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PREFACE

This book concerns the age and history of planet earth. Just how old are its continents, mountains, seas, rocks, and fossils? Some may reply that this question has already been answered by geologists. The earth is said to be ancient, with a current age estimate of about 4.56 billion years, or 4,560,000,000 years when written out. The universe beyond the earth is assumed to be much older, going back about 14 billion years. Just where do these incomprehensible numbers come from? The earth's age is based on the radioisotope dating of rocks and meteorites, a technique developed during the last century. Age estimates for the rest of the universe follow largely from the big-bang theory. These multi-billion year time spans are sometimes called *deep time*, corresponding to deep space. Deep time refers to time scales which are much larger than those by which we define our lives. It should be remembered, however, that the existence of billions of years of history is not a certainty. Deep time is a major "icon" or symbol of evolution, a presumption which is challenged in the subtitle of this book.

Evolutionary models for life, earth, and space are questioned today by a significant group of scientists worldwide. They are convinced that the earth and the entire universe are the result of a supernatural creation event which occurred just thousands of years ago, not billions of years. This book explains some of the fascinating scientific data which supports this recent-creation conclusion.

In addition to professional scientists, there are many others who have a special interest in earth history. This refers to all of us who hold a biblical world view. That is, we accept the Bible as the uniquely inspired book given to humanity by the Creator. The Bible tells us how to live and it also reveals many details of earth history including its approximate age. The straightforward reading of Scripture describes the earth and space as just thousands of years old, not millions or billions of years. Some have attempted to resolve this time difference by inserting vast ages into the biblical creation week. However, the results are neither satisfactory nor convincing. For some readers, the initial thought may be that the time of creation is not an important issue: "I believe God created everything and it simply does not matter when it all began, whether thousands, millions, or billions of years in the past." It may be true that the age of the earth is not obviously connected to the gospel message. However, many practical and profound implications follow from one's view of the earth's age. These implications are fully explained in creationist literature (Morris, 2002).

The goal of this book is to "open the window" on the serious possibility that an ancient earth is a false and misleading assumption. In sharp contrast, the following pages present the scientific case for a recently created world. If this is true, then the conventional view of ancient earth history is grossly in error. It is readily acknowledged that belief in a young earth is a radical change from the standard teaching and writing in earth science. To grasp these contrasting views of age, consider one human generation as a basic unit of time, about 25 years.

A world 6,000 years old then spans just 240 generations. However, 4.6 billion years of time would encompass 184 million generations. The young and old views of earth history indeed stand in stark contrast. The young-earth view is confidently promoted in this book because the Bible clearly points in this direction. All scientific data, as well, can be interpreted to support a recent creation. Not every reader will agree with this conclusion, but the following chapters offer challenging evidence for serious consideration.

Introduction to RATE

In 2003, a group of leading earth scientists met in Washington, D.C., to discuss the state of the geologic time scale. This topic concerns the history of the earth. There is general consensus on the ages of major rock strata, but the geoscientists concluded that the detailed record remained "hopelessly incomplete" (Clarke, 2003). Their recommendation was the construction of three new high-tech dating laboratories in the United States whose output could add to the database of known rock ages. This proposed multi-million dollar project is to be funded by taxpayers through the National Science Foundation.

In 1997, six years earlier, another group of scientists met in San Diego to discuss the age of the earth. Their goal was similar to the first group, that is, to clarify the chronology of earth history. However, this team sought a fundamental correction to the usual assumptions of deep time. They were skeptical of the evolutionary time scale which dominates modern geology. These scientists reviewed the assumptions and procedures used in estimating the ages of rock strata and they

recognized multiple weaknesses. This group identifies itself with the acronym RATE which stands for **R**adioisotopes and the **A**ge of the **E**arth. The seven RATE scientists include two geologists (Steven Austin, Andrew Snelling), a geophysicist (John Baumgardner), three physicists (Eugene Chaffin, Don DeYoung, Russell Humphreys), and a meteorologist (Larry Vardiman, chairman of RATE). Steven Boyd, a biblical Hebrew scholar, also joined the RATE effort. Each of the team members holds an earned doctorate.

Several research initiatives were identified and conducted over an eight-year period. The RATE project was sponsored and promoted by leading creation science organizations. These included the Institute for Creation Research and the Creation Research Society. The ministry Answers in Genesis also gave start-up support to the project. Technical research activity is expensive, and all RATE costs were covered by private donations. Sincere thanks are expressed to the many individuals and organizations which financially supported the RATE effort.

This book summarizes the RATE research and results with a minimum of technical terms. Several related references, available in many public and college libraries, are listed at the end of the book. They are indicated in the text by parentheses, for example (Morris, 2002). A comprehensive treatment of the RATE research is available in two publications. The first is titled *Radioisotopes and the Age of the Earth: A Young-Earth Creationist Research Initiative* (Vardiman et al., 2000). This volume fully explains the initial RATE research plans and also includes a comprehensive 90-page glossary of terms. The second technical book has the same main title with the subtitle *Results of a Young-Earth Creationist Research Initiative* (Vardiman et al., 2005). These two volumes give full details of the RATE research results with complete documentation.

I express thanks to each of the members of the RATE team for permission to highlight their research and to reproduce selected data,

tables, and figures. All the material in this summary book is fully credited to the RATE scientists. Any errors or misinterpretations of data are my own. Specific chapters are based largely on the research of the following RATE members:

3.	Carbon-14 Dating	John Baumgardner
4.	Helium Diffusion in Zircon Crystals	Russell Humphreys
5.	Radiohalos in Granite	Andrew Snelling
6.	Fission Tracks in Zircons	Andrew Snelling
7.	Discordant Radioisotope Dates	Steven Austin
8.	Radioisotope Dating Case Studies	Andrew Snelling
9.	Theories of Accelerated Nuclear Decay	Eugene Chaffin
10.	A Proper Reading of Genesis 1:1–2:3	Steven Boyd

During the entire project there was continual positive discussion between the RATE members. All of the RATE team contributed significantly to each of the topics and chapters in this book. Many other friends also offered helpful suggestions and encouragement to the RATE effort. The project has been a positive, educational experience for all of us. We hope for similar results for those who read and study the RATE material.

Our story begins just over a century ago in Europe. Several scientists explored the mysterious rays given off by various mineral ores mined from the earth. These invisible rays were observed to remove a build-up of static electricity and they also caused certain materials to fluoresce or glow in the dark. The names of the science pioneers include Henri Becquerel, Frederick Soddy, Ernest Rutherford, Wilhelm Roentgen, J.J. Thomson, Marie Sklodowska Curie, and her husband, Pierre Curie. Each of these eventually received Nobel Prizes for their scientific research.

One of the minerals they studied was a variety of uranium ore commonly called *pitchblende*. It is now known as uraninite with the chemical formula UO_2. Other uranium oxides refined by chemical separation include U_2O_3, UO_3, and U_3O_8. Working in Paris, Henri Becquerel noticed in 1896 that the radiation given off by uranium compounds could fog or darken a photographic plate even when the plate was kept inside its protective cover. Unseen particles emitted by the mineral ore were energetic enough to penetrate the shielding and expose the film.

To help our understanding of the radiation particles, a brief review of chemistry is helpful. There are currently about 115 known elements in the periodic table. Not all printed tables are up to date and the most recent elements have not been verified or named as of this writing. The newer entries are made in the laboratory by colliding known elements. They have very brief lifetimes, typically milliseconds or less. Of the total known elements, 92 occur naturally, the heaviest being uranium. Most of the elements themselves also occur in several varieties called *isotopes*. The Greek roots, *iso* and *topos,* mean "same place" since all the isotopes of a given element are chemically similar and occupy the same space in the periodic table. As an example, there are three naturally occurring isotopes of the element carbon — carbon-12, 13, and 14 (Figure 1-1). These numbers are the atomic weights or masses of the isotopes compared with hydrogen, which is the lightest element. The

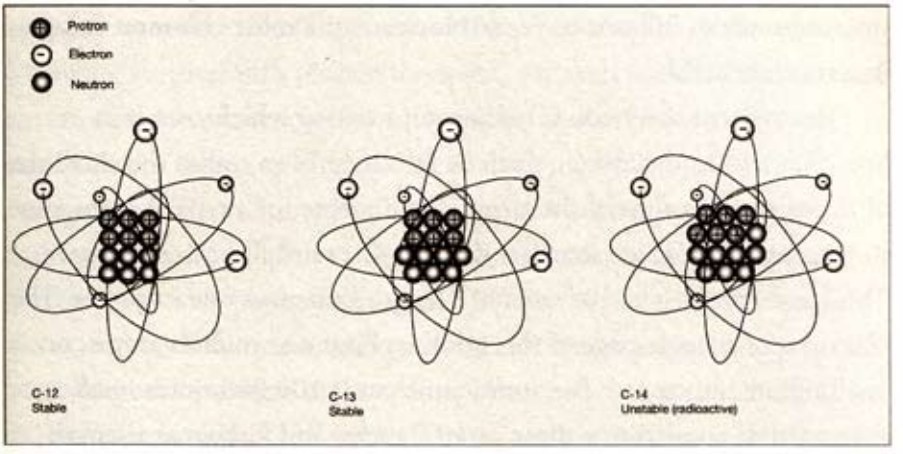

Figure 1-1. An illustration of three varieties or isotopes of the element carbon. The nucleus at the center of each carbon atom always holds six protons; the number of neutrons varies for the different isotopes. Carbon-12 and 13 are stable. Carbon-14 is unstable and radioactive with a half-life of 5,730 years.

carbon-12 atom is by far the most abundant carbon isotope and weighs 12 times as much as hydrogen. The number labels are often written as C-12, C-13, and C-14, or alternately as superscripts, for example ^{12}C, ^{13}C, and ^{14}C.

Each atom of carbon has six protons in its nucleus. The number of protons in an element is known as its atomic number. This is also the number of electrons which orbit the carbon nucleus, although electrons are often shared with other atoms by chemical bonding. Carbon-13 is slightly heavier than carbon-12 because the C-13 variety has one additional neutron in its nucleus, seven instead of the usual six neutrons of carbon-12. Isotopes which possess extra neutrons, such as carbon-14, often are unstable and eventually experience radioactive decay. In this process, the isotope radiates away energy and particles. There are more than 2,000 known isotopes among all the elements. Uranium alone has at least 28 distinct isotope varieties. The majority of all isotopes are radioactive, with a great range of lifetimes from

"Evolutionary models for life, earth, and space are questioned today by a significant group of scientists worldwide. They are convinced that the earth and the entire universe are the result of a supernatural creation event which occurred just thousands of years ago, not billions of years."

- Why do conventional methods for rocks differ so radically?
- What does carbon-14 found in diamonds tell us?
- Was there accelerated nuclear decay in earth's history?
- Are the creation account and flood genuine historic events?

These and many other questions are addressed in *Thousands . . . Not Billions.* This book summarizes eight years of research by the Institute for Creation Research (ICR) and a team of scientists, whose goal was to explore the age of the earth from a biblical perspective. The project title was Radioisotopes and the Age of The Earth, or RATE.

The age of the earth is one of the most divisive topics today, much debated by scholars and laypersons alike. What one believes about the age of the earth goes a long way in determining world views. The Bible is explicit that the earth is young, but many people feel that science has proved our planet is more than four billion years old. *Thousands . . . Not Billions* provides a compelling challenge to Darwinian evolution.

Author Don DeYoung is a member of ICR's RATE team of scientists. He is a physics professor at Grace College, Winona Lake, IN. Dr. DeYoung has written 12 books on Bible-science topics.

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