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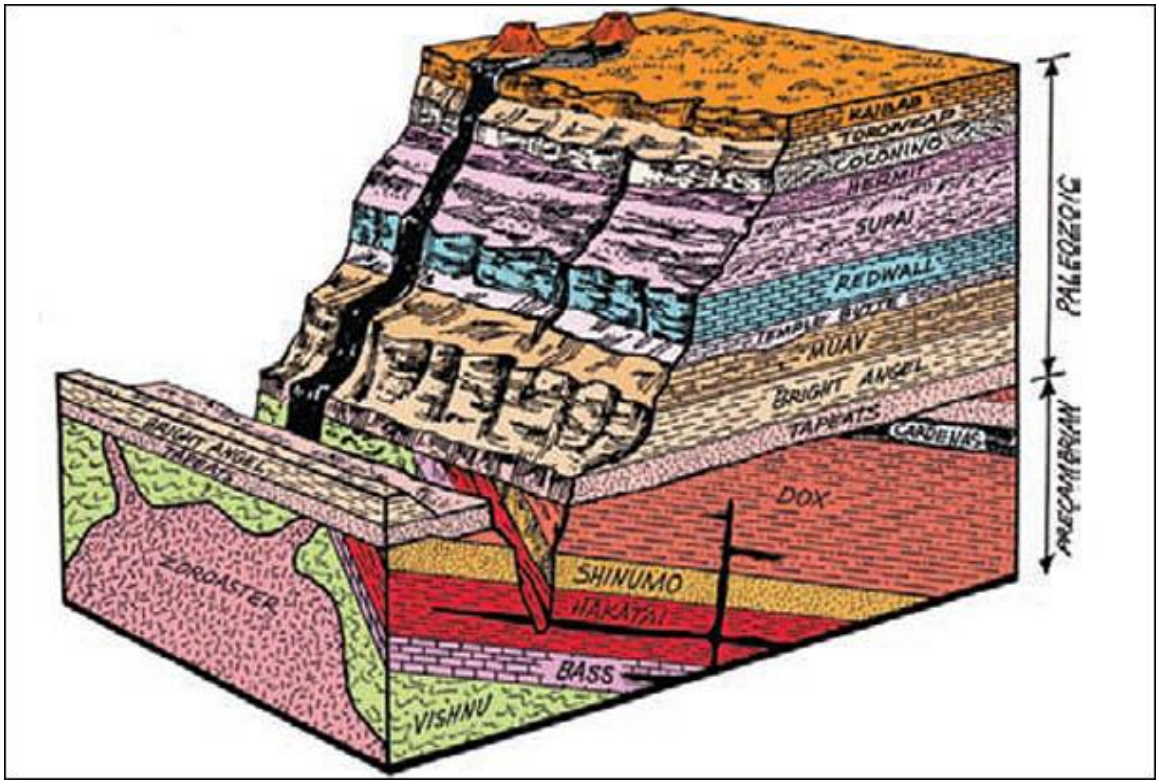
PO Box 8500, Charlotte, NC 28271

This article first appeared in the Viewpoint column of the CHRISTIAN RESEARCH JOURNAL, volume 35, number 01 (2012). For further information or to subscribe to the CHRISTIAN RESEARCH JOURNAL, go to: http://www.equip.org/christian-research-journal/.

Viewpoint: **JAF11351.1**

GRAND CANYON, CREATION, AND THE GLOBAL FLOOD

by Steven A. Austin



Two observers stand on the rim of Grand Canyon in northern Arizona. Like five million other people each year, these two visitors come to marvel at the spectacle displayed before them. One is an evolutionist, and the other is a creationist. They come to understand the evidence within the earth, and they are at the Canyon to decipher the clues to the inside story of the ground beneath their feet. Is Grand Canyon a monument

to the passing of the geologic ages? Or is Grand Canyon the graveyard of the world? Was the Canyon the product of a little water over a very long time? Or, was Grand Canyon sculpted by a lot of water during very little time?

FRAMEWORK OF ASSUMPTIONS

The evolutionist comes to the Grand Canyon with the dominant paradigm of our culture. The Canyon gives us a glimpse of the primitive earth from which, according to the popular model, the present earth slowly evolved during more than a billion years. Sedimentary strata of Grand Canyon (sandstone, limestone, and shale) are understood by the evolutionist to represent products of the passage of millions of years as calm and placid seas advanced and retreated over a dozen times on top of the continents. Grand Canyon erosion is supposed to have occurred very slowly during tens of millions of years by the almost trivial but incessant action of the small Colorado River. That evolutionary model has been derived from the uniformitarian assumptions of Charles Lyell and Charles Darwin that have become the prevailing story told today at the Canyon's rim.

The creationist comes to Grand Canyon with the historical framework of Scripture—Creation, the Fall, and the Flood. God's mighty hand formed and fashioned the original earth "in six days." That perfect world that was afflicted during the space-time Fall was later judged by a global flood in Noah's day. The historical narrative in Genesis confirms a year-long, global flood by stating that the cataclysm began as a tectonic event on the ocean floor ("All the fountains of the great deep [were] broken up" Gen. 7:11) and months later covered the continents ("All the high hills under the whole heaven were covered" Gen. 7:19). This year-long, global hydraulic cataclysm appears to be a strategic tenet in what the Apostle Peter wants the Church to remember in these last days ("The world at that time was destroyed, being flooded by water" 2 Pet. 3:6). Grand Canyon sandstone, limestone, and shale strata are recognized as containing fossilized marine organisms that died violently during rapid burial when ocean water was over the continent. Therefore, a flood interpretation proceeds easily from what we see at Grand Canyon. The erosion of Grand Canyon likely occurred during the years after the global flood.

CONFIRMING THE CREATIONIST PERSPECTIVE

Sandstone Strata. Recent geologic research on the sandstone strata of Grand Canyon appears to be confirming the creationist perspective. The Coconino Sandstone, a prominent cliff-forming layer one thousand feet below the Canyon's rim, was supposed to have been deposited by wind action in a colossal desert, not by an oceanic flood.

Signs at the Grand Canyon promote this interpretation. However, the overall texture of the Coconino has the unsorted appearance of sand accumulated by water current, not like the well-sorted, fine sand deposited by wind. Grains of the mineral dolomite, a diagnostic ocean precipitate, are now being recognized widely within the Coconino. Careful geologic study is showing that the diagonally sloping internal sandstone beds ("cross beds") of the Coconino Sandstone resemble closely, but on a much larger scale, modern submarine dunes accumulated rapidly during storms by ocean currents in estuaries. Flume experiments have been engineered within a giant channel at St. Anthony Falls adjacent to the Mississippi River in Minneapolis. These scale models indicate that the cross beds of the Coconino's scale formed in deep, southward-flowing water current moving at more than three feet per second, an extraordinary velocity within any open ocean. Dr. John Whitmore at Cedarville University in Ohio is doing ground- breaking research on this subject.

Limestone Strata. Recent geologic research on the limestone strata of Grand Canyon appears to be confirming the creationist understanding. The Redwall Limestone, the reddish cliff outcropping at half of the Canyon's depth, was thought to have formed in a shallow continental shelf from a slowly advancing, very placid ocean. The individual grains supposedly accumulated from lime mud as muds do today on the Bahama Banks. Recent study of a single seven-foot thick bed within the Redwall Limestone document billions of shells of large fossil marine squid (what are called nautiloids). That widespread squid-bearing limestone layer appears to have been deposited within minutes during a mass-kill event by a submarine mudflow. Now it is becoming tolerable for geologists to talk about catastrophic processes forming Grand Canyon limestones.

Particle Dispersement. A new line of thinking in sedimentology suggests that slurry-flow process is very important in understanding how ocean sediment was moved and deposited. In this thinking, concentrated sediment-water flows are supposed to behave like ketchup—the slurry loses its viscosity during rapid movement. The old idea is that particle transport was by traction with particles rolled or swept in turbulence in water-dominated, slow-moving currents. In this older view, the water moves the sediment, and deposition is understandably slower. In the newer view, particles are moved as high-concentration suspensions contained within laminar flows becoming essentially gravity-driven currents. The newer view is that the sediment dispersion moved the water, and sedimentation is understandably much faster.

Mudrock layers identified by the general name "shale" are figuring prominently in new geologic studies of rapid strata formation of Grand Canyon strata. The Hermit Formation, the brownish slope-forming deposit beneath the Coconino Sandstone, has abundant, very thin layering called laminae. These very thin layers have been long supposed by geologists to have been accumulated by sustained, exceedingly slow settling of individual dispersed clay or silt grains, as in modern river deltas. Recent flume experiments with flocculated silt- and clay-size particles show the structure of ripple cross-lamination that is abundant within the Hermit Formation. The old idea that the Hermit Formation was deposited on a river delta never had strong geologic evidence. Marine fossils within these mudrocks argue for deposition rapidly in ocean water.

TRANSITIONING VIEWS ON TECTONICS

How was the Colorado Plateau uplifted out of the ocean once the sandstone, limestone, and shale strata were deposited? Today, Grand Canyon marine strata occur at over eight thousand feet elevation in northern Arizona. These strata today compose the Colorado Plateau, a quarter-million-square-mile region dominated by marine sandstone, limestone, and shale. This plateau is embedded within the Cordillera, the gigantic terrain produced by global tectonics that dominated western North America. The classic view has been that the Colorado Plateau along with Grand Canyon was uplifted very slowly along faults beginning in the Cretaceous Period and being sustained through the Eocene Epoch (a sequence of earthquake events of twenty million year's duration supposedly finished fifty million years ago!). Time and very slow tectonics are coordinated almost as a "magic wand" that fashions plateaus within the interior of a continent.

Modern geologic studies appear to question the classic view of time and tectonics at Grand Canyon. The modern rates of erosion could not be sustained over fifty million years leaving the Colorado Plateau and Grand Canyon in its present form. At modern rates of river erosion the plateau could be beveled down to sea level several times within fifty million years. Marine strata still compose the highest portions of the plateau, demonstrating that the plateau's surface has been sparingly eroded. Time has long been regarded as the "hero of the plot," accomplishing geologic changes in believable ways. Instead, geologists are beginning to view time as the "villain of the plot," asking how Grand Canyon could endure given tens of millions of years.

Recent geologic studies are finding evidence of catastrophic uplift and collapse that paints a different view of tectonics than was supposed in previous generations. The Cordilleran tectonic belt is viewed as a collision of seafloor and continental plates at

faster rates than at present. Displacements occurred on "superfaults," great ruptures within the tectonic belt, where rocks were melted or break down into supercritical phases with solid particles mixed in liquids. Dr. Tim Clarey, geologist at Delta College in Michigan, has researched a fault on Kodiak Island, Alaska. His finding is remarkable, showing that the fault moved very fast and with great enough displacement to melt, not just powder, rock on the slip surface. Kodiak Island is where the Pacific Plate has been shoved under the North American Plate. Conventional thinking about faults is that they involve slow and short displacements that allow heat to be conducted away from the fault surface during infrequent smaller magnitude 8 earthquake events. Friction is not allowed to build up enough heat to melt rock. Rocks pulverize, they do not melt. However, the new thinking about "superfaults" allows us to suppose "superquakes" that fit nicely with theories of catastrophic plate tectonics and a much shorter time scale than imagined by conventional, evolutionary tectonics.

Once mountains and plateaus were uplifted adjacent to "superfaults," how were they denuded? Dr. Clarey has found evidence that nearly horizontal faults represent the shear surfaces on the undersides of gigantic landslides. Two big faults of Wyoming (Heart Mountain detachment fault and South Fork detachment fault) provide evidence that mountains were deformed above "superfaults," in these two cases as enormous rockslides on very gentle slopes. Displacements were rapid enough to decompose limestone into calcium oxide powder and compressed carbon dioxide, a mechanism that lubricated the displacement surface and allowed mountains to move at freeway speeds. These findings, according to Dr. Clarey, support ideas of catastrophic tectonic denudation of the Colorado Plateau, even of the Grand Canyon region.

A YOUNGER CREATION

Who has not heard the theory that the Grand Canyon was eroded slowly during tens of millions of years by the Colorado River? It is a simple and elegant story that has become a great nature myth of the twenty-first century. Geologists generally reject that explanation of Grand Canyon formed by a through-flowing river over tens of millions of years. The deposits on the western side of Grand Canyon are of the wrong character to argue for a long-enduring river. Also, the river delta deposit on the west side of the Canyon is only hundreds of cubic miles in volume, not thousands of cubic miles, as required by the ancient-river theory. So, the more-recent, popular theories of Canyon formation involve a younger Canyon formed by catastrophic process! A good theory for the formation of the Canyon recognizes lake silt deposits on the eastern side of the Canyon in the Hopi Buttes and elsewhere. These silt deposits are thought to be evidence of a large lake, or series of lakes, at six thousand feet elevation on the Colorado Plateau. Could these lakes have breached their natural dam in the eastern Grand Canyon, as

catastrophic drainage rapidly eroded Grand Canyon? Geologists are starting to think this way.

Radioisotopes. Part of the controversy about the age of Grand Canyon rocks has centered on the abundance of decay products of certain radioactive isotopes within Grand Canyon rocks. Some scientists have assumed that the abundance of the radioactive parent and the nonradioactive daughter can be used to tell the passage of time somewhat similar to how an hourglass tells the passage of time. A group of earth scientists with a project titled "Radioisotopes and the Age of the Earth" (RATE) spent one quarter million dollars measuring the isotope abundances within a horizontal igneous body in the Grand Canyon. That rock body (called the "Bass Rapids diabase sill") was molten when it was squeezed quickly into the Hakatai Shale deep within the Grand Canyon. However, four different radioisotope pairs yielded four different "radioisotope ages" for exactly the same rock body. The four different methods should have yielded a single "age" for the cooling of the rock body. The hourglass assumptions on which radioisotope dating is based appear to be challenged. The RATE researchers asked, "Has anyone successfully dated a Grand Canyon rock?"

MORE THAN SCIENCE

Two observers stand on the rim of Grand Canyon. Those two observers are geologists. One is an evolutionary geologist, and the other is a creationist geologist. They are seeking to decipher clues to an immense puzzle. They are trying to understand the geologic history of Grand Canyon. The conclusions of both geologists are derived largely from their framework of assumptions. It is not strictly speaking a scientific endeavor as no human observer was there, and no one can repeat or test scientifically interpretations of history. Creationists believe that God is the reliable observer when it comes to the issues of origins. We can trust the Creation-Fall-Flood framework of Scripture that God has provided. We can also trust our eyes as we seek to understand the great natural wonder He has made at Grand Canyon.

Steven A. Austin, Ph.D., is an adjunct instructor at Cedarville University, Ohio.

Viewpoint: **JAF11351.2**

HOW OLD IS THE EARTH? WHAT GOD'S CREATION PROFESSES

by Gregg Davidson and Ken Wolgemuth

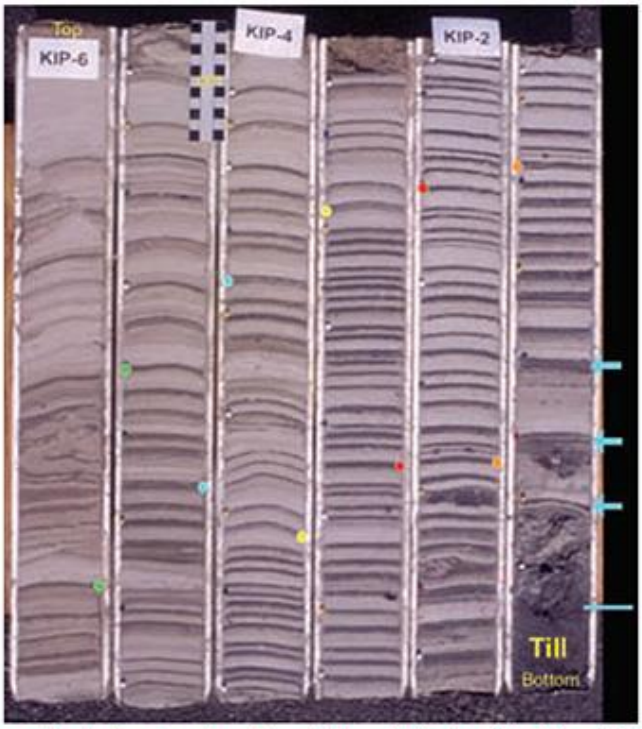


Fig. 1 Annual tree ring growth and sediment varve layers. Varve photo from (http://geology.tufts.edu/varves/Geology/deglaciation.asp).

How old is the Earth? Among those who believe that the Bible is the authoritative, inerrant Word of God, some believe the Bible is silent on the subject of age, and the question is better left to science, while others insist that Genesis constrains the age of the Earth to less than ten thousand years. But does it really matter? How important is it to resolve this question? Our experience is that the question is of great importance, for the question of age has become a common stumbling block to faith where many turn away

from the cross over a mistaken sense that acceptance of Christ is equal to rejection of science. Sadly, the church has been infused with a great deal of misinformation on this subject, making it difficult for the average Christian to discern what is true and what is not. It is our desire, first as disciples of Christ, and second as practicing professional geologists, to open the curtain on God's creation that others might see the wondrous things He has done.

The subject of this article is limited to the evidence found in God's natural creation, but we readily acknowledge the preeminence of Scripture over science. Science, as a study of God's natural creativity, merely serves as a tool for choosing between scriptural interpretations when more than one is hermeneutically plausible. Readers wrestling with the biblical arguments may refer to works such as *When Faith and Science Collide* by G. R. Davidson.

So what does a study of the Earth reveal? Of those insisting the Earth is less than ten thousand years old, many claim that an honest study of God's natural creation reveals evidence that contradicts the interpretations of conventional geology. It is asserted that the secular worldview of most scientists makes them see data as supporting long spans of time, while the worldview of Christian researchers makes them see the same data as supporting a recent creation date. This notion runs contrary to experience, for in fact, the vast majority of Bible-believing Christian geologists find the evidence of great age to be overwhelming.

So what is it that Christian geologists, like ourselves, see in God's creation that speaks convincingly of such a long history? For this article, we have selected three examples of methods used for dating, initially without addressing common young-earth counterarguments. These are saved for the final discussion, where counterarguments are put to the test by combining the previous examples.

TREE RINGS

Most people know what a tree ring is. Summer growth produces a wide band of lighter-colored cells, followed by a narrow band of darker-colored cells in winter. The light and dark pair are referred to as one "tree ring," and represents the passage of one year (Fig. 1). The oldest living trees have about four thousand rings, placing their age at the same number of years. To date the age of a dead tree, we can take advantage of the fact that the width of tree rings varies from year to year, creating a unique pattern of narrow and wide rings over the course of multiple years. By matching the pattern of rings in a dead tree with the pattern of rings from the living tree (called cross-correlation), the age of the dead tree can be determined and the number of total years extended back beyond

four thousand. Available logs from the same area allow cross-correlation back over twelve thousand rings before the matching becomes uncertain.[1]

This puts the minimum age of the Earth somewhere beyond twelve thousand years. Trees and logs used in these cross-correlations all come from the surface or upper layers of the Earth's sediments, with a vast number of preserved trees found in much deeper deposits, which suggests that the total age of the Earth is well beyond twelve thousand years.

VARVES

Varves are sediment layers formed in lakes in particular environments. In northern latitudes where lakes freeze over, fine-grained material will settle out in winter, followed by coarser-grained material in spring as ice thaws and increased stream flow carries larger particles into the lake. Each winter-spring cycle produces a fine-coarse couplet called a varve. In other places, varves may form from diatom blooms (Fig. 1). At all times of the year, fine particulate matter settles out to the bottom, but during the spring, single-celled organisms with a solid shell rapidly reproduce near the surface of the lake. As they die, the shells rain out onto the lake floor and form a light-colored coating. Each winter-spring cycle produces a dark-light colored sediment couplet, or varve. In both examples, each varve represents one year.

In one lake in Japan, Lake Suigetsu, a sediment core was collected in 1991 nearly 250 feet in length.[2] The core contained an uninterrupted sequence of varves, with a total count in excess of 100,000. These layers suggest a history of 100,000 years of accumulation, and an origin of the Earth at some time in the more distant past.

RADIOACTIVE DATING

Radioactive dating is based on the observation that specific unstable varieties of atoms, such as potassium-40, uranium- 238, or rubidium-87, decay into other atoms at a predictable rate that has not been found to significantly change under huge ranges of temperatures or pressures, or as a result of chemical reactions. If we know how much radioactive material was around at the start, or if we can measure the amount of radioactive material left and the amount of the new atoms that were produced, and if no material was added or lost over time, we can estimate an age. Radioactive dating methods are the tools used to estimate an age for the origin of the Earth as a whole; the oldest minerals and meteorites ever found have dates around 4.5 billion years.[3]

COMBINING METHODS TO CONFIRM ACCURACY

Young earth advocates create doubt by drawing attention to all the *ifs* in the methods described above. *If* radioactive decay is constant, *if* no material was gained or lost, *if* trees produce only one ring per year, and *if* sediments form only one light-dark or coarse-fine couplet per year, then the methods will work. But with so many *ifs*, how can there be any confidence that the methods work? What if radioactivity rates were faster in the past, and what if catastrophic wave action and climatic shifts resulting from the flood produced multiple tree rings and sediment layers in a short period? Wouldn't it look the same? Is the way we interpret this data simply dependent on our worldview? The answer is an emphatic *no!*

We can test for the accuracy of each hypothesis by combining our data. We will look simultaneously at tree rings, sediment varves, and carbon-14 (a radioactive form of carbon). In this approach, we will not use carbon-14 to calculate any ages, but instead will simply look to see how much is present in each ring or varve layer.

Carbon-14 is continuously produced in the atmosphere and incorporated into living organisms. At the time of death, no more is added, and the amount of carbon-14 begins to decline (regardless of whether the decay rate is constant or slowing down). If each tree ring represents one year of growth, or if each varve layer represents one year of deposition, then the amount of carbon-14 found in each successive layer should steadily decrease. Further, we should expect to see essentially the same amount of carbon-14 in tree ring twelve thousand as we see in varve twelve thousand (and any other rings and varves of matching number). We should see very different results if hundreds or thousands of layers formed over the span of one or a few years, as required for young-earth flood models. All sediment layers deposited in the same year should have roughly the same carbon-14 content, without a steady decline in carbon-14 from one layer to the next. Tree ring growth is completely unrelated to sediment formation, so if thousands of varve layers were formed in one year, then substantial differences should be found between the carbon-14 content of tree ring twelve thousand and varve twelve thousand. Finally, if the radioactive decay rate has remained unchanged, a plot of age versus the log of the carbon-14 content for any set of data should plot close to a straight line. If it has been slowing down over time, rapid decay in the past should produce a steeply curving line—not a straight line.

So what is actually seen? Figure 2 shows the carbon-14 content of cross-correlated tree rings, and sediment varves from lakes in Minnesota and Japan. The data falls on a remarkably straight line extending to fifty thousand rings/varves before carbon-14 drops below detection. Minor wiggles in the data indicate that there may have been years here and there with missing or double rings/varves, but on average, each ring or varve represents one year going back in time. The carbon-14 content of tree

ring twelve thousand is in fact essentially the same as in varve twelve thousand, confirming the accuracy of these counting methods. The straight line is also powerful confirmation that the radioactive decay rate of carbon-14 has remained constant over at least the past fifty thousand years, yielding confidence in the reliability of radioactively determined ages.

The high degree of linearity (straightness) of the combined data has two possible interpretations.

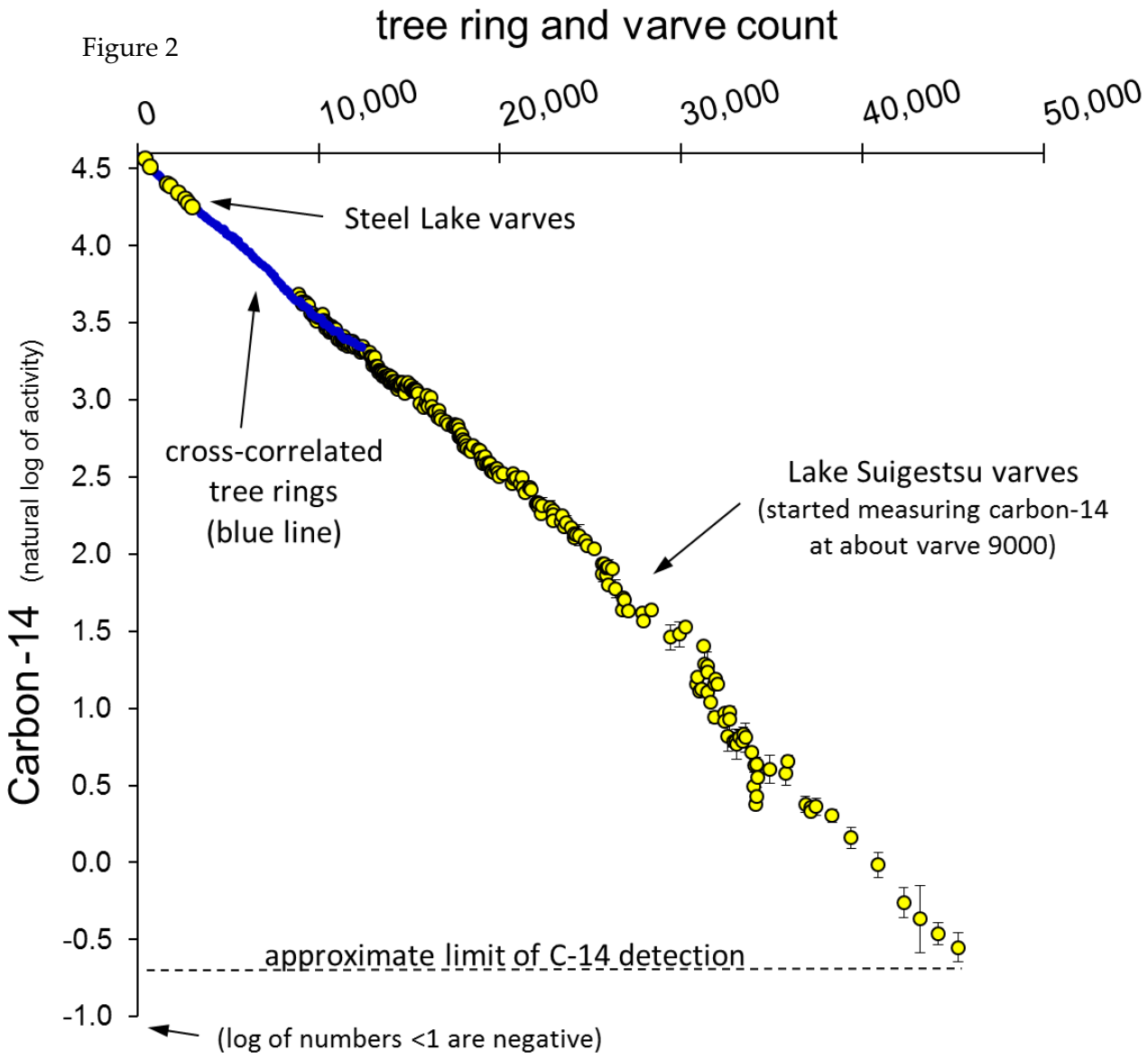
Option 1: The one hundred thousand varve layers in Lake Suigetsu represent one hundred thousand years, and radioactive decay rates have remained unchanged, resulting in reliable radiometric dates for the age of the Earth.

Option 2: God started with a fast rate of radioactive decay and dozens or hundreds of tree rings and diatom blooms each year, but then intentionally and precisely slowed down each independent and unrelated process in such a way as to make it falsely look as if the data confirms the accuracy of radioactive dating and counting methods for determining age.

We argue with great conviction that Option 2 does not reflect the God of King David who proclaimed that the heavens declare the glory of God (Psalm 19), nor of the apostle Paul who stated that God's eternal character and divine nature are manifest in what He has created (Rom. 1:20). If the creation speaks of a specific history, it is our belief that God's creation speaks truthfully and the history is real.

Where does this leave us? Many in the world marvel at the handiwork of God while denying the Creator. In response, some evangelicals demand that to acknowledge the Creator, we must deny His workmanship. Can there be a more ineffectual witness? If after seeing the results of God's creation in Figure 2, the church insists that the *obvious* meaning is in fact not true, we drive people away from faith in Christ on a misplaced assumption that belief in Christ represents the abandonment of reason. Christ Himself is a sufficient stumbling block—we need not create any other!

Figure 2



Figures:

1. Annual tree ring growth and sediment varve layers.

2. Tree-ring number and varve number vs. measured carbon-14. Varves less than four thousand are from Steel Lake, Minnesota[4]; varves greater than nine thousand are from Lake Suigetsu, Japan.[2,5] (Vertical bars represent the magnitude of uncertainty in the measured value.)

Gregg Davidson is a professor of geology and geological engineering at the University of Mississippi. He has a B.S. from Wheaton College in geology, and a Ph.D. in hydrogeology from the University of Arizona.

Ken Wolgemuth is a petroleum consultant who teaches courses on geology internationally for the energy industry. He has a B.S. from Wheaton College in chemistry and a Ph.D. from Columbia University in geochemistry.

The authors offer Creation Workshops to seminaries and related institutions.

NOTES

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3 G. Brent Dalrymple, *Ancient Earth, Ancient Skies: The Age of Earth and Its Cosmic Surroundings* (Palo Alto, CA: Stanford University Press, 2004).
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