

Radiohalos in diamonds

Mark Armitage's contribution on radiohalos in diamonds¹ is a valuable contribution to radiohalo study, but unfortunately he omitted some very important information about radiohalos necessary in their evaluation (all of which is included in an earlier paper).² These items are as follows:

1. Armitage did acknowledge (for example, on pages 93 and 100) that difficulties exist in explaining the relationship between Po halo-containing rocks and sediments of the Flood. The reason this is a concern is that by 1989, a total of one third of the sites known to have Po halos were from rocks conventionally understood to be Phanerozoic in age³ — that is, Flood-derived rocks. To my knowledge neither Gentry nor any other creationist has published a careful study of any of these sites to determine whether the Po-containing rocks were magmatic intrusions dating from the Flood (the traditional creationist understanding) or whether they were solidified rocks of the creation, technically emplaced among Flood sediments (Gentry's understanding⁴). If it turns out that Po halos are found in rocks cooled from a magma extant at the time of the Flood, then the Po in those cases is **not** primordial (unless God created Po atoms during the Flood). Po atoms would therefore **not have** to be primordial when found in any other setting (for example, in a diamond).
2. Armitage claimed (page 95) that the Po halo figured in his Figure 4 (page 96) was located in a region of the mineral without cracks or fissures. This is similar to Gentry's claims^{5,6} and Henderson's before him. However,
 - (a) it appears from the figures in his article that all Armitage's photographs of possible Po halos in diamonds are along cracks

(Figures 9-11) or at the termini of those strange tubes (Figures 12 and 14);

(b) earlier investigators claimed that all the Irish⁷ and German⁸ halos were found **only** along conduits within the minerals;

(c) Armitage's Figures 4-6 and all Gentry's figures showing Po radiohalos unassociated with cracks or conduits are found in the mineral biotite. Biotite is composed of crystals in the form of sheets. The sheets are only one molecule thick. Thus in biotite one is never more than one-half a molecule thickness away from a cleavage plane, and thus a substantial crack. It is impossible to get away from cracks in biotite! It is also significant that Meier and Hecker⁹ claim that in the biotites they studied, although the uranium and thorium inclusions were found within the matrix of the biotite mineral, the polonium was not. This suggests that the polonium was transported; and

(d) to my knowledge neither Gentry nor anyone else has produced pictures or other proof of a Po halo in a non-biotite mineral which is not near a crack, cleavage plane or hole in the enclosing mineral.

3. As of 1989, a majority of the rocks in which Po halos had been found were reported to have contained uranium.¹⁰ It was not possible in that earlier study to determine from the literature if all the rocks containing Po halos also contained uranium and/or thorium, but the possibility exists that this is the case. I indicated then¹¹ it needed to be studied, as a strong relationship between U and Po is implied in this. Meier and Hecker¹² also claim the frequency of Po halos they found was directly related to the uranium concentration in the rocks they examined. This further suggests a connection between U and Po. The fact that Armitage found no detectable radioactivity in the diamond he studied is

interesting and important, but it is also important to test the radioactivity of the rock in which the diamond was enclosed and not just the diamond.

4. As Brown¹³ and Dutch^{14,15} have asked, why is it that only isotopes of polonium in the decay series of uranium, thorium and plutonium have been found to produce radiohalos? Of the 26 known isotopes of polonium there are 15 not in the decay series of these elements which **could** be distinguished if they were once created within minerals and then allowed to decay. Yet, these other isotopes are not known. If God chose to leave His fingerprint in rocks to indicate He created them, then He chose the isotopes which can be produced by natural means. This seems strange ... to me at least.

The facts that:

- (a) the only known Po halos are of isotopes in the decay series of uranium (etc.),
- (b) the Po halos may occur only in rocks where uranium (etc.) is found,
- (c) the Po halos may occur in concentrations related to the concentrations of uranium (etc.) in the rock,
- (d) the Po halos may be occurring only along conduits, and
- (e) the Po halo inclusions may not be embedded in the crystalline structure of the minerals, strongly suggests that the polonium in question is not primordial, but that it has been transported into place.

Even if all these things are verified (which I suspect they will be), that is not to say that the Po halos have been explained. If we are to conclude that fluids brought in the polonium, then under **present conditions** such fluids would be radioactive. Alpha recoil evidence should then be found in the rock, but such seems to be absent.¹⁶ This may in turn suggest that present conditions do **not** typify what was happening when those fluids were passing

through the rock — another case of uniformitarianism's failing to explain the past.

We need more radiohalo studies, such as Armitage's. We need to determine most importantly if radiohalos were produced during the Flood. Secondly we need to determine if polonium is secondary (that is, somehow derived from the decay of other atoms, for example, uranium). Thirdly, we need to think imaginatively¹⁷ to find a solution to the truly intriguing question of the origin of the polonium halos.

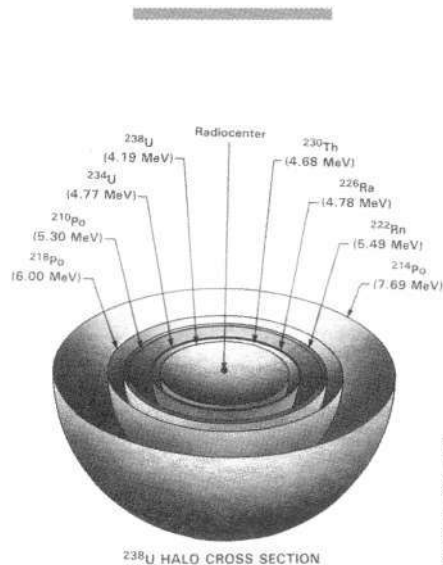
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11. Wise, Ref. 2, p. 175.
12. Meier and Hecker, Ref. 9, p. 188.
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Creationism, Vol. 2, Technical Symposium, Sessions and Additional Topics, R. E. Walsh, C. L. Brooks and R. S. Crowell (eds), Creation Science Fellowship, Pittsburgh, Pennsylvania, pp. 101-102.

16. Gentry, Ref. 5.
17. I encourage my students to 'think weird' as creationists. Whatever way conventional science thinks about a problem, consider turning that approach on its head and somehow think the opposite way about the same problem — or at least in some radically non-conventional fashion. On this topic, for example, D. Russell Humphreys is considering the possibility that there was no radioactive decay occurring at the time the polonium was being transported. If there was a significant period of time in the history of the earth when radioactivity was 'turned off' then polonium could be transported and concentrated at special sites in various rocks. When the radioactivity was 'turned on' again, then the polonium halos could form. This is an example of the kind of imaginative (or weird!) thinking in which I believe we need to be engaged.



238U halo cross-section. Idealized three-dimensional illustration of a uranium halo obtained by slicing the halo through the centre. Each halo ring is identified by the appropriate isotope and its alpha energy in MeV (Million electron Volts). 218Po halos contain only the three Po rings (see photo next page) and 210Po halos contain only one ring.

Mark Armitage replies:

I appreciate the opportunity to respond to Dr Kurt Wise's criticisms

regarding the radiohalos in diamonds.

Wise contends that I 'omitted some very important information about radiohalos necessary to their evaluation', and then proceeds to reiterate four of the points he argued in the *Creation Research Society Quarterly* nine years ago¹. Wise's arguments are old, and have been succinctly and sufficiently satisfied by Robert Gentry². I can do no better than to encourage the reader to request a reprint of the issue³ and read it for him or herself [or read Dr Gentry's letter which follows — ed.].

Although the radiohalos in the diamond I observed⁴ were not identified *via* ion microprobe analysis, it is possible that they are parentless with respect to uranium, however, parentless polonium radiohalos in biotites have clearly been identified in that manner.²

With respect to the diamond, none of Wise's points has any direct bearing:

Point 1: It is not clear whether Wise is redefining 'traditional understanding' of crystalline rock formation to include the possible formation of diamonds during the Flood, but many gemologists would doubtless be interested in arguing that point.

Point 2: Only a few of the 'strange tubes' observed in the diamond even ascended close to the surface of the processed diamond (none made contact with the surface), and none of the structures which 'shish-kebab' the halos are cracks. They appear, rather, to be solid inclusions as well, and again, are not in contact with the surface of the diamond. This means that they were well encased within a solid diamond matrix (and thus subjected to the commonly accepted diamond genesis conditions) which was later processed away by the diamond cutter. Even if there are cracks, however, as Wise claims, and polonium was transported along them in solution, how did the tightly packed, 2-micron inclusions form at the

radiocentres and not dissipate under extreme conditions (2-3 times melting point), why are there not halos all along their length, and why did the heat associated with such transport (let alone diamond crystallization) not anneal the halos? Additionally, Wise claims no knowledge of any halos in any crystalline mineral unassociated with cracks. I suggest that he carefully study the radiohalo catalog in Gentry's book⁵, and in particular, plates 7 and 8, where he will see Po halos in fluorite, a solid non-biotite mineral.

Point 3: Even if the rock surrounding the diamond had been preserved for my study, and demonstrated high radioactivity, it would mean only that the diamond possibly travelled through, or was emplaced in, U-rich rocks on its way to the surface. It would not necessarily mean that the diamond had been formed in a U-rich matrix.

Point 4: We do not know that these are polonium radiohalos in the diamond.

In the interest, however, of distilling this ongoing argument down to the single greatest dilemma for those, like Wise, who argue a transport-of-Po-solutions-through-cracks theory, and to conclusively show that the Po radiohalos in biotites are indeed primordial, I would draw the attention of the reader to the ion-microprobe data painstakingly collected by Gentry.²⁵ These data stand alone and remain unassailed in their ability to prove that the Po halos he studied could never have descended from the U decay chain. Wise and others can argue their transport theories until the 'cows come home', but their arguments are specious with respect to the ion-microprobe data. The ion microprobe data conclusively show that the Po halos in biotites are parentless. This is true regardless of:

- what interpretation of Earth history is used to characterize

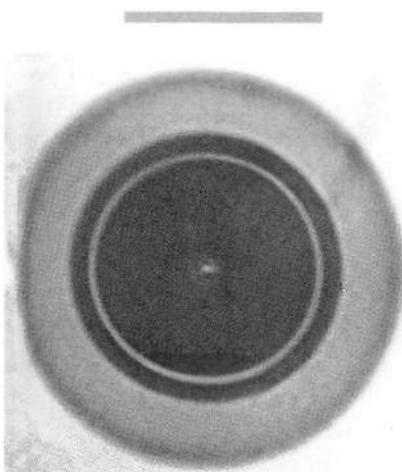
rocks (Point 1);

- how many cracks, fissures, splits or conduits riddle a biotite (Point 2);
- how much U surrounds a sample of biotite — in fact, it is more devastating to the transport theory to have an abundance of U in the presence of parentless Po halos (Point 3);
- how many different types of Po exist or do not exist (Point 4).

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²¹⁸Po halo in Mica (biotite)

Courtesy Robert Gentry

Robert Gentry replies:

I welcome the opportunity to clarify some important issues

concerning my polonium halo research. Because of space limitations, I respond only to Wise's most serious omissions and errors of fact.

For over thirty years, I have been publishing experimental results verifying that Po halos in granites and other crystalline rocks did not originate with secondary Po from U decay, but instead with primordial Po, and hence constitute *prima facie* evidence of almost instant creation of those rocks.¹⁻⁸ What is most revealing about Wise's attempts to cast doubt on the primordial nature of these halos is that he repeatedly ignores the published scientific evidence which contradicts what he is attempting to establish. As I will now show, what all this means is that the creation implications of Po halos in granites now shine brighter than ever.

Consider first, for example, that in my 1967 *Nature* report,¹ I published that fossil and neutron-induced fission tracks appear in U-halo centres in biotite, but are absent from Po-halo centres, thus excluding U-bearing solutions as the source of Po for those halos, irrespective of whether they occur along tiny conduits — i.e. microscopic-sized microchannels — or whether they occur in defect-free areas of the biotite where there are no cracks nearby.

In sections 4(d),(e) Wise essentially ignores these results and attempts to link Po halos in granites with secondary Po by assuming, as fact, the whimsical claim he made in section 2c — namely that it is impossible to avoid cracks in biotite. The reason Wise is so dogmatic about the existence of cracks is that he absolutely must have them to have any hope of justifying the passage of the hypothesized secondary Po atoms from some distant U source to the Po halo centres.

In one instance he uses 'cracks' to mean conduits along a basal cleavage plane, and in another instance to mean visible erratic features associated with separations between the cleavage planes. I now

cite evidence showing that in both cases Wise seriously errs in claiming it is impossible to avoid cracks in biotite.

First of all, anyone who wishes to do so may easily view spectacularly beautiful Po halos in clear, conduit-free or crack-free areas in micas in the colour-photo catalogue in my book. There, contrary to Wise's other claim, they can also find Po halos in fluorite separate from conduits. Secondly, the vast majority of perfect crystals of biotite — and I have worked with a very large number of them — do not exhibit basal cleavage separations unless something is done in splitting the mica in specimen preparation.

This I have demonstrated both by visual inspection before and after prolonged immersion of the crystals into an aqueous dye solution before proceeding with either peeling the biotite with scotch tape, or mechanically with a sharp blade. Either of these procedures can induce cleavage separations, but it is a *non-sequitur* to imply — as Wise implicitly does — that these experimentally-induced separations are the norm for the original unstressed crystals.

Clearly, an investigator can always choose perfect, defect-free crystals to search for halos if he takes care to do so. But Po halos in defect-free areas disprove Wise's claim that it is impossible to get away from cracks in the biotite; this result in itself shows that his speculations about the secondary origin of Po halos in biotite, as described in his section 4, are without any scientific foundation.

In a 1968 *Science* report² I published a definitive study showing that fossil alpha-recoil (oc-recoil) analysis of many Po-containing mica specimens revealed no excess of radioactivity near Po-halo centres. The purpose of the study was to test whether there was any evidence for any migration/movement/diffusion of any hypothetical oc-emitting precursors toward the Po centres. Such

movement would necessarily have been accompanied by the a-decay of such emitters as they moved toward the Po-halo centres along the same cleavage plane containing the centres. The recoil nucleus from any a-decay produces a tiny recoil pit, or track, which is rendered visible by an HF acid etch of the basal cleavage plane. In my study I measured the fossil a-recoil density in the basal cleavage planes above, below, and through the Po-halo centres. What one observes in these three areas near the Po halo centres is the same oc-recoil track density that is common throughout the mica; the background density is due to the a-recoils from the parts-per-million (ppm) concentrations of U and Th.

I performed about a hundred experiments, which showed that 'excess' a-recoil tracks do not exist near Po-halo centres. In his section 4e, Wise attempts to cast this result in doubt by claiming the absence of excess track density is only apparent. Experiments show this is false. The excess is truly absent. It is wrong to say the excess is only apparently absent. Movement of any hypothetical a-emitting precursors toward the Po-halo centres would have left an excess of fossil a-tracks in their wake. And the excess would have been huge, for well-developed Po halos show coloration corresponding to the decay of five billion Po atoms. These results unequivocally disprove the hypothesis that Po halos in granites originated from secondary radioactivity, showing instead that they originated with primordial Po.

Neither Wise nor anyone else has ventured to challenge these results in the established scientific literature. Evolutionists would gladly have done this if possible to do so, for the absence of excess a-recoil tracks unambiguously shows there was no migration/diffusion of radioactivity feeding the halo centres, thus powerfully disproving the secondary hypothesis for the origin of Po halos in granites.

In the early seventies, I published

results on the ion microprobe analyses of Po-halo centres in granitic micas.³⁻⁵ My book⁶ discusses why the ²⁰⁶Pb:²⁰⁷Pb ratios reported therein are uniquely traceable to the radiogenic decay of primordial Po. Wise mentions neither these reports nor my book.⁶ Nor does he mention my 1974 *Science* report,⁷ which showed quite definitively that ²¹⁸Po halos do not have a halo ring from ²²²Rn. This observation rules out a secondary origin of Po halos, thus proving from a completely different perspective that such halos could not have formed from secondary radioactivity derived from U decay, but instead originated with primordial ²¹⁸Po. Wise's failure to mention any of this raises serious questions about his methodology in evaluating the implications of Po halos in granites as they relate to Earth's instant creation.

Similar but far more serious methodological questions arise because of his failure to reference the discoveries in my 1976 *Science* report.⁸ That is, since Wise contends (section 1) that Po halos in granite-type crystalline rocks must somehow be halos that formed from secondary Po activity derived from U decay, and hence would supposedly — in his way of thinking — have their origin in a Flood-related event, one would have surely thought Wise would have discussed my discovery of secondary ²¹⁰Po halos in coalified wood from the Colorado Plateau,⁸ which are very clearly Flood-related specimens.

As I note in my book,⁶ there are enormous differences between the primordial Po halos in granite-type crystalline rocks, and the secondary Po halos in coalified wood. In granite, the typical U concentration is in the ppm range. In coalified wood it can amount to several percent, more than a thousand times that in granite. In granite, except in unusual circumstances, U-daughter migration is restricted to solid state diffusion, an extremely slow process. In contrast, my 1976 *Science* report⁸

presented evidence showing that U daughters in solution were quickly transported through a gel-like wood matrix, thus providing opportunity for rapid collection of secondary ^{210}Po in lead selenide sites. This is how secondary ^{210}Po halos formed. Later this gel-like wood turned to coal with the halos still intact.

Now in granite there are four different types of Po halos; on occasion two or three types can be seen microscopically in the same specimen of mica. This situation is virtually impossible to reconcile with the hypothesis that such halos formed from U-decay products because the different Po-isotope half-lives mean that greatly different quantities of each isotope will coexist. In particular, since the expected amounts are directly proportional to the different half-lives, this means that at any given time the atomic ratio $^{210}\text{Po}:^{218}\text{Po}$ should be about 67,000:1. Thus, if Po halos in biotites were from secondarily-derived Po from U decay, there should exist about 67,000 ^{210}Po halos for each ^{218}Po halo. This is definitely not the case. In some mica specimens the number of ^{218}Po or ^{214}Po halos far outnumbers the ^{210}Po halos.

On the other hand, this extraordinarily large abundance of ^{210}Po halos agrees with what I discovered in the coalified wood specimens.⁸ Moreover, in examining thousands of secondary Po halos in coalified wood, I have yet to find a clear example of either a ^{214}Po or ^{218}Po halo. To summarize: the reason for this disparity is that the 139-day half life of ^{210}Po enabled a sufficient number of these atoms to survive long enough in the gel-like wood to be collected at the PbSe sites, where they decayed and formed ^{210}Po halos. In contrast, the far more rapidly decaying atoms of ^{214}Po and ^{218}Po — with respective half-lives of 164 microseconds and 3 minutes — largely decayed away before they were collected at these same sites. This is the reason for the absence of

^{214}Po and ^{218}Po halos in coalified wood. That these latter two halo types failed to form naturally under the very best conditions of high U-daughter concentrations — coupled with rapid transport and ideal collecting sites — effectively removes any scientific basis for believing they could have formed by some natural process in U-poor granite.

This conclusion is additionally confirmed by the fact that primordial Po halos in granites are uniquely distinguished from secondary ^{210}Po halos in coalified wood by the distinctly different $^{206}\text{Pb}:^{207}\text{Pb}$ ratios. The latter unambiguously reflects an origin from U-decay products whereas the former can be traced to the decay of primordial polonium. The laboratory evidence is clear and unequivocal: primordial polonium halos do exist in Earth's foundation rocks, the granites. Biblically this is exactly what we expect because their discovery in these rocks fits with the precise description of the rocks God created in the beginning. 'In the beginning, LORD, you laid the foundations of the earth, and the heavens are the work of your hands' (Heb. 1:10).

Possibly Wise's difficulty in accepting the Po-halo evidence for creation can be traced to how he interprets earth history.⁹ The abstract of his talk at the First International Conference on Creationism (1986) contains the following statement:

*'Geologists commonly use only three dating methods. Creationists commonly claim each of these techniques is invalid. Carefully considered, each technique has difficulties, but none of them can be considered faulty enough to be invalid.'*⁹

This position has enormous hidden implications that need to be exposed. To say that creationists must show why dating techniques are invalid actually presupposes their validity; this in turn presupposes the validity of the evolutionary time scale. All this is fallacious reasoning.

In fact dating techniques don't date anything. A 'radioactive date' is in reality only an inference obtained by interpreting the ratio of the parent and daughter isotopes using the assumption of uniform radioactive decay. It is indeed unfortunate that some creationists have accepted this critical assumption when in fact the proven existence of primordial Po halos in Earth's foundation rocks effectively disproves the entire uniformitarian principle upon which all those dating techniques are based.^{6,10,12}

Despite this overwhelming evidence of fiat creation, in his section 4, Wise ventures from the scientific realm and joins others in wondering why, if God chose to leave His fingerprints, He didn't leave other Po halo types to prove instant creation. Wise says this absence seems strange to him. There are many mysteries in the natural world, but I suggest this is not one of them. Consider the following. Evolutionary geology holds that granites with Po halos formed naturally. But in 1979, I claimed this granite-Po-halo combination was a miracle of God's creation, impossible to reproduce by any natural methods, and challenged the scientific community to disprove it by first synthesizing a hand-size piece of granite and then producing a ^{218}Po in it.¹⁰ I repeated this challenge at the 1981 Arkansas creation trial,⁶ again at the widely-attended 1982 AAAS symposium, 'Evolutionists Confront Creationists',¹¹ and since then at a number of university-wide presentations, first at the University of Tennessee in 1987, followed by Stetson University in 1989, Clemson University in 1991, East Carolina University in 1993, Cornell University in 1996, and North Carolina State University in 1997. There has been a deafening silence to all these challenges.⁶

I believe this proves conclusively that God did far more than needed to scientifically validate His creatorship. So, what is truly strange to me

is why some evolutionists and others who question the granite-Po-halo evidence of instant creation keep wondering why God didn't provide more evidence for creation when, for over three decades, they continue to be baffled by the Po halos which do exist in these rocks.

I therefore suggest that evolutionists — and all who hold to a belief in an ancient, slowly-evolving earth — should not be surprised when the scientific truth about God leaving His fingerprints in Earth's primordial rocks begins to attract world attention. Indeed, I believe God's special stones — the granites, Earth's foundation rocks — will soon fulfil their special appointment with destiny as they cry out (Luke 19:40) in calling men everywhere back to the worship of our magnificent Creator God (Rev. 14:6-7).

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What is a day?

Dr Helweg¹ is right in saying that there is more than one meaning possible for 'day', but having spent 15 years reading and studying the story of creation with Semitic people, I assure you that not even once did it occur to them that 'day' in Genesis 1 meant anything other than a 24 hour period (give or take 12 hours; after all they are Eastern in mindset!).

If we accept verse one of the Bible as true, then to wrangle about how long a day is is asinine! Could God do it in six 24-hour days or is he a wimp?

My argument for a literal six-day creation runs as follows:

1. God is able to create everything in six days.
2. An unbiased reading of Genesis 1 leaves the reader with the clear impression that it is talking about a literal six-day period. Why would God deceive us? Could he not have said in Hebrew: 'After a very long time, God formed the sun, the moon and the stars'? Even I could say that in Hebrew!
3. Radiometric dating has been shown to be an inaccurate, unreliable means of arriving at 'absolute' dates and it *cannot be shown to be free from outside influences* which could alter the data.²
4. The fossil record is better interpreted in a diluvian framework

which is able to handle the many anomalies which crop up, without resorting to forced and far-fetched explanations of the evidence.

5. The geologic strata and features are more easily explained in a diluvian framework as well.
6. None of the other fields of scientific study (biology, genetics, astronomy, etc.) can offer any conclusive, irrefutable evidence in favour of evolution in general or millions of years in specific.
7. Given all of the above, I am now faced with a choice in which literal six-day creation has at least as good a basis as long-age creation or theistic evolution. Therefore, I *choose* to believe in the literal six days of creation. This requires much less faith than it would take to consciously deny the proofs against evolution and place my existence into the hands of blind chance.

I am very practically minded. If I chose to believe in long ages in Earth's history, what would I gain by it? The respect of a certain sector of intellectuals and scientists who choose to reject most or all of the Bible? I can live without such respect!

I know whom I have believed and am persuaded that He is able to keep that which I've committed unto Him against that day when we shall meet face to face, knowing also that I followed Christ's injunction to Jairus, 'Don't be afraid, only believe.'

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References

1. Helweg, O. J., 1997. How long an evening and morning? *CEN Tech. J.*, Vol. 11(3):299-300.
2. For points three through six I could compile an impressive list of books on these subjects from both creationist and evolutionist perspectives. However, this is only a letter, not a doctoral thesis.