Faith and Science: The Age of the Earth from Different Perspectives

By Dave DeMaster
Scientist, Geochemist, and Christian
“There is a God shaped vacuum in the heart of every person, which cannot be filled by any created thing, but only by God, the Creator.”

Blaise Pascal (French Mathematician, Philosopher and Physicist, 1623-1662)
How Do We See/Experience/Understand God?

Although the Science and Faith Perspectives can both “see” God through their window, they may see a very different facet of the Creator (as illustrated in the following poem).
Blind Men and the Elephant  
poem by John Godfrey Saxe (1816–1887)

It was six men of Indostan, to learning much inclined,  
Who went to see the Elephant, though all of them were blind.  
That each by observation, might satisfy his mind.

The First approached the Elephant, and happening to fall  
Against his broad and sturdy side, at once began to bawl:  
“God bless me! but the Elephant is very like a wall!”

The Second feeling of the tusk, cried, “Ho! what have we here  
So very round and smooth and sharp? To me ’tis mighty clear  
This wonder of an Elephant is very like a spear!”
The Third approached the animal, and happening to take, the **squirming trunk** within his hands, thus boldly up and spake: “I see,” quoth he, “the Elephant is very like a **snake**!

The Fourth reached out an eager hand and felt about the **knee** “What most this wondrous beast is like is mighty plain,” quoth he; “Tis clear enough the Elephant Is very like a **tree**!”

The Fifth, who chanced to touch the **ear**, said: “E’en the blindest man, Can tell what this resembles most; Deny the fact who can, This marvel of an Elephant is very like a **fan**!”

The Sixth no sooner had begun about the beast to grope, Than seizing on the swinging **tail** that fell within his scope, “I see,” quoth he, “the Elephant is very like a **rope**!”
And so these men of Indostan disputed loud and long,
Each in his own opinion, exceeding stiff and strong,
Though each was partly in the right, and all were in the wrong!

So oft in theologic wars, the disputants, I wean,
 Rail on in utter ignorance of what each other mean,
And prate about an Elephant not one of them has seen!

And so it is with discussions of Science and Faith
How Do We See/Experience/Understand God?

Although the Science and Faith Perspectives can both “see” God through their window, they may see a very different facet of the Creator (as illustrated in the following poem).

*Note the overlap in approaches used by Science and Faith
No Condition in the Universe (e.g., P,T) alters the rate of (nuclear) radioactive decay

\[ t = \frac{1}{\lambda} \ln \left(1 + \frac{D}{P}\right) \]

where \( t \) is the age of the rock or mineral specimen,
\( D \) is the number of atoms of a daughter product today,
\( P \) is the number of atoms of the parent isotope today,
\( \ln \) is the natural logarithm (logarithm to base e), and
\( \lambda \) is the appropriate decay constant.

(The decay constant for each parent isotope is related to its half-life,
\( t^{1/2} \) by the following expression: \( t^{1/2} = \frac{\ln 2}{\lambda} \))
The ratio of the number of atoms of the daughter nuclide to the parent nuclide uniquely determines the age of the system.
The Age of the Earth is 4.5 Billion Years. All 4 of the radioactive dating techniques yield the same age.

<table>
<thead>
<tr>
<th>Parent</th>
<th>Half-life (10^9 yrs)</th>
<th>Daughter</th>
<th>Materials Dated</th>
</tr>
</thead>
<tbody>
<tr>
<td>^235U</td>
<td>0.704</td>
<td>^207Pb</td>
<td>Zircon, uraninite, pitchblende</td>
</tr>
<tr>
<td>^40K</td>
<td>1.251</td>
<td>^40Ar</td>
<td>Muscovite, biotite, hornblende, volcanic rock, glauconite, K-feldspar</td>
</tr>
<tr>
<td>^238U</td>
<td>4.468</td>
<td>^206Pb</td>
<td>Zircon, uraninite, pitchblende</td>
</tr>
<tr>
<td>^87Rb</td>
<td>48.8</td>
<td>^87Sr</td>
<td>K-micas, K-feldspars, biotite, metamorphic rock, glauconite</td>
</tr>
</tbody>
</table>
The Uranium-Lead dating technique yields an age of the earth of 4.55 billion years. The approach uses both Uranium isotopes.
How Consistent are the Earth’s Age Dates?
4.55 Billion Years is very reproducible!

What Material is Being Dated to Provide the Ages?
Crustal Rocks, Ancient Meteorites, and the Moon

U-Pb Dating

Early Dates Indicating Earth's Age

<table>
<thead>
<tr>
<th>Source</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>St. Severin chondrite meteorite</td>
<td>4.55</td>
</tr>
<tr>
<td>St. Severin chondrite meteorite</td>
<td>4.51</td>
</tr>
<tr>
<td>St. Severin chondrite meteorite</td>
<td>4.68</td>
</tr>
<tr>
<td>Juvinas basaltic achondrite meteorite</td>
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<tr>
<td>Juvinas basaltic achondrite meteorite</td>
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<tr>
<td>Juvinas basaltic achondrite meteorite</td>
<td>4.5</td>
</tr>
<tr>
<td>Allende carbonaceous chondrite meteorite</td>
<td>4.553</td>
</tr>
<tr>
<td>Allende carbonaceous chondrite meteorite</td>
<td>4.52</td>
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<tr>
<td>Allende carbonaceous chondrite meteorite</td>
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</table>
The Rubidium-Strontium dating technique yields an age of the earth of 4.53 billion years.
On a sheep farm in Australia - scientists from the University of Wisconsin have found what they believe is the oldest piece of Earth ever discovered.... "Here it is, a zircon crystal 4.4 billion years old.

Geologists have found rocks/minerals that are nearly as old as the Earth (4.5 By). There are remnants of primitive life forms in rocks that were formed 3.6 Billion years ago.
How Old is the Moon? The moon cooled to a solid 4.4 billion years ago.

Rocks brought back from the moon contain zircon crystals. Zircons crystallize only after 80 to 85 percent of a volume of molten rock has solidified. By understanding how uranium within the zirconium breaks down into lead, scientists believe they know when the crystals formed with an error margin of less than 4 million years. The oldest zircons from the moon are about 10 million years older than the oldest yet discovered on Earth.

"Alexander Nemchin and his colleagues have used a uranium-lead dating technique to scrutinize a 0.5-millimeter-wide zircon embedded in a moon rock collected by Apollo 17 astronauts in December 1972. The crystal — which, although small, is rather large as zircons go — is about 4.417 billion years old, the researchers report online January 25 in Nature Geoscience."
How Old is the Moon?
Rubidium/Strontium Dating

Rubidium-Strontium isochron for lunar dunite specimen 72417 from the lunar highlands. It was collected on the Apollo 17 Moon mission.

Based on a technique completely independent from the U-Pb approach, the Rb-Sr data yield an age for the moon nearly identical (4.47 By) to that of U/Pb (4.42 By).
Plate Tectonics is a Great Example of Evolving Science

The **Hypotheses** Concerning Phenomena such as Continental Drift, Sea-Floor Spreading, Magnetic Pole Reversals, and Geochronology, all come together to form the **THEORY OF PLATE TECTONICS**
Wegener’s Evidence (1915)

The complementary shapes of the continents
Wegener’s Evidence (1915)

Similar rock types on different continents that match Super-continent positions

Location of Similar Rock Types

Location of Glacial Deposits of Common Age
Alexander Du Toit
“Wandering Continent Hypothesis” (1937)

- Built on Wegener’s arguments Du Toit introduced more evidence, including the distribution of fossils of the Permian fresh water reptile *Mesosaurus*.

http://pubs.usgs.gov/gip/dynamic/dynamic.html
Oceanic Bathymetry with its mid-ocean ridges and deep trenches also helped to form the Theory of Plate Tectonics
The “mirror-image” distribution of magnetic striping at the oceanic ridge crests indicates injection and spreading of new oceanic crust.

Other Evidence: 1950s Magnetic Patterns on the Seafloor
Magnetic Reversals are Recorded in Volcanoes and in Marine Rocks

On land and the seafloor
Age distribution of oceanic rocks shows increased age away from ridge crests. Oceanic basalts only get to be a few hundred million years old, whereas continental rocks can be billions of years old.

Other Evidence: Age of rocks on the seafloor (1970 – present)
The age of the continental crust (1-4 billion years) commonly is much older than that of the oceanic crust (< 0.2 billion years). This is consistent with subduction of oceanic plates down ocean trenches, leading to melting of the marine rocks and formation of volcanoes (resetting the geochronological clock).
GPS (Global Positioning System – satellite tracking) is used to measure rates of continental-continental spreading today, which can be used to check magnetic oceanic spreading rates between continents.
Surprisingly, the GPS spreading rates (20-year time scale) agree quite well with the oceanic spreading rates based on magnetic striping (million-year time scale). Thus, the injection of oceanic crust must be fairly continuous and uniform over both time scales.

\[ M = \text{Magnetic Spreading Rate} \]
\[ L = \text{GPS-Satellite Spreading Rate} \]

Note that seafloor spreading rates vary from 2 to 18 cm/y (1-7 inches/y).
Thus, based on numerous independent lines of evidence, *Plate Tectonic Theory* and many radiochemical dating techniques all indicate that the earth is very old (4.5 By). Thus, from a scientific perspective there is no support for a 6000 year old earth (as predicted from a literal interpretation of Scripture).

Unfortunately, there are people that contrive (kind of like proof texting) isolated scientific data to try and prove the earth is only a few thousand years old. Using poor/contrived science to verify theological principles does neither world (faith and science) much good.
Helium Dating of the Earth:
(Bad Science)

There are 3 types of natural radioactive decay: alpha, beta, and gamma emission. An alpha particle is just a Helium nucleus, so once it is formed, it grabs 2 electrons to form a Helium atom.

There are many long decay chains (such as U-238, U-235, or Th-232) that give off billions of alpha particles, which form Helium gas. If you take the amount of Helium in the atmosphere and divide it by the production of Helium in the earth’s crust (from U, Th, etc.), the resulting calculated age of the earth is 6000 years, similar to that based on a literal interpretation of the Bible. Gravity can explain the apparent discrepancy in the Helium Clock age!
Helium Diffusion Age of 6,000 Years Supports Accelerated Nuclear Decay

Science knows of no such phenomenon in recorded history

D. Russell Humphreys*, Steven A. Austin*, John R. Baumgardner**, and Andrew A. Snelling*†

The measured rates resoundingly confirm a numerical prediction we made based on the reported retentions and a young age. Combining rates and retentions gives a helium diffusion age of 6,000 ± 2,000 years. This contradicts the uniformitarian age of 1.5 billion years based on nuclear decay products in the same zircons. These data strongly support our hypothesis of episodes of highly accelerated nuclear decay occurring within thousands of years ago. Such accelerations shrink the radioisotopic "billions of years" down to the 6,000-year timescale of the Bible.
Could God have created an Earth with “Apparent” Age?

Yes, God **could** have created an Earth with “Apparent” Age!

But **Did** God Do So?
If so, Why?
(Remember your Experience, Tradition, and Reason)
Eric Liddell: “I believe God made me for a purpose, but God also made me fast. And when I run, I feel God’s pleasure.”

Some Scientists (like me) Might Say: “I believe God made me for a purpose, but God also made me curious. And when I discover things about God’s creation, I feel God’s pleasure!”

Science and Faith together! Complementing each other!