

Issue #3 Radiometric dating

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Assertions:

1. Radioactive elements decay at very predictable rates.
2. We can accurately measure concentrations of decay products.
3. We can use ratios to determine the absolute ages of some materials.
 - a) Rocks and minerals in rocks for commonly contain radioactive elements, in particular igneous rocks.
 - b) Carbonaceous materials that contain radioactive carbon-14 exist back to approx. 50,000 years ago
4. Dates for igneous materials in the stratigraphic column get successively younger from the bottom to the top and that would not be expected from a thick column of flood deposits.
5. Radiometric dates show dates that far exceed the 6-10,000 years proposed by YEC models

Key assumptions:

- a) God didn't set multiple ways of measuring decay rates, tree rings, and lake varves so that they agree on their age in order to deceive us
- b) The laws of physics have remained constant. (supported in many ways, such as by tree rings, lake varves, and scripture)

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Discussion:

If you ask a geologist for a number for how old a rock is, he will give you a number that ultimately goes back to a radiometric measurement. It provides that best number that we have today, though the recognition that the Earth is far older than 10,000 years took place long before radioactivity was discovered. Typically, sedimentary rocks are assigned a relative age based on their fossils (typically microscopic varieties). I then use the dates given by the International Stratigraphic Commission. (<https://stratigraphy.org/chart>) The ISC has tried to find the best constrained location in the world to define each of the stratigraphic boundaries.

A lot of geologic work really cares more about the relative age of rocks rather than the absolute age. Most of time, I only used these ages quantitatively in modeling thermal maturity of rocks such as for source beds that might generate oil and gas or modeling diagenesis effects due to

burial. It does help with regional paleogeographic maps in areas where volcanics are part of the story.

Here are a few points that I put in an appendix of my book, "*A Texas-Sized Challenge to Young Earth Creation and Flood Geology*":

- Recognize that large numbers of measurements have been made from around the world consistently point to the dated rocks being much older than the YEC time frame allows. These are not flukes. They are the rule not the exception.
- Most measurements are stratigraphically consistent. They are not randomly distributed.
- No easy errors are found in either the theory or methodology exist that invalidate this methodology (Large well-funded efforts have tried.)

Regarding the techniques:

1. Over forty different measurement techniques are used. In many cases, the same rock can be dated using multiple independent methods. Such cross-checks provide strong validation that such the dates are valid.

2. Today's instruments are extremely precise and capable of measuring isotopic concentrations of tiny, microscopic minerals. This helps both in terms of the precision of the measurement and y in allowing measurement of elements within the lattice of crystals that are far less altered and more pristine than were available in earlier days. Zircon is the favorite mineral because, though it forms as only traces in most rocks, it is very durable and typically has uranium and thorium incorporated into its crystal structure. Isotopes within tiny crystals of zircon can be measured today and provide valuable data. (It is very difficult to make a case for alteration within zircons deep within igneous rocks.)

3. Techniques are available that do not demand major assumptions about the original isotopic composition of the rocks. The assumption that we know the original composition is usually difficult to test. Removing this assumption raises confidence in dates. One way is to measure the isotopic ratios in different minerals within the same rock and from different rocks within a given igneous body. When no other processes have intervened, the ratios can be plotted to align and point to a date without knowing the original composition. If they do not align, this provides clues about what other processes have occurred.

4. Several techniques are self-checking. That is to say that when the data are plotted, bad data can be identified and often corrected.

5. Most alterations tend to make a rock appear to be younger than it is. Many of the "daughter" isotopes, those that result from decay, tend to be somewhat more mobile than the original isotope. If less of the daughter is found, then the resulting ratios will tend to be enriched in the parent isotope and make the rock look as though less time has elapsed than really did. This was the case with helium in Rutherford's early work.

As a scientist, although I like to see solid explanations based on physics that we understand. I also want to see validation and calibration. Gregg Davidson and Ken Wolgemuth's paper:

"*Testing and Verifying Old Age Evidence: Lake Suigetsu Varves, Tree Rings, and Carbon-14*" gives such results based on both annual tree rings and lake cycles known as varves. We find validation to a surprising degree. They also demonstrate that proposals that don't fit the data, like more than one tree ring per year or the tree rings were miscorrelated or multiple varves per year occurred. When multiple independent datasets give the same answer, it increases confidence.

How could anyone explain decay that appears ancient but is actually not? One YEC proposal that is made is that the rate of decay in the past was different. Remember that radioactive decay generates heat. Rapid decay would generate more heat. Radioactive decay rapid enough to have had any impact on this discussion would have generated enough heat to melt the earth. Looked at another way, why would the decay of all of radioactive isotopes have slowed down? There are basically two possible directions to look for answers.

1. A scientific reason (none proposed)
2. God deliberately caused it.

God could have used some miraculous means to change the rate of decay for all of these different elements, but it seems unlikely that all would have been necessary for some benefit to mankind. Based on what we have learned from the Moon and meteorites, the radiometric clocks are set for old, not just on Earth, but in outer space. Taking the example of the C-14, tree ring and varve data, the close agreement is anything but random or accidental. It looks like either truth or deception and God doesn't deceive.

YEC explanations:

What might make rocks look older than they are? In this case, we are talking about not just a bit older. We mean radically older. What would make a rock that is only ten thousand years old have measurements that appear to be one hundred million years old? YEC scientists have spent much effort trying to identify any possible explanations. They dug into every aspect of the theory and the methodology. YEC geologist John Woodmorappe has extensively searched the literature for examples of radiometric dates that are questionable (Woodmorappe 1999). It is common for scientific writers to express concerns and uncertainties about their data and interpretation. Woodmorappe has a large collection of such comments and other inconsistencies. It would be quite a job to investigate each of his interpretations. Here are a couple of the most common issues I hear raised.

C14 in diamonds:

Tests have been run on diamonds and in ancient rocks, that would normally be expected to be millions of years old and well out of the range of where C-14 should be expected to exist. How can that be? It turns out that in real life measurements with extremely sensitive devices, zero is only theoretical. Tiny trace amounts are detected from air and other inevitable contaminants.

Data from such sources is right at the detection limits. Both contamination and normal background give the same kinds of numbers.

Problems with K-Ar data in modern lavas:

Modern lavas sometimes do give anomalous data for several known reasons. Argon can be incorporated from the atmosphere as the lava comes up. Other techniques can correct for this. In some places, dates are derived from older material carried up in the lava (known as xenoliths). There is no reason to doubt the validity of these dates, but they are meaningless for the lava flow.

Radiometric Dating Resources:

Dalrymple, G. B. 1991. *The Age of the Earth*. Stanford: Stanford University Press.

Davidson, G, Wolgemuth, K, 2018, *Testing and Verifying Old Age Evidence: Lake Suigetsu Varves, Tree Rings, and Carbon-14*, from Perspectives on Science and Christian Faith, retrieved from: <https://www.asa3.org/ASA/PSCF/2018/PSCF6-18Davidson.pdf>

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Isaac, R, 2007, "Assessing the RATE Project"
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Woodmorappe, J, 1999, *The Mythology of Modern Dating Methods*. El Cajon, CA: Institute for Creation Research.

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