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Radioisotopes and the Age of the Earth

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The 1997–2005 RATE (Radioisotopes and the Age of the Earth) research project at the Institute for Creation Research (co-sponsored by the Creation Research Society) demonstrated that creationists could support a larger-scale collaborative research effort, particularly if it delivered significant breakthroughs on a key challenging issue. The primary focus of this research effort was the radioactive methods for dating rocks that supposedly yield age estimates of millions and billions of years and thus provide support for the claimed multi-billion year age for the earth. The research team assembled for this project included:

- Larry Vardiman, Ph.D. Atmospheric Science (project co-ordinator)
- D. Russell Humphreys, Ph.D. Physics (helium diffusion)
- Eugene F. Chaffin, Ph.D. Physics (theoretical models)
- Donald DeYoung, Ph.D. Physics
- John R. Baumgardner, Ph.D. Geophysics (radiocarbon)
- Steven A. Austin, Ph.D. Geology (rock dating)
- Andrew A. Snelling, Ph.D. Geology (rock dating, fission tracks, radiohalos)
- Steven W. Boyd, Ph.D. Hebraic and Cognate Studies (Genesis 1 text)

There were numerous significant outcomes from this project:

1. There is visible physical evidence in rocks, namely, fission tracks and radiohalos, that a lot of nuclear decay has occurred through earth history. Uranium atoms decay in two ways. Some uranium atoms spontaneously break apart (split or fission) into two smaller atoms. The energy of this fission process causes the two smaller atoms to fly apart, leaving observable linear scars called fission tracks in the host minerals that can be seen under a microscope. In most other uranium atoms, the size of their nuclei makes them unstable, and so, radiation particles called alpha-particles are ejected from them. These alpha-particles are like little "bullets" that damage the host minerals leaving physical scars. Because the alpha-particles are ejected in all directions from around where the uranium atoms are concentrated, the result seen in cross section is a halo of visible physical damage which can be seen under a microscope. These are called radioactive halos, abbreviated to "radiohalos." Some minerals from many levels in the geologic record were found to have high concentrations of fission tracks and numerous radiohalos consistent with much nuclear decay having occurred, equivalent to hundreds of millions of years worth of decay at today's slow rates. This would suggest that, because the Bible indicates the earth is young (about 6,000 years old), this large quantity of nuclear decay must have occurred at much faster rates than those measured today.
2. There are often systematic differences in the radioisotope age estimates provided by the four main radioactive dating methods from the same samples of rock units. Unstable parent atoms decay into daughter atoms of different elements, so measuring quantities of parent and daughter atoms in rocks and minerals, and knowing the rates at which this decay occurs, enables the calculation of when the decay process began in that rock or mineral, which is then deemed its age estimate. An example of the results obtained is provided by the rock layer of volcanic origin at Bass Rapids in the Grand Canyon, which yielded the following age estimates:

- 841.5 million years (potassium-argon)
- 1,060 million years (rubidium-strontium)
- 1,250 million years (uranium-lead)
- 1,379 million years (samarium-neodymium)

These four methods should have yielded the same age estimate for this volcanic rock layer because the decay of each of the four parent atoms all began at the same time when this volcanic rock layer formed. One way these different age estimates can be reconciled is if the different parent atoms decayed at different faster rates in the past. The parent atoms which give the older ages decayed much more, and thus much faster, relative to the other parent atoms.

3. There is evidence that nuclear decay rates were grossly accelerated during a recent catastrophic episode or episodes. They are the systematic differences in radioisotope age estimates for the same rock units, as explained in item two above, which can only be reconciled by grossly accelerated decay rates in the past. There are co-existing uranium and polonium radiohalos in the same mineral grains in granites from around the world. Because polonium has a fleeting existence, the polonium radiohalos had to have formed within hours and days. However, the source of the polonium had to be the uranium which was also at the same time producing the uranium radiohalos. So, the uranium had to be decaying extremely rapidly to supply sufficient polonium quickly enough to form the adjacent polonium radiohalos. And finally, helium gas is a by-product of the radioactive decay of uranium within minerals. However, this helium gas easily leaks out of the host minerals. Thus two age estimates can be calculated for these mineral grains—one based on radioactive decay of uranium to lead, and the other based on the rate at which the helium leaks out of the mineral grains. For certain mineral crystals it was found the uranium-lead radioactive age estimate was 1.5 billion years, yet the helium leak age was only about 6,000 years. Because the latter is based on experimentally verified physical laws, it can be concluded that a tremendous amount of radioactive decay (which would take 1.5 billion years at today's decay rates) must have occurred catastrophically during some event in the last 6,000 years!
4. There are significant detectable levels of radiocarbon (carbon-14) intrinsic within ancient coal and diamonds. Samples from coal layers conventionally "dated" at 40–320 million years old all yielded radiocarbon age estimates of around 50,000 years, implying that they were all deposited recently, at the same time and in the same event. Interestingly, diamonds conventionally dated at 1–2 billion years old gave only slightly older radiocarbon age estimates. When it is considered that radiocarbon levels and production rates were different in the past, these radiocarbon age estimates for these coal layers and diamonds are direct evidence of a young earth.
5. The mechanisms associated with how radioactive decay occurs within the nuclei of the parent atoms—when theoretically adjusted—change decay rates. Very tiny adjustments to the nuclear forces could produce very large changes in decay rates. It is realized that changes in fundamental constants, and also greatly accelerated nuclear decay, are radical suggestions.
6. The Hebrew verb forms used in the Genesis 1:1–2:3 creation account were compared with those used in other Old Testament passages that all are agreed are either narrative or poetic. The text of the Genesis 1:1–2:3 creation account was thus emphatically shown to be a narrative, to be read literally like any other historical account.

Because of the RATE research results, the long-age radioactive methods for dating rocks can now be more easily demonstrated to often be faulty, since there are problems with the three crucial assumptions on which they are based:

1. There are uncertainties as to the absence or presence of daughter atoms when the rocks formed, because there is much evidence of the rocks having inherited daughter atoms that were not formed by radioactive decay in those rocks.
2. There is abundant evidence of widespread "open-system" behavior of parent and daughter atoms. Rocks are often contaminated with extra parent and daughter atoms produced apart from radioactive decay. Parent and daughter atoms are also removed by various geologic processes (for example, leaching by fluids) subsequent to the rocks forming.
3. Nuclear decay rates may well have changed in the past.

Much research, even reported in the conventional scientific literature, has found that rocks of known age often yield erroneously old radioactive age estimates because either one of the first two assumptions, or both, can be demonstrated to be false. And if the radioactive "clocks" have not always "ticked" at the currently measured slow rates but were grossly accelerated in the past, then these radioactive dating methods cannot be used to provide reliable age estimates for rocks. After all, if these "clocks" don't work on rocks of known ages, how can they be trusted on rocks of unknown ages? To be sure, there is a systematic trend of radioactive age estimates for rocks according to their positions in the geologic record, but this would be expected if nuclear decay was grossly accelerated systematically when the rock layers were forming. For example, rocks laid down early in the Flood would yield older ages than rocks laid down later during the Flood because the earlier rocks would have experienced more accelerated radioactive decay.

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