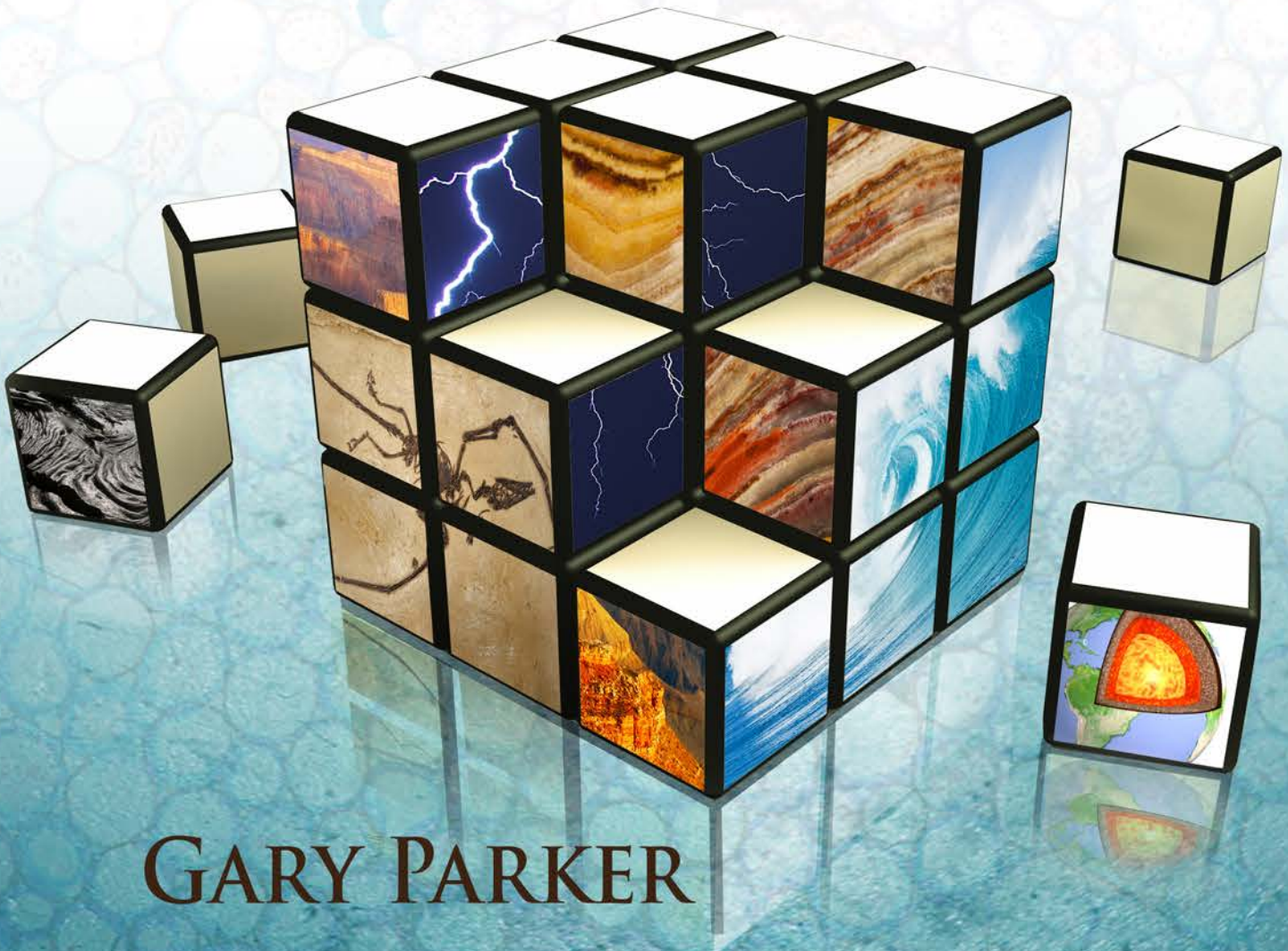




BUILDING BLOCKS in earth Science

FROM GENESIS & GEOLOGY
TO EARTH'S HISTORY & DESTINY



GARY PARKER

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Unit 1: Earth Science/Earth History

— Genesis and Geology



Earth is dotted with awe-inspiring physical features, many of which have been made into parks or travel destinations. More than a million people from all over the world visit Arizona's Grand Canyon National Park each year. Most just stop at viewpoints along the rim to scan (and photograph!) the gorgeous multi-colored rock layers stacked up a mile (1.6 km) deep along the zigzag path of the famed Colorado River, which cascades over hundreds of rapids along its 277-mile (443 km) route through the park. Most only dream of doing it, but some get to take one of the 3-, 7-, 10-, or 14-day raft trips along the Colorado, splashed by the river's cold water between exciting and challenging hikes up the steep sides of the flanking canyon walls. The author helped to lead two of the ten-day raft trips (wow!).

More accessible hiking trails extend down from the canyon rim, most from the South Rim. The author has

led over 40 week-long hiking trips into the canyon, at least 15 backpacking trips from rim to river and back, and at least another 25 trips in which participants camp at the rim each night between hikes down multiple trails of graded difficulty during the days. No matter how you see it, Grand Canyon is breathtaking (sometimes literally on a steep hike up!). The canyon's grandeur lifts our hearts and minds to grand thoughts about meaning and purpose, even to consider earth's history and destiny — and our place in it. And science lessons are everywhere, often up close and personal.

The scientific method is an awesome tool for understanding the workings of our world and for applying such knowledge to benefit mankind. Who wouldn't love (or at least respect) the scientists who give us cell phones, cure diseases, and explore space? Scientists succeed because they limit themselves to questions that

can be answered objectively by repeatable observations of patterns and processes in the present. “Scientific truth” is NOT determined by consensus, compromise, majority vote, popularity, celebrity endorsement, money, media endorsement, or best-selling books; one scientist with the evidence others can objectively verify ends debate and can lead the whole scientific community in a new direction. While philosophers, politicians, and even parents still struggle with the same age-old, non-scientific (but very important!) questions about love and morality and living together, scientists keep on moving ahead.

Like all scientists, geologists (“earth scientists”) study patterns and processes in the present, specifically those related to the composition and forces affecting earth’s physical features. A geologist at Grand Canyon, for example, could identify rocks and minerals for you, describe the different kinds of contacts between rock layers, explain evidence for faulting and folding, and discuss erosional and depositional effects of the Colorado River.

But, speaking strictly as a scientist, a geologist could NOT tell how Grand Canyon was formed. No scientists were there to record the forces at work, and there is no way to repeat the process in front of qualified observers. Grand Canyon formed in the past; its formation is a question of history, not science.

Historians trying to reconstruct past events operate more as detectives than as scientists. While scientists make repeated observations of processes occurring over and over in the present, historians and detectives are stuck with fragments of circumstantial evidence left by some unobserved process in the past that may have occurred only once. While scientists make theories that predict the repeated results of continuing processes in the present, historians and detectives make up storylines (scenarios) to propose how a series of unseen actions may have produced a unique past event, whether that’s the commissioning of grand theft or the formation of Grand Canyon. Different scientific theories are evaluated by objective tests; different scenarios for interpreting circumstantial evidence are more subjectively evaluated by jury votes, popular opinion, or salesmanship. As we shall see, however, some deductions from storylines about the past can be tested objectively by the scientific method, the results refuting or lending support to different competing views.

Geologists themselves recognize that different methods, and different degrees of objectivity, are involved in the study of earth’s past vs. earth’s present, so courses called “Historical Geology” are included in their academic training. During the 1600s and 1700s, the founders of geology reported numerous evidences that forces shaping earth’s

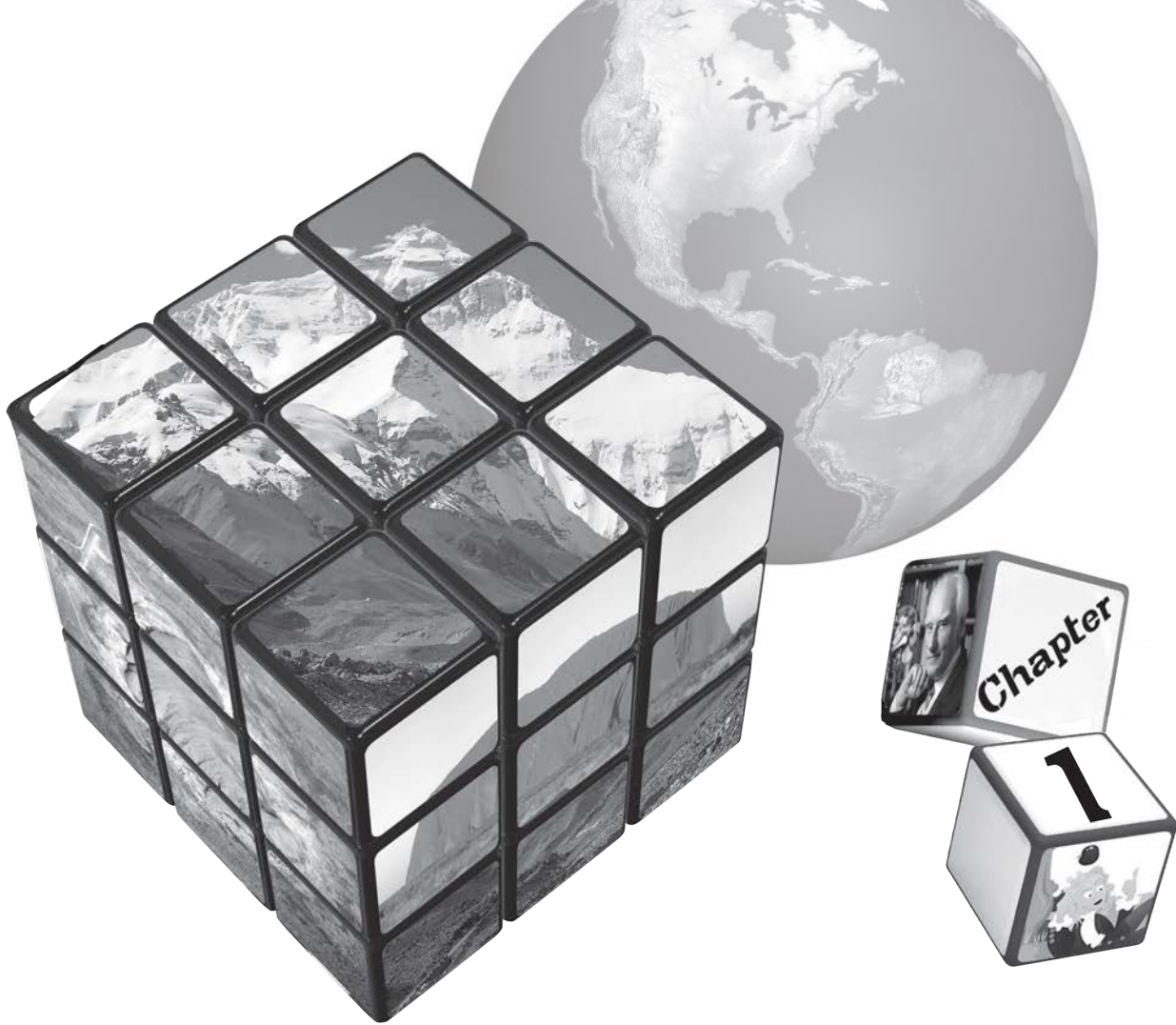
features in the past operated on a much grander rate and scale than similar forces today. Most of geology’s founders readily accepted the fossil-rich layers of water-laid sedimentary rock blanketing the continents as clear evidence of global catastrophe, specifically Noah’s Flood as described in the Bible (Genesis chapters 1–11, especially 6–9).

The biblical worldview gave birth to observational/empirical/experimental science, i.e., the scientific method, in the 1600s, and it’s not surprising that the Bible — a record of God’s acts in history — also provided biblical catastrophism or “flood geology” as the key principle for understanding the geological forces shaping earth’s past (historical geology).

In the 1800s, however, geologists began to reject their biblical roots in favor of a new principle for historical interpretation called uniformitarianism, the belief that geologists should never believe any process in earth’s past happened faster or on a larger scale than what can be seen today. First proposed by a lawyer, Charles Lyell, uniformitarian assumptions and assertions were accepted by Darwin and succeeding evolutionists as the basis for their beliefs in small (slow and gradual) changes requiring long periods of time. Promoted around the world by textbooks and television, museums and mass media, parks and politicians, the storyline and time-line taught as historical geology today is touted as the “scientific” alternative to biblical “faith.”

As finite beings limited in space and time and knowledge, however, we all live by faith; but which faith is more reasonable? Scientists can’t explore the past directly, but they can test deductions based on different “histories.” When it comes to factors that produced earth’s spectacular geologic features, which worldview best explains the evidence: processes acting “**small and slow and long ago**” (*uniformitarian evolution*), or processes acting “**big and fast in the recent past**” (*biblical catastrophism*)?

Much of this book is concerned with “observational geology,” scientifically observable patterns and processes about which there is objective agreement. But we will also discuss radically different views of “historical geology,” encouraging development of your critical thinking skills, which help you understand what you believe and why you believe it. The author, a former evolutionist, hopes you will come to see, as he did, that God’s world and God’s Word agree about earth’s history and earth’s destiny — and the new and eternal life we can have in Christ!



Where to Start?

Scientific discovery usually starts with an observation that attracts the attention of a curious mind. The curious observer then asks a question and poses a testable answer, often in a form like this: “*I wonder what would happen if . . .*”

As a young person I really enjoyed doing summer jobs on my grandparents’ farm. Once I was trying to paint a hot metal roof on a hot day, but the paint got so sticky it would hardly spread (*observation*). Asking myself what might make it spread better (*question*), I *wondered what would happen if* I added gasoline to the paint (proposed *answer* with observational/experimental *test*). It worked! I raced to the house to tell my grandma about my awesome scientific discovery, but about halfway there I realized I had only discovered (or re-discovered) paint thinner. Slowly I returned to finish the job, comforted a little by knowing that “real scientists” had made my discovery much earlier and had already used the principle to produce many people-helping products.

Pasteur’s scientific discovery in the late 1800s was much more awesome than mine. The curious mind of this legendary French scientist (and creationist) observed sheep dying of anthrax. (Yes, that’s the anthrax now

“weaponized” for biological warfare and terrorism.) It’s hard to believe, but Pasteur in France and Koch in Germany were developing the “Germ Theory of Disease” (which we take for granted!) only 150 years ago! Like all scientists, Pasteur made a point of knowing what earlier scientists had discovered. He knew Jenner had used cowpox as a “vaccine” to prevent smallpox (one of the world’s deadliest diseases), even though Jenner didn’t know why it worked. Pasteur was developing concepts of disease defense and immunity (again, something we think is obvious now) as he worked on the germ theory. We still use his tough and elaborate — but effective — treatment for rabies today!

Pasteur had already isolated the anthrax bacterium and shown it was the “germ” causing sheep to die. Now came the next question / proposed answer / observational test: “*I wonder what would happen if* I injected sheep with dead or weakened anthrax bacteria? Would they develop immunity and avoid sickness and death if they later contacted the live germ?” Since Pasteur had been mocked in public by other scientists who scoffed at his “unscientific” ideas, Pasteur arranged a large, public scientific test of his proposed answer (*hypothesis*): two large pens of sheep were displayed before reporters, his opponents’ untreated sheep and his own sheep pre-treated with his experimental vaccine. Then all the sheep were

exposed to anthrax. While Pasteur's sheep kept nibbling on grass, his opponent's sheep . . . well . . . did not. Not a pretty sight, but dramatic confirmation of the power — and objectivity — of scientific problem solving.

The prize for the smallest observation leading to the biggest scientific concept should go to the falling “apple” that triggered development of the theory of gravity inside the curious mind of Isaac Newton, a humble but most remarkable English scientist, mathematician, theologian, and creationist. For generations, people assumed that apples “just naturally” fall down without asking why or what “down” means. After quite a bit of thinking and testing, Newton finally concluded that the apple did NOT fall down; rather, the apple and earth “fell together” (although the much smaller apple did much more of the moving!). Newton proposed the existence of a force, called *gravity*, which *pulled things together*, i.e. it was *not* a *downward* force but a force of *attraction*. Newton went beyond the attraction of earth and apple to earth and moon and earth/moon and sun. In fact, Newton claimed that any two clumps of matter (we'll call them mass one and mass two, or m_1 and m_2) would attract each other with a force (F) equal to the gravitational acceleration constant (g) times $m_1 m_2$ (mass one times mass two) divided by the square of the distance between them (r^2). In Newton, the mathematician's shorthand, $F = g m_1 m_2 / r^2$.

Problem #1: For generations, people, including “science types,” had been thinking that things fall down. How can you convince them, especially fellow scientists, that things can fall up or sideways or in any direction that brings two masses (clumps of matter) closer together? “*I wonder what would happen if*” two heavy metal balls (non-magnetic heavy masses) were suspended by strong, thin wires that allowed them to swing freely? Just as Newton predicted by his formula, the metal balls came together when the distance between them (squared) was appropriate for the product of their masses. WOW! What's more, *other scientists could repeat Newton's experiment and make their own observations*, to see for themselves if he was right. They could change the size and materials used for the swinging masses and use balance beams instead of wires, but in every case the force of gravitational attraction (F) was always related to $m_1 m_2 / r^2$ by the value of g , the gravitational proportionality constant (Double WOW!!).

The goal of scientists is to make and to use theories, where *theories are statements that predict a broad range of events / relationships in nature*, (quite UNLIKE the popular use of “theory” for some “half-baked idea”!). Newton's developing theory predicted gravitational



attraction in advance of observation; that's *good*. His predictions were verified independently by a large number of other scientists, using varied conditions; that's *great*! Gravity could be used to explain earth-apple attraction as well as earth-moon, and it could be extended to design space craft to reach the moon on target. That's FANTASTIC! TRIPLE WOW!!! But, here comes. . .

Problem #2: Gravity is invisible. Forces are pushes and pulls, and scientists in Newton's time expected to see the agent doing the pushing or pulling. Observers could see the suspended balls come together, but no one could see a “gravitational force” either pushing or pulling them. Some related such “action at a distance” forces to witchcraft. Magnetism back then could be dismissed as a child's toy, but Newton was claiming that unseen gravity was somehow holding the orbiting planets together in a solar system!

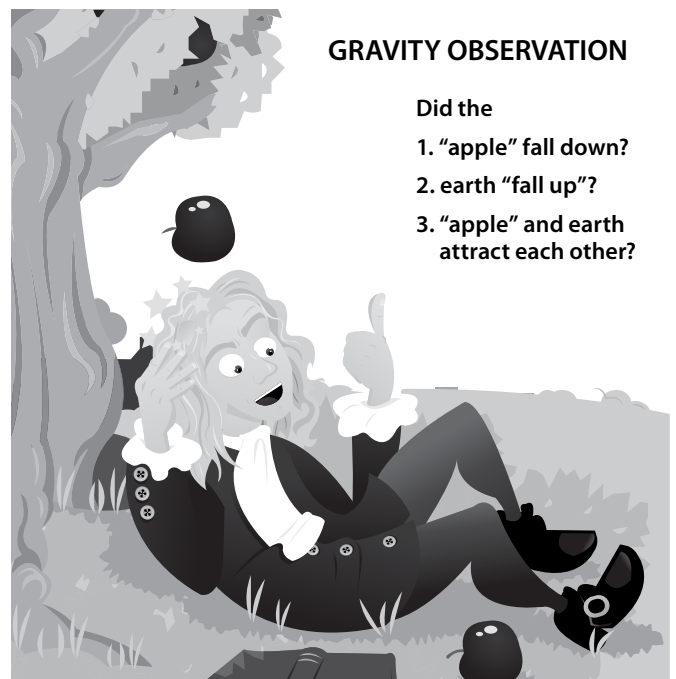


Figure 1.1. Sir Isaac Newton, brilliant scientist and creationist, made observations, asked questions about nature, and revolutionized science with his theory, confirmed by scientific testing, of a powerful, unseen attractive force called gravity!



Panorama of Uluru around sunset (CC BY-SA 3.0)

Another professor and I were having a friendly “debate/discussion” about creation/evolution in front of his class, asking each other questions and letting students question us. I said something like “Let me give you a couple of scientific evidences for creation.” The other professor quickly responded, “That’s impossible. Scientists only work with things they can see and touch, weigh and measure. Take gravity, for example.” Then he interrupted himself, “Whoops, made a mistake, didn’t I?” I was only too happy to fill in: “Yes, you did. What does gravity look like? How much does it weigh? *We can’t see gravity, yet we know gravity is there by the effect it has on other things.* God is something like that. God is a Spirit, but we know He is real by the effects He has on other things. Romans 1:20 puts it this way: ‘. . . the *invisible* things of God are clearly seen in all the things that have been made.’” Although scientists prefer to see things directly (with or without instruments), at least since Newton’s time they have *accepted unseen causes if they are inferred from predictable patterns of observable effects.*

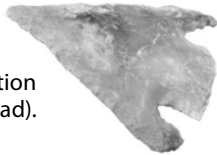
Creation — Pebble/Arrow

Without seeing either the creator or the creative act, people easily recognize differences in patterns of order produced by



time, chance, and natural processes (e.g., a tumbled pebble)

vs.



plan, purpose, and creation (e.g., an arrowhead).

The works of Pasteur in biology and of Newton in physics provide classic examples of scientific principles that we can now apply to earth science/geology. Near the center of Australia, surrounded by vast stretches of “outback” desert, is what many call earth’s largest rock. Once called Ayers Rock after its European discoverer, this majestic orange-red sandstone “pebble,” now called by its Aboriginal name, Uluru, rises 1,100 feet (340 m) above

the surrounding desert floor (and I climbed it!). Much more of the giant rock lies below the surface, and the trail around it (which I walked only partially) is 11 miles (over 17 km) long. What processes produced this seemingly out-of-place wonder of the world in the “Red Center” of Australia? That’s the kind of earth feature that geologists like to observe, and the basic question they eagerly desire to answer.

When I began doing university lectures and creation/evolution debates across Australia, I expected questions about Uluru. The story I found in textbooks and articles (and later in web searches) went something like this:

1	The source of the distinctive orange-red arkosic sandstone was in the Flinders Ranges, mountains about 300 miles (c. 500 km) to the south (where my wife and I have found numerous fascinating fossils!), although some cite alluvial fans from unspecified mountains somewhat closer.
2	Infrequent rains in this dry area gradually eroded the coarse sandstone over long stretches of time, perhaps including widely spaced episodes of flash flooding. Because Australia is shaped in general like a shallow bowl, streams washed the sand grains toward the continent’s center, more in wet years and less in dry years.
3	The sand accumulated in a large depression and cemented into sandstone.
4	Later earth movements tilted the giant rock so the part of it above the flat desert includes parallel, poorly sorted beds dipping 80–85°.

As a doctoral minor in geology, I had heard many other such stories in which ordinary processes acting gradually over vast amounts of time were invoked to explain a wide variety of earth’s most spectacular geologic features. The story certainly sounds scientific, especially since scientists continue to make numerous observations of rainwater erosion and stream transport under a wide variety of conditions. Scientists also directly observe sediments already cemented into rock, analyzing types of minerals, grain size and shape, bedding planes between layers, etc. However, we now have a *serious problem*: scientific observation of the basic *process* claimed to have produced the giant sedimentary rock (long, slow stream flow) contradicts the *pattern* of sedimentary features scientists actually observe at Uluru/Ayers Rock.

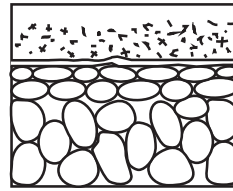
From grandchildren to grandparents, most people have actually observed water moving sand grains during a hike along a stream or a visit to the beach. As expected, fast-flowing water moves larger sand grains than slow flow does. In fact, flowing water is so good at separating or sorting particles by sedimentary properties (density,

size, and shape) that it is used commercially to separate cherries of different sizes, for example, and other things far less tasty. Suppose streams had carried sand grains from the Flinders Range 300 miles (500 km) northward to the depression where the sedimentary particles would ultimately form Uluru. Over the assumed long time period, rains would be heavy in some years and light in others, producing stronger and weaker stream flows which, in turn, would carry larger or smaller sand grains. So the sandy sediment slowly settling in the future Uluru depression should consist of multiple layers with larger and smaller grains at different depths, possibly reflecting annual variations in rainfall at the source. Problem: large and small grains are so thoroughly mixed (*unsorted*) in Ayers Rock that it is sometimes called the “world’s largest pebble,” as if it were formed at one time by one event!

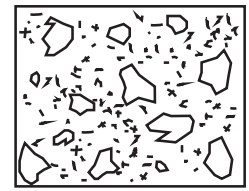
feldspar-containing sandstone beds at Uluru were slowly accumulated in thin sheets over vast amounts of time, the feldspar would have long ago weathered into clay. Does the pattern of evidence we see at Uluru (the thick sequence of jagged, unsorted grains with feldspar crystals still present) suggest that the popular story of processes acting “small and slow and long ago” should be replaced by processes acting “big and fast in the recent past”? What would scientists say?



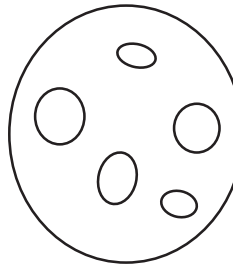
Grains - sorted/unsorted jagged/round



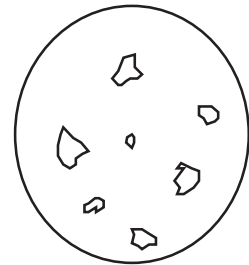
Sorted grains (graded bedding)



Unsorted grains (mixed) grains



Rounded grains



Angular (jagged) grains

There are still two more observational/scientific problems with Uluru forming by forces acting “small and slow and long ago.” Freshly broken sand grains and rocks are usually jagged, but they get rounder and smoother as they bounce along downstream. Mountain streams can quickly polish rock fragments (as I hope you’ve seen); surely the jagged edges of sand grains would round off in their bumpy journey, whether 300 miles (500 km) or “only” tens of miles (kilometers) from source to sink. But the sand grains are *still angular* as if they were transported together in a colossal underwater turbidity current (discussed later).

Finally, the coarse, arkosic sandstone is speckled throughout with numerous fresh crystals of feldspar. Exposed to the sun’s heat, moisture, and/or air, feldspar crystals rather quickly decompose into clay. So if the

Scientists readily recognize the evidence — the unsorted mixture of large and small angular sand grains — that disprove (falsify) the belief that stream erosion slowly and gradually formed Uluru. When I presented this evidence in numerous university lectures and debates around Australia, no science students or professors even tried to defend the popular view that Uluru was formed by forces acting “small and slow and long ago” — yet that



Aerial view of the Uluru, Australia (PD-self).

view is still the one taught in schools and touted by the media. *Why?*

Much more than scientists in most other fields, *geologists often find themselves hesitating between two different starting points*. When it comes to processes affecting earth features in the present, geologists share their first starting point with all other scientists, developing and testing ideas based on repeatable and objectively verifiable observations. For that reason, there is essentially universal agreement on how streams today erode and deposit sediments (including details and formulas far beyond what we've discussed so far!).

But so many of earth's spectacular features — from Australia's "Big Rock" to Grand Canyon and the Himalayan Mountains — formed in the past, "out of sight" for the scientific method. To "see" into the past, most geologists since the mid-1800s have made an absolute commitment to a second starting point, called *uniformitarianism*. Historical geologists accepting this assumption *promise themselves ahead of time* that, no matter what patterns of evidence they find, they will *always use slow and/or small-scale processes* like those going on today to explain it. Slow processes operating on a small scale would take a long time to produce colossal earth features such as Uluru, Grand Canyon, etc., so uniformitarianism *also requires belief in long ages* — again *no matter what patterns of evidence* in the present might suggest. The "eye of faith" the uniformitarian uses to look into the past can only "see" forces acting "*small and slow and long ago*."

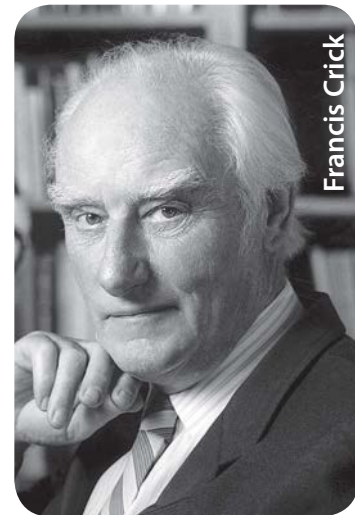
Seeing only small biological changes in the present, Darwin and succeeding evolutionists readily embraced the uniformitarian faith and its mantra "*small and slow and long ago*," using it to assert, for example, that processes producing variation in finch beaks would eventually change single-celled creatures into people. *For uniformitarians, "believing is seeing."*

To give uniformitarians credit, however, the assumption **sounds** scientific. After all, it appeals to observational science, the study of patterns and processes that can be repeatedly observed in the present. "What's the alternative," asks the uniformitarian, "belief in aliens?"

Actually, "aliens" have been invoked to "explain" several major mysteries in earth's past, including Stonehenge in England, the Nazca lines in Peru, statues on Easter Island, the Mayan Calendar, etc. More to the

Crick and Alien "Creation"

Convinced chemical processes on earth could NOT produce the biochemical order in living things, Francis Crick (Nobel Prize winner for his DNA work) claimed life came to earth from outer space!



scientific point, after admitting that chemical evolution could not happen on earth, Francis Crick (who shared the Nobel Prize for work on DNA) asserted that life must have somehow evolved on another planet and that the "Seeds of Life" (his book title) must have arrived here from "out there." Richard Dawkins, famed for his anti-creationist rhetoric, finally admitted that if evidence for creation were found, it would have to be creation by aliens, not God. Perhaps one day an enterprising geologist will write a book and go on talk shows claiming Uluru/ Ayers Rock is the crumbling remains of a spaceport built by aliens, and that is why its sedimentary characteristics are so different from those expected by stream erosion/ deposition.

The awesome rock in Australia's "red center" has generated a "faith crisis" for geologists. As earth scientists, they can see that the pattern of evidence at Ayers Rock contradicts their uniformitarian assumptions as historical geologists. Too many, it seems, allow their *uniformitarian faith to trump their observational science*, keeping silent about contrary evidence and allowing textbooks and television, parks and politicians to continue propagating the media myth that all earth's key geological features happened by processes "small and slow and long ago."

But if you're like most "science types" and think patterns of evidence from the past and observable processes in the present really ought to fit together, what can you do? As usual, *the Bible has the answer!* When they were in the field studying rocks and streams or along the shore observing wave action, the founders



Feldspar crystal
(CC BY-SA 3.0)

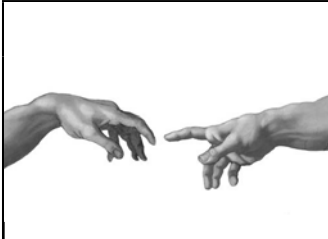



of geology were using their minds, eyes, and hands to explore God's world, grateful that God had created an orderly world and minds capable of understanding it. It was this biblical worldview that gave birth to observational science, specifically the scientific method. Indeed, many scientific discoveries were based on specific biblical verses, from ocean currents to anesthesia and split continents, etc.!

But geology's founders also recognized a great many of earth's most prominent features could not have been produced by the slow and gradual processes observed today, *no matter how much time was imagined* (as we'll see in later chapters). But the founders felt no need to invoke aliens, mysterious forces, or the "vain babblings and oppositions of science falsely so called" (1 Timothy 6:20) to explain the past. After all, they had the *Bible, the record of God's acts in history*.

The biblical record of earth's origin, history, and destiny can be summarized in "4Cs": CREATION, CORRUPTION, CATASTROPHE, CHRIST, that is, God's perfect world (*Creation*), ruined by man's sin (*Corruption*), devastated by Noah's Flood (*Catastrophe*), restored to new life in a "new heaven and new earth" (*Christ*).

God gave us *inquiring minds* to discover the details, and the *biblical outline of earth history* gives us *concepts* and *checkpoints* that *stimulate scientific/historical investigation* as well as data points that can be used to *test our ideas* about the past. The *Creation* concept is tremendously helpful in unraveling and applying genetic coding in DNA. The processes of time, chance, struggle, and death that neo-Darwinists invoke to explain the origin of species really explain the origin of defects, disease, and decline (*Corruption*). For the founders of geology, the record of events associated with a watery global *Catastrophe* (*the Genesis Flood*) provided numerous clues most helpful in explaining striking features of earth's geological past. Actually, *catastrophists* or *Flood geologists* appeal to the *same geologic processes* as uniformitarians, but they also recognize the patterns of evidence that suggest these processes have operated in the past on a *far grander scale and at a far faster rate* than anything seen today — "*big and fast in the recent past.*"

Let's re-visit Australia's Uluru/Ayers Rock. What explanation for its sedimentary properties could a catastrophist/Flood geologist offer? He or she might start by agreeing with the uniformitarian that the Flinders Range 300 miles (500 km) to the south was a likely source for the sediment. Both would recognize the sedimentary properties of Uluru (unsorted grains of large

4C'S OF BIBLICAL EARTH HISTORY	
The biblical record of earth's origin, history, and destiny	
	CREATION
	God's perfect world,
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	devastated by Noah's Flood,
	CHRIST
	is restored to new life in Jesus!

and small sizes, jagged/angular grains, and fresh feldspar crystals) rule out streams as a mechanism for transporting sand slowly over a long time, but the uniformitarian would tend to keep quiet about the contradictory evidence (or "**suppress the truth,**" Romans 1:18; RSV) while the catastrophist would use the biblical record of Noah's Flood to propose a solution to the problem. Gigantic waves associated with the global Flood could have slammed into the Flinders Mountains, pulverizing huge quantities of orange-red arkosic sandstone in moments, quickly transporting the sandy sediment in a slurry flow that preserved the angularity of the grains and kept large and small grains mixed until the whole mass was suddenly dumped in the central Australian depression that uniformitarians also accept.

Flood geologists could also refer to studies of slurry flow through pipes to support their explanation for transport of unsorted and angular particles. Most dramatically, all geologists now accept the evidence for



{ Trees growing in a crack up the rock face Uluru, Australia. }

turbidity currents, colossal underwater landslides like the one in 1929 that flowed down the 2 percent continental slope off Newfoundland at over 60 miles per hour (nearly 100 kph) until it finally dumped massive amounts of unsorted, angular sediment on the floor of the Atlantic Ocean abyss!

Notice that Flood geologists/biblical catastrophists and uniformitarians can have *the same* understanding of geological processes and *the same* respect for testing ideas against observations (*scientific method*). It seems to be only Flood geologists, however, who are willing to use historical evidence (the biblical record) to investigate historical questions, and *only Flood geologists* who are *free to explore* whether geological processes acting “*small and slow long ago*” are better or worse at explaining features of earth history than processes acting “*big and fast in the*

recent past.” We will continue to contrast these two views through the rest of this book with the goal of better understanding earth’s history and destiny — and our place in it.

Form your foundation.

Scientists, Christian or not, agree on geologic processes observable in the present. But to explain Earth’s past, followers of Lyell and Darwin believe such forces acted only “*small and slow and long ago,*” while geologists building on the biblical record of Earth history find abundant evidence for the Genesis Flood and processes acting “*big and fast in the recent past.*” Can Earth features like Uluru and Grand Canyon help us decide this “*war of worldviews?*”

Building Inspection

1. Geology has two major parts: (1) Earth _____, repeatedly observable processes and patterns in the present, and (2) Earth _____, ideas about how major earth features formed in the past.
2. Mark the following as questions for earth science (S) or earth history (H):
 - a. What kinds of fossils are found in the Grand Canyon layer called Bright Angel Shale? (S/H) _____
 - b. Did Grand Canyon come first (opening a new channel), or the Colorado River (cutting the canyon)? (S/H) _____
3. Circle the letter of each correct completion for this sentence: The scientific method . . .
 - a. is based on processes and patterns that can be repeatedly observed by many scientists.
 - b. tests ideas objectively, so even those with different worldviews can accept the results.
 - c. is ideal for constructing a time line of history occurring over vast amounts of time.
 - d. is less important in deciding scientific truth than the majority opinion of scientists.
 - e. was developed by Christians believing God created an orderly universe and human minds to understand it.
4. Unlike the scientific method, historical methodology used to study the past (circle correct completions) . . .
 - a. is like methods used by detectives to solve mysteries vs. methods used to cure diseases or invent computers.
 - b. decides “truth” (best scenario) by popularity, publicity, politics, or vote of jurors or “experts.”
 - c. is strongly affected by worldview, subjective personal opinion, and bias.
5. Evolutionary uniformitarians, abbreviated “EU”, (circle letters of correct completions) . . .
 - a. have a starting point for studying earth’s past based on the words of Lyell and Darwin.
 - b. assume geologic processes in the past never acted on a larger scale or faster than is seen today.
 - c. must believe in “*millions of years*” because they believe only in small geologic changes occurring slowly.
 - d. assume all earth’s features were produced by processes acting “small and slow and long ago.”
 - e. believe the *naturalistic worldview* that NO “god” or “spiritual force” (except aliens) affects natural processes.
 - f. encourage *open discussion* in science classes of geologic evidences that may favor other worldviews.
6. Biblical catastrophists/Flood geologists, “BC/FG”, (circle letters of correct completions) . . .
 - a. use the Word of God, the Bible, as their *starting point* for exploring earth’s geologic past.
 - b. think, like geology’s founders, that the *Genesis Flood* produced globally BIG geologic effects FAST!
 - c. find evidence relating earth features (fossils, Grand Canyon, etc.) to LOTS of WATER, not lots of time.
 - d. test scientific models showing how geologic processes may have acted “big and fast in the recent past.”
 - e. believe scientists searching for truth about nature can find patterns of order pointing to *God’s plan*.
 - f. encourage *open discussion* in science classes of geologic evidences that may favor other worldviews.
7. At Uluru, the “Big Rock” in Australia’s “Red Center,” scientists found sand grain sizes were (sorted/unsorted) _____ (mixed large and small), grain shapes were (jagged/rounded) _____, and included minerals were (feldspar/clay) _____ — all evidences that Uluru formed by processes “_____ and _____ in the _____ past.”
8. Catastrophists use present geologic processes acting “bigger and faster” to explain many past features (T/F)_____
9. *Adam, God, Jesus, Noah*: Put these names where they fit in this brief outline of biblical earth history: Created perfect by _____, the world was ruined by _____ sin, destroyed by _____ Flood, restored to joy by _____.
10. CREATION, CORRUPTION, CATASTROPHE, and CHRIST are “4Cs” of biblical history affecting earth history. Which “C” . . .
 - a. could geologists infer from evidence of continental features formed/eroded by lots of water? _____
 - b. could be “seen,” like Newton “saw” invisible gravity, by patterns of order in visible things? _____
 - c. means Darwin’s “war of nature” (struggle and death) makes defects and disease, not “higher animals”? _____
 - d. means history ends with joy, not death — new life and a new heaven and earth at Jesus’ return! _____



Answers to Questions

Chapter 1, page 13

1. science; history
2. a. S, b. H
3. a, b, e
4. a, b, c
5. a, b, c, d, e
6. a, b, c, d, e, f
7. unsorted; jagged; feldspar; big and fast in the recent past
8. T
9. God(Jesus); Adam('s); Noah('s); Jesus(God)
10. a-CATASTROPHE, b-CREATION, c-CORRUPTION, d-CHRIST

Chapter 2, page 21

1. fossils
2. a-war of nature; increasing; slowly; millions of years
b- mankind's sin; decreasing; rapidly; year of the Flood
3. a- paleontologic systems
b- stratigraphic
c- Only 3; are; quite different
d- Permian
4. a-EU, FG; b-EU, FG; c-FG, EU; d-FG,EU
5. GCD1; GCD12; GCD9
6. sorting; sea floor — near shore — lowland — upland; from bottom to top
7. big and fast
8. Sample answer to compare with yours:
If uniformitarians were right in their extreme belief that no past geologic processes ever happened faster or on a larger scale than we see today (i.e., “the present is the key to the past”), then there would be no vast fossil deposits to name as geologic systems (paleosystems), no vast rock layers (like those glimpsed at Grand Canyon) to diagram as a “geologic column,” and no fossil evidence pointing to either belief in evolution of “new and improved species” or in the catastrophic destruction of land life around the globe during the Genesis Flood! There might not even be a science of paleontology! (See subsection “1. Extent of Fossil Deposits” in Chapter 2.)
9. Sample answer: What scientists today call the “Cambrian Explosion” Darwin recognized as the “sudden appearance of complex life forms in the lowest known fossiliferous [fossil-rich] strata,” and he admitted this evidence contradicted his belief that living things began — without God's help — as a few simple creatures that developed slowly and gradually as a result of struggle and death into the many complex creatures we have today.
10. Sample answer: With their eyes like ours, a two-hemisphere brain, circulatory and digestive systems with organs like ours, etc., the “shelled squids” called nautiloids are perhaps the most complex of all animals without backbones (invertebrates) — yet they are found with the “first” (“deepest buried” or “lowest stratigraphic group”) animals preserved at the base of the GCD in the lowest

Cambrian strata, and they occur throughout the GCD in many large and varied forms, with a form much like the “first” surviving today. After calling the nautiloid a “simple or “primitive” animal, a doctoral student realized it was too complex. Then when she called it “old” because it “went back to” Cambrian, she realized an animal that “old” — by evolutionary belief — should not be that complex. If it was “that old” it should not be that complex, and since it is that complex it should not be that old—unless evolutionary belief is wrong, and the biblical record of earth history [Creation — Corruption — Catastrophe — Christ] is correct!

Chapter 3, page 29

1. Sample answer: Using a fossil's assumed “stage of evolution” to “date” rock layers, then using those rock layers “dated” by evolutionary assumptions to “prove” evolution is just using your assumption to prove your assumption — a “circular argument,” an error or fallacy in logic (a tautology) of no use in science on any other reasonable endeavor [but not to be confused with admitted interdependent definitions, such as saying heat causes molecular motion and molecular motion causes heat].
2. (1)- place; times (2)- time, places
3. a-Sample answer: Chemical evolution changed minerals in rock of the earth's crust into “simple” life forms like lichens, and some of them evolved by time, chance, struggle and death (TCSD — Darwin's “war of nature”) into moss. Then more TCSD changed some mosses into ferns and then some ferns into shrubs and trees — all by struggle and death over vast amounts of time, without any help from “god.”
b-Complex combinations of fungi and algae called lichens can absorb moisture and break down rock for mineral nutrition (the fungus) and make food using the sun's energy and complex chemical reactions [photosynthesis] (the algae). Lichens make enough soil for moss to grow, and moss and lichens build soil and hold enough moisture so that ferns can grow when their spores blow in from another place and “sprout” in the new environmental conditions provided by lichens and moss. Ferns help to anchor the soil and provide moisture-holding shade to make conditions suitable for seeds of shrubs and trees brought in from other places by wind, water, animals, or man. This observable, scientific process of ecologic succession may take tens or even hundreds of years, but it enables plants (and animals that follow them) to “multiply and fill” the earth as pre-existing (created) plants move into new places and change the environment (NOT the species of living things) to make it suitable for other creatures to follow — quite UNLIKE the unobserved, hypothetical process of evolution believed to take millions of years as “simple” organisms are believed to change into others by time, chance, struggle, and death, with environments “changing” organisms instead of the other way around.
4. a- ecology; evolution
b- ecology; evolution
c- ecology; evolution