# Genesis and Time

## *What Radiometric Dating Tells Us*

*by* Clyde L. Webster, Jr.

Upon hearing estimates of the earth's age that range from 6,000 to more than four billion years, you may have wondered, "What difference does it make what I believe about the earth's age and how long has life existed on it?" Simply stated, your beliefs about these matters reflect your perception of the Bible's reliability. They also make an important difference in how you interpret the hypotheses offered by science and the information presented in the Bible.

As Bible-believing Christians, we accept as fact that God created the earth. As intelligent beings, we strive to understand God's creation using the analytic tools offered by human science. Radioactive dating is among the more widely used methods of calculating the age of our planet. It is based on the analysis of radioactivity in matter. This article will explore what radioactive dating can tell us about the age of the Earth and our Solar System, and the implications for our interpretation of the scriptural account of Creation.

### A Brief History

The study of radioactive decay (the natural and spontaneous decomposition of atoms) is less than a century old. In 1896, French physicist Henri Becquerel reported to the Academy of Sciences in Paris radioactive decay in uranium. As early as 1904, Lord Ernest Rutherford recognized the potential of observing radioactive decay to determine the passage of time. Two years later, Rutherford and Soddy calculated the age of a uranium sample found in the state of Connecticut, U.S.A. to be 550 million years.

Despite its promising early applications, radiometric dating was not fully exploited until many years later, with the greatest radio-chronologic activity taking place after World War II. W. J. Libby's famous book *Radiocarbon Dating* was published a little over 30 years ago. Therefore, as a relatively new area of science, radiometric dating still poses many unanswered questions.

### Definition

In order for us to discuss the question we have set out at the beginning, it is necessary for our readers to be at least superficially acquainted with the process of radioactive decay that is studied to determine radiometric age. Briefly, radiometric dating seeks to establish the age of matter based on the ratios of parent to daughter isotopes and the constancy of decay rates of radioactive isotopes present in it. Isotopes are two or more atoms whose nuclei have the same number of protons but a different number of neutrons. The atomic nuclei of radioactive isotopes are unstable. As they move to a more stable configuration, the nuclei rid themselves of sub atomic particles, different elements, and excess energy. This process is known as decomposition, or decay. As radioactive decay proceeds, the radioactive "parent" material (e.g., uranium) is transformed into more or less stable offspring or "daughter" products (e.g., thorium, etc.). This process continues until a stable daughter product is achieved (in the case of uranium, this is lead).

The length of time required for half of the original parent material to decay is known as the "half-life" of the isotope. These half-lifes range from those far too short to measure (less that 0.000000001 seconds) to those extremely long (more than one billion years). For a given radioactive isotope, infinite age is assumed after the passing of 7 to 10 half-lifes

## Time Frames

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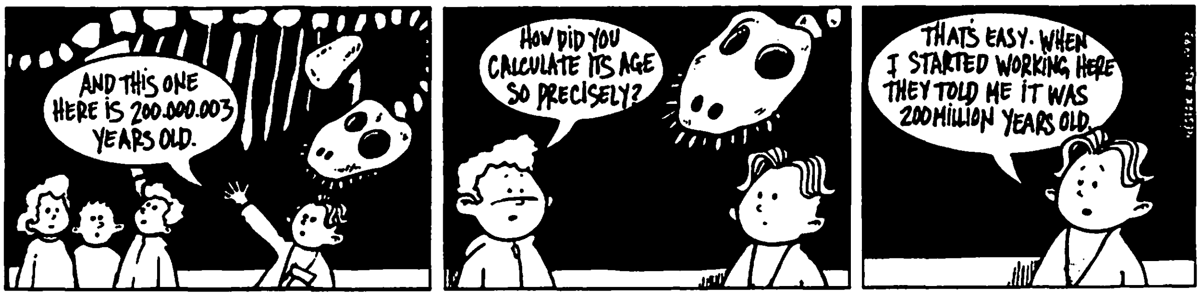


forest of trees that have a carbon-14 date that is less than 300 years![1] Lava rock from Mt. Capulin in northeastern New Mexico in the United States has nearly four times as much of the radiogenic daughter-product argon-40 as would be expected to have accumulated during the age of this rock. Furthermore, if the rock were as old as its determined radiometric age it should be pure potassium![2] Other incongruities have also been reported.[3]

In 1976, it was reported that recently deposited sediments on the floor of the Ross Sea, Antarctica, exhibited a rubidium-strontium (Rb/Sr) age of 250 million years rather than the zero age which would be anticipated due to the recency of the sedimentary deposits. Further study revealed that the two source areas for the Ross Sea sediments, the Trans-antarctic Mountains and the West Antarctic Mountains, had Rb/Sr ages of 450-470 million years and 75-175 million years respectively.[4] It can readily be seen that the Ross Sea sediments did not undergo the hypothesized zero clock reset, but are instead a blend of the radiometric characteristics of the source areas.

Radiometric ages greater than within the expected range are attributed to various factors: an incomplete resetting of the radiometric clock at mineral formation, a partial removal of the parent isotope, or an infusion of the daughter isotope after mineral formation. On the other hand, radiometric ages less than the expected range are attributed to the partial removal of the daughter isotope after mineral formation, or an infusion of the parent isotope.

These types of illustrations are numerous, but I think my point has been made: When dealing principally with sedimentary materials, and fossils in particular, it appears highly probable that radiometric dates more reasonably represent the initial characteristics of the source material in which organisms were buried rather than the time of their burial.

Now that we have determined that fossils do not necessarily share the same radiometric age as the surrounding rock, we face the remaining challenge of determining the significance of the radiometric characteristics. Keep in mind that these characteristics not only represent the initial radiometric characteristics of the matter analyzed but also any changes that were produced by heat, water, etc., during the relocation process. According to Genesis 1, 7, and 8 our planet has experienced three major modifications that should be expected to have altered the characteristics of many mineral formations in the planetary crust. These modifications are the appearance of continents and ocean basins on the third day of Creation week, the subsequent weathering of the crust and reduction of topographic relief until the planet was again completely covered with water (the Noachian Flood), and the reappearance of continents and ocean basins after the Flood. Each of these modifications, and particularly the combined effects of all three, introduce severe complications into the interpretation of the radiometric information for many of the mineral specimens available for our study.

### Strategies for Accommodating Data

This discussion has been limited to radiometric age data for inorganic minerals, especially those associated with fossils. Three strategies can be considered to accommodate these data to the chronologic data presented in the Scriptures.[5]

1. Ignore any data provided by radiometric techniques.
2. Assume that the Earth, Moon, and stars are only thousands of years old and that the radiometric data observed today are the result of processes that are not completely understood. (Some suggest the Earth was created with apparent age).
3. Assume that the activities of a recent Creation week (thousands, not millions of years ago) involved large amounts of elementary inorganic matter that was previously created some 4.56 billion years ago.

The first approach is no approach at all and does not warrant further consideration.

### Real or Apparent Age?

The second approach is taken by many individuals whose convictions concerning the biblical interpretation of Creation do not allow a 4.5 billion-year age for any inorganic matter found in the Solar System. This approach assumes that what most believe to be long-term radiometric features were introduced into inorganic matter in a recent creation for reasons unknown. Some interpret these long-term features as "apparent age."

The strongest support for this approach comes from the Genesis account of because after this point it is statistically impossible to accurately detect the presence of the parent isotope. An object that is infinitely old with respect to all isotopes would exhibit no radioactivity, for the radioactive isotopes would have decayed completely to their stable daughter products. Although radiometric dating is widely used and accepted, it is far from problem-free, as we will see below.

### Our Solar System

The fact that we find radioactive isotopes present in the materials from Earth, the Moon, and meteorites strongly suggests that our Solar System has a finite age. Can this age be calculated? Potential minimum and maximum ages for the coming together of our Solar System may be obtained through an analysis of radioactive isotope ratios, parent:daughter ratios, and missing radioactive isotopes. For example, uranium-238 has a half-life of 4.47 billion years. Observing the limitation mentioned above, which does not permit age calculations beyond 7-10 half-lifes, we may conclude that the presence of uranium-238 in the Solar System implies a maximum age of about 45 billion years for its consolidation. This figure is further refined by analyzing the uranium-235:uranium-238 ratio, which implies a maximum age of about five billion years.

Using the same method of analyzing parent:daughter ratios, paying attention to cases where daughter isotopes are found and parent isotopes are clearly absent, a minimum age can be obtained for the consolidation of the Solar System. For example, samarium-146, with a half-life of about 100 million years, is not found in naturally occurring deposits. However, its stable daughter product, neodymium-142, is found there. A 10 half-life calculation would therefore set a minimum age for consolidation of about one billion years. Thus, this process brings us to the interesting conclusion that the radiometric age of the planets, moons, and meteorites of our Solar System may range between one and five billion years.

### Different Techniques

A variety of radiometric techniques are used (e.g., potassium-argon, rubidium-strontium, etc.) to measure the parent:daughter ratios of different elements found in a sample. This variety of techniques allows scientists to interpret the approximate age at which a specimen experienced major events such as its elemental formation (nucleogenesis), solidification, heating, remelting, shock, mixing with other materials, exposure to water or to high-energy radiation.

Scientists performing more than one measurement of radiometric age on a given sample are not surprised when the resulting ages disagree. This disagreement implies that the sample being studied may have experienced more than one age-altering event. These events affected differing isotopes in the sample in different ways. Discordance may provide useful insight into the chronology of events that the sample has experienced.

In many cases chemically and physically independent radiometric dating techniques will agree. These concordant dates cannot be easily explained away and often point to physically significant events. The concordance observed between the numerous radiometric-age determinations for the consolidation of our Solar System is one such event. However, before we can establish the age of our Solar System, it is crucial to note that concordance of radiometric dates does not automatically imply direct correspondence between the radiometric age and real time.

### Radiometric Age and Real Time

Radiometric age and chronological age may be assumed to be equivalent only if the following criteria are fulfilled:

1. Initial conditions are specified with a high degree of precision. In other words, if there were any radioactive parent or daughter products present initially, these must be known very accurately.
2. The radioactive decay constants under study have remained unchanged during the lifetime of the mineral assemblage.
3. The sample has remained a closed sample. In other words, the sample has been chemically and physically isolated since its emplacement.

### Resetting the Clocks

It is important for us to realize that the academic climate in which radiometric dating techniques were developed was one which assumed long ages for the development of life forms through evolution. This assumption promoted the search for such supporting ages.

This current of thought also produced an unsophisticated and unjustified assumption: that radiometric "clocks" in matter are set or reset to zero when the matter is moved due to igneous or sedimentary action (e.g., lava flows and river deposits, respectively, etc.) rather than their retaining all or part of their "age information" during their transport.

In the process of fossilization (when the material of an organic form, such as a plant, is replaced by mineral material) the zero-set hypothesis suggests that the radiometric age of the mineral material in the fossil or surrounding it is also the minimum real-time age of the fossil. Unqualified support of such an application of the zero set hypothesis can be described as supporting a "graveyard hoax." It is similar to a person's attempting to calculate the age of a buried corpse by checking the age of a layer of soil both above and below the casket instead of reading the headstone. We must not characterize any individual who uses the zero set hypothesis as supporting this "graveyard hoax" but rather look at such examples as emphasizing an important concept that is generally overlooked. Simply stated, the radiometric ages for the mineral components of the earth in a cemetery plot are not necessarily expected to date the ages of that plot's occupants!

While ample evidence supports the zero-set hypothesis of various radiometric chronometer systems during the igneous transport or metamorphosis of minerals, what is not so well-publicized is that the scientific literature also authenticates the inheritance of previously established radiometric age characteristics during metamorphic and igneous transport processes. In some situations age characteristics, measured independently, have survived volcanic events. The survival of such age characteristics may be anywhere between total and nonexistent. Let me give a few illustrations.

A volcanic flow from Mt. Rangitoto in Auckland, New Zealand, yields a potassium-argon (K-Ar) date of 485,000 years. However, this eruption destroyed a

Creation week's fourth day, which may be used to support the assumption that the Sun, Moon, and stars were brought into existence on that day. However, this approach carries some potential problems.

If the Sun, Moon, and stars were created on the fourth day a few thousand years ago, then God also created light waves in transit, making them appear as if they had originated at various stars many millions of years ago. The stars also had to be created in various stages of maturity, from black holes to giant red stars to white dwarfs. In addition, the nova and supernova such as SN1987A,[6] and other events that seem to have taken place hundreds of thousands of years ago, according to information transmitted via light waves, are merely illusions superimposed onto light waves.

The "apparent age" of the inorganic matter or the various stages of star maturity can be looked upon as simple manifestations of God's creative powers. However, the creation of light waves seemingly in transit for millions of years and carrying evidence of supernova that actually did not take place seem to be illusions, objectionable because they imply that God is dishonest. Why should the Creator fabricate evidence for events that did not occur or find it necessary to change laws governing the speed of light?

## A Broader Interpretation

The difference between the second and third choices outlined above depends upon the broadness of one's interpretation of Genesis 1:1-3:

*1. In the beginning God created the heavens and the Earth. 2. Now the Earth was formless and empty, darkness was over the surface of the deep, and the Spirit of God was hovering over the waters. 3. And God said, "Let there be light," and there was light.*

It appears that the first day of Creation week actually begins with verse 3.

The third approach assumes that elementary inorganic matter existed in our planet before the creation of life. The reasoning is as follows: Verse 1 identifies God as the Creator regardless of when the creation process took place. Verse 2 identifies the earth before Creation week as formless (i.e., no specific organization) and void (i.e., no inhabitants).

Additionally, there is no reference in the Scriptures within Creation week that addresses the creation of water or the mineral components of dry land. The only reference made to their creation is "in the beginning." It seems possible then that the elementary inorganic matter is not bound by a limited age in the same manner as is the living matter.

Either approach two or three strongly suggests that the radiometric age assigned to the inorganic minerals associated with a fossil is more a reflection of the characteristics of the source material than an indication of the age of a fossil; however, in approach two, this remains open to question since all age is "apparent".

## Science and Faith

If science indicates a particular hypothesis and Scripture allows it, it seems reasonable to accept such a position. While this approach minimizes conflicts between scientific and biblical interpretations, not all questions are answered. Areas requiring more than a small measure of faith remain.

We must realize that there is no way to proceed directly from radiometric data to a fiat creation for living matter within the past 10,000 years and a worldwide flood some 5,000 years ago. These are religious concepts that are accepted on the basis of faith in the same manner as is salvation.

Through a proper blending of this faith viewpoint and science it is possible to obtain a more complete understanding of God, our Creator and Sustainer. In seeking to harmonize God's character as it is revealed in the Scriptures and in nature, we must seek a model that is consistent with both sources of information. The third approach mentioned above begins to meet these requirements. Where we do not find such consistency, we need to search for a better understanding of both sources of revelation (nature and Scripture), asking for the Holy Spirit's guidance during our research.

Radiometric dating is an interpretative science. The complex chemical and physical processes taking place within the Earth's mantle and crust are neither completely known nor understood. This is especially true when the radioactive isotope parameters are considered. Couple these uncertainties with the fact that there are numerous times where radiometric ages are not in agreement, it would seem logical, almost compelling, to seriously consider other sources of data for determining the time of Creation. For the Christian who is a scientist, such a primary source is the Holy Scriptures. ❑

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## Notes and References

1. I. McDougall et al., "Excess Radiogenic Argon in Young Subaerial Basalts from Auckland Volcanic Field, New Zealand," *Geochimica et Cosmochimica Acta* 33 (1969), pp. 1485-1520.
2. E. W. Hennecke and O. K. Manuel, "Nobel Gases in Lava Rock from Mount Capulin, New Mexico," *Nature* 256 (1975), pp. 284-287.
3. An oil well in southwestern Louisiana (U.S.A.) that was drilled into formations that have a conventional geologic age in the 5-25 million year range (Miocene) produced drill cuttings from shale at the 5190 foot level that has a K-Ar age of 254 million years. When the shale cuttings were ground and screened into component particle size, the average K-Ar age was found to be 164 million years for particles less than one-half micron in diameter, 312 million years for particles in the 1/2 - 2 micron diameter range, and 358 million years for particles greater than 10 microns in diameter. (See E. A. Perry, "Diagenesis and K-Ar Dating of Shales and Clay Minerals," *Geological Society of America Bulletin*, 85 [1974], pp. 827-830.) It is evident that the larger ratio of surface to volume for the smaller particles favors diffusion loss of the argon-40 that was inherited from the source of this shale. (The argon loss resulted in younger ages.) The radiometric age characteristics of the sediments into which this well was drilled reflect the radiometric age characteristics of the source areas drained by the Missouri and Ohio river systems, not the time of sediment placement.
4. Nelson R. Shaffer and Gunter Faure, "Regional Variation of Sr-87/Sr-86 Ratios and Mineral Compositions of Sediment from the Ross Sea, Antarctica," *Geological Society of America Bulletin* 87 (1976), pp. 1491-1500.
5. These concepts were originally proposed by Robert H. Brown, retired director of Geoscience Research Institute.
6. Kenneth Brecher, "Fascinating Supernova," *Physics Today* 41 (1988), pp. S-7 to S-9.

## Additional Reading

R. H. Brown, "Geo and Cosmic Chronology," *Origins*, 8:1 (1981), pp. 20-45.