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# Fifty Years of Physics: Some Observations Regarding Radiohalos and Magnetic Fields

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## Abstract

**Some important evidence regarding tiny, spherical discolorations in rocks, seen in photographs as radiohalos, was reported in the *Creation Research Society Quarterly* in Volume 3, 1966. In 2002, another report was made regarding the decrease in energy in the earth's magnetic field over historical time. In retrospect, both of these papers were highly successful in advancing the creation model, and their significance will be reviewed here in honor of the 50-year anniversary of the Creation Research Society and its technical journal, the *Creation Research Society Quarterly*.**


## Introduction

When Creation models, or models of origins, are published, there is always some risk involved, the same as in studies of science that do not have much to do with origins. By "risk" I mean the likelihood that the proposed explanations may turn out to have little to do with reality. Subsequent observations or experiments may show that proposed explanations do not work or were based on assumptions that turned out to contradict other known results. So, in any scientific journal, there will be articles in the older issues that were based on sincere work by the scientists involved, but the results of that work are now mostly discarded. In this summary, I will review a few physics articles published during the 50 years of existence of the *Creation Research Society Quarterly* and will concentrate on a couple of articles I view as having been largely successful, at least in the furthering of Creation models.

## Parentless Polonium Halos

In volume 3 of the *Quarterly*, issue 2, there appeared an article by Robert V. Gentry that brought the subject of radiohalos to the attention of the creationist community and showed that certain halos due to polonium isotopes were difficult to explain in the traditional uniformitarian paradigms (Gentry, 1966). Gentry did extensive observational and experimental work on radiohalos over his career and is arguably the world's leading expert on this subject. Halos are formed when small radiocenters of the size of a few microns are accumulated in rocks, and over time the subsequent radioactive decays send alpha particles out in all directions, forming a spherical region of damage to the crystalline structure of the surrounding mineral, which may be mica, corderite, sphene, etc. These spherical deformation regions are typically tens of microns in size and show up in photographs as circular, colored "halos." For creationists, Gentry reported the importance of halos due to Po-210 (half-life 138 days), Po-214 (half-life 164 microseconds), and Po-218 (half-life 3 minutes), which are distinguishable by the number of rings in the halo—one for Po-210, two for Po-214, and three for

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fully developed Po-218 halos, as shown in Figure 1.

The sizes of these rings are correlated with the predominate energies of the alpha particles emitted in the decay of the parent nuclei. Using various advanced experimental techniques, Gentry and his colleagues at Oak Ridge National Laboratory cast doubt on the idea that the polonium was a result of the accumulation of uranium-238 or any other radioactive precursor at the radiocenter that subsequently formed the radiohalo. He instead favored the hypothesis that these halos were the result of the Creator forming them along with host granite rocks during the six-day Creation week. After all, numerical simulations of the accumulation of the polonium at such sites could not result in the formation of a halo, since that would require somewhere around $10^8$ to $10^9$ decays, and the halo rings due to the progenitors such as radon are not found and the half-lives of the polonium isotopes in question are much too short for them to accumulate in the short times that are necessary. Snelling (2005) favored the hypothesis that many of these halos were formed during the Genesis flood and cited overwhelming geological evidence that these halos are found in Flood rocks (Phanerozoic rocks) rather than Creation-week rocks. However, Snelling (2005) did not offer a way for these halos to form on the time scales involved, instead he appealed to other evidence uncovered in the RATE (Radioisotopes and the Age of the Earth) project that half-lives may have changed over earth history and particularly at the time of the Genesis flood.

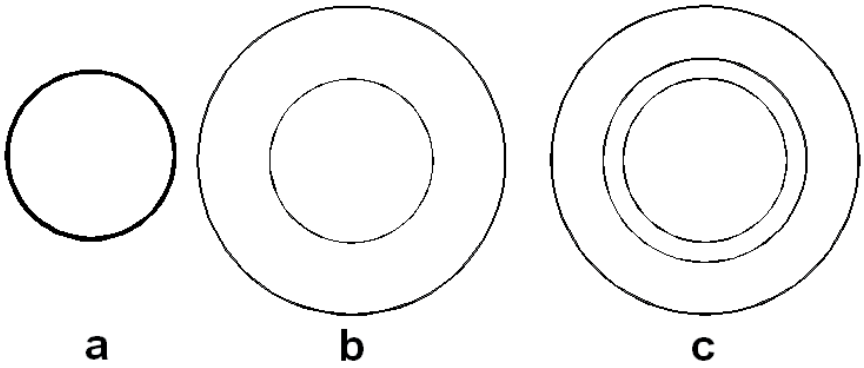


**Figure 1 Polonium halos. Part a represents a Po-210 halo, which has a radius of 18.8 microns. Part b is a Po-214 halo, which includes the Po-210 ring plus another ring of radius 34 microns. Part c is a Po-218 halo, which adds a ring of radius 22.5 microns to the Po-214 halo. The corresponding alpha-particle energies are 5.30 MeV for Po-210, 6.00 MeV for Po-218, and 7.69 MeV for Po-214.**

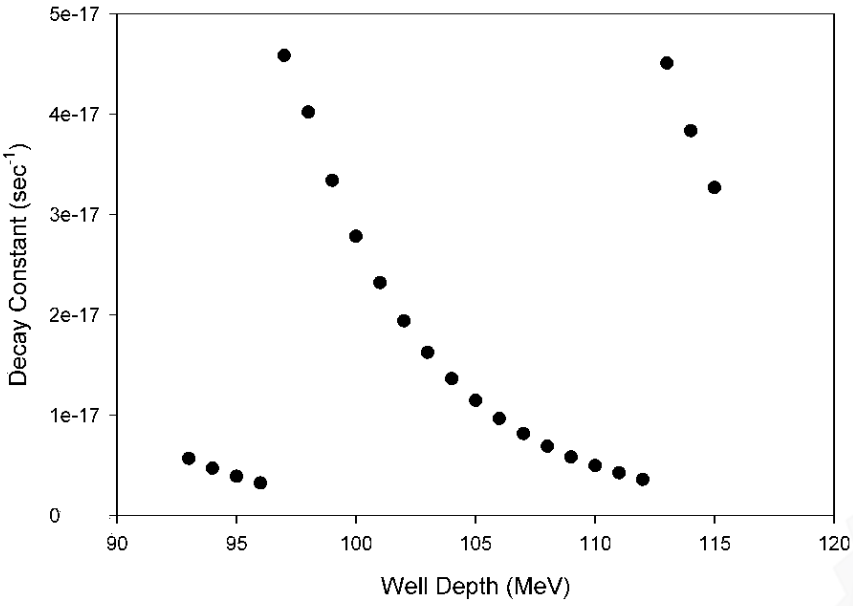


**Figure 2. The decay constant, which is the fraction of the nuclei decaying per unit time, is plotted versus the nuclear well depth for the alpha particles. If the well depth, which measures the strength of the nuclear force, were to change over earth history, then there could be either increases or decreases in the decay constant, depending on the initial value of the well depth.**

My own work (Chaffin, 2000, 2005, 2008), which was done along with some former students of mine, offered possible mechanisms for the accelerated decay that was involved. In the case of alpha-decays, the proposed mechanism involving a change in the strength of the nuclear force over earth history could also result, for some isotopes, in a decrease in the half-life, while others would have an increase in half-life. The work showed that the half-life for alpha-decay, proceeding by quantum mechanical tunneling, could radically change as a function of the strength of the nuclear force. Figure 2 shows a plot of the decay constant, which is the fraction of the

nuclei decaying per unit time, versus the nuclear well depth, which measures the strength of the nuclear force. I also presented experimental evidence, based on studies of double-beta-decay, which indicate a change in beta-decay half-lives at the onset of the Genesis flood (Chaffin, 2009, 2013) and, by implication, alpha-decay half-lives also.

The mechanism of halo formation supported by Snelling's work could not occur unless the very short half-life polonium isotopes had a prolonged half-life during the time they were being formed, i.e., while the polonium precursors were being transported by hydrothermal flows to the sites where the halos formed.

One should also mention the helium diffusion work of Humphreys (2005), which continues to offer evidence for a period of accelerated decay in order to explain the amounts of helium in zircons from the Jemez Mountains boreholes, New Mexico. This work was originally begun by Gentry, Glish, and McBay (Gentry, et al., 1982).

Thus, in spite of the questioning of the model that Gentry put forward to explain his halos (Brown, 1990; Gentry, 1990; Snelling, 2005), I still consider his work to be highly successful, since it brought the relevance of these polonium halos to the attention of creationists and offered the results of various very technical procedures as supporting data. Gentry's article in the *Quarterly* was a milestone that deserves applause.

## Earth's Magnetic Field Is Fading Away

Another example of a successful model is a 2002 scientific paper by D. Russell Humphreys showing that Creation models of the decrease in the earth's magnetic field were not guilty of neglecting higher order effects. Barnes (1973) had originally proposed a test of origins models based on the observationally observed decrease in the earth's magnetic dipole. A simple dipole consists of a north pole and a south pole, a short distance apart. The earth's magnetic field, at least in the first approximation, can be represented by imagining a dipole located deep within the earth. Observational data, beginning with measurements of the earth's magnetic dipole dating back to the early 1800s, showed that the earth's dipole strength has been decreasing exponentially over time.

When we try to represent a magnetic field that is only approximately a dipole field, the necessary next-to-leading order correction is called the *quadrupole term*. We add the field produced by the quadrupole term to correct the dipole field found at each point. Prior to the 2002 work of Humphreys, an anticreationist could have claimed that the decrease in the earth's dipole field was compensated for by an increase in the quadrupole term. Humphreys, however, gathered the necessary data and actually did the calculations of the total energy in the earth's field due to both dipole and quadrupole contributions. His results showed that the non-dipole is increasing, but the energy gained by the total non-dipole contributions is not nearly as much as the energy lost by the total dipole contribution. This net decrease in the energy is a fact that has not been successfully explained by advocates of the traditional evolutionary timescale. According to their model, the total energy should not decrease appreciably except over a timescale of millions of years. Hence, the earth's magnetic field offers evidence of a timescale of only thousands of years, not billions of years, for Earth history.

## Conclusion

The Gentry work on radiohalos is very difficult to explain, unless radioactive decay rates have varied over Earth History. Andrew Snelling's work speaks in favor of a large amount of change in decay rates during the Genesis flood, since rocks attributable to the Genesis flood contain numerous halos due to polonium isotopes. If it is possible to explain these halos as due to hydrothermal flows, it is only by also involving changes in decay rates after their formation. Humphreys' work on energy contained in the earth's magnetic field indicates a much more rapid decline in this energy than should be occurring if the field were due to the mechanisms offered by the old-earth advocates. Those interested in accurate views of Earth history would do well to consider these results.

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