Another puzzle in the evolutionary story for the origin of the solar system

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The nebular hypothesis is the most accepted naturalistic theory today for explaining the formation of the solar system. It postulates that the sun, planets, moons, comets, and meteorites were all formed from a huge gas and dust cloud that collapsed under gravity. This hypothesis is widely believed in spite of many serious problems.

In an earlier report,[1] I discussed the difficulty within the nebular hypothesis of explaining how very small dust particles could have first stuck together while colliding, and the inadequate solutions employed to patch up this difficulty. Even this first step in the process toward planet formation is problematic.

A second difficulty is that certain meteorites found on Earth show the presence of daughter isotopes of 10 radioactive elements with short half-lives. These isotopes are found in small pebbles within the meteorites. These pebbles are believed to have been once molten before becoming incorporated into the meteorites that formed from the dust cloud. Radioactive isotopes cannot form without a mechanism, and a dust cloud, itself, cannot provide that naturalistic mechanism:

> 'The primary conundrum on which these surrogates for the young Sun are intended to shed light is the surprising presence of telltale daughters of certain short-lived isotopes in small, once molten pebbles embedded in a class of meteorites that are thought to be pristine representatives of the material comprising the disk of dust and rock that orbited the embryonic Sun.'[2]

The surrogates referred to are 'young stars' with a mass similar to the Sun that mostly give off X-rays. These short-lived radioactive elements, which include ^{41}Ca, ^{26}Al, ^{10}Be, ^{53}Mn and ^{60}Fe, must have been present in the dust cloud before it supposedly condensed into the solar system. The radioactive half-lives of these isotopes range from a few million years to 100,000 years. Eugene Chaffin has also noted that special processes would be required to account for the possible daughter products of the extinct radioactive isotope ^{244}Pu that also needed to form in the dust cloud.[3] So, the naturalistic scientists need some mechanism to form these radioactive elements within the dust cloud. Bertram Schwarzschild explains the problem:

> 'All the isotopes in question have lifetimes of a few million years or less. Thus their presence in primordial disk material poses a perplexing problem of timing: Having been melted into pebbles together with their stable chemical kin from dust balls in the circumstellar disk [the star-surrounding disk that evolved from the cloud], the short-lived isotopes could not have existed much before the disk was formed. And yet, none of these elements could have been made by nucleosynthesis in a young star as light as the Sun.'[2]

Nucleosynthesis is the mostly hypothetical process in which elements higher in the periodic table than helium are produced, either within stars or during supernova explosions.

In this version of the nebular hypothesis, the protosun or very early sun had formed first from the dust cloud, leaving a disk of dust orbiting around the protosun from which the planets, moons, and meteorites subsequently developed. The short-lived radioisotopes could not have originated much before the dust disk formed and they could not have formed within the dust disk without the aid of some special process. So, how did these radioactive isotopes originate, assuming the evolutionary nebular hypothesis is true?

The two current subsidiary hypotheses

Evolutionary astrophysicists need an answer to this 'long-standing puzzle about the origin of our Solar System.'[2] So, they are forced to invent subsidiary hypotheses, a common occurrence in evolutionary theory, to patch up its many difficulties. As creationists we must examine these auxiliary hypotheses to see how much sense they make, if any.

There appear to be two candidates at this time.[4] The most accepted hypothesis, proposed by Alastair Cameron in 1977, is that there was a type II 'core collapse' supernova explosion very close to the cloud of dust and molecular gas that comprised the dust disk. According to this hypothesis, the explosion, which resulted in a neutron star,[5] is called on to overcome two difficulties. Not only is this supernova suppose to 'seed' the dust cloud with short-lived radioactive isotopes created in the supernova, but it is suppose to produce the shock needed to start the dust cloud collapsing, first into the protosun and then into the planets.

The newest alternative mechanism is the spallation method. Spallation is a process in which pieces of the stable nuclei of atoms are knocked off by fast-moving protons and light atomic ions. This hypothesis recognizes that almost all the short-lived isotopes believed to have formed in the dust disk are also formed today by spallation in the present atmosphere by cosmic rays and occasional magnetic solar flares of unusual violence. For example, this is how ^{14}C is formed today.

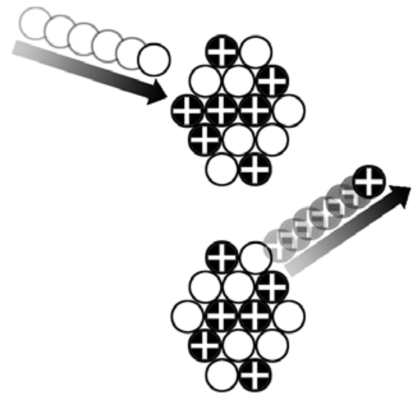
Both of these present-day spallation methods, however, are much too weak to account for the abundance of short-lived radioactive elements that ended up in the meteorites. But, according to new ideas, the protosun was different from our familiar sun. Astronomers, led by Eric Feigelson, have cataloged about 41 'young stars' about the mass of the sun that are used as surrogates or analogs for the protosun. With the aid of NASA's Chandra X-ray Observatory orbiting the Earth, they have discovered that 39 out of 41 give off X-rays. These 39 'young stars' are used to justify their suggestion that that the protosun also gave off powerful X-rays for awhile.

As a result of the X-rays, the protosun, which evolved first within the evolutionary scenario, supposedly produced highly energetic protons and ions that resulted in the spallation process in the dust and gas disk. This spallation was almost a million times the current rate of spallation in the Earth's atmosphere. Furthermore, the occurrence of such energetic solar flares on the protosun would have melted dust balls within the dust cloud to form the metallic pebbles that eventually incorporated the short-lived isotopes. Feigelson is quick to point out that this mechanism does not establish how the isotopes were actually produced, but it provides a 'quantitative' basis for future spallation calculations.

Both hypotheses are far fetched

Cameron is skeptical of the new spallation hypothesis because, although such a mechanism could hypothetically produce neutron-short ^{26}Al, it could not produce neutron-rich ^{60}Fe.[6] He further points out that the spallation rate would decrease with distance from the protosun. This would have resulted in meteorites with heterogeneous isotopic anomalies, which is contradicted by the striking uniformity of the anomalies from one meteorite to another. There are further problems, admitted by the spallation hypothesis' chief supporter, Feigelson, such as the inadequacy of the protosun-disk magnetic dynamo and the resulting magnetic field needed to generate X-rays and powerful solar flares. It seems that at this point the mechanism breaks down into many cumulative, speculative hypotheses.

The difficulty with the earlier supernova mechanism is that if a supernova exploded near the dust cloud and created the radioactive isotopes, there are still too many problems left to be solved.[5] Especially troubling to many astronomers is that the mechanism, itself, is *ad hoc*, resulting in our solar system being something of a special case,[2] which is an evolutionary anathema. The reason is that there are



$$^{1}_{0}n + ^{14}_{7}N \rightarrow ^{14}_{6}C + ^{1}_{1}p$$

^{14}C is produced when fast moving neutrons collide with ^{14}N displacing a proton.

very few type-II supernova explosions per century in the whole Milky Way Galaxy. To suggest that these rare supernovas blew at the right place and at the right time next to the dust cloud is special pleading that makes astronomers uncomfortable. Furthermore, Feigelson points out that in the supernova hypothesis, ^{41}Ca would be especially hard to form and incorporate into developing meteorite pebbles because of its very short half life of only 100,000 years.[7] The supernova scenario would have to be extremely fine tuned to work. Donald Clayton of Clemson University is so uncomfortable with the supernova hypotheses that he compares it to pulling 'a supernova rabbit out of a hat'. But, he also realizes the 'necessity' for the special supernova hypothesis, regardless of its farfetched nature, because astronomers still need to account for the occurrence of ^{60}Fe in the early solar nebula which the spallation hypothesis apparently cannot produce.[6] So, he believes that astronomers may need both speculative hypotheses! It is less likely that two speculative hypotheses would be correct than one being correct.

Both hypotheses appear to be far fetched. They demonstrate how eager astrophysicists have become to account for any paradox within their naturalistic framework. It also shows the length they will go in their speculations. Eventually with time, they may come up with an 'acceptable hypothesis', but an astrophysical hypothesis on the origin of the solar system would still be just speculation. Just because a hypothesis is acceptable by a majority does not automatically mean it is true. The best and most straightforward explanation for the formation of the solar system is still that God created the solar system essentially as we observe, and that meteorites were created with short half life isotopes. Since these isotopes in the meteorites have already decayed into their daughter isotopes, we can surmise that there likely was rapid nuclear decay early in the Earth's short history as proposed by several creationists.[3,8–10]

References

1. Oard, M.J., The naturalistic formation of planets exceedingly difficult, *TJ* **16**(2):20–21, 2002.
2. Schwarzschild, B., X-ray observations of young stars address a puzzle of the solar system's origin, *Physics Today* **54**(11):19, 2001.
3. Chaffin, E.F., A model for the variation of the Fermi constant with time, *CRSQ* **38**(3): 127–138, 2002.
4. Schwarzschild, Ref. 2, pp. 19–21.
5. Cameron, A.G.W., Some properties of r-process accretion disks and jets, *The Astrophysical Journal* **562**:456–569, 2001.
6. Schwarzschild, Ref. 2, p. 21.
7. Schwarzschild, Ref. 2, p. 20.
8. Chaffin, E.F., Theoretical mechanisms of accelerated radioactive decay; in: Vardiman, L., Snelling, A. and Chaffin, E.F. (Eds), *Radioisotopes and the Age of the Earth—A Young-Earth Creationist Research Initiative*, Institute for Creation Research and Creation Research Society, El Cajon, CA and St. Joseph, MO, pp. 305–331, 2000.
9. Humphreys, D.R., Accelerated nuclear decay: A viable hypothesis? in: Vardiman, L., Snelling, A. and Chaffin, E.F. (Eds), *Radioisotopes and the Age of the Earth—A Young-Earth Creationist Research Initiative*, Institute for Creation Research and Creation Research Society, El Cajon, CA and St. Joseph, MO, pp. 333–379, 2000.
10. DeYoung, D., Radioisotope dating review; in: Vardiman, L., Snelling, A. and Chaffin, E.F. (Eds), *Radioisotopes and the Age of the Earth—A Young-Earth Creationist Research Initiative*, Institute for Creation Research and Creation Research Society, El Cajon, CA and St. Joseph, MO, pp. 27–47, 2000.