are important for life on Earth. Ninety-five percent of stars in the universe are smaller than our sun. Planets around small stars must be close to the star to get enough heat to allow liquid water, a requirement for life. But being so close, gravitational forces would act as a brake and could result in rotation lock where the planet would nearly stop spinning on its own axis. The planet then would end up showing the same face to the star continuously as it orbited. In this case, the days would last forever—and so would the nights on the other side of the planet. It would be forever hot on the side facing the star, and forever cold on the opposite side. This is essentially what has happened to the planets Mercury and Venus. So, the size of our sun is good, providing temperatures that allow liquid water while also allowing our planet to be far enough away from the sun that Earth can keep on spinning.

There are many stars that are larger than our sun as well. But the problem with larger stars is that they are hotter and produce more charged particles in their solar winds. The more heat and charged particles that beat down on a planet's atmosphere, the more the atmosphere will have a tendency to escape the planet and be lost. It is good that our sun is not larger than it is.

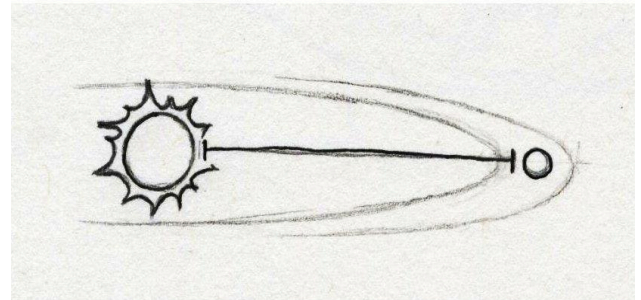
The Sun Is a Single Star

Two-thirds of all stars the size of our sun exist as binary stars; that is, they come in pairs and are close to one another. There are even some multiple star systems. Planets that orbit binary stars or multiple star systems have orbits that end up being irregular or elongated,

making for wide fluctuations in the heating and cooling of the planet. Seasons would be erratic or extreme, not conducive to life. In addition, a planet that has an irregular orbit around multiple stars stands a risk of being dislodged from its orbit and being flung out into space.

Earth Is in a Habitable Zone Position

All planets exist within certain temperature zones as they orbit their stars. Liquid water appears to be an absolute requirement for life, so any planet that does not have liquid water is not a place where life likely will be found. If planets are



too close to the star, the planet surface gets too hot to support complex life; all the water will be in vapor clouds, as the heat will evaporate all water from the surface. If planets are too far away, everything is frozen and too cold for complex life to function. So, planets must be in just the right zone.

The smaller the star, the thinner this habitable zone is. As most stars are small, they have extremely thin habitable zones, and the likelihood that a planet will be found within that zone becomes very unlikely indeed. A star that is bigger, with a wider habitable zone, increases the probability that a planet will lie within the desired distance from the star. Even with our sun, the habitable zone is not all that wide. If Earth were 5% closer to the sun, it would be too hot on the surface for complex life to exist. And if Earth were only 1% further away from the sun, it would be frozen, covered with glaciers. Earth, however, is in the just right position.

A Habitable Zone with Sufficient Time

These habitable zones are not permanent. When a star burns up all the hydrogen in its core, it begins to burn helium. Burning helium in the core now creates enough heat that it causes some of the hydrogen still left in its outer shell to start burning too, converting the

hydrogen out there to helium by the process discussed earlier. In doing so, the outer shell of the star expands. As our sun goes through this process, the sun's shell will expand its diameter and will become so big that the edge of the sun will reach the orbit of Earth, causing Earth to melt away in the process. So then, there is a time limit for some planets to exist. Earth is at the correct distance from the sun for a habitable zone to last between 5 to 8 billion years before it is caught by the expanding sun and disappears. Gratefully, we have quite a few years left before this happens to us.

The size of the star determines how long the habitable zone will last. Small stars burn slowly, so their habitable zones last a long time. But as pointed out before, they have very thin habitable zones so most planets are not going to benefit from the slow burn. Stars larger than the sun have larger habitable zones but burn faster, often burning out within a few billion years. It took four-and-a-half billion years to get life to its present point on Earth. Large stars burn too fast to allow this much time for development. Thus, it seems that our star, the sun, had properties that made it a desirable star for God to use when creating life on one of its planets. It is not too large, nor is it too small; it is just right.

Favorable Atmosphere

As the planets were forming, heat, UV radiation, and charged particles of the solar wind favored burning off Earth's lighter elements, especially hydrogen and helium, sending these elements off into space. Gravity, on the other hand, tried to hold on to these elements, keeping them in the atmosphere around Earth. This struggle between solar output and gravity occurred on the other planets also, and is why Jupiter, Saturn, Uranus, and Neptune are giant gaseous planets. They all have rocky cores but are dominated by massive atmospheres as the sun was not strong enough at the distances of the outer planets to burn away the lighter elements. Their huge gravities also were able to hold on tightly to basically all gases that ever surrounded those

planets. Compare this to Mercury which has very little atmosphere as it has all burned away, being close to the sun and not having enough gravity to hold onto the light elements.

Much of the hydrogen and helium of early Earth did, in fact, burn away at some point, but Earth's gravity allowed it to retain its subsequent gaseous atmosphere of the somewhat larger molecules of nitrogen, oxygen, water and carbon dioxide. Had hydrogen and helium not been burned off, the atmosphere would primarily consist of these two elements; and all other elements, including oxygen, would not be in a very high concentration, Oxygen would be probably less than 1% rather than the 21% that we use today when we breathe. So, Earth's size and position are just right to retain an atmospheric makeup beneficial to supporting life.

Favorable Gravity

There is another consequence of the size of a planet and its gravity to consider. Earth's gravity is high enough to keep objects close to the ground, but not so high as to make movement difficult. Space missions have shown how objects bounce quite high in low gravity. Keeping our feet on the ground could be problematic on a small planet, but we would probably be crushed by the high gravity on a large planet such as Jupiter. Again, Earth's size is just right.

Circular Orbit

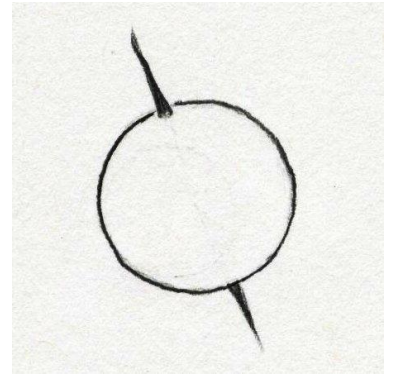
All the planets in the solar system have elliptical orbits. Earth's orbit is also technically elliptical, but actually it is in nearly a circular orbit around the sun. This helps keep the climate more stable. If the orbit were more elliptical, the extremes of hot and cold would be greater. At certain times of the year, planets in elliptical orbits are further from the sun than at other times. Earth does experience seasons, but this relates more to the tilt of Earth's axis and the angle at which sunlight reaches the surface. With a circular orbit, the total amount of heat and light reaching the whole earth is relatively constant, as the distance from the sun remains nearly constant throughout the year.

Favorable Axis Tilt

Earth's axis tilt produces the seasons in the nontropical regions of the planet. If there were zero tilt, there would be no seasons, but there would be climate bands around the earth that would go from warmer at the equator to colder as one got closer to the poles. There would basically be a single temperature, a single season at each latitude, all year long. While we could probably survive on an Earth like that, it is likely that biodiversity would be less, and less likely that humans would populate the more northerly or southerly regions. The lack of a seasonal variation in temperature would not allow for food sources to be grown during the warmer times of the year. The seasons due to Earth's tilt, therefore, allow the population to spread out more across the planet, and allows the planet to support more people in general.

Note that there is a social principle that the larger the population, the faster innovation occurs. Not being able to support a large population would greatly slow advances in general knowledge, technology, and social structure. Thus, we could be experiencing a much less developed world today, and possibly could still be stuck in the stone age if Earth's tilt were not as it is. It has been estimated that half of Earth's surface would be uninhabitable without its 23-degree axis tilt.

In a worst-case scenario, Earth's axis could have been tilted to 90 degrees. That would make it permanently cold at the equator as the angle of sunlight reaching the earth surface there would be great, which causes heat from the sun to be spread out over a large area. At the poles, the temperatures would be drastically different depending on time of the year—with hot, constant daylight in the summer and cold, constant night in the winter. In the great collision with Earth that resulted in the moon being formed, Earth was tilted at its present 23.5 degrees. It seems that this was a good number, as such a tilt produces the seasons as we now experience



them, and it appears to have worked well for the survival of life and the development of mankind.

Favorable Spin

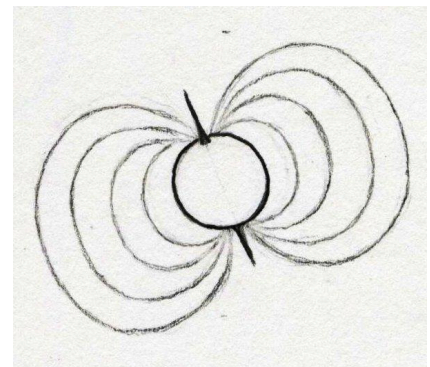
Earth's spin is fast enough that it distributes heat and light relatively evenly, causing temperatures to remain moderate. Compare this to Mercury. With a spin once every fifty-nine Earth days, it has a nearly locked rotation keeping one face to the sun for prolonged periods. Temperature differences between the side of the planet facing the sun and the side facing away from the sun are great. Venus is even more extreme, with a spin of once only every 243 Earth days. These spins are too slow to distribute heat to both sides of the planet. Crops would not tolerate such temperature patterns. Also crops would struggle to survive in the long periods of darkness. Earth's spin is much faster, allowing for more even heating and lighting.

Earth's spin is faster than Mercury and Venus, yet slow enough that the extremely violent weather patterns seen on planets with faster spins, like Jupiter and Saturn, do not occur. And if the earth were to rotate much faster than it does, it would also cause a fixation of the jet streams such that rain patterns would be much more uneven on the earth's surface.

While we are adapted to a spin of twenty-four hours, we could probably adapt to spins of less than twenty-four hours; however, it would seem inconvenient for human activity to have days and nights be significantly shorter than they are now.

Favorable Magnetic Field

Earth produces a sizable magnetic field, a result of electrical currents caused by the motion of the molten iron in Earth's core. The spin of Earth on its axis results in spinning of these electrical currents. Spinning electrical currents produce a



magnetic field. We would probably not be alive if there were no magnetic field to protect us.

Charged particles from various sources in space, especially from the sun, have the capability to wipe out life by damaging the biological molecules that make up all living organisms. However, the vast majority of space-originated charged particles that are headed to Earth are deflected while still in space by the magnetic field that stretches around Earth, and the particles never reach us. If our planet had formed in a region of the galaxy that was not as rich in heavy elements as is our solar system, the core of the planet would not contain as much iron, and this would result in a much smaller magnetic field.

Some other planets in the solar system, such as Mercury, have iron cores, but the spin of Mercury is only once every fifty-nine Earth days, and for Venus only once every 243 Earth days—not enough spin to produce a magnetic field of any significance. Thus, they have no protection against charged particles. Mars has no magnetic field because it is smaller in size than Earth. Thus, Mars has cooled down internally as it is not big enough to retain heat as well as larger Earth. Mars had a molten iron core in the distant past, but so much heat has been lost that the core has solidified. It cannot, therefore, produce electrical currents with the movement of liquid iron like occurs within Earth, and Mars has no magnetic field even though it spins as fast as Earth. Planet size, spin, and planet iron content of Earth are all just right to produce a magnetic field large enough to protect the life that exists there.

Asteroid Protection

Asteroid bombardment of Earth was crucial to the construction of the planet in its early days. But once life was established, asteroids were detrimental, threatening to destroy life. Remember that the extinction of the dinosaurs is thought to have been caused by a single asteroid collision with Earth.

There are millions of asteroids in and around the solar system. A great many of them exist in the asteroid belt located between Mars and Jupiter; these are thought to be leftover

fragments from the great cloud of space dust and rocks from which the solar system had originally formed. Occasionally, intermittent gravitational tugging on the asteroids by either Mars or Jupiter will cause an asteroid to break out of its orbit and begin to wander through space. Fortunately, the large gravity of Jupiter tends to then pull that asteroid to itself, where it will crash into the giant planet instead of potentially heading to Earth where it could be a serious problem.

Also, if an asteroid that had been wandering about outer space began to pass through the solar system, it would likely be drawn either into the sun's gravity or into the planet Jupiter by Jupiter's very large gravity. It is estimated that the number of asteroids heading toward Earth would be ten thousand times higher than it is now if it were not for the gravitational pull of Jupiter. Jupiter, and to a lesser extent the giant planets of Saturn, Uranus and Neptune, act as asteroid protectors for Earth.

UV Light Shield

UV light from stars is detrimental to life as it breaks down biological molecules, most importantly DNA. Fortunately, there are significant amounts of oxygen in our atmosphere which result in an ozone layer (ozone is O_3 , which can be derived from O_2). Ozone absorbs UV light and acts as a UV protection shield, decreasing the amount of UV light that reaches Earth's surface. This ozone layer is a unique feature to Earth and is a result of the presence of life, its related photosynthetic activity and the subsequent production of oxygen that is pumped into our planet's atmosphere. Ozone protection is not likely on any planet that does not already contain life and photosynthesis.

Plate Tectonics

Volcanoes formed by tectonic forces are responsible for spewing huge amounts of CO_2 into the atmosphere. But CO_2 does not last forever in the atmosphere. It is absorbed by the

oceans where plankton use it up through photosynthesis, or by land plants which do the same. In the oceans, CO₂ is also taken up by sea life that need it to form shells, and some CO₂ is captured in the formation of limestone rock. Further, CO₂ combines with rainwater to form carbonic acid (acid rain), which falls to the earth and contributes to the weathering of rocks, helping to form more soil.

If it were not for tectonics, the amount of CO₂ in the atmosphere would drop. But a certain amount of CO₂ is necessary in the atmosphere, not only to continue to refuel all the aforementioned processes but also to act as a greenhouse gas, to help act as a blanket around the earth, maintaining Earth's surface temperature.

In our present day, Earth has between 1300 and 1400 active volcanoes expelling large amounts of carbon dioxide into our atmosphere. Volcanic activity helps to regulate the amount of CO₂ in the air. If plate tectonics were to stop, enough CO₂ could be removed from the atmosphere that Earth would freeze. Cold temperatures around the surface, furthermore, would speed the heat loss from the core of the earth, ultimately causing Earth's crust to become too thick to move if a cold situation lasted long enough, spelling serious trouble for the existence of life.

Plate tectonics are also important for the diversity of life on our planet. Plate tectonics are continually forming new rock that increases the size of the continents. Every year, an estimated 240 cubic miles of new rock are produced, while weather, waves and other sources of erosion break down old rock into soil, much of which eventually gets washed into the sea. If plate tectonics stopped, all continents would slowly erode down to nothing, and Earth would be covered with only the ocean on its surface. There would be no mountains, deserts, forests or rivers, only one great body of water. Diversity of life would decrease, with only some sea life surviving.

Plate tectonics enhance the complexity of the environment by forming plains, mountains, ocean borders, continents, and islands. A complex environment creates more opportunities for

and challenges to biological species, stimulating more evolutionary changes than a totally flat earth or one covered by a single ocean.

As continents have enlarged over time, and have drifted about on the underlying magma, their positions affect the direction of ocean currents, sometimes opening up new passages for oceans to flow through or sometimes blocking old passages. Ocean currents convey heat from one world area to another. They affect weather and global climate, which in turn affects which species are able to survive and where they can survive. Ocean currents also affect how nutrients in the sea are distributed and therefore how creatures there are fed.

The drifting to and fro of the continents across the planet's surface causes continents to fuse together at some times and to break apart at other times; this may aid or inhibit the flow of genes in biological species. Tectonic activity then is a factor in how species continue to live and thrive, and is a factor in which species go extinct.

Large Moon

It is felt unusual for a planet like Earth, which is relatively close to its star, to have a moon. The space dust that would be needed to provide material to build a moon would be more likely drawn to the star than to an inner planet such as Earth, so most inner planets would not be expected to have any moon. For outer planets, the gravity of their associated star is not as strong at those long distances, so it is often that moons do form around outer planets. Yet, moons that form there tend to be tiny compared to the size of the planets they orbit. Note that Earth's moon is a quarter the diameter of Earth—very large for a moon. The conditions that formed our moon were highly unusual, but were extremely beneficial for us, as the moon plays several vital roles.

The moon's gravity pulls on the earth's crust. By pulling on the crust, it facilitates the action of plate tectonics, helping the plates move along and not be as likely to get stuck as one

plate slides under the other during subduction. Thus, the moon aids all the things that plate tectonics do for Earth.

The moon produces tides which play a role in the erosion of continents and the breakdown of rock to sand and soil. Tidal pools that form at certain times of the day become special environments that nurture some creatures, and tides often replenish the nutrients in coastal waters. Moonlight itself becomes a stimulus for points in the life cycle of several life forms. The moon therefore affects food supplies and some of the rhythms of life, and in that way promotes animal and plant diversity.

The moon has also been responsible for slowing Earth's spin. Prior to the formation of the moon, the spin was much faster, with days lasting only an estimated six hours. The moon's gravitational pull acts as a brake, slowing down the spin of Earth. The moon has been reducing the rate of rotation of Earth for a long time, until today when it spins at only once every twenty-four hours.

Lastly, but not least in importance, the moon prevents the axis of Earth from wobbling excessively. The tilt of Earth's axis is what causes seasons to occur. As the year progresses and as Earth orbits the sun, the angle of the sunlight striking the surface of Earth changes. Direct angles of sunlight spread the light and heat over a smaller area of the surface than do more oblique angles. Thus, it will be warmer in the summer when sunlight angles are direct, and cooler in the winter when the sunlight angles are more oblique. The angle of the sun experienced on Earth depends largely upon the tilt of the axis of Earth. If the axis were to alter its tilt, it would greatly affect the variability of the seasonal temperatures. If there were no moon, the axis would periodically wobble and deviate much further from its usual 23 degrees tilt. Wobble is influenced substantially by the gravitational pulls of both the sun and of Jupiter, and tilt would vary depending upon where Earth was in relation to either of these two bodies. Fluctuations in temperature from summer highs to winter lows would be more severe, and less consistent from year to year. This could have disastrous effects on plant and animal life.

Mercury and Venus have no moons, and Mars does not have large moons, and as a result the axis tilts of these planets can deviate quite a bit. In contrast, Earth's axis stays relatively stable with its tilt of about 23 degrees. This is because Earth's moon is so large and so close that it makes the gravitational pull from the sun and Jupiter relatively small compared to that of the moon. The moon's gravity then keeps Earth's tilt at nearly the same angle at all times. The climate does not change dramatically, and the summer and winter temperature differences remain roughly similar from year to year. If this were not the case, most of the plants and animals that had adapted to one set of seasonal variations would die off when the seasonal variations became too extreme. Those that did survive would have to face another serious challenge when the next axis shift occurred.

In recent years, astronomers have found evidence of planets orbiting other stars. Given the incredibly large number of stars in the universe, it is very conceivable that there is another planet somewhere that is similar in size to our Earth. And this planet may actually be in an orbit at an optimal distance from its star such that temperatures on that planet would allow water to exist in a liquid state. But does life exist there? If our planet sets an example for what it would take to support life, a number of very particular requirements would be needed in addition to the planet size and temperature. Would all the necessary conditions be present in one place and at one time? And even if life existed at the microbe stage, would conditions allow subsequent highly complex intelligent life to develop there?

We have seen all that Earth had gone through to allow life at the human level to occur. Is it possible that all the same events or even similar events would happen to bring about beings like us on another planet. Considering the estimate that there are on the order of 10 billion trillion (10^{22}) planets in our universe, would not there at least be a few that would be capable of supporting higher life-forms? Calculations suggest that the odds of having a planet with all the

characteristics needed to support such beings is on the order of one chance in 10^{1050} , an astoundingly and impossibly small probability!²⁶ Therefore it does not follow that the probability of finding a planet supporting life is very likely.

But could these things occur? Only God knows. If He has desired that beings exist elsewhere in the universe, He could make it happen. Just as He orchestrated the formation of our world and the life-forms that inhabit it, so He could do the same in another galaxy. After all, He is the one who created the laws of physics and chemistry, and has control over the laws of probability. God gave us a very special place to live. To look upon what He has made, and to contemplate how He might have gone about constructing the galaxies, stars, and planets; and to think about all of the things that have to be just right to support the diversity of life that our Earth possesses has to fill us with a deep sense of awe of who God is and what He is able to accomplish.

Chapter 7

FOUR WAYS OF LOOKING AT CREATION

By faith we understand that the entire universe was formed at God's command.—Hebrews 11:3

It is well known that there are varying perspectives regarding the creation story. Among the views that are most prevalent today, the traditional and the modern scientific views are quite different in their concepts and this has resulted in a difference of opinions when discussing the topic of origins. Yet even amongst scientists there are disagreements of interpretation.

There appear to be four main views concerning the development of our world. But even within these views there are many variations, with people sometimes embracing ideas

²⁶ Hugh Ross, *Why the Universe Is the Way It Is* (Grand Rapids, MI: Baker Books, 2008), 123.

somewhere between two particular concepts. Indeed, it may not be possible to categorize people's opinions as neatly belonging to one category or another. In reality, the views can be so variable that it may be possible to find a spectrum of ideas that goes continuously from one extreme to the other.

The four main views are as follows:

- 1) *Young Earth Creationism*: God is Creator; Genesis 1 is literal; the earth is young; the entire universe was created as it can be seen today in six days about six thousand years ago.
- 2) *Old Earth Creationism*: God is Creator; Genesis 1 is metaphor; the earth is old, there were multiple acts of creation in the universe that occurred periodically over millions to billions of years.
- 3) *Theistic Evolutionism*: God is Creator; Genesis 1 is metaphor; the earth is old, there was only one act of creation thirteen-and-a-half billion years ago at the Big Bang, after which the universe evolved over long periods of time by way of natural processes that were created by God in the beginning.
- 4) *Atheistic Evolutionism*: There is no God; Genesis 1 is fiction; the earth is old, the universe has evolved over long periods of time by way of natural processes that happen to exist by chance alone.

Note that old earth creationism is also known as progressive creationism by some, and that theistic evolutionism is also known as evolutionary creationism.

The discussion that follows is not intended to lead to any conclusion, but to point out the arguments that one set of beliefs use to disagree with the other set of beliefs. The reader then can take these arguments as points for contemplation.

The points presented below, giving the pros and cons for a particular viewpoint, are very brief and not fully developed explanations. In an effort to keep this book short and concise, this method of presentation is chosen. What follows could almost be considered as a series of bullet points. It is intended that these points alert the reader to a particular issue, and that if there is interest the reader could look for other writings that expand further upon these ideas.

Young Earth Creationism

Bible Interpretation

The traditional story of creation is the view held by all of Christianity up to the latter half of the 1800s and is still held by many today. It is also the view that most commonly appears in debates pitting creationism against evolutionism in the press.

The Bible is to be interpreted in its most literal sense. God created the universe in six twenty-four-hour days. The Genesis account must be interpreted literally, to add our own interpretations dangerously moves us away from the truths that are written down. The problem with trying to harmonize science and the Bible is that there is no limit to misinterpretations. The Bible is the ultimate truth, and in places where there is conflict with science, it is the Bible that must win out. If we try to interpret Genesis 1 to fit what science is telling us, what is to prevent us from interpreting the rest of the Bible, including the message of salvation to fit whatever idea we wish? Clearly, it says in Genesis that there were certain things that happened on each individual day. The book of Genesis was originally written in Hebrew. The Hebrew word that is

used for the word “day,” means twenty-four hours, not millions of years. You cannot interpret it any other way than a twenty-four-hour day.

Dating

The earth is young, only six thousand years old. This number was arrived at by adding up the ages of all the people mentioned in the biblical genealogy that starts with Adam, continuing through Abraham and on through the kings of Israel. The date of creation then is thought to be October 23, 4004 BC (first calculated by Archbishop James Ussher of Ireland and published in 1650; this is now known as Ussher's Theory).

Scientific calculations of the earth's age are not accurate for several reasons. Radioactive methods of dating are flawed and cannot be used with accuracy. Carbon-14 dating, for example, is no good beyond four to five thousand years, so to try to use it to date anything older cannot be done.

Evolutionists point to light from stars as demonstrating the age of the universe. Their mistake is that they do not take into account that light from stars was created in place such that the light only had another six thousand light-years further to travel before reaching Earth. It did not travel all the way from the star where it appears to have originated; it only looks that way as God created it in transit, partway between the star and Earth.

Some young earth creationists believe that the speed of light was actually much faster shortly after creation so that light from distant objects got to Earth right away, and it was later that the speed of light dropped to what it is now. Scientists have also used the rate of drifting apart of the continents as an argument for a very ancient Earth, but a number of young earth creationists believe that continental drift before the flood was quite rapid, then slowed significantly after the flood. Both of these concepts greatly affect how the age of the universe and of the earth are determined.

Look at how the dates of each geological period are determined. The geological column (the concept that the remains of each geological period lie one on top the other on the surface of the earth) is dated on the basis of the fossils found at a particular level. But when one looks at how the fossils are dated, it is found that they are dated on the basis of the level at which they are found in the geological column. This is circular reasoning and makes no sense. Besides, despite all the drilling into the earth that has taken place over the last 150 years or so, no complete geological column has ever been found.

When man was first sent to the moon, scientists had built large discs on the lunar landers as they had expected that millions of years of space dust would have collected on the moon's surface. It was hoped that the discs would prevent the lunar lander from sinking too deeply into the dust. Instead, they found only an inch and a half of dust—more consistent with only six thousand years of accumulation.

Origin of Life

Evolutionists claim that life on Earth originated when there was just the right combination of chemicals that self-assembled into a living cell. First of all, a simple cell is a very complex thing. Even simple cells contain hundreds of proteins, of a number of varieties, which perform multiple different and necessary functions within the cell. Assembly instructions for all these proteins are found in the DNA molecule. You must have DNA for a cell to function, and you must have DNA for the cell to multiply into more cells. You cannot explain the origin of DNA by the arguments put forward by atheistic evolutionists. The amino acid sequence needed for the DNA of the simplest cell—represented by the letters ATCG, the four amino acids that make up the DNA code—would take a book of six hundred pages of these letters in small print and in single-spaced type. The probability of this happening by chance is so hugely and phenomenally small that it is, in reality, impossible.

Random processes produce gibberish; they do not produce information. Intelligence produces information. Ask any computer programmer if typing keys at random will put any useful information into the computer. Therefore, the cell and its DNA could only have formed by means that included intellectual involvement.

The concept of spontaneous generation, which held that living organisms could arise by natural processes from nonliving matter, was disproved by Louis Pasteur more than a century and a half ago. Anyone who continued to believe in it after that became a laughingstock in the scientific community. Yet this discredited idea is now promoted by those pushing concepts of evolution.

Life will never be reducible to a physical or chemical cause. Organisms were designed such that they obey physical and chemical laws but could never come into being by these laws alone. It took a supernatural cause to do this and is why a physical cause will never be found.

Species Development

All organisms were directly created by God during creation week, and largely appeared in the forms that they are today. Some young earth creationists will agree that there may be mutations that have occurred over time—that is, changes from the original creations—but such variations are relatively minor. These would include such changes as color, or the size or shape of a particular body part. Organisms do not undergo major evolutionary changes. God designed each creature for a specific purpose, and there are limits to the degree with which variations in the organism are tolerated. If those limits are exceeded, that organism will not evolve; it will die.

Man is the crown of creation, not the evolved product of algae slime, nor an accident of physics. As man is the whole point of creation, there is no reason for a long, drawn-out period of time prior to man.

Death

Before the fall of Adam, the first man, there was no death in the world. No human death, no animal death, no plant death. We know this because the apostle Paul says it in the New Testament: through one man, Adam, death entered the world (Rom. 5:12). Therefore, the act of disobedience to God by Adam profoundly affected every aspect of life on Earth, bringing death to all. This also shows that, because there was no death before Adam, dinosaurs and all other fossils could not have died before Adam died. The majority of fossils and all the dinosaur bones were laid down in the great flood of Noah.

Fossils

Evolutionists discuss missing links in the fossil record. If there are missing links, where are they? There are some fantastic collections of fossils in museums, but there is a glaring lack of any that might be considered to be missing links. Darwin had predicted that the earth would ultimately produce large numbers of fossils that would show the sequence of evolution of one form to the next. This simply has not happened. Some minor differences in fossils can indeed be seen, but these cannot account for the evolution of one major species to another. All species were largely created without significant changes over time.

Men lived to 900 years old prior to the flood. Lizards also likely lived for a very long time, but unlike humans they just kept growing, attaining huge sizes; that's how dinosaurs came to be. Things lived a long time then because their DNA was perfect and did not yet have the time to deteriorate through mutations. Modern DNA has been affected by so many mutations that life today is much shorter. All the dinosaurs were created six thousand years ago, and they all died in the worldwide flood at the time of Noah. Alternatively, some young earth creationists believe that dinosaurs never really existed, but that God just placed bones in the ground for us to contemplate.

Scientists who accept evolution theory are not to be trusted. It has been seen that some scientists force their data to show what they have already pre-concluded. There have been instances where there were claims of having found skeletons thousands of years old, proving the existence of a missing link, only to have it shown later that the whole thing was a hoax. There was Piltdown Man and Peking Man in the last century—both were proven frauds. More recently, data was fudged trying to link dinosaur bones with the evolution of birds. And then there was Lucy, a skeleton that was supposed evidence of a missing link between apes and humans. The whole skull was sculpted on the basis of a few tiny bone chips that someone found. There is absolutely no way they could have determined skull shape on the basis of those little chips. Yet this is still held in high regard as evidence of the evolution of man. It is likely that the phenomenon of wishful thinking in the data is so rampant that no credibility can be given to any evolutionary concepts.

Adam and Eve

Adam and Eve were supernaturally created by God on Day 6 of creation week. As the first humans to live on earth, they are the ancestors of all of mankind. There were no humans before Adam and Eve. Humans did not develop from the apes. Such a concept degrades the idea that God made man in His own image. Humans are special, far superior to anything else that God created and they were created completely independently from all other animals.

Second Law of Thermodynamics

The second law of thermodynamics says that, overall, the energy in a particular system will decrease over time and will result in more organized forms transforming to less organized forms. Organized matter will naturally tend to become disorganized matter. Motions will have a tendency to run down as some energy is lost to the heat of friction. The amount of heat in a system will tend to decrease as a system cools off. It is this law of science that argues strongly

against evolution. How can a less organized life form evolve into a more organized life form? This does not follow the second law of thermodynamics. Evolution, therefore, runs contrary to one of the most fundamental of scientific laws.

God

God is the originator of the universe. The appearance of the universe from nothing can have no explanation other than God. There is no property of matter, nor any physical law, that allows something to suddenly appear from nothing. How can anyone, especially those with a background in science, buy into this? And how is it that this something that has suddenly appeared from nothing has the capability to transform itself from chaos into a highly ordered universe of galaxies, stars, planets, molecules, and atoms? This can only point to God as the director of such developments. It takes faith to believe in God, but it would seem that it is a more secure decision to put faith in God than to put faith in the concept that the universe came from nothing and say that we believe it all happened by random chance. Yes, it is not possible to see God, but everyone can see His handiwork everywhere.

Atheistic evolutionists criticize the other views for involving faith in their interpretations, but they involve faith to the same degree as the others do. They have faith that it was not God that created the universe—faith that nothing but random processes and chance determined the course of changes in the earth. Faith that life arose from nonliving matter. Faith that demonstrable minor changes within a species can be generalized to prove evolution from one species to another. Faith in the capacity of man to make sufficiently accurate scientific measurements, and to draw undeniable conclusions about how things came to be. Further, we all know that the belief that there is no God whatsoever, is defined as atheism, and that belief system, by definition, is a religion. So regardless of whether atheistic evolutionists say that they have excluded faith and religion, in fact they have not.

Old Earth Creationism

Bible Interpretation

The Bible is true—and science is true. God invented science. He created all the laws of physics and chemistry. These are His laws. Science, for us, is just a tool by which to understand the nature of God and the majesty of His creation. When there is apparent conflict between the Bible and science, we need to look at both to see where our interpretation of either is wrong. The problem lies with us, with our understanding, not with the Bible or with science.

It is not possible to abstain from interpreting the Bible as young earth creationists wish to do; a literal interpretation is, by definition, an interpretation. There are countless other passages in the Bible that require interpretation to get at the true meaning; Genesis 1 is not different in this respect. The fact that old earth creationists and theistic evolutionists interpret Genesis 1 differently than young earth creationists does not result in a different salvation theology. The understanding of who Jesus is and the need for all men to be reconciled to God are largely the same in all three of these groups.

The creation account in Genesis was not intended to be a literal account. It is rather a metaphor, just as there are many other metaphors in the Bible that describe God and His efforts here on Earth. We cannot truly comprehend the magnitude and scope of God's work. When recounting something beyond human description, it is only possible to express this in metaphorical terms. This is true for us in the twenty-first century, and it was true for those who lived thousands of years ago. While today we understand the laws of physics to a significant

degree, the people of the Bible did not. There was no concept of millions of years in ancient societies, nor of the speed of light. Therefore, the Bible was not written in terms of physics, but in terms that could be understood by people in ancient times. Genesis 1 was written to establish that God was the one who created it, and to demonstrate that He is a God of order. It was not written as a technical manual on how He did it.

Attempting to interpret the text as literal can actually be dangerous, as it could make the text say what it never intended to say. For example, young earth creationists can get very wrapped up in dealing with the semantics of the word “day” that they miss the intent of the passage. The fact is that the word “day” in Hebrew has several meanings, just as it does in English, and the specific meaning depends on the context. Note that Genesis 2 recapitulates the creation story but focuses on the beginnings of God’s relationship with humanity rather than the appearance of the cosmos. In this second chapter, the order of the creation is not exactly the same as it is in Genesis 1. Furthermore, the Hebrew text starts Genesis 2 with “in the day that God created the heavens and the earth,” where the word for “day” is the same word for “day” as in Genesis 1—except there is only one day in Genesis 2, not six. All of creation appears to happen on the same day, with no light and dark periods to separate the days. “Day” in this context would seem to mean “in the general time,” rather than “in the twenty-four-hour period.” Since the two chapters give different perspectives of creation, interpreting them in a nonliteral manner is less problematic. It is the theological truth that is important.

While young earth creationism believes that the entire creation process was by supernatural means, old earth creationism believes that God is capable of creating everything by means of supernatural intervention or by personally guiding the natural processes that He created, or by allowing the natural laws He created to be followed without further intervention. Biblical and scientific information together suggest that He used none of these methods exclusively, but some combination to construct our world.

Dating

Science is correct in saying that Earth is four-and-a-half billion years old, and that the universe began thirteen-and-a-half billion years ago. The days of creation are long periods of time, thousands to billions of years long. God's activity in creation occurred in a number of steps. Over each of these prolonged periods, He developed a new level of the environment. Then to the new environmental conditions He added a level of higher complexity to the new creatures He placed there, creations that were based on ones from the preceding period. Why did He take such a long time to do this? Again, time is irrelevant to God. Time itself is one of His creations; God lives outside of time. A billion years is not long for Him. Besides, it is thought that God was thoroughly enjoying Himself, making first one thing then another; it did not matter to Him that time was passing by.

The ideas of science are based on evidence. It does not work to add up the ages of the people in Biblical Genesis to come to the date of creation. It is very likely that the ages given for the earliest people mentioned are not their actual ages. Archaeology or paleontology has never found evidence that any man has ever lived to those ages of the early Genesis peoples. Did people even know how old they were in that day? It has been shown that less developed societies have no need to keep track of how old they are. (I saw this firsthand when working for several years in a developing country.) In our modern society, we must register our birthdate on many papers and forms throughout our lives—for school, for job applications, for driver's licenses, for taxes—but all of this is nonexistent in societies that are just beginning to advance. There, how old one is is not important.

If keeping track of someone's age were to have been something early peoples wanted to do, it is more likely that they would have kept track of time by numbering the moons, not the suns. It was not until the great Egyptian civilization that the sun was introduced as the time-keeping device, and the concept of the year came into existence. Earlier societies marked

time by the moon. If you divide Methuselah's age of 969 by twelve moons per year, you come up with 80 years—a much more reasonable number for his age.

Furthermore, archaeologists have found writings in the ancient ruins of Sumer, where the ancestors of Abraham lived. These writings give the names of kings, specifically ones who ruled before the great flood that had occurred there. These kings are listed as each reigning anywhere from 8,000 to 43,200 years. Clearly, this cannot be right. The conclusion from this is that the numbers had some significance other than age. Perhaps they were related to the number of people who answered to the king, or they had some relationship to the size of his territory or symbolized something else. Bible scholars know that numbers in the Old Testament are often symbolic rather than actual. These writings are referring to exactly the same time period as the pre-flood peoples in Genesis, so whatever the significance of the numbers, it was likely not their age. It may have been a cultural designation that people of that region used for something else. The point of the Genesis genealogies was to show the connection between Adam and Noah, and ultimately to Abraham. The numbers are only incidental, maybe symbolic, but not expected by the ancient Hebrews to be used for dating purposes.

Carbon-14 dating is only one method of dating. It can only be used on things that had been living at one time in the past. It can reasonably date things as far back as forty thousand years, or even to fifty thousand years if the technique is combined with accelerator mass spectrometry. Uranium dating can go back much further than carbon dating. Radioactive uranium-235 decays to lead-207, with a half-life (the time for half of it to decay) of 4.47 billion years. Using uranium dating, the age of Earth comes out to 4.55 billion years old. Radioactive potassium-40 decay to argon-40 has a half-life of 1.3 billion years and is also useful in dating things from early Earth. There are more than forty other radioactive isotopes that are used for dating a variety of things. Then there are the dating techniques that use radiation exposure, thermoluminescence and electron spin resonance. And there are other methods like geomagnetic polarity changes, amino acid racemization, obsidian hydration, dendrochronology,

lichenometry, and gene mutation rates. All these techniques can be applied in specific situations where dating is important. Our ability to reach back in time for dates can have limitations, but we are fairly confident that dates for Earth's age are in the right ballpark.

Dating of the geologic column—that is, dating the layer upon layer of earth and rock that were formed in the succession of all the geologic time periods—is not done by circular reasoning. Dates for these layers can be determined by using radioactive uranium or radioactive potassium measurements. Once the date of the layer can be established, then we can find what type of fossils are found in that layer. If, subsequently, those types of fossils are found in another area of the world, we can say that we are in a layer whose date we likely know. If there is a question regarding the date, potentially, it can be checked using radioactive uranium or potassium again.

It is true that the entire geological column has never been found. The earth is a dynamic place, and there is a constant shifting and mixing of the rock and soil. Partial sequences of the geological column have been found all over the world, but typically only parts of the layer sequence are identified at each place due to this shifting.

The age of the universe is based on measurements of the distances of stars and the rate at which galaxies are receding from us. This information is then plugged into physics equations, giving the result of thirteen-and-a-half billion years. The dates are all based on measurements, mathematics, and the laws of physics. They are not based on some wild theory which is attempting to eliminate the existence of God. Furthermore, it appears that the same results come up when measurements of dates by more than one technique are made, such as dating of meteorites, calculations of the cooling characteristics of the universe or measurements made on background microwave radiation, thereby strengthening the calculation of thirteen-and-a-half billion years.

One of the foundational concepts in science is that the laws of physics cannot change. Even the Bible seems to confirm this in Jeremiah 33:19–26 and Romans 8:20–22, implying that

physical laws have remained fixed throughout all cosmic history. It is impossible that the speed of light changed its rate at some time during the lifetime of the universe as some young earth creationists propose. What has been found instead is that the laws of physics give rise to an interlocking network of equations that can then be used to illustrate the vast array of physical phenomena. These equations are so tied one to the other that if one value, such as the speed of light, were to be altered, the whole system of equations would collapse. And since these equations are descriptions of what happens in the real world, it would mean that the entire physical world would collapse if the value were to be altered. We would cease to exist.

Consider Einstein's $E=mc^2$, the equation that describes the conversion of mass to other forms of energy. In our sun, some of its energy output is from this conversion of mass to energy. If c , which stands for the speed of light, were much faster at any given time in the past, the huge amount of solar energy that would have been produced at that time would have completely melted the earth away. God set these laws at the beginning, they cannot change, they are the only way that the universe can work.

Origin of Life

Old earth creationists agree with the young earth creationists that unguided evolution is inadequate to explain the origin of life, and that it required an intelligent force—namely, God—to assemble the original cell and instill life into it. Atheistic and even many theistic evolutionists, however, are reluctant to accept any idea other than that changes still follow only the natural laws without further interference from God. Even though a good scientific explanation for the origin of life has not yet been found, they keep hoping that someday new discoveries will provide an explanation.

Some evolutionists have proposed that life originated on another planet and was ultimately transported to earth. But the problems explaining the origin of life on earth are the

same problems explaining the origin of life on another planet. It is no different. Such a theory only adds the difficulty of explaining how that life then came to earth.

Species Development

Old earth creationists believe that often God separately created the great variety of plants and animals at different stages throughout each of the long geological periods. Sometimes, He likely did this to provide needed new survival characteristics for His creatures as Earth conditions had changed; other times He likely did this out of the pure joy of His creativity. Some old earth creationists believe that God supernaturally created each new plant or animal as a new organism from scratch, similar to previous organisms but not directly descended from them. Other old earth creationists believe God acted by changing an organism's DNA so that it would "evolve" into a new organism. By changing gene sequences in the DNA of plants or animals that were already alive, plants or animals would be made that had the necessary new characteristics. In either case, it is believed that God had an active part in the development of His creation as the Earth progressed from its beginning to the present day. He did not just standby passively but continued creating throughout Earth's history.

Both Theistic and Atheistic Evolutionists claim that organisms developed over long periods by an extended sequence of random single gene changes over many generations. Old earth creationists counter that organisms are complex, and if only one small step in building that organism were taken at a time, the organism would often not work. For the organism to function properly, sometimes many changes would have to happen at the same time. You can't have part of an eye, or part of a kidney, for it to work. You have to have the whole thing, and that takes many DNA changes. If there were only a part of it, it would not function properly, it would be useless to the organism, and there would be no evolutionary reason for the change to be passed on to the next generation. It would be more likely the organism would die and the DNA

change would be eliminated from the gene pool. God must have been involved in making sure that all the DNA changes could be made at once so that things would function properly as the probabilities that multiple changes at one time could happen without intervention are infinitely and impossibly small.

There is also disagreement between old earth creationists and all evolutionists regarding the Cambrian Explosion, that time span during the Cambrian Period where basically all the major categories of animal and plant life suddenly appear. Prior to this period, animal life consisted of only tiny, few-celled, very primitive creatures, most of which were no more advanced than minuscule worms. Then in a very short time (in terms of geological time spans), a great variety of animals with a wide diversity of body style plans appears. Many are large, and have fully developed, specialized body parts. Science has not yet been able to satisfactorily explain this. Old earth creationists point out that the transition is too abrupt to be explained on the basis of slow, gradual evolutionary processes. And these old earth creationists believe this is an instance where God likely intervened by interfering with the laws of probability, or in a supernatural way, to bring about the changes so rapidly. Evolutionists insist that someday a scientific explanation will be discovered.

Evolutionists claim there are skeletons that show the ascent of man from the apes. But, say old earth creationists, if you were able to put muscle and skin back onto the bones of these skeletons, it would not be difficult to distinguish which ones were apes and which were humans. This would suggest that the DNA of apes did not change by single mutations when transitioning to humanlike beings, but by many changes at one time.

It appears that chimpanzees and humans possess about 96% identical genes. Evolutionists would say that this argues that both species had a common ancestor, and humans are not that different from apes. Old earth creationists, however, argue that given there are 3 billion base pairs in human DNA, this would mean that 4% or 120 million base pairs are different in humans than those in chimpanzees, which is a very significant difference. Chance mutations

in this many base pairs, even over millions of years, are not likely to happen and still leave a functional human at the end of it. There would have to be some control of the process.

The human brain is the most complex structure known to exist in nature. No computer yet built is as sophisticated as the human brain. Evolutionists ask us to believe that this brain, with all its amazing powers, evolved from an ape brain in about five million years or less. Natural selection is not sufficient to explain this. And if the human brain were simply a product of natural selection, then what purpose does any function have other than those needed for survival? How does one explain playing chess, composing a symphony, designing spacecraft, or doing advanced research? These are not survival necessities.

Humans were made to be the pinnacle of all animal life. The physical makeup of humans does have a resemblance to that of apes, but God also provided humans with abilities and characteristics that were not given to the ape-like creatures. He gave them the ability to reason and think abstractly, to discern truth, and the ability to contemplate the future. He also instilled in them the sense that there is a higher power—a sense of God. These characteristics are what placed humans into a very special category; they were made to reflect the image of God Himself. Nothing else in creation compares.

Old earth creationists often feel that God's intermittent intervention in creation parallels God's intermittent intervention in the history of the redemption of man. God created humans, then entered into a relationship with individuals through Adam. Next, He entered into a relationship with a nation through Abraham, and finally opened this relationship to all men through Jesus Christ. It did not happen that Jesus came when humans first appeared on Earth, but there was a step-by-step process over a period of time, each step involving direct intervention by God.

Death

All the other views feel that the idea held by young earth creationists stating there was no death prior to Adam is not reasonable. Even if there had been no humans to die before Adam, Adam had to eat. Did he eat meat from animals he killed? What about the skins that he used as clothing? Even if Adam was a vegetarian, he killed plants to eat them. He likely killed insects as he accidentally stepped on them while walking. And hopefully, the bacteria in his intestines died at a steady rate, for if they did not do so, he would have been overtaken by the massive volume of bacteria that would have resulted. In the New Testament, it is more likely that the apostle Paul was referring to spiritual death—something that did not exist before God entered into a relationship with man through Adam—not to physical death. Since Adam and Eve did not physically die on the day they sinned against God (they lived for quite a few years afterward), this also argues that the death in Genesis 2 refers to a spiritual death, not a physical death.

Fossils

Most old earth creationists do not believe that fossils show a steady slow evolution from one species to the next; rather, they show that evolution occurred in a more stepwise fashion. While some old earth creationists believe that God supernaturally created each new species from scratch, basing the new design on a preexisting pattern, many other old earth creationists believe that God started out with the first cell as the common ancestor to all subsequent living creatures. To make new species, He altered the DNA of a preceding species, often employing multiple changes at the same time. Either of these two possibilities then led to the stepwise evolution that the fossils appear to show.

Old earth creationists generally agree with young earth creationists that there are insufficient numbers of fossils that have intermediate forms which could be used to verify a steady slow evolution of species from one form to the next. Many of what are being called missing links, they feel, are just variations within family groups. As there is great variation in size

and appearance amongst humans, so there will be variation amongst fossils. The evidence of a slow transition from one species to the next is lacking.

All old earth creationists disagree with young earth creationists who give the flood as the cause of the fossil record. The fossil record is far too complex to be explained by a single flood episode. In the Gulf of Mexico, for example, the depth of the fossil record goes down into the earth five miles; there are layers and layers of rock, each formed under different geological conditions. It would be very difficult to accept a one-time flood as producing this phenomenon. Also consider that if all the fossil plants and animals were alive between Adam and the flood, there would have been so many organisms that they would have been crawling over each other many feet deep on earth's surface. Furthermore, while archaeology does show evidence of large floods in some localities, there is no evidence for a flood that enveloped the entire world at one time.

Both old earth creationists and theistic evolutionists take issue with young earth creationist ideas that dinosaur bones were just put into the earth for us to contemplate—or for that matter, that light from galaxies outside our own galaxy simply gives the appearance of having come from a longer distance away. That anything would have an apparent history rather than a real history makes for the problem of God giving fictitious information. This cannot be the case. God is not in the business of being fictitious.

Adam and Eve

Most old earth creationists believe that Adam and Eve were real persons, not just literary figures. The genealogies in the Bible put Adam as an actual historical person, and the apostle Paul compares the life, fall, and death of Adam to the life, death, and resurrection of Jesus. This would carry much less impact if Adam were merely a literary character.

If Earth were created only six thousand years ago as young earth creationists believe, and Adam and Eve appeared around this same time, it would be problematic to expect the

world population to have reached present-day levels in that short of time. It should take many more years for the population to reach the several billions of people on earth we have now. This has caused some to think that maybe Adam and Eve were created much earlier than we had previously thought, perhaps tens or even hundreds of thousands of years ago.

There are old earth creationists, however, who object to this idea. Not to consider Adam as the ancestor of all people today could be thought to be a contradiction to Scripture and could result in significant adverse theological repercussions. Yet, the Bible's description of Adam's world is not consistent with a deeply ancient time, leading other old earth creationists to believe there is a better explanation. They judge that contradictions regarding the timing of the appearance of Adam and Eve do not occur if we consider Adam and Eve to be spiritual ancestors rather than physical ancestors.

Some believe that while Adam was indeed a historical person, he was only the ancestor of all Jews today. In this case, Adam's creation six thousand years ago would not be impossible, as there would have been enough time for the population of Jews to reach the present levels. Then, since many Christians view Jews as their spiritual ancestors, so too then is Adam the spiritual ancestor of Christians and through Adam the spiritual fate of all subsequent humans has been decided.

Second Law of Thermodynamics

Young earth creationists use the second law of thermodynamics as an argument against evolution. The law states that all energy will tend to become more disorganized over time. Young earth creationists say that this means that the amount of energy available in a system will always decrease, and therefore, evolution could only result in more primitive organisms as time goes forward, not more sophisticated ones. Old earth creationists, theistic evolutionists, and

atheistic evolutionists all respond to this by saying that while it is true that the total energy in a system will follow the second law of thermodynamics, it is possible for a biological system in one part of the universe to become more organized if it takes in additional energy from some other part of the universe. Biological systems on earth take in energy from the sun, for example, giving them the additional energy they need to develop a higher level of organization. In this situation, it is the sum of the energy of the biological systems on earth plus the energy of the sun that is still following the second law of thermodynamics. Evolution to higher and more organized forms on Earth is thus not ruled out, but in fact does occur.

God

Atheistic evolutionists object to including God in any discussion about origins, but the other three views say that the evidence of God's work is all around us. God does not exist, atheists say; no one has ever seen Him. But, reply the other views, while you cannot see the wind either, you know the wind is there because you can see what it does. It is like that with God also.

Consider the principles that are used in the historical sciences (archaeology, paleontology, and even forensic science) to determine whether a discovered object has been produced by an intelligent creator of that object, or whether that object is the random product of natural causes. The scientific principles here involve probability, pattern, and purpose. First, what is the probability that this object was a random formation? If the object appears to be well-formed, it would be said that the probability is high that someone made it, and not likely attributable to chance. Random processes will not produce a precision product. Second, does the object show any patterns? Recognizable patterns make it more likely that someone made this object. And third, can a purpose be described for which this object would be used? If the answer is yes, it is more likely that it was formed by someone who gave the object a reason to exist.

Look at nature all around you—an almost infinite number of things in your environment can be seen that fulfill the above requirements leading to the conclusion that these things were made by an intelligent being. Followers of God will have no trouble perceiving this, but those who are not followers will resist such an interpretation. To recognize the work of God is to admit the existence of God, and this would have great implications for how life is lived.

Suppose you heard that someone had just won the multi-million-dollar state lottery. Out of the thousands of ticket buyers, maybe hundreds of thousands, that person was the lucky winner. The probability that he would win was exceedingly small, but he won. Then, you heard that the person who won the national drawing for a luxury car was the same person who had won the state lottery. What are the odds of that? Two wins at lottery in a row? Next you found out that the winner of the huge powerball jackpot was the same person who won the previous two lotteries. Now questions are being raised. Is this truly random chance? It seems more likely that there is an influence that is driving the outcomes of these events. Someone has decided what the outcome should be and has interfered to make it happen.

It is like this when looking at how creation came together. There are so many events that have an extremely small probability of occurring, yet they all seem to occur nevertheless, one after the other, and the timing of each occurrence also defies the odds. The only good explanation is that someone is influencing the probabilities to make them happen in this way, and that someone can only be God. Yet atheists casually cast off the impossible improbabilities as being just lucky. This is foolishness!

There are several high points in the story of the universe that underscore the power of God and the input of His genius mind. These include the Big Bang, the sudden appearance from nowhere of an unfathomable volume and intensity of energy; the fine-tuning of the laws and constants of physics and chemistry; the uniqueness of Earth; the improbability of the appearance of life; the specified complexity of information in DNA; the Cambrian Explosion. Perhaps others can be named. Chance or natural laws are not sufficient to explain these things

to have occurred in an undirected fashion. The only way to explain these things is God, who made them to be.

Theistic Evolutionism

If you are familiar with the atheistic evolution that is taught in the public schools and accepted by the popular media, you will recognize theistic evolution. The beliefs of these two views are nearly the same, except for one very important distinction: theistic evolutionists believe it was God who created the Big Bang and put into motion the processes that allow evolution to occur. With all the laws of physics and chemistry, and all the laws of probability that God established prior to creation, God knew He had made systems that would not need additional input from Him to guarantee the arrival of man—and that Earth, as it would evolve naturally, would be a good place for man to live. God created the mechanisms of evolution, and they were sufficient to bring the creation to where we are today without additional interference from Him over the last thirteen-and-a-half billion years.

Bible Interpretation

Theistic evolutionists believe similarly to old earth creationists regarding interpretation of the Bible. Genesis 1 is written as a metaphor which may give some of the broad brushstrokes of how creation developed, but the details are hugely modified so that ancient peoples would be able to understand them. In ancient times, seven was a symbolic number signifying completeness, therefore the story describes the first seven days not as real days but to symbolize that on the seventh “day,” the whole process was complete. The point of Genesis 1 is not how creation happened but who did it, and that humans as well as the entire universe exist at the will of God.

Both the Bible and science are true. God invented science; therefore, science is true. Young earth creationists have been trying to stretch science to match their ideas for many years

without convincing success. This suggests a serious problem for them, and it will only get harder with further advances in astronomy, geology, and paleontology. Young earth creationists, however, say that any difficulties they have with science only means that there are either flaws in our understanding of the evidence, or that new scientific concepts have yet to be developed that will change this situation.

Dating

The Earth is old—four-and-a-half billion years old—and the Universe was created thirteen-and-a-half billion years ago. The days of creation are millions of years long or more. To paraphrase Scripture, one day in the eyes of the Lord is as a billion years. God is not bound by time; time too is one of His creations.

The universe had to be old for humans to arise through evolution. All the chemical elements needed for life were forged deep in the interiors of stars. Several cycles of stars forming, then exploding, had to occur before there were enough necessary elements available. This process required billions of years. The sun, a later-generation star, began its life about nine billion years after the Big Bang, and it took time for the Earth to form from the same stellar debris. Then on Earth, it took a few billion years before organisms became multicellular, and several hundreds of millions of years to produce more and increasing numbers of complex animals. The universe is so old and so big because it had to be around for the length of time it took for humans to appear, and it had been expanding that entire, very long time.

Origin of Life

Theistic evolutionists do not necessarily agree with old earth creationists who believe that God intervened at the point of the origin of life. Some feel that the natural processes that God set up in the beginning were enough to cause the beginning of life. Life was included in the

package of capabilities of nature from the very start, and it was the intention of God that this would happen.

There are other theistic evolutionists who do feel that the origin of life was something very special and not within the abilities nature has been given. For them, it is felt that special intervention from God was needed for life to begin. How life suddenly and drastically diversified at the Cambrian Explosion, however, is thought to be best explained by natural processes, even though it does not appear that science has yet found the most satisfactory solution to describe how it did occur. In future years, perhaps the explanation will be found.

Species Development

All life-forms share a common ancestor. God created the first organisms to have the ability to transform through adaptation, genetic diversity, mutation, and natural selection. These abilities, given by God, have taken us from the first form of life to the incredible variety of life-forms that have existed throughout Earth's history. Much of evolution appears to involve random processes, but these random processes function within a framework that can nevertheless produce the desired outcomes. Chaos theory in mathematics, for example, holds that patterns and systems can sometimes develop from seemingly random states.

The laws of nature, or ordinary miracles as defined earlier, are the primary way in which God has physically interacted with His creation. As God created these laws, God's hand is in everything that occurs, so it cannot be said that nature runs on its own accord. The idea that God is less involved with ordinary miracles than with supernatural miracles is mistaken thinking.

There should be no objection to the idea that humans are ultimate evolutionary outcomes that began with a common ancestor. From the DNA in the first cell that appeared on Earth 3.8 billion years ago, multiple evolutionary changes in the amino acid sequences of that original DNA eventually led to the human species. While humans and animals are made of the same physical materials, humans and animals are not the same. Belief in this is no different

than believing that rocks and animals are different despite both being made up of atoms that at one time were formed deep in the cores of stars. We are only referring to the physical makeup here. Rocks and animals are different because animals have life and rocks do not. Humans and animals are different because humans have capabilities that are far beyond those possessed by animals. While there is a range of human-like abilities in some animals, they are only partially evident. Only in humans do they reach the highest level. The distinctive characteristics of humans are consistent with being made in God's image. No animal has knowledge of God, nor is any animal able to relate to God. The physical makeup is the same, but the spiritual makeup is the quality which separates man from the rest of creation.

Death

Theistic evolutionists agree with old earth creationists that death existed before Adam. Genesis says that Adam was formed of the "dust of the ground." This is a phrase used in Sumerian literature (the culture from which Abraham and his ancestors came), and it implies that Adam was a mortal creature who was subject to dying from the day he came into existence.²⁷ The Bible does not say that Adam had an immortal body. The idea that Adam would have physically lived forever if he had not sinned was derived from the writings of St. Augustine around 400 AD. St. Augustine admired the ancient Greek philosopher Plato, whose ideas led Augustine to propose that Adam could have avoided physical death. The theme of the whole Bible is the covenantal relationship between God and man; it is speaking of spiritual concepts. Therefore, the story of Adam's fall is referring to a spiritual death, not a physical death. As 1 Corinthians 15:22 (NKJV) says, "For as in Adam all die, so in Christ all will be made alive." This suggests a spiritual situation.

²⁷ Carol A. Hill, "Original Sin with Respect to Science, Historicity of Genesis and Traditional Church Views," *Journal of the American Scientific Affiliation*, Vol. 73, No. 3 (September 2021), 138.

Fossils

The relative lack of fossils that show a steady transition from one species to the next is a bit like the question of the glass being half empty or half full. Theistic evolutionists feel there is sufficient evidence for the transitioning of species, and that in the future paleontologists will uncover more transitional forms that will settle this issue. They believe that young earth creationists and old earth creationists are on dangerous philosophical grounds when they propose God as creating a new species to explain the gaps in the fossil record. Because what will happen when, in the future, the gap is filled by a new discovery that goes along with evolutionary transition? The God of the Gaps then becomes discredited. It is better to leave it open that God could have allowed evolution to occur, and not embarrass oneself to the rest of the world if transitional fossils are found later. Young earth creationists and old earth creationists counter that to do so is to actually deny that God could have been the involved Creator that He is.

Adam and Eve

Theistic evolutionists have a range of thoughts about the identity of Adam and Eve, including: 1) a *Homo sapiens* pair selected by God about 200 thousand years ago, who are essentially ancestors of all people living today; 2) a *Homo sapiens* pair who lived somewhere between forty thousand and six thousand years ago, and were selected by God to represent all of mankind; and 3) a pair of humans who were not real people but literary figures representing all of humanity.

In the last few years, genetic studies regarding the mixing of genes from various populations on earth have suggested that a couple who existed six thousand years ago could in fact have their genes found in all humans alive today.²⁸ This could actually make Adam and Eve

²⁸ S. Joshua Swamidass, *The Genealogical Adam and Eve: The Surprising Science of Universal Ancestry* (Downers Grove, IL: Intervarsity Press, 2021), 175.

physically ancestral to all of us. However, for this to occur, there would have to have been humans alive before them to pre-populate the world.

Second Law of Thermodynamics

Theistic evolutionists agree with old earth creationists and atheistic evolutionists that the second law of thermodynamics does not mean that evolution to more sophisticated biological systems is prevented, as young earth creationists have tended to claim. If one part of the creation is able to take energy from another part of creation, then the first part can develop into a more organized entity. It is then that these two parts of creation, added together, that are still following the second law of thermodynamics.

The orderliness of life-forms that have resulted from evolution has a lot to do with the incredible orderliness of the natural laws themselves. As one dives deeper and deeper into the natural laws—that is, going from the macro scale to the micro scale to the molecular scale to the atomic scale to the elementary particle scale—one sees great structure and symmetry on all levels. The design of the natural laws is extremely intricate and precise. Life-forms on the macro scale are a reflection of these natural laws. If the natural laws had been less intricate, the second law of thermodynamics would have more likely led to poorer outcomes as evolution proceeded.²⁹ God built this orderliness into His natural laws during the pre-creation.

God

Young earth creationists and many old earth creationists disagree with theistic evolutionists in how God involves Himself with His creation. Theistic evolutionists, they say, have God initiate the Big Bang but then have Him stand on the sidelines, not taking an active part from that point. This sounds a lot like the beliefs of the deists of the 1700s, who held that God wound up the world like a big clock then just let it do what it would do on its own from there.

²⁹ Stephen M. Barr, *Modern Physics and Ancient Faith* (South Bend, IN: University of Notre Dame Press, 2003), 23.

Theistic evolutionists respond by saying that God does continue to watch over His creation. He sustains all space and time; by His choosing, these continue to exist, and His natural laws are constantly maintained by Him. Without God's hand, the laws of nature would fall apart. He works through those natural processes He set up at the beginning.

Although there are some theistic evolutionists who feel that God will occasionally influence the probability of a particular outcome, most say He does not generally interfere with the laws of nature. And to say that God intervened in the various geological time periods by populating them with new creations, as some of the old earth creationists are proposing, brings with it the problem of "God of the Gaps," which is a very unsatisfying situation. What will their position look like if scientists find stronger proof of a steady transitional evolution? Theistic evolutionists do believe in miracles, but in the Bible, miracles are extraordinary acts that God performed specifically to show humans His character, or to redeem someone. Why would God perform such extraordinary acts prior to the appearance of man?

Atheistic Evolutionism

Bible Interpretation

Science is the ultimate truth. In places where the Bible and science appear to conflict, it is science that must win out. Regarding the origin of the universe, we need to leave the Bible out of the discussion entirely. The Bible is total fiction and contains no shred of truth on this subject. The universe came into being spontaneously by itself. How the Big Bang occurred has not been explained yet, and it may be that we will never know as we have no way of getting information from anywhere outside of our present universe. To drag ancient writings into this is unnecessary; ancient people had no concept of science. All that exists can ultimately be described in terms of mathematics, physics, or chemistry. That is all there is.

Dating

The earth is four-and-a-half billion years old, and the universe thirteen-and-a-half billion years old. There are a variety of measurements that can be made which tell us the answer to the question of how old these things are. Remarkably, the same answers come up if we compare the results of different ways of measuring, so we are quite sure that these numbers are correct.

Origin of Life

All life shares a common ancestor. The first living organism arose through the action of chemistry and the nonliving environment. Conditions were such that a living cell developed from the chance arrangement of certain types of molecules, and that resulted also in the ability to replicate itself. It does not matter that a scientific explanation which satisfactorily details the mechanisms of how this happened has not been found. In time, it will be able to be explained.

Species Development

Through adaptation, mutation, and natural selection there has developed an incredible variety of life-forms over these last 3½ billion years. All of this takes place by natural law, there is no supernatural power to guide it along the way. Random processes are important to our understanding of how we have arrived at where we are today, as things could have turned out very differently. Sharing the same origins with other animals shows that humans are little different from other primates. There is nothing radically unique about humans; they are made of the same material. By chance, you and I exist. We are not here for a purpose; there is no such thing as a soul.

Death

As soon as there was life, there was death. The two go hand-in-hand; they have never been apart. There was never a period where there was life but no death.

Fossils

Fossils are strong supporters of evolution. More fossils are found by scientists every year, and the picture is steadily becoming clearer that species slowly transitioned from one to the other as time progressed.

Adam and Eve

Adam and Eve are fictional characters and have nothing to teach us.

Second Law of Thermodynamics

Atheistic evolutionists agree with old Earth creationists and theistic evolutionists on the manner in which more highly organized species can occur while still obeying this law.

God

It is agreed that the probability is infinitely small that the universe formed when all the atoms and other various components combined under what seem to be extremely finely tuned forces. But the fact that the universe exists says that we just got lucky and that all the right numbers came up, for if they had not, we would not be here. There is no God; He was not involved. All of this has occurred as a result of overwhelming good fortune. The universe is a great, cold-hearted, purposeless machine. All is just a conglomerate of atoms and chemical reactions.

Old earth creationists and theistic evolutionists counter that the claim showing that God is not involved is totally false. Science cannot prove God, but neither can it disprove God. Atheists fail to see the hand of God in creation because they have first concluded that God does not exist, they then twist their ideas of origins to verify their preconceived conclusion.

A key message found in the above discussion of the four views of the origin of the universe is that there is more than one Christian view of creation. In the past, there was only a single view—young earth creationism. But with new evidence coming in by way of science since the twentieth century, a number of Christians have rethought their positions, resulting in additional views that take the known science into account. So, when a discussion about creation arises, there should be an awareness that there may be persons who do not hold to the traditional young-earth way of thinking. Why might this be important?

In the creation-evolution debate, a large portion of the Christian community strongly rejects the concept of evolution. One costly outcome of the controversies created by these debates is the difficulty that may develop when a traditionalist shares with others about who God is and what He has done. If someone who considers himself to be scientifically literate is led to believe that he must reject what he considers to be solid scientific concepts in order to accept the Christian message, a stumbling block has been put in his path. When the majority of biologists, geologists, chemists, astronomers, and physicists all agree that Earth was formed four-and-a-half billion years ago in the context of a universe that came into being thirteen-and-a-half billion years ago, what must be the approach of Christians who are discussing spiritual matters with those who hold science in high regard? If it is to present ideas that make no scientific sense, these others may turn away. But it is not necessary for this to occur. There are many Christian believers who share newer scientific views, and they may be

more effective in such situations in helping others to know the God who made heaven and earth.

The creation-evolution debate is not as straightforward as the press makes it out to be. In the media, it is almost always young earth creationism versus atheistic evolution. But Christian beliefs cover a greater spectrum than just young earth alone. Many atheists' arguments against Christian beliefs become invalid when compared to the other creationist views.

Is it important that you personally believe one Christian view or the other? There can be very heated arguments over this topic about who is right and who is wrong. While I think it is very helpful to build our personal ideas about God and to form our inner framework of understanding about how God interacts with His world, I also think that our ideas of how creation took place are of secondary importance. When we come to the end of our lives and stand before God, it will not matter whether we are young earth creationists, old earth creationists, or theistic evolutionists. The truth is, we have no real way of knowing how God actually put His creation together. We do know that our human understanding is imperfect, and how we believe that God formed the universe will never change how He truly went about it.

All Christians can accept that God is all-powerful and that He has the capability to use the natural laws He has created, or that He can use His supernatural abilities to rise above the natural laws and achieve things by miraculous happenings. Therefore, I do think that we must all remain open to the possibility that we ourselves have not understood God's actions at creation correctly, and that someone else may have ideas that are closer to the truth.

When we stand before God at the end of time, what *will* matter is that we call Him Lord, and that we claim His promises to us through Jesus Christ. Everything else will ultimately have no significance. It will not matter whether we are United Methodist, Catholic, Lutheran, or Presbyterian. It will also not matter which of the Christian views on creation we feel is correct.

If you have been confused by the things you had heard at church, if you have had difficulty reconciling the concepts you have learned from science with ideas that some church people have relayed to you, then know that there are Christian views that you can hold that do not result in conflict. It is not necessary to leave God and the church behind. The various views on creation and evolution presented here are only ideas that help us understand the world in which we live. It is not required to choose one view or another to enter into a relationship with God. He will meet with us whatever approach that we take regarding this subject. The God of heaven and earth, however, does desire that you open your heart to Him, and to let Him be your guide through life.

It *is* important, then, that we understand that God is the originator of the universe. If God were not involved, then galaxies, stars, and planets all formed as a result of complete chance. Then, by chance, chemicals combined under just the right conditions such that life arose. Then every organism on Earth is the result of natural selection of random mutations in the descendants of the first life-forms. And somewhere, a couple hundred thousand years ago, humans evolved by an undirected process. And if we know that humans came into existence by an undirected process, then sin becomes a very difficult concept to explain. If human behavior is the product of natural selection, there is no right or wrong. I can do whatever I want. There is no responsibility. Guilt is a fabrication. There is no evolutionary explanation for what is said to be morally correct. If the universe functions without God, there is no need for salvation through Jesus Christ. There is no point to life; we are aimless and meaningless in our existence.

The outcome of the false idea that God does not exist is that we ultimately have no value. Nothing we do is important, life is short, so grab what fleeting pleasure there is for the moment, take the path of least resistance, we will never be remembered anyway. This is a prescription for a ruined life on a personal basis, and If everyone believed this way, it would be a recipe for societal chaos and a most depressing, hopeless reality.

But God is, in fact, very much alive and present. Look at the world outside your window, then look in the mirror at yourself. Think of all that God has done in the past to make you today. Examining how the universe and the natural world came to be shows abundant evidence of a work that can only be realistically explained as coming from the mind of God. The Bible teaches that God gives meaning and value to each one of us. Who we are and what we do *is* important. It is God who placed us here on this wonderful Earth He has made. And as individuals, we can know Him who created us and has given us life. God has revealed Himself to us through what is written in His life-instruction book, the Bible; through the natural world that is all around us; and through the many ways we can experience Him on a daily basis in our own lives. The God that created the universe is looking for you, and wants to have a relationship with you, that you may have real life deep within your soul. A life with God is a fulfilled life. He, the Creator and Sustainer of the universe, offers that kind of life to you.