

EVIDENCE FOR AN ANCIENT EARTH

Radiometric Dating - A Christian Perspective

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*Radiometric dating--the process of determining the age of rocks from the decay of their radioactive elements--has been in widespread use for over half a century. **There are over forty such techniques, each using a different radioactive element or a different way of measuring them.** It has become increasingly clear that these radiometric dating techniques agree with each other and as a whole, present a coherent picture in which the Earth was created a very long time ago. Further evidence comes from the complete agreement between radiometric dates and other dating methods such as counting tree rings or glacier ice core layers. Many Christians have been led to distrust radiometric dating and are completely unaware of the great number of laboratory measurements that have shown these methods to be consistent. Many are also unaware that Bible-believing Christians are among those actively involved in radiometric dating.*

This paper describes in relatively simple terms how a number of the dating techniques work, how accurately the half-lives of the radioactive elements and the rock dates themselves are known, and how dates are checked with one another. In the process the paper refutes a number of misconceptions prevalent among Christians today. This paper is available on the web via the American Scientific Affiliation and related sites to promote greater understanding and wisdom on this issue, particularly within the Christian community.

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Radiometric Dating Does Work!

by G. Brent Dalrymple

http://www.ncseweb.org/resources/rncse_content/vol20/4180_radiometric_dating_does_work_12_30_1899.asp

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INTRODUCTION

Radiometric dating of rocks and minerals using naturally occurring, long-lived radioactive isotopes is troublesome for young-earth creationists because the techniques have provided overwhelming evidence of the antiquity of the earth and life. Some so-called creation scientists have attempted to show that radiometric dating does not work on theoretical grounds (for example, Arndts and Overn 1981; Gill 1996) but such attempts invariably have fatal flaws (see Dalrymple 1984; York and Dalrymple 2000). Other creationists have focused on instances in which radiometric dating seems to yield incorrect results. In most instances, these efforts are flawed because the authors have misunderstood or misrepresented the data they attempt to analyze (for example, Woodmorappe 1979; Morris HM 1985; Morris JD 1994). Only rarely does a creationist actually find an incorrect radiometric result (Austin 1996; Rugg and Austin 1998) that has not already been revealed and discussed in the scientific literature.

The creationist approach of focusing on examples where radiometric dating yields incorrect results is a curious one for two reasons. First, it provides no evidence whatsoever to support their claim that the earth is very young. If the earth were only 6000–10 000 years old, then surely there should be some scientific evidence to confirm that hypothesis; yet the creationists have produced not a shred of it so far. Where are the data and age calculations that result in a consistent set of ages for all rocks on earth, as well as those from the moon and the meteorites, no greater than 10 000 years? Glaringly absent, it seems.

Second, it is an approach doomed to failure at the outset. Creationists seem to think that a few examples of incorrect radiometric ages invalidate all of the results of radiometric dating, but such a conclusion is illogical. Even things that work well do not work well all of the time and under all circumstances. Try, for example, wearing a watch that is not waterproof while swimming. It will probably fail, but what would a reasonable person conclude from that? That watches do not work? Hardly.

A few verified examples of incorrect radiometric ages are simply insufficient to prove that radiometric dating is invalid. All they indicate is that the methods are not infallible. Those of us who have developed and used dating techniques to solve scientific problems are well aware that the systems are not perfect; we ourselves have provided numerous examples of instances in which the techniques fail. We often test them under controlled

conditions to learn when and why they fail so we will not use them incorrectly. We have even discredited entire techniques. For example, after extensive testing over many years, it was concluded that uranium-helium dating is highly unreliable because the small helium atom diffuses easily out of minerals over geologic time. As a result, this method is not used except in rare and highly specialized applications. Other dating techniques, like K-Ar (potassium-argon and its more recent variant $^{40}\text{Ar}/^{39}\text{Ar}$), Rb-Sr (rubidium-strontium), Sm-Nd (samarium-neodymium), Lu-Hf (lutetium-hafnium), and U-Pb (uranium-lead and its variant Pb-Pb), have all stood the test of time. These methods provide valuable and valid age data in most instances, although there is a small percentage of cases in which even these generally reliable methods yield incorrect results. Such failures may be due to laboratory errors (mistakes happen), unrecognized geologic factors (nature sometimes fools us), or misapplication of the techniques (no one is perfect). In order to accomplish their goal of discrediting radiometric dating, however, creationists are faced with the daunting task of showing that a preponderance of radiometric ages are wrong — that the methods are untrustworthy most of the time. Not only that, they have to show the flaws in those dating studies that provide independent corroborative evidence that radiometric methods work. This is a tall order and the creationists have made no progress so far.

It is rare for a study involving radiometric dating to contain a single determination of age. Usually determinations of age are repeated to avoid laboratory errors, are obtained on more than one rock unit or more than one mineral from a rock unit in order to provide a cross-check, or are evaluated using other geologic information that can be used to test and corroborate the radiometric ages. Scientists who use radiometric dating typically use every means at their disposal to check, recheck, and verify their results, and the more important the results the more they are apt to be checked and rechecked by others. As a result, it is nearly impossible to be completely fooled by a good set of radiometric age data collected as part of a well-designed experiment.

The purpose of this paper is to describe briefly a few typical radiometric dating studies, out of hundreds of possible examples documented in the scientific literature, in which the ages are validated by other available information. I have selected four examples from recent literature, mostly studies involving my work and that of a few close colleagues because it was easy to do so. I could have selected many more examples but then this would have turned into a book rather than the intended short paper.

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