Finally, then, it follows that the constant "295.6" in equation (1) must increase rapidly with specimen age, and for a specimen which trapped a piece of atmosphere at the instant of creation it would be highest of all, and completely unknown.

The conclusion is that equation (1)–but with a totally unknown constant-is just as valid for rocks formed at a Creation 7,000 years ago, as for rocks formed at a Creation 7,000,000,000 years ago. It tells absolutely nothing about the date of the rock until one first assumes a date of creation and a rate of buildup of Ar-36 in the air thereafter. Only then can the constant even be estimated, much less be determined exactly.

In closing it should be noted that the basic equation (1), even as it stands, is used to determine quantities of radioargon (left side of equation) in *trillionths* of a cubic centimeter, as the *difference* between two quantities on the right side each a thousand to ten thousand times greater. Every scientific investigator knows how untrustworthy is such a procedure. In this particular case the probable error in the result is well over 50%.

The errors of ±10% cited for many samples in the latter pages of Schaeffer and Zahringer are estimated gravimetric errors only. The authors apparently ignore the dominating influence of uncertainty and variations in the constant 295.6 which of course swamps out all others.

This then is the timeclock without hands-without even a face—upon which evolutionary faith now depends to prop up its desperate belief in a world that never began, a creation that never occurred, and a Creator who never created and no longer exists!

And the record of Scripture was never so sure!

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ON THE INVARIANCE OF THE DECAY CONSTANT OVER GEOLOGICAL TIME

ROBERT V. GENTRY*

Radioactiue inclusions such as zircon, which show a considerable volume increase due to isotropization from radioactiue decay, often fracture the surrounding mineral in a random pattern. On uniformitarian concepts the surrounding mineral should expand slowly over geologic time. Expansion cracks should occur first along cohesion minimums and grain boundaries, but instead individual cracks surrounding the radioactive inclusion are randomly distributed and occur suddenly, in an explosive fracture. Anomalous decay rates would explain this world wide phenomena. Mathematical equations showing the relationships involved in pleochroic halos are given.

While the past several years have seen steady advances both in the techniques and precision with which isotopic ratio determinations are made, there has been relatively little discussion about the fundamental premise that translates these data into radiometric ages, namely, the invariance of the decay constant lambda (λ) over geological time.

Pleochroic Halos: a Test

It was noted early in the study of radioactivity that pleochroic halos presumably furnished an ideal way to test this premise via observing the ring structure of uranium-238 and thorium-232 halos in ancient rocks. The rationale was that since the halo ring radii (R) develop as a result of alpha emission from uranium-238 or thorium-232 and their respective daughter products, any change in λ would be reflected in a change in ring radii.

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For example, if the alpha ranges were known in minerals of varying geological ages, then the Geiger-Nuttall Law[2] in the form

$$(1)\ \ln \lambda = A + B \ln R_a \dagger$$

(A and B are parameters and R_a is the alpha range in air.)

and the Bragg-Kleeman Rule[3]

$$(2)\ R_m = CR_a$$

(R_m is the alpha range, i.e., halo radius in the mineral; C is a parameter dependent on the mineral.)

may be combined to yield an expression equation for the fractional change in λ due to any variation, delta R_m, (ΔR_m) in the halo radius:

$$(3)\ \Delta\lambda/\lambda = (1 + \Delta R_m / R_m)B \sim B(\Delta R_m / R_m) \text{ for } \Delta R_m << 1.$$

†This equation should be read: "The natural logarithm (ln) of the decay constant lambda (A) equals A + B times the natural logarithm of the alpha range in air, Ra."

Variation in Decay "Constant"

Surprisingly enough, on the basis of this theory Joly[4] earlier reported a possible variation in the uranium-238 decay constant from his extensive studies on radioactive halos. Later Kerr-Lawson[5] and Henderson[6] in their investigations on halos in Canadian Pre-Cambrian mica concluded there had been no change in l.

However, as Picciotto and Deutsch[7] point out, the logarithmic nature of equation (1) makes it difficult to present convincing arguments for the absolute invariance of l. I have found after examining many uranium and thorium halos[8] that the experimental difficulties in measuring the exact outer boundary of the various rings, plus the problem of accounting properly for the finite size of the central radioactive inclusion, contribute to a minimum uncertainty in R_m of about D R_m = 0.1 m (micron) for a given set of measurements. (Note: A micron is the equivalent of 10^{-4} cm.)

It is probably not generally known, but due to the nature of the experimental method, this essentially establishes a minimum uncertainty in l as

(4) $Dl/l = B\ (D\ R_m/R_m) \sim ½$ for uranium 238.

This result is conservative in the sense that other uncertainties, not included in the above computations, arise when ring radii in various minerals must be compared.

Furthermore, Henderson[9] measured differences of three to four percent in halo radii for the same alpha emitters (polonium isotopes) in different halo types, and my own measurements have corroborated this variation. Though as yet unexplained, it is likely that some of this difference is due to the advanced stage of development of the polonium halos where the coloration will extend to the full alpha range and not just to the peak of the Bragg ionization curve.

Another Problem Noted

A more subtle problem and one which has received little discussion is whether any discontinuities have occurred in the space-time continuum such that one or more non-statistical decay periods may have transpired over geological time.

In other words, have periods of time D T ever existed such that for sub-intervals D t << 1 sec., l (D t) did not represent the probability of a single radioactive atom decaying within D t? These periods would be characterized by the decay rate proceeding at an anomalous rate while the alpha particle energy would remain fixed, for there would be no change in the parameters of the nucleus.

The range of the alpha particles emitted during these time periods would therefore remain unchanged, and hence no change in the radii of the various rings in the uranium-238 and thorium-232 halos would be expected. The usual arguments for the invariance of l from pleochroic halo radii data as presented above would therefore no longer be applicable. This type of discontinuity in the space-time continuum is not to be confused with the analysis of a very different problem; i.e., the determination of the invariance of (l) in the presence of a relativistic time dilation[10].

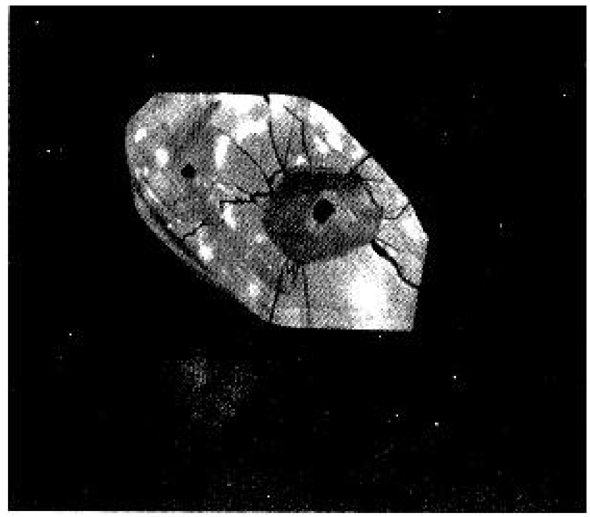

Figure 1. Zircon from "Rapakivi." The isotropic central part fractures the non-isotropic outer zone. (250x)

The question may be raised as to what experimental evidence may be adduced that would tend to support an anomalous decay rate hypothesis.

Evidence of Anomalous Decay

Ramdohr[11] in his extensive mineral studies has observed radioactive halos in polished mineral sections which exhibit an unusual appearance. Radioactive inclusions (such as Zircon), which show a considerable volume increase due to isotropization from radioactive decay, have in numerous cases been observed to fracture the surrounding mineral in a random pattern.

Ramdohr points out that the surrounding mineral should expand slowly over geological time due to radioactive isotropization, and individual cracks should appear as soon as the elastic limit is reached. He further points out that, while these expansion cracks should occur first, along cohesion minimums and grain boundaries, *nothing like this happens.*

Individual cracks surrounding the radioactive inclusion are randomly distributed and evidently occur quite suddenly in the form of an explosive fracture and not a slow expansion. Figure 1 shows a photograph (due to Ramdohr) of such a phenomenon wherein the isotropic central inclusion fractures the non-isotropic outer zone. The occurrence of this phenomenon is worldwide in extent.

Conclusions

While there might be other alternatives, one possible explanation of these "fractures" or "blasting" halos is that the rate of radioactive decay was at one time greater than that observed today. The isotropization of the host minerals would have occurred very rapidly due to an anomalous decay rate, and hence fracturing of the outer mineral would be expected.

Whether further investigation will prove this hypothesis correct or not, it would seem premature to claim that all the problems relating to the invariance of λ over geological time have been solved. There is, then, *no conclusive* evidence that isotopic ratios of radioactive decay nuclides represent elapsed time as is usually considered the case.

Acknowledgment

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A PALEOECOLOGICAL MISINTERPRETATION

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The small marine tubeworm, Spirorbis, is abundant in the fossil record. No member of this genus is found in a fresh water habitat. Since Spirorbis tubes are found as a constituent of Carboniferous coal, they are strong evidence for the allochthonous, or transported, origin of much of the coal. This is contrary to the presently popular view that coal originated in swamps and marshes due to the accumulation of plant materials over long periods of time.

In attempting to understand the environments and relationships of ancient living organisms, a discipline called paleoecology has developed. Interpretations, which of necessity must be tentative because of the subjective evidences on which they are based, are unavoidably influenced by the researcher's concepts of time and geological processes during the earths past history.

A strained interpretation has been given the small marine tubeworm, *Spirorbis.* This worm, which secretes a calcareous tube for protection of its fragile body, is ubiquitous in the modern oceans of the world. Because the diameter of the whole coiled tube, which has the appearance of a small snail, is not usually over 2 mm., it can be easily overlooked. It is a sessile organism which attaches on one side to any suitable substrate such as corals, mollusks, bryozoans. and other invertebrates. Floating sargassum or gulf-weed is also covered with many *Spirorbis* tubes and furnishes a planktonic environment[1].

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Description and Classification

This worm is hermaphroditic, spawns during high spring tides, and releases its larvae a certain number of days later.[2] In keeping with other organisms of this class, it produces free-swimming trochophore larvae, which move by means of bands of cilia which circle the oval-shaped body[3]. They are positively phototaxic when first released into the water, but usually become negative about three weeks later when metamorphosis commences. A negative reaction