BIBLICAL GEOLOGY 101

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Preface

Geology is foundational to creation science. With a little knowledge of geology, you can discover remarkable evidence for biblical Earth history—especially evidence of Noah's Flood. Geology seen through biblical glasses will help you understand geologic features in a new and faith-building way. The reader will discover that the first attacks on the Bible were by self-named 'Enlightenment' intellectuals in the 1700s and 1800s who discounted Noah's Flood and the short timescale of Scripture determined by Genesis 1–11. These assertions were made for philosophical reasons, and the evidence was interpreted with that philosophy already in place. When we realize this, the alleged evidence for millions of years simply evaporates. The supposed contradictions to the Bible are based on the worldview of *naturalism* that has been assumed since the so-called Enlightenment. Geology was the wedge that ultimately opened the door to the theory of evolution.

Understanding the basics of biblical geology increases our confidence in the consistency of Scripture. God is true not only in faith and morals, but His revealed word (the Bible) is reliable and trustworthy in all areas. With a better understanding of the issues, we are better able to stand our ground against attacks from our secularized culture (and sometimes from within the professing church itself) concerning the integrity of the Bible. This knowledge will help us to prepare the next generations who receive the brunt of secular indoctrination. It is our hope that, after learning the principles we outline in this book, young people will understand why the culture teaches millions of years and evolution, and why this is wrong.

In the first nine chapters of the book of Proverbs, 'Wisdom' is calling out to anyone who is willing to gain knowledge and wisdom. Wisdom begins with the fear of God, and we would do well to pay attention to this. Another principle is stated in Proverbs 18:17: "The one who states his case first seems right, until the other comes and examines him." Naturalistic scientists have presented their case first. We have an alternative that explains the evidence better. We need to understand how to examine and refute the prevailing cultural origins story.

This book will start with a discussion of the history of the Enlightenment and its eventual takeover of the culture. The goal is to reveal how origins is a worldview issue. We will then begin to study the rocks from a biblical point of view. We will use the biblical geological model of the Flood to connect the real-world observations of geology to a Flood framework—which is superior to the prevailing old-earth frameworks in explaining the data. We will end with the aftereffects of the Flood, specifically concentrating on the Ice Age. The Ice Age can explain numerous mysteries, as we will discover. This all points back to the Flood as a real event in Earth's history. Many references will be provided for those who want to dig deeper, and a glossary for bolded words in the text is provided for the reader's convenience.

Chapter 1

The blessing of learning a little geology

Many people are convinced that **science** has proven the Bible wrong. This belief is reinforced by what is now taught as 'fact' in public schools, popular books, and by most of the broadcast media (TV, radio, internet, etc.). Scientists confidently declare the earth is billions of years old, the first cell evolved from chemicals, we evolved from the first cell, and that it took millions of years for the rocks to form. Geologists point to dozens of processes going on today, claiming that these prove 'millions and billions of years'.[1] Confusion abounds, especially for the person who believes the Bible is God's Word.

Most of this is based on the thought that 'the present is the key to the past'. On the surface, this phrase makes sense. We see all sorts of things happening around us today: slow erosion of soil, slowly meandering rivers, slow sediment buildup at river mouths, etc. Is it possible that present processes are *not* the key to the past? What does the Bible tell us? What does geology *actually* say? Could a massive cataclysm (that is, Noah's Flood) have had a dramatic effect on the earth's geology? If so, what we see happening today cannot be used to exclusively explain the geological features we see around us.

Nearly every ancient civilization speaks of a global watery cataclysm similar to the one described in the Bible. Comparing these ancient flood records shows us that the Hebrew Scriptures are the most believable.[2] You can read the biblical version for yourself in Genesis 6–9. The Bible tells us the reason for the global Flood (man's sin) and a timeline of events during the Flood year. It gives us enough details that we can flesh out a model of the Flood and compare it to what we see in the rock record. Looking at geology from the biblical point of view illuminates our understanding of the Flood and the Bible. The agreement is remarkable!

What is geology?

Geology studies the non-living parts of the earth. 'Geo' means *earth* and 'ology' means *the study of*. Geology is officially defined as, "The study of the planet Earth, the material of which it is made, the processes that act on these materials, the products formed, and the history of the planet and its life forms since its origin."[3] And, since earth is made of rock, geology in one sense boils down to simply the study of rocks. Geology includes studying the processes of rock formation, erosion,

sedimentation, and fossilization. The field of geology interacts with many other scientific disciplines and is subdivided into specialties. For example, a geologist who specializes in the chemistry of the rocks is called a geochemist.

The benefits of studying geology

Christians can benefit greatly from learning a little geology. Studying geology from the biblical point of view reveals the remarkable verification of Genesis Chapters 6 through 9. Geology gives solid evidence that the Bible is true, and studying it will prepare you to counter many different criticisms of biblical origins. Historically, geology has been a powerful tool used to assault the Bible, and the belief in deep time led directly to a rejection of the biblical origins account. Yes, **evolution** started with geology! Yet, it was not the direct observations of geology that led to evolutionary **theory**. The *misinterpretation* of these observations was the issue.

But before we dig any deeper, a lot of the confusion can be cleared up if we understand what science *is* and what it *is not*.

What is science?

A classical definition of science is: "… a search for truth through repeated experimentation and observation."[4] Notice that this definition depends upon observations and experiments. Science is what we see, feel, touch, or observe directly, or by artificial extensions of our senses using things like microscopes and telescopes. Scientists have a method to arrive at scientific truth in the natural world. It is called the **scientific method** and is fleshed out in the in-depth section at the end of the chapter.

However, over the years something of incredible importance has crept into the study of science. Starting with the Enlightenment philosophers of the 1700s, science as an enterprise began to be taken over by men who only accepted ongoing natural processes as explanations. The belief that natural processes can explain everything that has ever happened, is happening today, or will happen in the future is called **naturalism**. Notice that the bedrock of modern science is a *belief*.

Of course, we do not expect God—who is a God of order, not chaos—to reach down and mess up things in our laboratories.[5] Yet, there is no reason to accept naturalism either, especially since it cannot explain the most important thing: origins.[6] Since many scientists claim that naturalism also applies to the past, in their minds this automatically eliminates Creation and the Flood from consideration.[7] As the philosopher Alvin Plantinga said:

> For example, if you exclude the supernatural from science, then if the world or some phenomena within it are supernaturally caused—as most of the world's people believe—you won't be able to reach that truth scientifically.
>
> Observing methodological naturalism thus hamstrings science by precluding science from reaching what would be an enormously important truth about the world. It might be that, just as a result of this constraint, even the best science in the long run will wind up with false conclusions.[8]

He uses the term '**methodological naturalism**' to indicate that naturalism is being used as a method, that is, a means or set of rules by which the practice of science is carried out.

Science and interpretation

The key to science is observation. According to the scientific method, if something is not or cannot be observed, it is not science. Also, observations need to be repeatable for the evidence to be accepted. But repeatable observation is only the first step. Once a scientist records their observations and experiments, they must be *interpreted*. Hence, there are two aspects of geology: the observations and the interpretations. There is nothing in

observational geology that contradicts the Bible. It is certain *interpretations* of the observed results that contradict the Bible. But these interpretations depend upon our assumptions about the past.

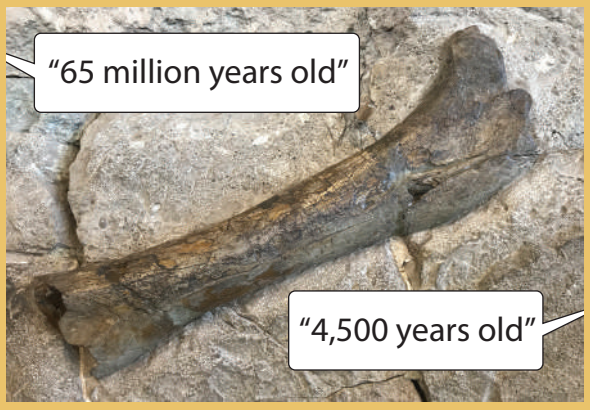
Two competing worldviews

When making interpretations about the past, there are two primary, competing **worldviews**. One is naturalism, which we defined above as the belief that nature is all there is and that everything came about without God. Another word for this is **materialism**. The other worldview is the biblical worldview, where we look at the observations of geology and interpret them from the lens of the Bible (figure 1.1).

Genesis 1–11 is written in historical narrative and meant to be taken as straightforward history.[9] Some may object that there are other religions, worldviews, and religious versions of history. This is true, but the purpose of this book is to compare the biblical and naturalistic worldviews. Other religious concepts are incomplete or inadequate to explain origins or contain internal contradictions. The biblical worldview possesses a reasonable summary of past events (like Creation, the Fall, the Flood, and the origin of languages) and a reasonable explanation of where things came from. The Bible also gives us the reason *why* we can understand what we see. Plus, objective evidence exists that the Bible is true, some of which will be presented in this book.

Figure 1.1. Creationists and evolutionists have the same facts, but different interpretations of those facts based on their worldviews.

Figure 1.2. A dinosaur bone unearthed with no date.



Keaton Hailey

Figure 1.3. A scientist's worldview dictates how old the bone should be.

Perhaps this can best be explained with an illustration. **Paleontology**, the study of fossils, is closely connected to geology. When a paleontologist digs up a dinosaur bone (figure 1.2), the bone and the rock containing the bone is directly observed. Any interpretation about when they lived, when they died, and how they were fossilized goes beyond what is directly observed. Any assigned date (figure 1.3) is based upon many assumptions.[10] Hence, the naturalist will give it a vastly different date than the biblical creationist.

Operational versus historical science

Another way to understand the issue of origins and how it affects science is to think in terms of **operational science** and **historical science**. Operational science deals with things we can observe, test, and repeat *in the present*. It is the science that gave us airplanes, computers, and cell phones (figure 1.4). Making accurate observations while we describe rocks and fossils is also operational science. But historical science

Figure 1.4. Operational versus historical science. One is concrete and is based on what we can know. The other is abstract and is based on what a person believes is true.

Figure 1.5. The Grand Canyon National Park, United States.

is different. Since history cannot be directly observed, and since history is not repeatable, the study of things that happened in the past is not the same thing as studying things that happen in the present. Thus, operational science, which deals with the way things *work*, is different from historical science, which deals with the way things *were* or *how they began*. The creation-evolution debate is not about the boiling point of water or the force of gravity. It is about ideas of history that cannot be directly measured.

But when we are talking about the historical sciences, there are other assumptions we have to make before the discussion can proceed. Traditionally, a scientist who assumes naturalism also assumes **uniformitarianism**. This is the belief that everything in history pretty much happened at the same rate. It is true that most things in geology happen very slowly today. Erosion, sediment building up in river deltas, carbonate rocks dissolving due to rainwater, cave formation, etc. are all very slow processes *today*. However, catastrophes have happened in modern times. For example, the Mount Saint Helens volcanic explosion in 1980 left huge amounts of sediment buildup and carved deep new canyons in the landscape. Since such events are not debatable, and since they can make huge changes to geology, most geologists today would follow the principle of **actualism**. That is, they acknowledge that catastrophes do occasionally occur, and they do occasionally leave a dramatic record. A belief in actualism does not make a catastrophist out of a geologist. They still believe in deep time and 'slow and gradual', but they do allow for occasional meteor strikes or volcanic eruptions to leave marks in the record.

The Grand Canyon gives us an important illustration of how historical science works. A geologist who assumes naturalism will look at the Grand Canyon (figure 1.5) and conclude that the Colorado River must have carved the canyon slowly over millions of years. This is the '*a little water over a lot of time*' **hypothesis**. A geologist who assumes biblical history will look at the Grand Canyon and conclude that a lot of water catastrophically carved the canyon quickly. This is the '*a lot of water over a little time*' hypothesis. They draw radically different

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Figure 1.6. Different interpretations of canyon formation (Zion Canyon, USA).

Figures 1.7. Oroville Dam spillway under high flow, as the concrete spillway was eroded, cavitation cut a 400 m (1,300 ft) long, 120 m (400 ft) wide, and up to 49 m (160 ft) feet deep gouge into the embankment.

Wikipedia/US Army

Figures 1.8. Cavitating propeller model in a water tunnel experiment.

conclusions because of their different worldviews (figure 1.6). Happily, for us, the Flood does a much better job of explaining the Grand Canyon than uniformitarian ideas.[11]

For example, early in 2017, the highest dam in the United States almost failed. Too much water had built up in the Oroville Reservoir due to excessive snowfall in the mountains of northern California that winter. The authorities had to open the floodgates (figure 1.7), and they had to leave them open even after they noticed massive problems in the sluiceway. When they finally turned off the tap, they found that the water had eaten through the steel-reinforced concrete and had cut a side canyon 400 m (1300 ft) long, 120 m (400 ft) wide and 49 m (160 ft) deep, through solid rock.[12]

The physical process that caused all this erosion is called ***cavitation*** (figure 1.8). When water flows slowly over any surface, nothing much happens. But, once it reaches a certain critical velocity, it tends to lift off the surface when it passes over any bump, creating a vacuum. When the vacuum bubble collapses, the concussion can pulverize even hard rock. It will even wear out stainless steel components.

This is a natural process that happens in real life. So, the question, "How long did it take to form the Grand Canyon?" should be answered with, "How fast was the water flowing?" Not only can cavitation cause massive, wasting erosion, but even without it, the erosive power of water increases with approximately the fourth power of velocity (in other words, erosion approximately equals v^4). During the **Recessive Stage** of Noah's Flood we would expect massive amounts of erosion to occur. Current speeds through **water gaps** are expected to have exceeded 160 km/h (100 mph). The scouring power of the debris caught up in such fast-flowing water would also have been catastrophic. Thus, the present is not necessarily the key to the past (uniformitarianism may not hold true) and we have to think through these issues very carefully.

The scientific method (in-depth section)

We now know that there are two main types of science (historical and operational). But there are also two main ways to approach the acquisition of knowledge. These are the inductive and deductive methods. Understanding the difference is important and this understanding will help us immensely in our study of biblical geology. Neither the deductive nor the inductive method is infallible, but they do provide a starting point for science.

The deductive method

The **deductive method** is the scientific method that is most frequently used today. A scientist begins with a universal statement *first*, and then sees if it can be supported with observations and experiments. Let's say a person wants to know whether or not if they will live forever. They start with a universal statement (something like "all men are mortal"). They then accumulate facts and try to draw a conclusion:

> *All men are mortal. All who have ever lived before me have died. Therefore, I am mortal.*

This seems like sound reasoning. Using the available information, why would anyone think they will live forever? There is no rational reason for believing you will not die. In fact, with deductive reasoning, *if* your starting premises are true, the conclusions you reach are *necessarily* true. This is known as a *valid* argument.

Note the catch. The validity of an argument does *not* depend on the truth of the premises, only that *if* they are true, *then* the conclusion follows. This only works if your starting premises are true. A valid argument with true premises is called a *sound* argument. Thus, a conclusion drawn from a sound argument is also necessarily true.

If all men are not mortal (e.g., Jesus, Enoch, and Elijah!), you could be wrong. Thus, scientists are forced to draw conclusions based on what they know only. They work in a box. Given additional information they could be shown to be wrong. Hence, they use phrases like "the data indicate" and "according to what we know today." These are not 'weasel words' like some people claim but carefully worded statements that allow the scientist to save face if they are contradicted by someone else. If everything was worded carefully, *they* were not wrong. Instead, the *data* were wrong.

This is a book on geology, so let's use an example about rocks.

> *Diamond is the hardest mineral. This unknown mineral can be scratched with a diamond. Therefore, the unknown mineral is not a diamond.*

This is so obvious it is almost trivial, so why are we discussing deductive reasoning? The reason is that in this book we will see many conclusions being drawn by secular geologists that are based on faulty assumptions. We have to be able to see the logical errors in what is being said. Hence this brief review.

The inductive method

Distinctly different from the deductive method, the **inductive method** begins with a set of observations and experimental results. After a sufficient amount of information has been accumulated, a hypothesis is suggested to explain the observations. To illustrate this, let's say a person is holding a coin. You do not know if it is a fair coin or a trick coin with 'heads' on both sides. You ask them to flip it ten times. What can you conclude if they get ten heads in a row? Nothing! You can, however, make an inductive argument that they are *probably* holding the trick coin. If they flip it 1,000 times and always get heads, you can be *more certain* that the coin is a fake, but you can never by 100% certain. This is the nature of induction. We accumulate experimental results and then try

to draw conclusions or make guiding principles from the data. It is not easy!

Fact: all scientific laws are inductions. Think of the Law of Gravity. We amassed a lot of facts before gravity was understood. Centuries of astronomical observations had been tabulated. Dozens of experiments with falling bodies had been performed. This was necessary before Sir Isaac Newton (1642–1727)[13] could finally connect the dots and conclude that all objects in the universe are mutually attracting each other. He could still be wrong, but it is so incredibly unlikely that we have elevated his discovery to the status of a scientific **law**.

Now that the Law of Gravity has been established through the inductive method, we can use the deductive method to make follow-on predictions. Assume that Newton's law is universal. Now start measuring the positions of the planets that you can see with the naked eye. After a while, you will notice that Jupiter, Saturn, and Uranus (discovered in 1781) are not behaving quite like they should. You might suggest that there is a hidden planet. In fact, this is exactly what led to the discovery of Neptune in 1846.[14] Uranus had completed about ¾ of an orbit since its discovery, but perturbations in its path led directly to the discovery of Neptune. This planet cannot be seen with the naked eye. As you can see, both the inductive and deductive methods are fully accepted in science. They can be powerful (like using the path of the visible planets to discover an invisible planet!), but they can also be abused.

Inductive reasoning, deductive reasoning, and the scientific method

When naturalism was adopted during the Enlightenment, it was still an untested hypothesis. They did not *know* that naturalism could explain everything; they just assumed it. But it was a powerful assumption, and it took many years for enough information to accumulate before we could finally reject it. We see this in biology specifically. The cell is simply too complex for naturalism to explain.[15] But we also see this in geology. 'Slow and gradual' is falling by the wayside as more and more geologists grapple with the tremendous amount of evidence that the rock record was formed quickly and that fossils are not millions of years old. Yet, despite the several 'huge catastrophes' that geologists are now forced to accept, most geological observations are still interpreted within 'slow and gradual' uniformitarianism. However, the more we know about present geological processes, the more we see how uniformitarianism fails to explain the rock record.[16]

Whichever method a scientist starts with, the next step is to show repeatability by more observations and experiments. Over time, other scientists must be able to duplicate the results with even more observations and experiments. These must verify the initial hypotheses, although a hypothesis can always be modified along the way as needed. If the hypothesis remains viable after rigorous testing, it becomes a theory. A theory is essentially a well-substantiated hypothesis. Over time, if no contradictions are found, the theory can become a scientific law, but this only applies to physics and chemistry. There are no official laws of geology or biology. Yet, repeated observations and experiments are the *key* to the scientific method in these fields as well. If something is not observed, in many important ways it is not 'science', and no scientist has ever observed the formation of the earth. A scientist might try to *deduce* an explanation for the formation of the earth, but what if the universal statements used in the deductive method (e.g. uniformitarianism, slow and gradual, etc.) are wrong?

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Chapter 2

The secular worldview dominates geology

Geologists used Genesis as a framework for understanding until about the 1800s. The early geologists assumed Noah's Flood formed all of the earth's **sedimentary rocks**,[1] and they calculated from the genealogies of Genesis that the earth is about six thousand years old.[2] You may not be familiar with all the names, but the renowned scholars of that time who dealt with these issues included Isaac Newton (1642–1727), Niels Steensen, or Steno (1638–1686), Thomas Burnett (1635–1715), John Woodward (1665–1722), William Whiston (1667–1752), Alexander Catcott (1725–1779), and Johann Lehman (1719–1767).[3]

But people began to seriously question these beliefs during the 'Age of Enlightenment'.

The 'Age of Enlightenment'

The Enlightenment began with just a few skeptical intellectuals in the 1600s. By the late 1700s and 1800s, many scholars had rejected Noah's Flood as a viable explanation for sedimentary rocks and fossils.[4] They strongly adhered to naturalism and began to reject any vestiges of a creator and especially anything to do with **catastrophism**. With little understanding of geology and the effect turbulent water would have on the earth during the Flood, they concluded it was impossible for the Flood of Genesis to account for the earth's massive amounts of sedimentary rock. Over time it became popular to believe that 'real science' is based upon reason *alone*. Those making the assumption of naturalism boldly declared then, just as they do today, that 'nature is all there is, all there was, and all there will be'.[5]

This belief came to dominate all fields of science. It is not surprising that this would cause many to question the Bible. But, when the assumptions of naturalism and an ancient earth are removed from the equation, observable science provides an exciting alternative, which will be laid out in Chapter 3 and developed in Chapters 4 to 11.

Strict naturalism directly led to a belief in **deep time**: the idea that the universe and earth are extremely old.[6] Early Enlightenment scientists declared the earth had to be millions of years old. This assumption was necessary because, without the power of Noah's Flood to form sedimentary rocks, all they had were the slow processes of erosion and deposition. Nothing seemed to be

changing fast, so they assumed all changes were slow. Consequently, the naturalists created multiple explanations for the formation of sedimentary rocks. But these explanations were too weak, so they added more and more years to give chance time to do its magic. The age of the earth was eventually inflated to 'four and a half billion years' by the mid-1900s.

It is important to note that the *assumption* of naturalism and the *assumption* of an ancient earth and universe were held at a time when little was known about geology or astronomy. Something as basic as the origin of **basalt** was an unknown (figure 2.1) with some arguing that basalt is an igneous rock (i.e. volcanic) and others that it is a sedimentary rock (i.e. laid down as small eroded particles and then cemented together).[7]

The concepts that came to us through the Enlightenment were very popular and quickly became an alternative to Scripture. Eventually, they became the 'modern' way, arbitrarily accepted and spread with little or no evidence. There was very little scholarly give and take. Those who questioned the rigour of the day were marginalized and mocked.[8] From that time until now, these assumptions have been the glasses through which all of geology is viewed.

Figure 2.1. Basalt lava flows of the Columbia River Basalts at Frenchman Coulee, Washington, that were eroded during the Lake Missoula flood.

The irony is that some professing Christian scholars aided the process in the early days of the Enlightenment, thinking that 'reason' could assist their quest for truth.[9] And it does–up to a point.[10] But once the foundational truths of Scripture were rejected, reason lost its moorings. It is a well-known principle in logic that when the premise is flawed, the conclusions will also be flawed. Most Christian scholars eventually agreed with the basic principles of naturalism, and many decided to leave the age of the earth to the scientists. This was a grave mistake because it directly eroded confidence in God's word. Some tried to reconcile the science of the day with Scripture by concluding that Genesis is just a morality tale or a myth and so cannot be interpreted in a straightforward manner.

At the beginning of the Enlightenment, uniformitarianism was vigorously opposed by a group of both deistic and Christian scientists, such as Georges Cuvier (1769–1832) and William Buckland (1784–1856). They were called **catastrophists**. But many of these catastrophists became convinced of deep time. Many thought sedimentary rocks and their fossils represented different eras that were wiped out by a succession of catastrophes. A modest number of catastrophists believed that Noah's Flood was the *last* catastrophe, and only a very few believed the Flood created the bulk of the rock record. Yes, a small group of scholars still held that Noah's Flood laid down the sedimentary rocks. These were called the **scriptural geologists**.[11] They were much maligned by the uniformitarians.

Most of the scriptural geologists were good scientists. Some of their ideas are still accepted today by creation scientists (a modern term for scriptural geologists, biologists, etc.). For instance, Andrew Ure (1778–1857) suggested that the Ice Age was caused by the Genesis Flood and that glaciers transported much of the diluvial[12] gravel—the

sediments on the surface thought to be laid down by water at the time.[13] George Fairholme (1789–1846) stated that the sedimentary rocks were laid down by Noah's Flood, since there is a general lack of erosion between the layers. The subject of '**flat gaps**' will be covered extensively in Chapter 5.[14] Secular geologists commonly assume sedimentary rocks were deposited very slowly over tens to hundreds of millions of years. Flat gaps, on the contrary, show that millions of years cannot exist because even at the present rate of erosion the exposed layers would be quickly and heavily eroded. Erosion is too fast to conform with their timescale.[15]

Eventually, the catastrophists were silenced,[16] not by facts but largely through ridicule and marginalization. For example, in 1827 Charles Lyell referred to the intellectuals who disagreed with him, i.e. the scriptural geologists, as "wholly destitute of geological knowledge" and unacquainted "with the elements of any one branch of natural history which bears on the science"; he wrote, "… every page of their writings proves their consummate incompetence."[17] Ridicule is the weakest form of scientific argumentation, yet it continues to this day. Is it any wonder that uniformitarianism dominates earth science?

Soon after uniformitarianism swept the scientific world, it was challenged by the discovery of catastrophes. Uniformitarians had no choice but to accept the evidence, but not without a fight. The Ice Age was the first catastrophe discovered (circa 1840). It presented a major setback for the assumption of uniformitarianism[18] and was resisted for decades by none other than Charles Darwin. The second major challenge was the discovery of the Lake Missoula flood (figure 2.1). The conflict of 'reality versus theory' has a colorful and controversial history and we will be dealing with this more in Chapter 11. The third catastrophe was the discovery of meteorite and/or comet impacts in the late 20th century.[19]

The Enlightenment scholars who hijacked geology also wrote the history books. They coined the term 'Enlightenment', to promote their rebellion against Scripture. They even started capitalizing 'Enlightenment'. The *Encyclopedia Americana* defines the Enlightenment as:

> …the name popularly given to much of the philosophical thought of the 18th century, which cut loose from superstition and attempted to establish reason as the foundation of all belief and of all rules of conduct.[20]

While it is true that there was much 'superstition' to overcome, they were also referring to biblical, orthodox Christianity. For the purpose of contrast, the philosophers of the time named the era before the Enlightenment the '**Dark Ages**', although in truth it was a time of great progress. It would be more appropriate to call the time before the Enlightenment 'the Middle Ages', which we Latinize to 'medieval'.[21] It was during the Middle Ages that universities were started (e.g. in Paris and Bologna in the middle of the 1100s and Oxford and Cambridge following in about 1200[22]). It was also during this time that the groundwork for modern science was being developed, coming as a direct consequence of the biblical worldview.[23]

Uniformitarianism becomes a fact

When Noah's Flood was discarded,[24] the Enlightenment intellectuals had to conjure up a scientific way to analyze rocks and fossils. Their revolt against biblical history led them to conclude they must allow only *presently observed processes* to explain the past. By definition, this eliminated a global flood and virtually any other mega-catastrophe. The influential lawyer-turned-geologist Charles Lyell (1797–1875) gave us the phrase, "the present is the key to the past", which we mentioned often in the last chapter. Under uniformitarianism, no

Bidgee, Wikipedia Commons CC-BY-3.0.

Figure 2.2. A flood on Rapid Creek, 19th February 2008, in Darwin, Northern Territory, Australia.

catastrophes were allowed, and this was *strictly* adhered to.[25] Consider the small-scale flooding, erosion, and deposition caused by a small river (figure 2.2). The scale of the effects is not large and the time it takes to create any significant change is very long. To account for what we see in the rocks using nothing but what we see happening on Earth today, uniformitarianism *instantly* required millions of years to be added to the age of the earth. Uniformitarianism was used to explain many rock features like the sedimentary rocks of the Grand Canyon or valley erosion by rivers. The assumption of uniformitarianism was no more scientific than the arbitrary rejection of Noah's Flood. It is important to recognize that deep time cannot be observed, nor can the events that formed things like the rocks of Grand Canyon be repeated.

Many scholars assumed uniformitarianism in the late 1700s when they knew very little about rocks. The principle became formalized by about 1795 by James Hutton (1726–1797). Charles Lyell put the finishing touches on the philosophy between 1830 and 1833 when he published his three-volume book, *Principles of Geology* (figures 2.3 to 2.5). The importance of the work of these two men cannot be understated. They were incredibly influential in their day. Charles Darwin (1809–1882) read Lyell's works while on his around-the-world voyage on the *H.M.S. Beagle*, causing him to become an ardent defender of Lyell's views. Uniformitarianism eventually won over the secular scholars. However, it came under fire with subsequent work in geology after 1833, although this was mainly restricted to the scholarly world, so most of the public missed the debate.

To make uniformitarianism plausible, the scholars of the time had to develop 'evidence' that they felt contradicted Noah's Flood. Enlightenment philosophers had to persuade each other and the public that Noah's Flood was not possible. They used three

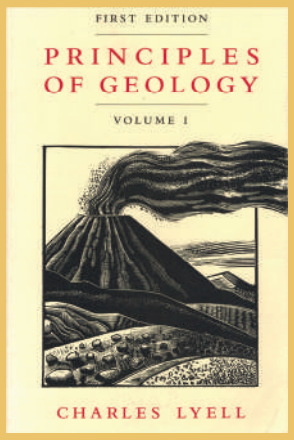


Figure 2.3. *Principles of Geology*, Volume I, first edition.

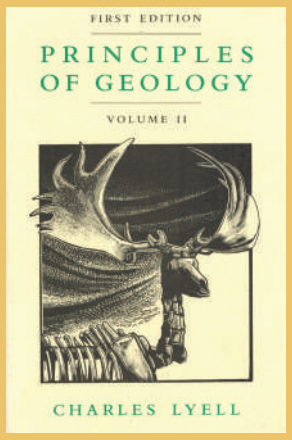


Figure 2.4. *Principles of Geology*, Volume II, first edition.

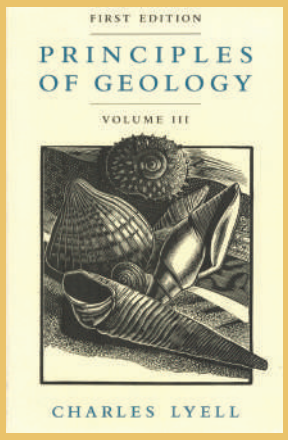


Figure 2.5. *Principles of Geology*, Volume III, first edition.

main features they claimed could not have been produced by the Flood,[26] including (1) the size of modern river valleys, (2) volcanic terrain, and (3) thick accumulations of sedimentary rocks.[27] But it is easy to see that their conclusions came from their assumptions. They assumed uniformitarianism first, then concluded the Flood did not occur.

These decisions were made prior to a thorough study of rocks worldwide. Since then, geological data have been gathered from all over the world. An analysis of these data reveals that contradictions to Noah's Flood do not exist unless uniformitarian gradualism is accepted *first*.[28,29] But these early conclusions persuaded many people to abandon the straightforward reading of Scripture and accept the new worldview.

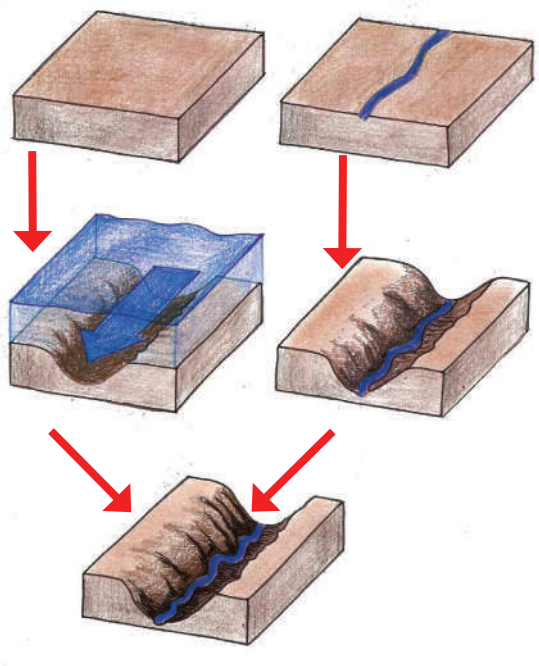
Valleys do not prove uniformitarianism: The origin of valleys was strongly debated in the late 1700s and early 1800s. The fathers of uniformitarian geology, largely Enlightenment secularists, thought it would take millions of years to form broad, deep valleys. In fact, they argued that valleys proved the earth's vast age.[30] This is an example of **circular reasoning**. (figure 2.6).

Geologists have since learned that valleys and canyons can be formed by a variety of processes, from glaciation to **sediment gravity flows** (the movement of sediments downslope). Since they can be formed rapidly, their value to uniformitarian gradualism is minimal.[31]

It is only because they first rejected Noah's Flood that the origin of deep valleys was used to support uniformitarianism. The **Channelized Flow Phase** (phase 5) of the Flood, discussed in Chapter 8, would quickly and easily carve valleys. The Channeled Scablands of eastern Washington, U.S.A. were carved late in the Ice Age during the **Lake Missoula flood**. The landscape here provides an excellent example of how multiple erosional features, including rapidly carved valleys, can be formed within days.[32]

Volcanic terrain can form quickly in Noah's Flood and even afterwards: The second early argument against Noah's Flood and the biblical timescale was the origin of extensive volcanic terrains. Scholars of the late 1700s estimated the rate of accumulation of lava and ash from modern eruptions of Mount Vesuvius and Mount Etna in Italy. They concluded it took tens of thousands of years for the lava to accumulate. From these estimates they generalized, declaring it would take too much time for other volcanic terrains to form in the biblical timescale.

The estimated rates of accumulation for Mt. Vesuvius flows were not a result of careful scientific study, but were greatly influenced by their assumptions. They did not consider that volcanic activity during and after Noah's flood would have produced higher rates of accumulation and higher rates of erosion. Nor did they imagine that Vesuvius and Etna may have erupted more often in the past.



Mrs. Melanie Richard

Figure 2.6. Comparison of the two highly disputed hypotheses for the origin of valleys around 1800. One group (left) believed the valley came first through catastrophic erosion, while others (right) believed the valley was eroded slowly over millions of years.

On top of that, they did not consider that other volcanos may have erupted more frequently than Vesuvius and Etna. As with the origin of valleys, this objection to Noah's Flood was because they assumed uniformitarianism first.

Noah's Flood would produce thick sedimentary rocks: Sedimentary rocks average roughly 2,500 m (8,200 ft) thick over all the continents, though 30% of the earth's surface is exposed igneous or metamorphic rock with no sedimentary layer at all. These sedimentary layers can exceed 15,000 m (50,000 feet) in thickness in some deep **basins**. It would take millions of years for present-day geological processes to produce the thick sedimentary layers seen in places like the Grand Canyon.[33] But we now know that sedimentary rocks can be deposited rapidly, with layers that look very much like what we see in the rock record.

During the Lake Missoula flood, rhythmic layers up to 40 m (130 feet) thick were deposited in tributary valleys within a few days (figure 2.7)! This happened because the massive amounts of water released by the glacial lake could not drain fast enough. The water ended up flowing upriver in places, into multiple side channels, and dumping a massive amount of mud in those areas. Another example of layered sedimentation that formed quickly occurred in 1996 during a large flood in Iceland. As the water issued from underneath a glacier, it spread into a small valley. Within a short time, it had formed layered sediments.[34,35] The flow rate was only 0.2% of the Lake Missoula flood, yet the Icelandic flood managed to deposit 200 layers, totalling 15 m (50 feet) thick in just 17 hours! Each layer was formed by a short pulse of water.[36]

The biblical Flood was much larger than these examples. Multiplying the Lake Missoula flood by something like 1,000 times and the Icelandic flood by something like 50,000 times makes us appreciate how Noah's Flood could have *easily produced the bulk of the sedimentary rocks* within the year allotted to the Flood (from Scripture, the length of time Noah and his family spent on the Ark was about one year).[37] As with the Lake Missoula and Icelandic floods, sedimentary layers would be a result of decreasing and increasing water flows. To be fair, the early scientists had far less data than are available today, but their strong bias against Scripture informed their conclusions. So, the bulk of the sedimentary rock, used early on as a strong argument against the reality of Noah's Flood, was in fact a testament to that very Flood.

Figure 2.7. Burlingame Canyon, Walla Walla Valley, southeast Washington. The canyon is about 38 m (125 feet) deep and formed in six days after engineers temporarily diverted water in a drainage canal into a small side stream. The flooding cut through the muddy layers left behind by the Lake Missoula Flood. Dennis Bokovoy (arrow) provides the scale.

Uniformitarianism led to evolution

Charles Darwin first read Lyell's *Principles of Geology* while famously sailing around the world on the H.M.S.

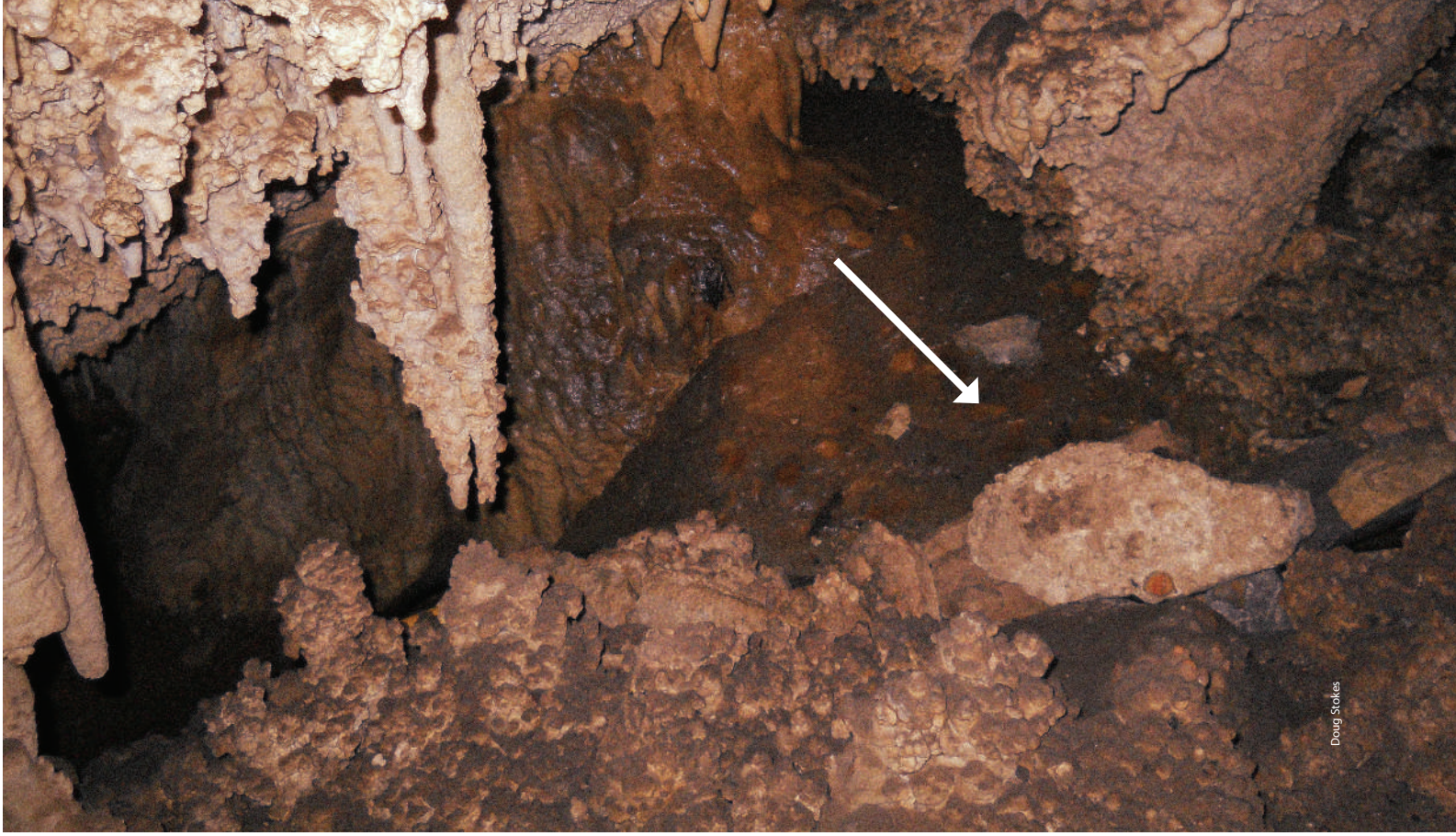


Figure 2.8. A bat fossil (arrow) trapped in flowstone in Lewis and Clark Caverns, west of Bozeman, Montana. [Bat not distinct]

Beagle. He became an ardent uniformitarian gradualist at that point, and these views were strongly influential in the development of his evolutionary ideas. In short, deep time in geology produced evolution in biology. This is another reason why we need to understand a little geology. Geological historian Martin Rudwick states,

> In any event the historicization of the earth [the development of millions of years], in what became the science of geology, was soon extended to other parts of the natural world, above all in Darwin's conception of the historical character of living organisms [evolution].[38]

Evolution is not even remotely plausible without the assumption of deep time. This is because the modern science of biology shows that each and every step in the supposed evolutionary process would require a huge amount of time, assuming 'chance' is able to create.[39] Time becomes a necessity when each step must also be useful for survival of the organism (or at least not harmful). The gradual formation of an organism would involve millions of steps, which is why evolution could not work in even *trillions* of years.[40] Modern biology also reveals the amazing complexity and interdependence of nature, which by itself disproves evolution.[41,42,43] As a consequence of these discoveries, some atheists have lost their faith in naturalism.[44] Even the once-notorious atheist, Anthony Flew, came to realize late in life that the biological complexity of the cell requires a Creator.[45]

The geologic column

During the early to mid-1800s, scholars who studied geology[46] examined rocks close to home, mainly in northwest Europe. They discovered that there were fossils in most of the sedimentary rocks. **Fossils** are the evidence of past life recorded in rock (figure 2.8). Fossils include remains, imprints,

or tracks of formerly living things (figure 2.9). Imprints and tracks are called **trace fossils**. We have known about fossils for a long time, but for a long time we did not have a way to link them all together in any sort of a sequence. It was not until William Smith (1769–1839), a surveyor, became fascinated with rock layers and the fossils they contained. Between 1815 and 1817, after many years of field observations, Smith published three now-famous geological maps of England and Wales that showed the sequential order of rocks and fossils.[47,48] The fossil order became known as **fossil succession**. This was refined and eventually became known as the **geologic column** (see Chapter 6).

In the early 1800s, the **surficial sediments**[49] were called **diluvium**, from the Latin word *diluvialis,* which means deluge or flood. Some scientists still considered them Flood sediments, and, unfortunately, the *only* Flood sediments. But when the **Ice Age** was discovered in the mid-1800s, much of the diluvium was attributed to glacial action. This led to the Flood no longer being considered a part of secular Earth history. A faulty understanding of the nature of the Flood led to its wholesale rejection.

There were several more refinements of the geologic column over the years, but the basic sequence was in place by the mid-1800s. The age of the layers increased with time until the 1950s, when radiometric dating became more firmly established (see Chapter 9).

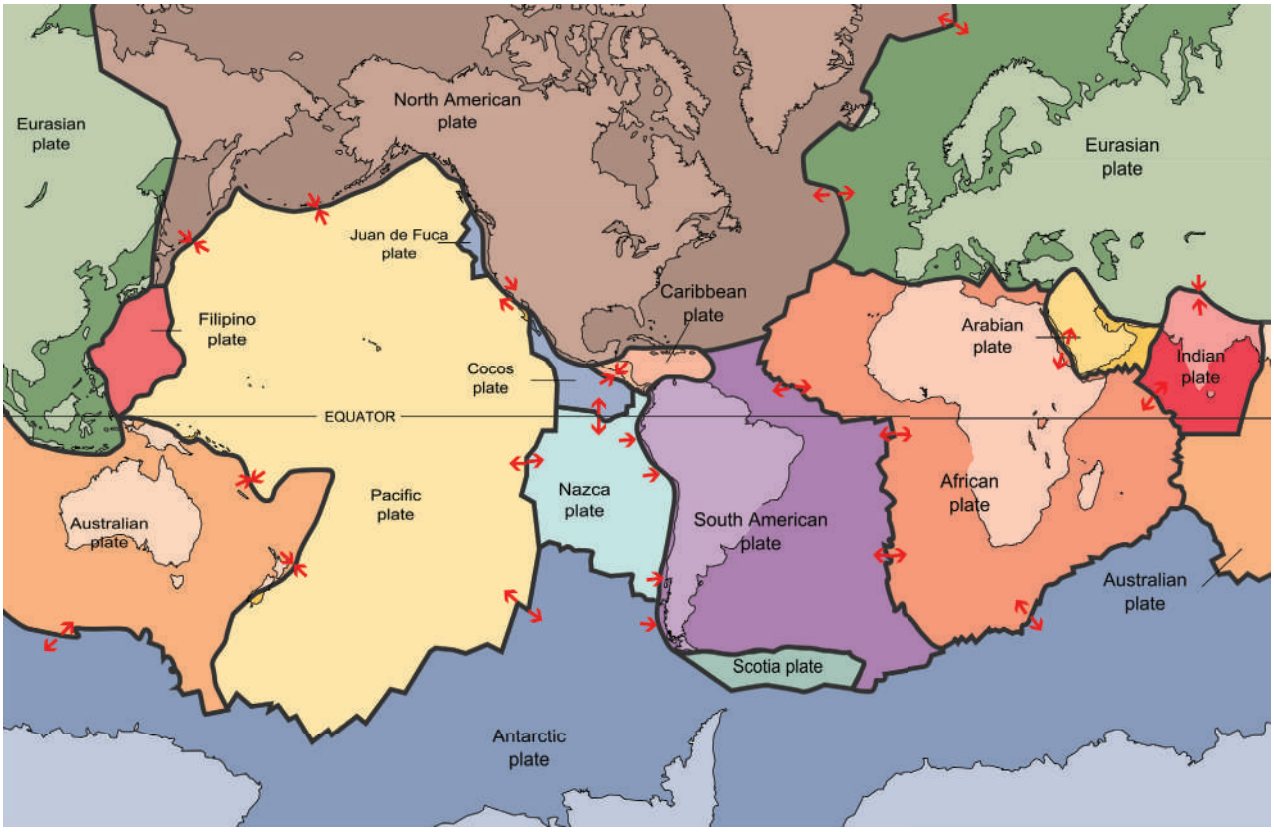
Recent developments in secular thinking

After the geologic column and evolution became entrenched, three major paradigms were added to secular geology in the late 1900s: (1) the conclusion that an impact from a meteorite caused the demise of the dinosaurs, (2) **plate tectonics**, and (3) the **Milankovitch mechanism**.[50] A **paradigm** is defined as 'an all-encompassing model that is used to organize and explain data'. It is similar to a worldview. Once it is decided upon, all relevant scientific data are fitted into the paradigm, sometimes whether they fit well or not.

Meteorite impacts and the extinction of the dinosaurs: One of the largest challenges to the principle of uniformitarianism came in the 1960s and early 1970s. We knew about the craters on the moon, but new telescopes revealed that other objects in the solar system had numerous craters as well. At first, many scientists believed they were volcanic, and were the result of a gradual, ongoing process. However, the data overwhelmingly told us the solar system had been bombarded by many asteroids or comets sometime in the past. This conclusion was impossible to ignore.[51,52] In fact, it is so obvious to us today that it is hard to imagine why people wrestled with it at all. It took a moon landing and advanced telescopes for scientists to get a fuller picture of the extent of this bombardment. Secular scientists had missed the evidence of widespread bombardment because of their allegiance to uniformitarianism: volcanoes are observed; meteorite impacts had not been observed. This is one of numerous examples of how unquestioned belief in uniformitarianism hindered science. Once scientists accepted that meteorite or comet bombardment had been widespread in the past, the idea that the dinosaurs went extinct from a meteorite impact gained traction.

The question of dinosaurs and dinosaur extinction has always had a special place in the hearts of paleontologists and the general public. Scientists have searched for years for a mechanism that could explain how a well-adapted group of animals from a wide variety of environments collectively went extinct.[53] One dinosaur expert listed 63 dinosaur extinction theories.[54] In all, there are probably about 100 different hypotheses. Most of them are implausible, such as: their brains were too small, they developed psychotic suicidal factors, or they ate plants that had become poisonous.

Figure 2.9. Three-toed dinosaur trackway near Shell, Wyoming.



USGS, Wikipedia Commons PD-USGS

Figure 2.10. The major plates on the surface of the earth.

In 1980, a layer of clay enriched in the element **iridium** was discovered in Italy that was thought to have resulted from the dust fallout of a meteorite impact.[55] They happened to date this iridium layer to about 65 million years ago, close to their assumed date of the final demise of the dinosaurs. This led to the idea that the dinosaurs went extinct because of a meteorite impact—an idea that was considered a longshot before 1980. Soon, scientists discovered a buried impact crater along the northern coast of the Yucatan peninsula in Mexico that they also think dates to about 65 million years ago.[56] The meteorite extinction hypothesis was born. Since then, more iridium-enriched layers, and other evidences, have been presented to bolster the connections. However, some scientists remain skeptical of the impact hypothesis for dinosaur extinction, mostly because many paleontologists believe that the dinosaurs gradually went extinct and not abruptly in a cataclysm.[57,58]

Plate tectonics: The idea of **continental drift** was slowly gaining momentum during the 1900s, mainly due to the efforts of the meteorologist Alfred Wegener (1880–1930). It was soon discovered that whole plates, including continents and adjacent ocean crust and upper mantle were moving horizontally. This can be measured to several centimetres per year by satellites. Figure 2.10 shows the largest plates of the earth that are defined by earthquakes and volcanism at their boundaries. Using the assumption that the present rates of horizontal motion have continued for the past tens to hundreds of millions of years, scientists concluded that many plates have moved thousands of miles. This view is called plate tectonics.[59] If plates have moved horizontally thousands of miles, it would have happened rapidly during the Flood. This is called **catastrophic plate tectonics** and is one of the models of the Flood (see chapter 5).

The Milankovitch paradigm: The addition of the third paradigm was a result of the work of Militun Milankovitch (1879–1958), a Serbian meteorologist. He claimed that changes in the earth's orbital geometry affected the amount of solar radiation absorbed by the earth. Gravitational forces of the sun, moon, and planets cause cyclical changes in the earth's orbit. For instance, the earth's tilt, which causes the seasons, is now 23.5 degrees, but it can theoretically vary from 22.1 to 24.5 degrees, and current rates of change indicate it would go through a cycle every 40,000 years, very much like the wobbling of a giant spinning top (figure 2.11). When calculated backwards for millions of years, these cyclical changes have been matched with assumed changes in the climate. This has been used to claim multiple ice ages have occurred, which alternate between a colder **glacial phase** and a warmer **interglacial phase**.[60] Therefore, it was named the '**astronomical theory of the ice ages**'. It is also called the Milankovitch mechanism. The theory suffers from many problems, the worst of which is that the change in solar radiation on the earth is too small to cause an ice age.[61] An ice age requires a much more powerful mechanism for climate change (see Chapter 11).

Scientists have also used the Milankovitch mechanism to explain sedimentation.[62] Sedimentary rocks commonly form layers and often within those layers are smaller sublayers. Secular scientists have attempted to relate the changes in solar radiation to these sublayers. Hundreds, if not thousands, of research papers have been published claiming a connection. However, this connection is only speculative.[63] Many other processes are known to cause layered sedimentary rocks.[64,65]

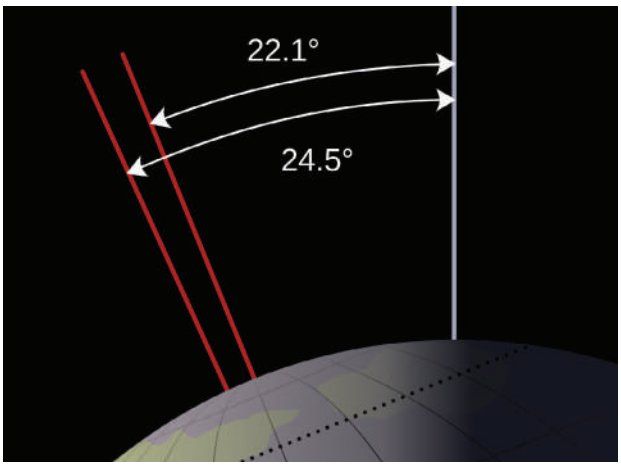


Figure 2.11. Range of the tilt of Earth's axis of rotation (obliquity). Present tilt is 23.4°. One cycle would be about 40,000 years.

A summary of secular geologic thinking

Enlightenment philosophers began to take over the earth sciences beginning in the late 1700s. The purveyors of the Enlightenment established naturalism as the basis of knowledge. From this assumption, uniformitarianism became an axiom of the earth sciences. Using the assumption of uniformitarianism, the Creation and the Flood were eventually eliminated. Deep time then became a major assumption of historical science. All of these assumptions led to evolution being accepted as fact in the mid-1800s. Fossil succession became the basis for the geologic column and is considered one of the proofs of evolution. Recent major developments within the naturalistic worldview are (1) an impact killed off the dinosaurs 65 million years ago, (2) plate tectonics was accepted as a fact, (3) the Milankovitch mechanism came into fruition, and (4) local catastrophic processes are being accepted as part of 'actualism', while strict gradualism has been abandoned in many places.

We are constantly amazed at how many secular scientists, as well as theologians and scientists within Christianity at large, have confidence in *interpretations* of the past that are based on a naturalistic worldview. Some have even considered these speculations, made by sinful men and women, as repeatable, observational science! But there is an alternative to the naturalistic worldview that has a remarkable amount of evidence that is unseen by secular scientists. This alternative will be the focus of the rest of this book.

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