A careful reading of his paper will show that he does not actually claim that the total dipole magnet reversed. But what he does claim needs to be challenged. His "evidence" is difference-in-direction of magnetization in rocks on the earth. There is much difference in having reversed magnetization in rocks here and proving a "flip" in the dipole magnet, or even a part of it. That magnet is more than a thousand miles away.

In his argument he refers to *magnetic field.* That is not synonymous with *dipole magnetic field.* Magnetic field includes the "noise" from extraneous sources. Whereas the dipole magnetic field is the ideal field with the "noise" removed, by Gauss' procedure. To have a reversal, the axis of the dipole magnet must reverse.

There is no conclusive evidence that the axis of the dipole magnet has ever reversed. There is evidence, from the historic evaluations of the dipole moment, that the axis of this dipole magnet has been precessing westward.

Stanley F. Stanulonis, Jr. (1974) has shown this precession to be due to solar wind—dipole magnetic field interaction. He carried his research further to evaluate the charge density in the earth's core. Here is an illustration of a physical cause and effect based on good physics and magnetic moment data. Nothing of this caliber has been advanced to prove reversals of the axis of the dipole magnet.

In support of his reversal theory, Humphreys refers to a figure, in my book *Origin and Destiny* of *the Earth's Magnetic Field",* which I used to discredit the "rock" magnetization data. It is reprinted here as Figure 1 for reference. This figure has only the most recent 160 years of archeomagnetic data (the bottom curve) from a Russian paper's 8,000 years of data. This figure also contains, for comparison, a plot of the earth's magnetic moment data, of the Gaussian type (the upper curve), which is the scientifically valid one. Let the reader decide where the credibility lies.

*Available from CRS Books—see inside back cover.

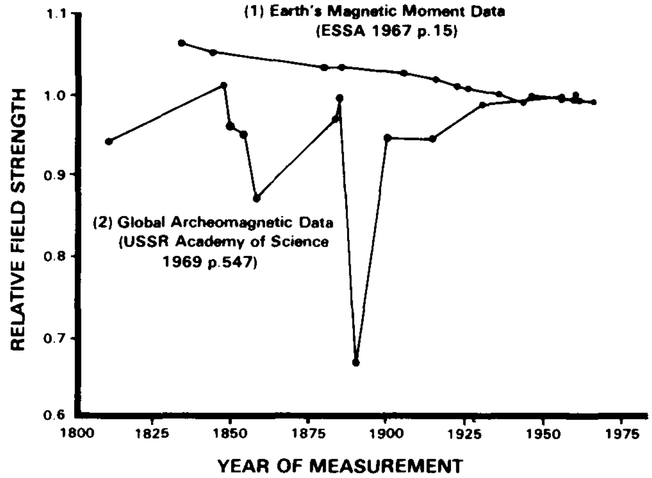

Figure 1. The most recent 160 years of archeomagnetic data (bottom curve). Also see *CRSQ* 21:109-13.

It may be commendable in Humphreys to associate reversed directions in rock magnetization with the Biblical Flood, a catastrophic event that certainly changed the face of this earth. But like so many other problems that have never been solved, it would be more convincing if there were a physical model from which one could derive a physics solution.

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RADIOACTIVE HALOS: GEOLOGICAL CONCERNS

KURT P. WISE*

Received 6 August 1987 Revised 24 July 1988

Abstract

The geology involved in the polonium halo research is examined. Since there is a lack of locality and specimen information, the geology associated with the presence of polonium halos is incompletely understood. A preliminary examination of this geology casts doubt on the explanatory power of Gentry's model. Further research into the geology of halos is necessary.

Introduction

Robert Gentry has presented polonium halos as evidence for the rapid formation of the earth's crystalline rocks—at a rate that is too great to allow for the operation of currently understood natural laws and processes. Gentry (1984, 1986, 1987a) has also produced an explanatory model—not only for the origin of the polonium halos, but also for the granites in which they were supposedly found, and even for the earth itself.

*Kurt P. Wise, M.A., receives his mail at 1307 Longfellow Glen, Sudbury, MA 01776.

According to Gentry's theory for the origin of polonium halos, God created the earth's primordial rocks, including granites and contained polonium, sometime during a singularity in the creation week about 6,000 years ago (Gentry, 1987a, pp. 97-8, 104). The theory also posits that God created granites and large biotite crystals almost instantaneously (Gentry, 1987a, p. 97) in forms that cannot be reproduced by man or natural process (Gentry, 1987a, p. 104). I call this theory Gentry's "special creation-week theory" for polonium halos. It is a "special" theory in that it requires that created rocks *cannot* be reproduced, and a "creation-week" theory because the origin of the rocks is thought to have occurred during the creation week. Many variations of this theory can be imagined. A "general singularity theory" for polonium halos might simply posit that God created the rocks containing polonium halos in less than 1/100 of a second. This theory neither requires that it happened during the creation week, nor that the created rocks are non-reproducible. It is thus a singularity theory rather than a creation-week theory, and a "general" rather than a special theory. Another variation is what might be called the "general creation-week theory" which would require that the creation of the rocks occurred during the creation week, but not necessarily in non-reproducible forms. Gentry's "special creation-week theory" is one type of "general creation-week theory," which in turn is one type of "general singularity theory" for the origin of the polonium halos (Figure 1). The purpose of this paper is to examine Gentry's model and each of the above-mentioned variations to determine if any such non-naturalistic theory for the origin of the polonium halos is sufficiently justified by the physical data.

Geological Problems

Gentry's model depends heavily upon a proper understanding of the geologic setting of his polonium halos. However, Gentry has made the understanding of the geology very difficult. As Wilkerson (1987) points out, Gentry has provided a very incomplete and imprecise list of localities from which his polonium halos were taken. This neither allows us to fully understand the geology of the sites, nor to reproduce his data by collecting more samples. Furthermore, he has neither provided a single museum catalogue number, nor even the name of the museum(s) into which he deposited his slides and specimens. According to the acknowledgements on several papers (Gentry, 1967, 1968, 1970, 1971; Gentry, *et al.*, 1976; Gentry, *et al.*, 1974) many of his specimens were borrowed from museums. Without a list of museum specimens, the geology of the radioactive halos cannot be investigated

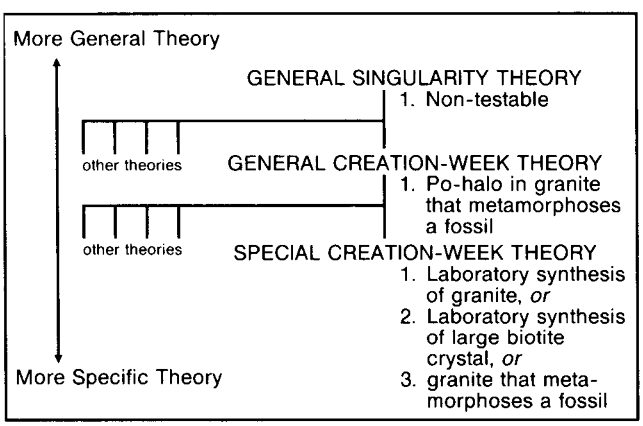

Figure 1. The relationships among the Three Different Non-naturalistic Theories for the Origin of Gentry's Polonium Halos. The more general theories are displayed higher and the more specific lower. Listed beneath each of the three theories are those physical observations that would falsify that particular theory and any of those beneath it, *but not above it.*

Attempting to improve our picture of the geology of Gentry's polonium halos, I have searched his papers for locality information. Table I lists the result, along with the references. Table I also includes references to the geology of some of the areas. These references are the result of a preliminary investigation. A better understanding of the geology of the sites must await a complete locality and specimen list.

Table II summarizes some of the geology of the localities listed in Table I. Although the mineral species in which the halos were found is always given (column 2, Table II), the radiohalo papers do not always identify the rock type from which the minerals were taken. As a result the identity of many of these rocks (column 3, Table II) remains uncertain. In some cases the geologic reports mention that only a single class of rocks is found in the area which could provide the mineral species. In such cases the designation is reasonably certain. In other cases the reports mention that more than one likely rock type is found in the area. In these cases, the identity of the rock is very uncertain. It must be noted that all such uncertainty could be eliminated by a petrographic examination of the rocks from which Gentry made his slides. Once museum specimen numbers are supplied such a study of Gentry's specimens should be performed.

A study of the geology of the polonium halos raises some disturbing issues. Firstly, Gentry (1987a, p. 97) claims that the polonium halos were always found in granites. This is not true (column 3, Table II). Most of the rocks from which polonium halos have been taken are actually granitic pegmatites. Granitic pegmatites have the mineral composition of granite, but not the texture of granite. Rhyolite is another rock with a granitic composition but not granitic texture. Yet, Gentry feels that rhyolites are not granites (Gentry 1986, p. 130). Rhyolites *have* been reproduced in the laboratory, so to accept rhyolites as granite would falsify his "special theory" of polonium halos. If the rocks identified as pegmatites in Table II are truly found to be pegmatites, Gentry's "special theory" will have to be modified to include granitic pegmatites as well as granites (and somehow *not* include rhyolites at the same time).

As Wakefield (1988a) and Wilkerson (in press) have shown, both the Fission and Silver Crater Mines are dug into calcium vein-dikes—the former primarily of calcium and fluorite, and the latter of calcium and biotite. These rocks are neither granitic in composition, nor granitic in texture. If this identification is verified, Gentry's theory should be modified to include some calcite vein-dikes. Finally, the South India halos were supposedly found in gneiss, a rock considered to have been altered by heat and/or pressure since formation. Since some gneisses are thought to have been formed from granite, one might ask if it is not possible that the polonium was created in granite and the granite metamorphosed into gneiss. However, such metamorphism would most likely destroy the halos, as Gentry thinks it destroyed the halos on the moon (Gentry, 1987b, p. 104). Furthermore, the halos themselves are found in the mineral cordierite. Cordierite is not produced in conventionally-defined granite, but rather is produced under the conditions that caused the metamorphism itself. There is then little doubt that the

Table I: A List of Localities from Which Polonium Halos Have Been Reported and References to the Geology of the Areas.

1) India (Gentry, 1971, p. 729)—actually Southern India, Mahadevan (1927, p. 445 [emanation halo]) locality. Geology: Krishnan, 1968.
2) Ireland (Gentry, 1968, p. 1229) Gentry's reference does not mention any Ireland localities. Possibly locality #3.
3) Co. Carlow, Leinster Province, Ireland (Joly, 1917, p. 458 [emanation halo])—probably at Ballyellen (Joly, 1923, p. 682). Geology: Stilhnan and Holland: 1981.
4) Japan (Gentry, 1973, pp. 358-9)—actually Ishigure District, Japan, Iimori and Yoshimura (1926, p.19 [Z_1 halo]) locality.
5) On river, near Woelsendorf. Bavaria, West Germany (Schilling, 1926, p. 241; Gentry, 1973, p. 355). Geology: Wakefield, 1988b.
6) Scandinavia (Gentry, 1971, Figure 1A; Gentry, *et al.*, 1973, p. 283). Possibly one or more of localities 8 thru 12.
7) Norway (Gentry, 1968, pp. 1228, 1230, Figure 1 left). Possibly one or more localities 8 thru 11.
8) Iveland District, Aust-Agder Co., Norway (Gentry, 1971, note 9; Gentry, *et al.*, 1974, p. 566). Geology: Bjorlykke, 1935.
9) Froland, Aust-Agder Co., Norway (Meier and Hecker, 1976, p. 186). Geology: Barth and Dons, 1960.
10) Moss, Ostfold Co., Norway (Meier and Hecker, 1976, p. 186). Geology: Barth and Dons, 1960.
11) Kragero, Telemarck Co., Norway (Meier and Hecker, 1976, p. 186, figures 4, 8, 10). Geology: Kofseth, 1942.
12) Ytterby, Sweden (Gentry, 1966, p. 453 [Type G halo]; 1973, p. 358 [may be ^{210}Po halo]).
13) Mount Apatite, Androscoggin Co., Maine (Henderson and Sparks, 1939, p. 240 [Type A halo]). Geology: Fisher and Barrell, 1934.
14) Portland, Middlesex Co., Connecticut (Henderson and Sparks, 1939, p. 241 [Type C halo]). Geology: Stugard, 1958.
15) Cottman Street Quarry, Philadelphia, Philadelphia Co., Pennsylvania (Henderson and Sparks, 1939, p. 241 [Type B and Type C halos]). Geology: Rose, 1970.
16) La Malbaie (Murray Bay), Gaspe Co., Quebec, Canada (Henderson and Sparks, 1939, pp. 240, 241 [Type A and Type C halos]). Geology: Alcock, 1935.
17) Dingwall, Victoria Co., Cape Breton Island, Nova Scotia, Canada (Henderson and Sparks, 1939, p. 240 [Type A halo]). Geology: Neale, 1955.
18) Huron Claim, Manitoba, Canada (Henderson and Sparks, 1939, p. 240 [Type A halo]). Geology: DeLury and Ellsworth, 1931
19) Star Lake, Manitoba, Canada (Henderson and Sparks, 1939, pp. 240, 241 [Type C halo]). Geology: Davies, 1952; Lang, 1952.
20) Wilberforce, Haliburton Co., Ontario, Canada (Henderson and Sparks, 1939, pp. 240, 241 [Type A and Type B halos]). Probably the Fission Mine, since Fission bought out Wilberforce in 1947. Geology: Wilkerson, in press; Rowe, 1952.
21) Weissman Mine, Dill Township, Sudbury District, Ontario, Canada (Henderson and Sparks, 1939, pp. 240, 241 [Type A and Type C halos]). Geology: Ellesworth, 1932.
22) Cheddar, Hastings Co., Ontario, Canada (Henderson and Sparks, 1939, p. 241 [Type C halo]). Geology: Hewitt, 1957; Slack, 1949.
23) Faraday Mine, Faraday Township, Hastings Co., Ontario, Canada (Gentry, 1971, p. 728, figures 1B, 1C). Geology: Lang, Griffith and Steacy, 1962; Wakefield, 1988a; Wilkerson, in press.
24) Silver Crater Mine, Faraday Township, Hastings Co., Ontario, Canada (Gentry, *et al.*, 1974:564). Satterly and Hewitt, 1955; Wakefield, 1988a; Wilkerson, in press.
25) Conway Granite, New Hampshire (Gentry, personal communication, August 1986).

The underlined name in each is the abbreviated form of the locality used in the text and Table II. General localities (e.g. Scandinavia) are not otherwise discussed if polonium halos are known from more specific localities within that region (e.g. Kragero Norway, within Scandinavia References in parentheses are those pages and figures that indicate polonium halos were found in that locality. If the reference uses an abandoned name, that name is indicated in brackets.

South India polonium halos were *not* formed in granite, but rather in gneiss. This would indicate that in addition to granitic pegmatite and possibly some calcite vein-dikes, at least one gneiss possibly would have to be included among the created rocks of Gentry's theory. With further examination however, the geologic picture causes even more difficulty for Gentry's model.

In nearly every case the rock in which the polonium halos were found can be interpreted to be *younger* than some other rock (column 5, Table II). The pegmatites and granites are sometimes observed to have halos of metamorphism about them, seemingly indicating that when they were hot, they were hotter than their surroundings. This implies the surrounding rock had cooled earlier, and thus is older. In other cases the polonium-containing rocks are seen to include partially melted pieces of the surrounding rock. These "xenoliths," "roof pendants," etc., also seem to indicate that the surrounding rock was already cool or at least solid when the polonium-containing rock was still fluid enough to allow the xenolith to be incorporated. In still other cases, the polonium-containing rock is seen to separate two pieces of the surrounding rock and even in some cases to distort it. In other cases the polonium-containing rock is finer-grained near the contact with the surrounding rock. Collectively these evidences indicate that at one time the surrounding rock was more solid and cooler than the polonium-containing rock. This, in turn, is interpreted to mean that the polonium-containing rocks are actually *younger* than the rocks that surround them. Now it may well be that God created these "older" rocks as well. After all, God must have created other things with the appearance of history.

However, Gentry tells us of none of this in any of his papers. He claims simply that ". . . Precambrian granites . . . are the basement rocks underlying the continents . . ." (Gentry, 1987c, p. 235). This claim is incorrect as rocks at great depth are actually much more mafic. In addition, the polonium-containing rocks have much apparent history inscribed within them indicating they are not simply "basement" rocks of the continents. In some cases, not only are the polonium-containing rocks younger than granites, pegmatites, and gneisses, but also volcanics and even sediments. If the rocks in Table II are correctly assigned and the geology of the area actually shows the age relations of the last column, and polonium halos could only be formed as a result of God's creation, then it must be admitted that God created the primordial rocks with a tremendous amount of apparent history.

Gentry not only claims that the polonium-containing rocks are granite and primordial, but also that they are Precambrian. This may also be incorrect (column 4, Table II). At least six of the polonium-containing rocks—the Carlow and Conway granites, the Woelsendorf fluorite and the rocks of Malbaie, Mount Apatite, and Portland—are thought to be Phanerozoic (post-Precambrian). If this is verified, then not only is Gentry's understanding of their geologic position incorrect, but also his "special theories" as well as the "general creation theory" are falsified as well (see discussion of the "general theories" below).

Problems with the "Special Theories"

One of the most serious problems with Gentry's model is that his "special theory" has been virtually, if not completely falsified. Gentry's "special theory" (1987b, p. 104) maintains that God created granite and that it cannot be simulated by man. A necessary deduction from Gentry's "special theory" is that man cannot create granite in the laboratory (Figure 1). And truly, an artificial granite has not yet been produced.

Table II: Geology of Localities from Which Polonium Halos Have Been Reported.

Locality	Mineral	Rock	Accepted Age	Older Rocks
S. India	Co	Gn	PrC: Arch**	----
Carlow	B@	Gr*	Phz: Dev*	Phz Sed
Ishigure	B@	----	----	----
Woelsendorf	F@	vein*	Phz*	Gr/Gn
Iveland	B@	P	PrC: Prot*	Gr/Gn
Froland	B@	P** (Gr, Gn)	PrC: Prot*	Gr/Gn
Moss	B@	P** (Gr, Gn)	PrC: Prot*	Gr/Gn
Kragero	B@	P** (Gr, Gn)	PrC: Prot*	Gr/Gn
Ytterby	B@	P	PrC: Arch*	----
Mt. Apatite	B@	P** (Sh, Gn)	Phz: Dev/Carb**	Gn & Sch
Portland	B	P*** (Gr, Gn, Sh)	Phz: Dev/Carb***	Gn/Gr/Gn/Sch
Cottman	B	P*** (Gr, Gn, Sh)	PrC	Sch, Gr & Gn
Malbaie	B	Gr****	Phz*	Phz Sed
Dingwall	B	P*** (Gn, Gr)	PrC**	Gr/Gn
Huron Claim	B@	P* (Gr, Sh)	PrC: Arch	Sch
Star Lake	B@	P*** (Gr, Gn, Sh)	PrC	Sch & Gn
Fission M.	B@	Ca-F vein*	PrC: Prot*	Gn
Weissman M.	B@	P* (Gn)	PrC: Prot*	Gn
Cheddar	B@	GR*	PrC: Prot*	Gn
Faraday M.	B@	P* (Gr)	PrC: Prot*	PrC Sed
Silver Crater M.	B@	Ca-B vein*	PrC: Prot*	----
Conway	---	Gr	Phz	Sch, Gn

Abbreviations: Arch: Archaean (Early Precambrian); B: Biotite; Ca: calcium; Carb: Carboniferous; Co: cordierite; Dev: Devonian; F: fluorite; Gn: gneiss; Gr: granite; P: granitic pegmatite; Phz: Phanerozoic; PrC: Precambrian; Prot: Proterozoic (Late Precambrian); Sch: schist; Sed: sedimentary rock. Symbols: @: uranium is reported from the locality, the rock, or the mineral; *: very likely that designation is correct; **: possible, though somewhat uncertain, that designation is correct; ***: very uncertain that designation is correct; ----: no data found; /: means "which is older than." Rocks in parentheses are other possibilities based on the geology of the area, with the most likely rock listed first, the next most likely listed second, etc.

However, the physical process of cooling of granitic plutons has long been thought to require thousands to millions of years of time. Consequently, up until recently, most researchers have felt that long periods of time (many human generations) were *required* to produce granitic texture. So strong has been this conviction that before the mid-1970's no real attempts were made at simulating granitic textures. The classical study of Jahns and Burnham showed that the cooling of a molten pegmatite or granite produced "typical assemblages of major minerals, along with many textural features characteristic of natural pegmatites . . . duplicated in miniature . . ." (Jahns and Burnham, 1958, p. 1592). Large crystal size was thought possible only if one waited lifetimes. It was when silicate crystal growth studies produced large crystals in short times (e.g. Mustart, 1969; Swanson, Whitney and Luth, 1972), that granitic texture simulation began to be considered. Swanson's (1977, p. 977) study of cooling molten synthetic granite led him to conclude that ". . . long periods of time are not necessary for the development of plutonic textures" [Swanson's emphasis]. In sum, though a true granite has not yet been produced in the laboratory, many granitic features have been. The most common granitic minerals—plagioclase, orthoclase, and quartz—have each been grown in crystal forms and sizes characteristic of granites (e.g. Mustart, 1969; Swanson, Whitney and Luth, 1972). In addition, plagioclase zoning (Lofgren, 1974), comb-layering (Lofgren and Donaldson, 1975), and mafic-before-felsic crystallization (Nany and Swanson, 1980)—all observed in field granites—have been simulated in the laboratory. Though a true granite has not been simulated, the evidence indicates that it soon may be. Even if simulation of a granite were unsuccessful, the experiments so far conducted have shown that if God created granites, He did so with many features now reproducible by man.

Since Gentry (1986) feels that fossils in sedimentary rocks from at least the Eocene and below were buried in the Flood, he then believes that all fossils are post-creation in age. Thus if it can be shown that there is *any* granite in contact with a fossiliferous rock which has a halo of metamorphism about it, then Gentry's "special theory" and his "special creation-week theory" are both falsified (Figure 1). Any granite that so metamorphoses a fossil, must postdate it, and thus is not primordial, but actually post-Flood. There are many claims in the literature of Phanerozoic granites, and a number of them are in contact with metamorphosed, fossiliferous sediments. If it can be shown that any of these granites' halo of metamorphism has actually metamorphosed a fossil, then Gentry's theories are falsified. One example of a claimed Phanerozoic granite is a quartz monzonite (granite variety) pluton in contact with metamorphosed limestones containing fossil corals, brachiopods, crinoids, forams, etc., in Inyo County, California (Hall and MacKevett, 1962). Another example is the Galloway granite complex of Scotland, which is claimed to actually metamorphose graptolites (Peach and Horne, 1899, p. 644). These examples and others (Wilkerson, in press) should be examined to test Gentry's special theory.

Problems with the "General Theories"

There is at least one observation which would falsify both Gentry's "special theories" *as well as* the "general creation theory. If a granite can be found which has metamorphosed fossiliferous sediments *and* contains an apparently primary Po halo, the halo must be acknowledged to be post-creation-week in age (Figure 1). To test this a search should be made for polonium halos in granites that metamorphose fossils (Wilkerson, 1987). It would be necessary to find polonium halos in only one such granite. If any of the six Phanerozoic-aged rocks in Table II are found to metamorphose fossils, the falsification would also be complete. It is most likely that at least one of these rocks is truly post-creation in age. If halos were found in any Phanerozoic granite, then both "special theories" as well as the "general creation theory' would be falsified (assuming God did not create the fossils at the creation event as well).

Although it is most probable that both special theories as well as the "general creation theory" of radiohalos may soon be falsified, the "general singularity theory" will prove to be more elusive. There is no observational data that can be compared with the theory's deductions to either falsify or confirm. As a result, the "general singularity theory" of polonium halos may be true, but since empirical evidence cannot be brought to bear upon it, it is not a scientific theory.

Naturalistic Origin Likely

No satisfactory, naturalistic theory has yet been proposed for the origin of the polonium halos. There is some circumstantial evidence, though, that suggests a naturalistic explanation is possible. Radiohalos are found in over 40 different minerals (Gentry, 1973), all of which can be produced hydrothermally in the laboratory (Brown, 1987a). Although the lack of radiohalos in moon and meteorite rocks could be due to post-creation metamorphism (Gentry, 1987b, p. 104), it may be more than coincidence that these rocks also formed in environments considered to have lacked water (Brown, 1987a). Furthermore, most of the polonium halos are found along conduits, cleavage planes, fractures, and dislocations in crystal structure (Joly, 1917, p. 458; Schilling, 1926; Meier and Hecker, 1976, p. 188). These would be expected to be sites where water could deposit radioactive uranium and/or daughter products. All Irish halos (Joly, 1917, p. 458) and Woelsendorf halos (Schilling, 1926) are claimed by the original investigators to have occurred *only* along cracks or conduits. Gentry (1968, p. 1229; 1973, p. 355) claims to have found halos not associated with conduits, verifying Henderson's similar claim but he neither identifies the locations nor the specimens. Meier and Hecker (1976, p. 188) also point out that the polonium halos they found had a distinctly different origin than the uranium and thorium halos. Although the uranium and thorium was found within the lattice of the biotite, the polonium was not. This seems to indicate that the emplacement of the polonium *post*-dated the creation of the biotite. Perhaps there was a post-creation dissolution/precipitation event that allowed for the transport of the polonium and/or radioactive precursors. None of these observations, either singly or collectively, produce an alternative explanation. Gentry's work on the halos still stands as a challenge to anyone trying to explain them by a naturalistic explanation. However, they *suggest* the possibility that water may be related to the origin of the polonium halos.

Additionally, most, if not all, the rocks which contain polonium halos also contain uranium (column 2, Table II). Each of the polonium-containing rocks should be examined to determine if this relationship is always valid. Furthermore, polonium halos should be sought in granites that do *not* contain uranium, in case the search for polonium halos has thus far been biased toward those units where uranium halos are found. Meier and Hecker (1976, pp. 188-9) also report that polonium halos are found in abundance in those minerals where uranium is also found to be abundant. So perhaps relative abundance of uranium and polonium halos should also be determined for each of the polonium-containing rocks. If there is a strong correlation between polonium halo abundance and uranium concentration, perhaps there is also a causal relationship.

Brown (1987b) also elaborates on an argument of Stephen Dutch (1983; 1987). Why is it, that not all the polonium isotopes were created in the earths first rocks? Of the 26 known isotopes of polonium only nine are in the decay series of other elements (U-238, U-235, Th-232, or Pu-241). Polonium radiohalos that appear to be primordial are identified *only* with isotopes from among this set of nine that can be produced by natural decay. Yet, 15 of the remaining 17 independent polonium isotopes produce daughter products which would allow them to be distinguished from the others. If any of these 15 other isotopes had been created in abundances similar to the abundances of Po-218, Po-214, and Po-210 then their halos should be identifiable. However, no evidence has been produced to date for any of these other 15 isotopes of polonium. The only "primordial" isotopes of polonium found thus far just "happen" to be those isotopes which are found in the decay series of other elements. If God created this polonium, it seems that He only chose to create the isotopes that can be formed naturally.

Their association with uranium in abundances that may be correlated with uranium concentration, as well as their identity as polonium isotopes only found in the decay series of other elements, seem to suggest that the origin of polonium halos is related to the decay of other radioactive substances. This fact, combined with the circumstantial evidence for water in the origin of polonium halos, suggests a naturalistic explanation is possible.

Conclusion

There are serious geological problems that should be considered in the evaluation of Gentry's research. These problems leave our understanding of the geological setting of the polonium halos uncertain. A better understanding of the geology of Gentry's localities is needed. With a complete list of localities and specimens, many important questions can be resolved.

Gentry's particular "special theory" of polonium halos encounters problems on the mode of God's creative activity which can be avoided with "general theories." His special theory has also been virtually falsified—namely with laboratory studies in granitic texture, the limitation of polonium isotopes to those in radioactive decay series, and the possibility of Phanerozoic plutons which metamorphose fossiliferous sediments. Additionally, it seems that some of the polonium-containing rocks are actually post-creation-week in age. If this is true, then even the "general creation-week theory" is falsified. The remaining theory, the "general singularity theory" cannot be tested empirically, so is not a scientific theory. All non-naturalistic theories for the origin of polonium halos proposed to date seem unsatisfactory in the light of geologic data.

There exists some circumstantial evidence that the origin of polonium halos is related to the presence of water. Further circumstantial evidence indicates that polonium halos are somehow dependent upon the presence of uranium and possibly thorium. The collective consideration of all such evidence leads to the possibility that the so-called "primordial" polonium *may* be uranium- (and possibly thorium-) derived and hydrothermally transported.

Acknowledgements

I thank Robert H. Brown and Gregg Wilkerson for reviewing earlier drafts of this paper and making valuable suggestions for its improvement.

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NA—Nature
OR—Origins *Research*
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RESPONSE TO WISE

ROBERT V. GENTRY*

Received 3 November 1988 Revised 20 November 1988

Abstract

I appreciate the opportunity to respond to Wise's comments. I respond on a paragraph by paragraph basis to the criticism.

*Robert V. Gentry, M.S., Earth Science Associates, P.O. Box 12067, Knoxville, TN 37912-0067.

Pars. 1 and 2.—In these two paragraphs Wise mixes some of his own views with mine. To clarify the issue, I