PCA Geologists on the Antiquity of the Earth

A paper by eight professional geologists who are members of the
Biblically conservative Presbyterian Church of America (PCA)

This paper was originally published in the May/June 2010 issue of Modern Reformation, with one paragraph inadvertently dropped at the time of publication. With permission from Modern Reformation, the missing paragraph has been restored (2nd paragraph of page 4). The two figures were originally published in black and white. Affiliation of the authors has been updated, current as of September, 2010.

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How old is the earth? Does an honest reading of the opening chapters of Genesis confine creation to six days a few thousand years ago, or does it allow for an origin of much greater antiquity? These questions are hardly new. Scientific assertions suggesting an alternate interpretation of the length of creation began more than 200 years ago, well before the days of Charles Darwin. With a debate more than two centuries in the making, one might reasonably expect that Reformed scholars long ago resolved the issue. In fact, the much-sought resolution has proven elusive. In 1998, the Presbyterian Church of America (PCA) commissioned a Creation Study Committee (CSC), made up of both Bible scholars and natural scientists, to consider the relevant Scriptures in light of the various existing interpretations and scientific evidence. The report, submitted after two years of investigation, did not recommend a definitive answer, but did at least conclude that it is possible to believe both in an ancient earth and the inerrancy of Scripture. The statement below is extracted from the concluding pages of the 2000 *Report of the Creation Study Committee*.

> Clearly there are committed, Reformed believers who are scientists that are on either side of the issue regarding the age of the cosmos. Just as in the days following the Reformation, when the church could not decide between the geocentric and heliocentric views of the solar system, so today there is not unanimity regarding the age question. Ultimately, the heliocentric view won out over the geocentric view because of a vast preponderance of facts favoring it based on increasingly sophisticated observations through ever improving telescopes used by thousands of astronomers over hundreds of years. Likewise, in the present controversy, a large number of observations over a long period of time will likely be the telling factor.

The geocentric/heliocentric debate refers to a controversy starting some 500 years ago between two conflicting views of nature. The geocentric position held that the sun, stars, and planets revolved around the earth. In contrast, the heliocentric position held that the earth and planets revolved around the sun. Several passages of Scripture appeared to support the geocentric view,

and heliocentrism was considered by many to be a direct challenge to the authority of God's Word. Others recognized more than one possible interpretation of the Scriptures in question, and scientific evidence eventually persuaded them that the sun was indeed the center of our solar system.

In this context, it is important to recognize that science did not prevail over Scripture. Scripture was and remains true. Scientific evidence only served as a God-given aid in selecting the more accurate of two plausible, Bible-honoring interpretations. The CSC report suggests we are at a similar crossroads concerning the age of the earth, but without sufficient evidence to tip the scales one way or the other.

The CSC commendably included several scientists, though none were geologists. So what would a geologist add to the discussion? As practicing geologists committed to the authority and inerrancy of Scripture, in keeping with Reformed tradition, the eight authors of this article maintain that the "large number of observations over a long period of time" mentioned in the CSC report have already been made, and the data are sufficient to unequivocally answer the question. We also understand, however, the inherent difficulty that people have in assessing a vast body of scientific literature filled with terms and jargon that often require years of schooling in very specific fields to comprehend. Such difficulties have landed even well-read and godly individuals such as Martin Luther on the wrong side of these debates. Luther addressed the heliocentric theories of Copernicus in his day as being little more than the pursuit of vanity since Scripture clearly speaks of the sun moving and not the earth.

In this article, we wish to provide our brothers and sisters in the body of Christ with a few general observations, some clarification of a common misconception about our science, and two specific examples that speak convincingly that God's earthly creation has been around for a very long time.

General Observations

Science can be a contentious business when data can be plausibly interpreted more than one way. One of the best ways of making a name for yourself in the scientific community is to challenge a widely held scientific understanding with a strongly defended alternative theory. It is thus of considerable significance that the tens of thousands of geologists worldwide are virtually in complete agreement that the question of the earth's age has been answered: roughly 4.6 billion years.

The agreement is perhaps even more striking in the world of economic geology (oil and mineral exploration) where theories that lead to increased revenue always win, even if philosophically distasteful. Understanding the age of the earth and its layers plays a critical role in natural resource exploration, yet to our knowledge there is not a single oil or mining company anywhere in the world that uses a young-earth model to find or exploit new reserves. Old-earth models work. Young-earth models do not.

But Isn't an Old Earth Based Entirely on Assumptions of Naturalism?

There is some confusion over the term *naturalism* because it is variably used as an approach to day-to-day research and as a philosophical worldview. As a philosophical position, it is better termed *materialism*, which holds that all that is real is observable or testable using natural tools. Supernatural phenomena and beings unconstrained by time and space, such as angels, demons, or God himself, are deemed impossible by simple definition. Ironically, materialism lacks the tools to test its own postulates and is devoid of real merit. It is nonetheless the mantra of many atheistic scientists who have latched onto evolution and deep time as ways of getting around God. This has led to an unfortunate misrepresentation of the age of the earth debate among Christians.

The debate over the age of the earth is frequently characterized as science versus religion or as naturalism/materialism versus theism/Christianity, but these are utterly false dichotomies. In *The Bible, Rocks and Time,* Davis Young and Ralph Stearley note that many of the early advocates of an ancient earth were devout Christians. Among geologists such as Deluc, Buckland, Sedgwick, Conybeare, Fleming, Hitchcock, Guyot, Dana, Winchell, Dawson, and Walcott, several were Calvinists. These men did not regard the scientific evidence as challenging the veracity of Scripture, but only as challenging one aspect of the traditional *interpretation* of Genesis 1 and 2. The central message of God's authorship of creation was and remains undisputed by evidence of great age. It was not a commitment to naturalism that convinced Christian geologists of the antiquity of the earth, but rather a belief that the history of nature recorded in the earth's rocks should be consistent with the unchanging, truthful nature of its Author. In their estimation, the rock record in outcrop after outcrop in all parts of the world clearly told a story extending far beyond a few thousand years.

This sentiment underlies the current position taken by most Christian geologists today. The Creation Study quote at the start of this article implied that a roughly equal number of Reformed scientists could be found on either side of the age of the earth controversy. This perception is understandable given the high-profile nature of young-earth organizations, but it is not what we have encountered in our experience working among Christian geologists. Of those who claim belief in an inspired, inerrant Bible, an overwhelming majority fall within the "old earth" camp. In fact, we are not aware of a single practicing geologist who was convinced of a young earth by studying God's physical creation. Though an exception may well be out there somewhere, the few young-earth geologists we have seen in print or have spoken to privately arrived at their position solely on an assumption of how Scripture should be interpreted, not on a study of God's creation.

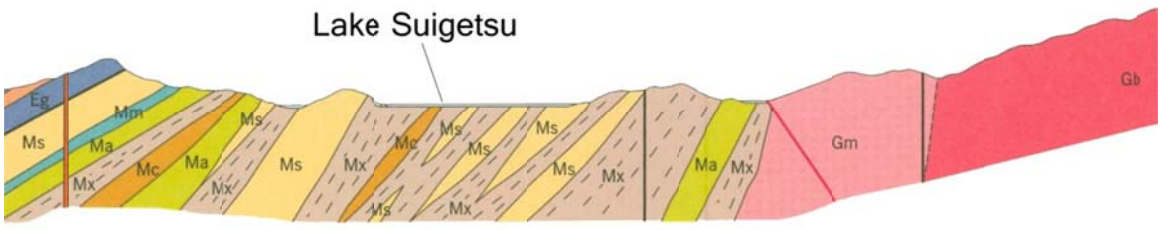
Evidence for the Earth's Antiquity

When selecting examples to convey the strength of the evidence for the earth's antiquity, we faced two challenges. One was selecting examples that can be easily explained in just a few paragraphs to those unfamiliar with geology. The more difficult challenge, however, was selecting a mere two out of the literally thousands of good candidates from every corner of the globe.

Lake Suigetsu, Japan: Rocks and Sediments Aren't Just Old, They Have a History

In many places around the world, rocks and sediments preserve evidence not only of their age but also of the processes that produced them and the order in which events took place. Consider Lake Suigetsu in Japan, starting with the loose sediments that have been slowly accumulating at the bottom. The bulk of these bottom sediments consist of darkly colored silt and clay particles that settle out after being washed into the lake by streams. In the spring, single-celled organisms called *diatoms* living in the water increase in number. As they die off, their microscopic shells settle to the bottom to produce a whitish layer that gets covered during the following season by more silt and clay. Each pair of light and dark layers, collectively referred to as a *varve*, represents the passage of one year. Lake Suigetsu contains more than 100,000 of these varves, which strongly suggests the lake has been collecting sediment in excess of 100,000 years.

If forced to compress this history into a few thousand years, more than a dozen alternating layers had to form every year up until the present where suddenly only one pair now forms annually. No mechanism is known that could accomplish this, but fortunately, we don't have to simply rely on untestable assumptions about the past. We can test the "multiple varves per year" hypothesis by comparing the ^{14}C (carbon-14) content of each varve with that of tree rings collected from a similar latitude. This method works because trees and diatoms both incorporate carbon into their tissues or shells that comes from the atmosphere. Carbon-14 is continuously produced in the atmosphere, and a portion gets included in actively growing tree rings and diatom shells. Carbon-14 is unstable and decays over time, so once a diatom dies or when tree growth moves on to the next year's growth, the ^{14}C content of the shell and contemporaneous tree ring steadily declines at the same rate. As a result, a varve deposited say 2,000 years ago should have a similar residual ^{14}C content as a 2,000 year old tree ring. The beauty of this comparison is that it will be true even if decay rates somehow turn out to be variable or if the ^{14}C content of the ancient atmosphere is unknown. In other words, *the test is independent of assumptions* about decay rates and historical atmospheric processes. At Lake Suigetsu, hundreds of samples from among the upper 45,000 varves (as far back as ^{14}C can be reliably detected) have been analyzed for ^{14}C content and compared with tree rings. The results unambiguously confirm that each varve indeed represents one year of sediment deposition – and this lake has more than 100,000 of these annual layers.



Geology beneath Lake Suigetsu, Japan

And there is still more to this story. Those 100,000-plus layers lie on top of bedrock that has its own history. The solid rock beneath and around the lake sediments is a complex assortment of granites that formed from intruded magma (melted rock) and tilted sandstones, mudstones, limestones, and cherts that formed from accumulating sediments in an ocean environment. The *abbreviated* history all this reflects starts with deposition in a shallow ocean environment, followed by multiple changes in sea level, cementation of grains to harden sands and mud into rock, intrusion of magma, tilting and uplift above sea level, erosion of these rocks to present level, and finally formation of the lake where sediments and diatoms began to accumulate on the bottom.

No single event can be called upon to plausibly produce all these observed changes. Each feature and rock unit records a unique aspect of earth history. Dating techniques applied to these rock units yield the same sequence of ages inferred from logically sorting out the order of events from visual observations. The fact that the order of ages follows the logical sequence of events that must have taken place lends credence to the absolute values, but again, we do not have to depend on untestable assumptions to accept that ages in the millions of years are credible. This leads us to Example 2.

The Atlantic Ocean: Plate Velocity Confirms Measured Ages of Rocks

The details of how radioactive dates are determined are irrelevant for this example. It will be sufficient to make a general observation about their application and proceed with an example of how the dates can be independently verified.

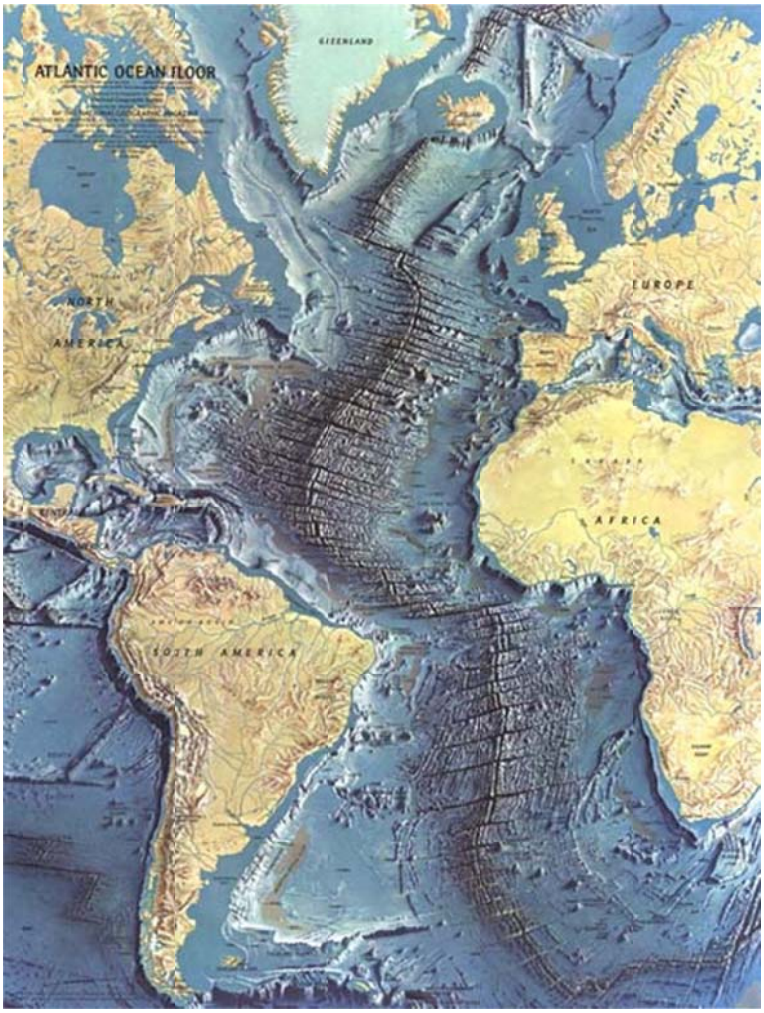
The utility, if not the absolute accuracy, of radioactive dating methods is evident from the sheer number of analyses performed every year, with the vast majority yielding ages consistent with independent observations of layering, cross-cutting, or presence of unique fossils. Since the discovery of radioactivity, literally hundreds of thousands of samples have been analyzed from all over the world. If the various radioactive methods yield random or inconsistent dates as often claimed, few researchers (including some of us) would waste valuable resources on these measurements.

A simple method for checking the accuracy of radioactive dating methods makes use of our knowledge of plate tectonics: the movement of plates making up the earth's crust. If we consult a map of the Atlantic Ocean floor, a ridge – aptly named the *Mid-Atlantic Ridge* – is readily visible exactly dividing North and South America from Europe and Africa. Lava observed welling up along the ridge attests to modern day separation of the continents and expansion of the ocean floor. Seafloor ages determined using radioactive methods are consistent with this observation; the farther one moves away from the ridge, the older the seafloor. Maximum ages of about 180 million years are obtained at the edge of the continents. Intermediate ages determined for seafloor samples between the ridge and continents suggest that the rate of spreading has been relatively constant at about 2.5 cm per year since the continents first started splitting 180 million years ago.

Now for the test. Satellite stations on different continents allow precise distances to be measured down to the centimeter scale. Long-term measurements of the relative position of North America

and North Africa document a steady current spreading rate of 2.5 cm per year – the same value calculated using positions and radioactively determined ages of ocean crust.

From these examples, there are only two possible conclusions: either the earth is very old or God intentionally made the earth to *appear* old. At first glance, apparent age may not raise a red flag, but it should not take much thought to recognize a serious theological problem. Ocean spreading rates and radioactive decay rates are entirely unrelated. If the earth is truly young, it means that God started rapid plate movement and rapid radioactive decay and diminished these independent rates precisely so that today the observed rate of spreading would only *appear* to confirm the accuracy of radioactive dating methods. From the previous example, the ^{14}C (carbon-14) decay rate is unrelated to the number of tree rings or sediment layers formed in a year, meaning God started creation with a higher ^{14}C decay rate, and a dozen or more tree rings and varves formed each year, and then he diminished each independent process in such a way to only *appear* to confirm that one varve and one tree ring typically forms each year.



Mid-Atlantic Ridge
(World Ocean Floor Panorama by Bruce C. Heezen and Marie Tharp, 1977)

In other words, God designed the earth intentionally to mislead all those who are unwilling to ignore the obvious history his natural creation reflects. Reformed believers should be quick to reject this possibility on the grounds that it denies the truth of Romans 1:20, where Paul assures us that God's character is evident in the universe he created. Apparent age makes God a deceiver.

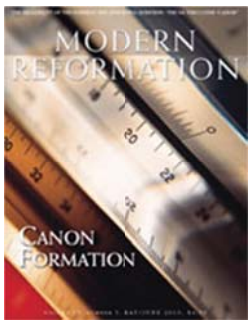
Young-earth advocates counter that Creation had to have the appearance of age, without deception, because Adam, mature forests, and even flowing rivers would all of necessity have the appearance of age. This confuses *maturity* with *history*. A miraculously created tree might well appear mature, but apparent age arguments suggest that if Adam cut down several of these trees, he may have found 50 growth rings with matching patterns of variable growth and burn marks at rings 21 and 43. These data represent not just maturity or age, but history – a history that never actually occurred. This is not the Creator described in Romans 1. We may not always have a complete understanding of the history revealed in the earth's layers, but Reformed theology should insist it is a *real* history.

Does My Belief Regarding the Age of the Earth Make Any Practical Difference?

If Biblically conservative denominations such as the PCA recognize that mature believers fall on either side of the age of the earth debate, does it ultimately make a difference which side you fall on? We suggest it does matter for two important reasons.

The first is a greater appreciation of God's handiwork. If creation conforms to God's trustworthiness and looks old because it is old, we are free to marvel at each new discovery that further reveals the incredible complexity and grandeur of his creativity. If the earth is old and we insist it is young, every new discovery can be met only with distrust and disdain – disdain of his creation!

The second reason is of perhaps greater importance. If the earth is old and Christians insist it is young, we risk becoming a tragic obstacle to faith for those both inside and outside the church. Non-Christians who understand geology logically conclude that the path to Christ requires belief in an intentionally deceptive god and choose to place their faith elsewhere. Covenant children who are raised with the impression that a young earth is integral to Christianity have their faith needlessly undermined when they are later confronted with the overwhelming evidence of the earth's antiquity, and many leave the faith. It is our prayer that no Christian would be such an obstacle!



Statement from MR editors

Modern Reformation as an organization does not take a view on the age of the earth other than to say that Genesis was not revealed in order to provide a scientific description of origins but as an historical prologue justifying God's lordship over all creation. The editors believe that this article is an important contribution to the "hallway" conversation (C.S. Lewis) that we are trying to facilitate in our pages. We realize that not every article we publish will appeal to every one of our subscribers, but we hope that you'll agree that *Modern Reformation* stimulates your thinking, challenging you to know what you believe and why you believe it.

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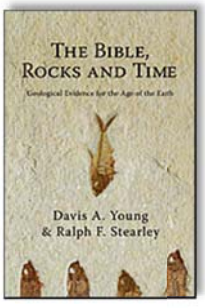

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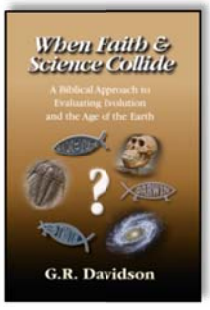

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