

LITERATURE REVIEWS

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AN AGE-OLD QUESTION

THE AGE OF THE EARTH. 1991. G. Brent Dalrymple. Stanford, CA: Standord University Press. 474 p. Cloth, \$49.50.

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There has been a long-standing need for a convenient compilation of the radiometric data from which conclusions have been drawn concerning the length of time planet Earth and other components of the Solar System have been in existence. *The Age of the Earth* meets this need more than adequately. The author is Research Geologist at the U.S. Geological Survey, Menlo Park, California, and is preeminently qualified to give a comprehensive, authoritative, and readable treatment of the topics he addresses. In his Preface he states that the book was “written for people with some modest background in science, ... [to be] useful and informative to those without a deep knowledge of geology or physics.” The book provides valuable resource material for individuals who make a professional-level witness for a creationist viewpoint, although the author’s analysis of data is from a purely secular, uniformitarian approach that dismisses concepts of supernatural and revelation as purely human and non-authoritative.

Technical terms and concepts are explained within the text so that the treatment is understandable to the non-specialist. A 14-page glossary provides additional assistance. The treatment is well-illustrated by 15 half-tones, 14 maps, and 98 high-quality line drawings. Many readers will not be interested in the extensive mineralogical and geological detail in some sections of Dr. Dalrymple’s treatment, but the persistent reader will be well rewarded. Citations to the original supporting scientific literature are given within the text. Readers who wish to investigate any topic more deeply have 37 pages of references for these citations. Each technical chapter concludes with a summary, and the final chapter is a summary of the entire book.

Chapter Two reviews the estimates for the age of planet Earth that were made before the radiometric era (before circa 1950), including those based on the Pentateuch. A tabulation of these estimates (Table 2.1) covers four pages.

The third chapter is a tutorial on the use of the various radiometric daughter/parent pairs for data from which age estimates may be made. These estimates cover primary age, age since a metamorphism, and ages over the range between these limits. To the evidence given for the constancy of radioisotope decay rates, I can add that provided by radiohalos (Brown 1990). I recommend this chapter to anyone who is looking for a relatively quick and easy way to become familiar with the rudiments of radioisotope dating. Toward the end of the book (Chapter 7), an entire chapter is devoted to the use of lead isotope ratios as indicators of time spans.

It is unfortunate that the author's treatment of isochrons (linear sequences of a group of associated daughter/parent isotope ratios) does not explain how these sequence plots could also be interpreted as mixing diagrams, rather than a daughter isotope accumulation plot (isochron). This possibility has been used by some apologists in efforts to discredit use of radioisotope data as an indication of real time.

If there is a non-uniform distribution of parent isotope among a group of related samples, a plot of daughter concentration against associated parent concentration (or more commonly, plot of the ratios of daughter and parent isotopes to a reference isotope) will be a straight line if the daughter concentration represents growth by radioactive decay of the parent. For a common time lapse the amount of daughter difference between any two samples will be proportional to the amount of parent difference, hence the term isochron (equal time). An identical plot can be produced by an incomplete mixture of material from two sources that had differing parent and/or daughter concentrations. Such a plot would be merely a mixing line that has no relationship to the time at which the mixing occurred. But the upper end of the line of data terminates at or points to the daughter/parent ratio which specifies a radioisotope age for one source, and the lower end terminates at or points to the daughter/parent ratio which specifies a radioisotope age for the other source. If the ratio of parent to excess of daughter above the amount of daughter specified by cosmic isotope abundance ratios is the same for each of these sources, an isochron interpretation assumes

the daughter excess accumulated since mixing, and hence specifies *time since the mixing* that produced the common suite of samples. A mixing line interpretation, however, gives the *age of the components* of the inhomogeneous mixture, but provides no indication of the time since mixing occurred.

Interpretation as a mixing line is clearly indicated if the best straight-line fit to the data points intercepts the daughter isotope axis at a point significantly different from the cosmic ratio of the daughter isotope (ratio characteristic of minerals which have no indication of having been associated with the parent element). In such cases the data set limits for the radioisotope age which characterizes each component of the mixture.

Mixing line interpretation is a valid option regardless of where the line intercepts the daughter isotope axis. In any case a mixing line interpretation provides no escape from a real time significance of radioisotope daughter/parent ratios. Linear plots of daughter versus parent for some inhomogeneous sets of samples may be expected to represent isochron development following initial formation by mixing. Isochron development gives a counterclockwise rotation to the initial mixing line, but leaves no basis for determining how much time has elapsed since the mixing process.

The Age of the Earth makes two major contributions. One is a convenient collection of radioisotope data for the lowest rocks in the geological sequence of Earth's crust (Chapter 4), rocks from the Moon (Chapter 5), and meteorites (Chapter 6). The other major contribution is ready access to analysis of these data. Any reader will be impressed at the frequency with which the figure 4.56 billion years appears from a wide range of independent radioisotope techniques applied to a wide range of samples. How a creationist accommodates to this evidence will depend on whether he/she considers it to be a consequence of the way God has managed/maintained the Universe, or a design characteristic expressed at initial creation.

Dalrymple makes a good case for an age of about 4.5 billion years for the material of which the earth, moon, and meteorites are composed. He evidently believes that he has thoroughly discredited special creationism. His treatment in *The Age of the Earth* has made it much more difficult to plausibly explain radiometric data on the basis of a creation of the entire Solar System, or the physical matter in planet

Earth, within the last few thousand years. In my opinion, the defense of such a position is a losing battle.

However, the data presented by Dr. Dalrymple are not incompatible with a model which allows for most of the Solar System to have come into existence about 4.5 billion years ago, the creation of life on planet Earth within the last 10,000 years, and a subsequent reorganization of the planet's surface by a cataclysm in which there was water burial of a vast number of organisms.

The final technical treatment in the book (Chapter 8) completes age considerations with a summary of speculative models concerning the ages of stars and galaxies. Readers who follow details carefully should correct Table 8.5 on p. 388 to specify 1/137.88 for R of $^{235}\text{U}/^{238}\text{U}$.

In concluding this review, I should say that in my opinion it is both incorrect and inadequate to model the physical features of the universe on the basis of natural evolution from an unexplainable initial "Big Bang"; and that it is equally incorrect to ignore the evidence for physical process and change. The basic data and their implications as given in *The Age of the Earth* present no conflict with biblical testimony as long as the creation account is interpreted strictly in accord with the definitions given in Genesis 1:8-10, and if the radioisotope ages of material that encloses or overlies fossils are recognized as having no more relationship to fossil age than similar data for a modern cemetery, or a community buried by a landslide, have to the dates of the interments therein.

ACKNOWLEDGMENT

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REFERENCE

Brown RH. 1990. Radiohalo evidence regarding change in natural process rates. *Creation Research Society Quarterly* 27(3):100-102.