Radiohalos—Solving the Mystery of the Missing Bullets − Origin of Po halos Revisited

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Introduction

In 2010, I wrote an explanation for the origin Po halos at the following link: http://www.csun.edu/~vcgeo005/Collins&Collins.pdf

On October 1, 2012, Andrew Snelling published an article titled: "**Radiohalos − Solving the Mystery of the Missing Bullets**" that was later featured in *Answers Magazine* on April 9, 2014. See:

https://answersingenesis.org/age-of-the-earth/radiohalos-solving-the-mystery-of-the-missing-bullets/

It has many erroneous interpretations that require a response. In the following sections I have selected paragraphs that are in a **black font** from his article and have given my responses in a **red font**.

Snelling Interpretations

Granite rocks exhibit mysterious black spheres (dark brown in **Figure 1**), known as radiohalos.

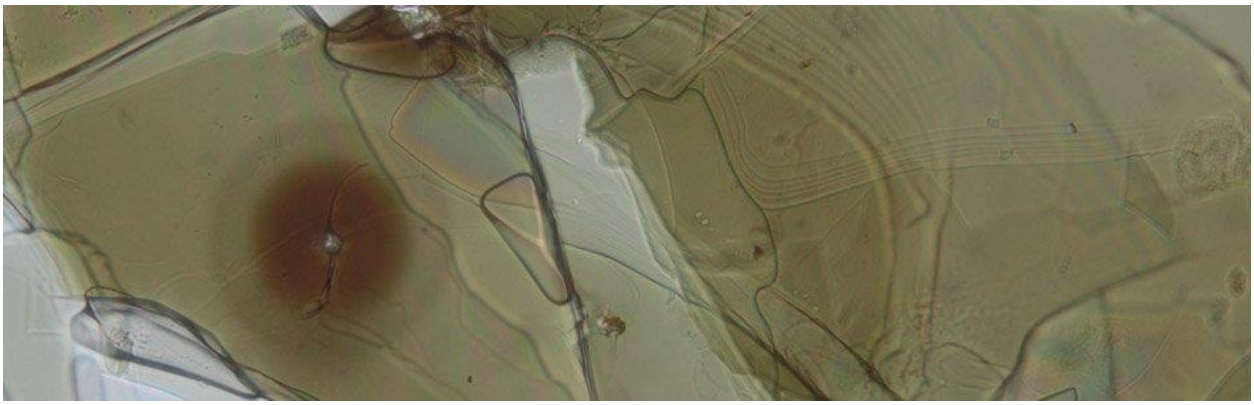

Figure 1. Radiohalo (Po-14 halo) in biotite.

The only reasonable explanation for their origin is a recent, worldwide Flood. Indeed, the unique conditions required to form such spheres show us that radioactive decay—and granite formation—was extremely rapid in the past.

Not true, as explained in subsequent sections.

The source of these halos, polonium, is an unstable, radioactive element that does not survive long in nature (only milliseconds, in some cases). It appears only briefly during the decay of another element, uranium. But no uranium source is found at the center of these polonium radiohalos! Where did the polonium come from?

The cataclysmic, worldwide Flood provides the answer. Uranium-238 is found a short distance away from the polonium radiohalos.

Yes, uranium-238 is a necessary source for the polonium.

Hot water seeping through the granite during the Flood could easily explain how products of the uranium's decay could be transported to the site of the polonium radiohalos.

But the granite that Snelling visualizes is not the granite in which the polonium originates nor does hot water seep through this alleged granite source at rapid speeds. Snelling's granite is crystallizing from a viscous melt that is nearly at constant pressure in which the seepage of water in this melt of such high viscosity upward toward the Earth's surface is far too slow to produce the polonium radiohalos quickly.

As will be explained in this article, this whole process must have occurred rapidly. Otherwise, not enough polonium would be produced to form each radiohalo, which requires hundreds of millions of polonium atoms in a short amount of time.

No, this is not true! See later explanation.

The rapid formation of polonium radiohalos has astounding implications for earth history and physics. It means that radioactive decay must have occurred at a much faster rate in the recent past, and it also means that the earth's granites must have formed under catastrophic conditions …during the world-wide Flood.

Accelerated Radioactive Decay

`Two basic kinds of radiohalos are found in biotite: some come from uranium (**Figure 2**) and others come from polonium (one example in **Figure 1**). Something very unusual must have taken place for both kinds of radiohalos to appear together.

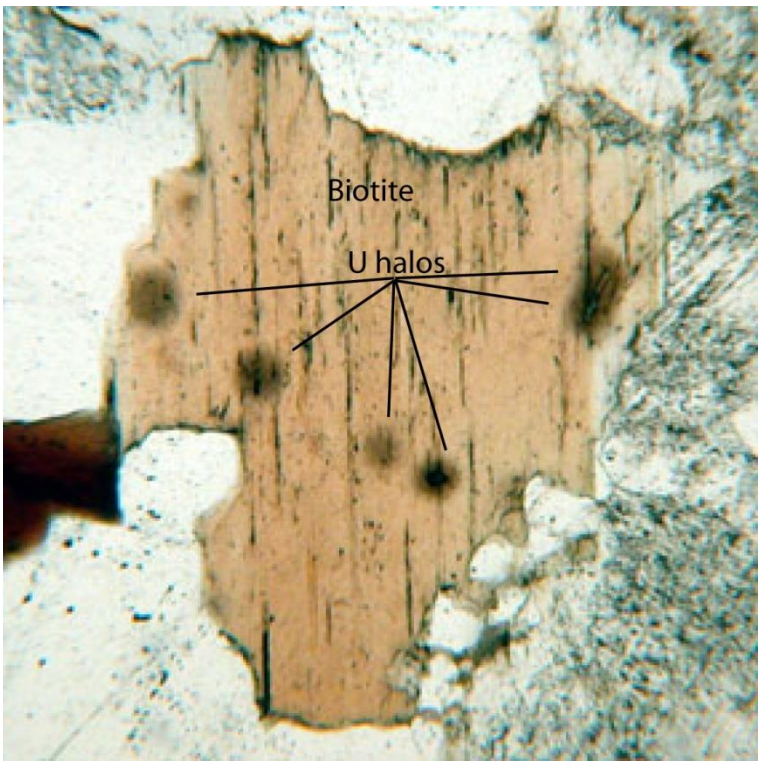

Figure 2. U-halos in biotite. Tiny zircon crystals containing uranium in the cores of these U-halos.

However, generally,U-halos do NOT occur in the same granite in which polonium radiohalos occur.

According to standard estimates, uranium must eject at least 500 million alpha particles to form a single dark radiohalo. At their current very slow rate of radioactive decay, parent uranium-238 atoms would need nearly 100 million years to produce that many alpha particles. So each uranium radiohalo would require 100 million years to form.

That is true, because the half-life of U-238 is 4.5 billion years, and the decay rate produces this many polonium atoms in 100 million years.

In contrast, the polonium radiohalos had to form very, very quickly. While the reasons are complex, basically the only way to transport polonium is as its precursor, a radioactive gas called radon.

That is partly true, but 3 daughter polonium ions (Po-218, Po-214, and Po-210) can also move by diffusion along fractures into the biotite.

But this presents a huge problem. The only reasonable way to transport the radon is hot water, water so hot that it would destroy any polonium halos that formed! That makes the polonium radiohalos "a very tiny mystery" for long-age geologists.

But steam is not transporting the radon. It is diffusing as a neutral gas (perhaps partly accompanied by steam but not necessarily so) along fractured grain boundaries or through fractures in broken crystals in rocks below melting temperatures. Yes, hot water (steam) at

temperatures in excess of 550ºC would destroy the polonium radiohalos, but these polonium radiohalos form in another kind of granite at temperatures much below 550ºC where they are preserved.

This means that all the radon had to be transported first, while things were hot, and then the polonium halos had to form later, after things got "cooler." But since both radon and polonium have short half-lives, the entire process had to occur in days (not true). Radon-222 has a half-life (decay rate) of only 3.8 days, and polonium-218 and polonium-214 have half-lives of 3.1 minutes and 164 microseconds, respectively. At least 500 million radon atoms had to be produced, be transported, decay, and then be deposited as polonium. This would require 100 million years' worth of decay in just a few days (not true, as explained later).

Expressed another way, rare conditions were required to form the polonium radiohalos, and those conditions had to remain in place for more than 100 million years. The hot waters would have to keep seeping into and through the biotite flakes for more than 100 million years at current rates of uranium decay, and this had to happen in granites all over the globe (*Figure 1*). Such a scenario is impossible.

Yes, relatively rare conditions are required to form the radiohalos in granite, but such granite is not crystallizing from a melt at temperatures above 550ºC.

The only viable alternative is that all the needed polonium was available very quickly, before it could decay away.

But all polonium does not decay away quickly because the U-238 has a half-life 4.5 billion years, and it is continuously being formed and with the Earth being 4.6 billion years old (not 6,000 years old), about half of the original uranium is still present in the Earth, and this half is generating polonium all the time. It is not disappearing quickly.

That is, it had to be transported to the various points within the biotite flakes within hours, or days at the very most.

Such is not true as explained as follows. Granites that have coarse crystals (1 cm in diameter) and which do NOT contain polonium radiohalos in biotite, are generally produced at least 5 km below the Earth's surface far from the Flood waters. It is true that uranium 238 must be nearby to generate radioactive radon-222 that produces radioactive Po-218, Po-214, and Po-210 with short half-lives, but crystallizing granite from molten rock (magma) will not have fractures in it through which hot water can diffuse into fractured biotite crystals.

What I have observed is that the granite that contains polonium radiohalos is not primary that has crystallized from magma, but is a secondary chemical replacement product in which former already

crystallized plutonic igneous rocks, such as diorite, has been micro-fractured such that hot water (steam) can move through the rock at temperatures below melting temperatures and subtract iron, magnesium, aluminum, and calcium from such a rock and at the same time introduce silica and potassium to convert the rock into granite. See: http://www.csun.edu/~vcgeo005/Nr56Metaso.pdf During that process, uranium in scattered crystals in the rock is continually releasing radioactive radon and polonium ions so that this radon and polonium can diffuse through grain-boundary fractures and into fractured biotite crystals. The creation of a polonium radiohalo only requires a nucleation site to form the core of a halo, and progressive growth of this core by the addition of incoming polonium will eventually produce more than 500 million atoms in the tiny core that will produce a recognizable dark halo in the adjacent biotite lattice (**Figure 1**). That is, nearly instantaneous precipitation of polonium is not required. This diffusion may occur over, say, 10,000 years or more as repeated earthquakes fracture the rock to keep the rock in an open system for diffusion of elements (ions). Thus, the time for radiohalo formations is not necessarily during Noah's Flood about 4,350 years ago and while the Earth is said to be only 6,000 years old.

Snelling believes that granite can form at catastrophic rates, but experimental studies in laboratories show that the rate of cooling in granite masses 5 km in depth where commonly coarsely crystalline plutonic rocks occur can only happen during 3 to 5 million years of slow

cooling before a solid rock with coarse crystals can form. See: http://www.csun.edu/~vcgeo005/Snelling.htm

But steam is not transporting the radon. Radon is diffusing as a neutral gas along fractured grain boundaries or through fractures in broken crystals in rocks below melting temperatures.

This means that all the radon had to be transported first, while things were hot, and then the polonium halos had to form later, after things got "cooler." But since both radon and polonium have short half-lives, the entire process had to occur in days. Radon-222 has a half-life (decay rate) of only 3.8 days, and polonium-218 and polonium-214 have half-lives of 3.1 minutes and 164 microseconds, respectively. At least 500 million radon atoms had to be produced, be transported, decay, and then be deposited as polonium. This would require 100 million years' worth of decay in just a few days.

This amount of decay in just a few days is NOT true!

Thus, the decay rate of uranium had to be nearly a billion times faster in the past than it is today! And if uranium decayed at such an accelerated rate, then other radioactive elements, which are even less stable, must have also decayed much faster.

Uranium-238 has a half-life of 4.5 billion years. The Earth is about 4.6 billion years old. This means that the time since the Earth was

first formed about one-half of the original uranium has now decayed to radioactive daughter products that also includes radioactive radon and polonium. This decay process releases heat which slowly moves up from the Earth's mantle to the Earth's surface. If the decay rate were a billion times faster for uranium and other radioactive elements of shorter half-lives, Snelling (2005, p. 183) actually calculated that if 500 million years' worth of radioactive decay occurred during Noah's Flood, that the radiation emitted from just the terrestrial granitic rocks would have raised the temperature of the Earth's crust to 22,400 K. In comparison, the surface of the Sun is only 5,778 K. If that faster rate were true, the Earth's crust would still be molten in the supposed 6,000 years in which Snelling claims is the age of the Earth.

The granite masses that contain the radiohalos are typically cubic miles in size (TRUE) and originally formed under ground from molten magmas at temperatures between 650°C and 705°C (1200–1300°F). (TRUE) It is usually claimed that they thus take millions of years to crystallize and cool. Since radiohalos can survive only at and below 150°C (302°F), based on observed evidence, the radiohalos had to be generated very late in the granite formation process.

But the granite that contains the radio polonium halos in biotite is not formed from a cooling granite magma, but in plutonic rocks that have formed at much higher temperatures than 705ºC and have crystallized and are in solid rocks at temperatures below 450ºC.

By this time, though, most of the polonium would have decayed away. Any polonium halos that might have formed would be destroyed by the heat.

Also, not true! Most polonium has not decayed away because at a decay rate (half-life) of 4.5 billion years for the parent uranium atoms, the daughter polonium ions are continuously being generated and have not disappeared. This is described in the following link. http://www.csun.edu/~vcgeo005/Collins&Collins.pdf

In granites all over the earth's surface, we find polonium-210 radiohalos near uranium-238 sources at the centers of uranium radiohalos. True! Two rare conditions were required to form these polonium radiohalos. First, a constant flow of hot water within forming granites had to rapidly transport millions of decaying atoms from the uranium to the sites of the polonium radiohalos.

A constant flow of water can only happen in an open system where water is moving from a site of high pressure to a site of low pressure in an open system. Molten granite (magma) is not an open system. It is a closed system where the pressure in melt is locally equal in all directions.

Second, molten granite magma, where the radiohalos formed, had to crystallize and cool quickly—in a matter of days.

That is fantasy to make Snelling's model fit what he wants to believe. Granite magma at 5 km depth does not cool quickly. For a discussion of the failure of rapid formation of granite, see: http://www.csun.edu/~vcgeo005/Collins&Collins.pdf and http://www.csun.edu/~vcgeo005/Snelling.htm

Probably at the rate that heat flows in granite to the Earth's surface from that depth takes at least 5 million years.

Only a global, cataclysmic Flood could explain these unique conditions.

But cold water in Noah's Flood at the Earth's surface has no effect on cooling the granite as it crystallizes at depths of 5 km. Nor can cold water seep down 5 km into granite magma from the Noah's flood water where Snelling claims the radiohalos are formed in biotite.

(a) The uranium-238 in the zircon crystal generated the uranium-238 radiohalo.

Yes, that is true, but it is U-halo (**Figure 2**) and not a Po-halo.

Water flowing past the crystal carried along decaying radon and polonium atoms between the same biotite sheets to a nearby location,

where a polonium-210 radiohalo developed. Nothing remains at the center of this radiohalo, however, because whatever was there has been dissolved away.

U-halos are not found in the same kind of granite as the place where Po-halos are found. Po-halos are only found in granite formed by chemical replacement processes in which myrmekite is found which is also evidence for chemical replacement processes. Myrmekite (**Figure 4**) does not occur in granite crystallized from a melt. http://www.csun.edu/~vcgeo005/Nr56Metaso.pdf

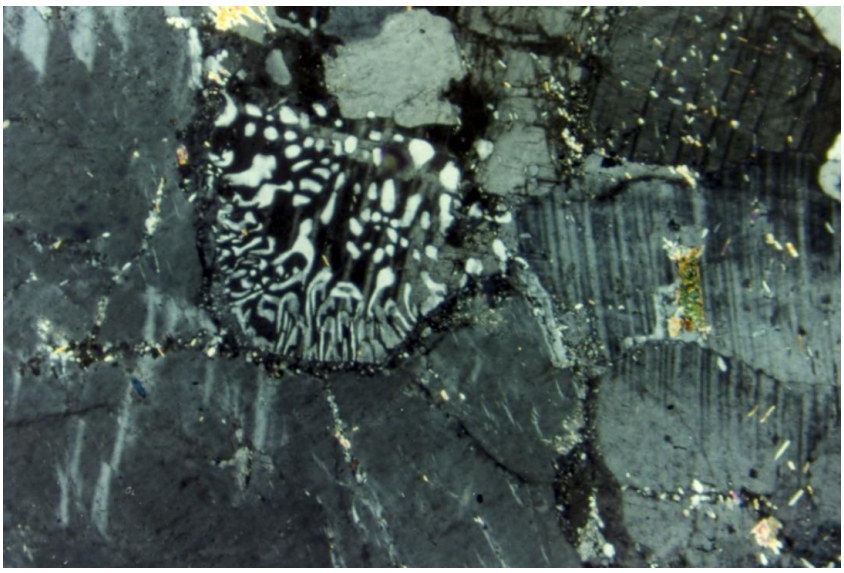

Figure 4. Myrmekite (white quartz vermicules in black plagioclase) adjacent to microcline (grey; left and bottom), and parallel albite-twinned plagioclase (right)

Constantly Flowing Hot Water

(b) The crystallizing granite magma included zircon crystals containing radioactive uranium-238 atoms that emitted alpha-particles. The cooling residual magma then released hot water, which flowed through the minerals.

But crystallizing granite magma at temperatures in the range of 550-700ºC contains water, but this water is at constant pressure and cannot flow through crystals that are forming from the magma. Only rock that is solid and at temperatures below 550ºC can be fractured by earthquake waves so that such water and ions of elements can move through the rock.

The hot water dissolved any products of the uranium decay (radon and polonium atoms) and then carried them a slight distance away. These radioactive products also emitted alpha-particles. True!

Falling Temperatures

(c) To dissolve and transport radon gas requires high temperatures, but such high temperatures would remove any evidence of alpha-particle decay. (In essence, the minerals were so hot the tracks left by alpha decay were erased.)

Erasure of polonium radiohalos would occur at high temperatures, but such high temperatures actually do not exist where these radiohalos are created.

(d) The hot, mineral-rich water also carried sulfur atoms, which lodged in the mineral's cleavages. As temperatures dropped near 150°C (302°F), the polonium in the hot water combined with the sulfur and was removed from the water flow. The uranium in the zircon continued to decay and replenish the supply of radon and polonium to the hot flowing water.

Sulfur atoms do not exert any influence on how Po-halos are formed

(e) Once the temperature dropped below 150°C (302°F), the alpha particles started to leave trails, discoloring the mineral. As the polonium decayed to lead, more polonium flowed in. Both uranium and polonium radiohalos formed at the same time.

True! This is the temperature range in which Po-halos are preserved. This happens when deep seated plutonic solidified diorite at depth is raised progressively through geologic time to be brought near the Earth's surface as overlying rocks are eroded away (requiring immense amount of geologic time) and, then, where near the Earth's surface, say, 3 km down can be affected by earthquake waves that cause

fracturing of the rocks, whereas at greater depths the crystalline rock merely flows plastically. The diorite is converted to granite by chemical replacement processes.

(f) Once the granite cooled completely, the hot water flow ceased, leaving behind the polonium radiohalos we find in granites today.

The implications are astounding. At least 500 million uranium-238 atoms had to alpha decay within a few hours or days. The equivalent of "100 million years" of uranium-238 decay had to occur within hours!

Not true! Such movement of elements through solid rock and solid crystals by chemical replacement processes is constantly causing elements to form new crystals of different chemical and mineralogical compositions. In that process the system becomes closed to further movement of elements. So, repeated earthquakes over geologic time must occur to re-fracture the rock and open the system for fluids to begin to flow again and to allow further movement of elements through the rock as well as through pore spaces in the crystals themselves (Putnis and Austrheim, 2012). In this way, Po-halos can form over thousands of years and not nearly instantly during Noah's Flood.

Yet long-age dating methods assume that the radioactive decay rates have never changed.

True! There is no evidence that radioactive decay rates have ever changed (Dalrymple, 1984ab). This constant measurement of half-lives of radioactive elements has been tested experimentally that shows that temperature, pressure, magnetic fields, or other outside conditional changes do not have any effect on the inside of atoms where the instability of the atom's nucleus containing protons and neutrons cause the nucleus to spontaneously decay at constant half-lives of decay.

The very existence of the polonium radiohalos is evidence that the radioactive rates were accelerated in the past. This means that dates for rocks of billions of years must be questioned, as the rocks are in fact only thousands of years old.

This is not true as explained above.

This means that all the rocks we know of—meteorites, rocks brought back from the moon, and the "oldest" rocks on the earth—are in fact only thousands of years old. This gives us good scientific reasons to believe that the earth, the moon, and all the objects of the solar system are only thousands of years old.

Not true.

Conclusion

Snellng's model for the origin of polonium radiohalos by rapid diffusion into biotite in granite that is rapidly cooling from a melt has no merit. Polonium radiohalos can only form in granite created by chemical replacement processes at temperatures below melting conditions. However, polonium radiohalos can form in granite pegmatites where uranium is concentrated in water-rich accumulations that allow large biotite "books" to form during late-stage crystallization of granite magma. See: http://www.csun.edu/~vcgeo005/Collins&Collins.pdf

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