How to Determine Earth’s Age: A Small Clarification and a Big Lesson for *The New York Times*

David Seidemann

I can foresee a day when a proponent of young-earth creationism says, “The 4.5-billion-year age of Earth can’t be trusted because it isn’t based on analysis of any material from Earth itself.” And that argument would not be so easily dismissed by the public because it could be supported using information reported in *The New York Times*, a respected authority with the power to move public opinion.

The *Times* said that the age of Earth (4.54 billion years) was “based on the radiometric dating of meteorites” (Wade 2012), a misleading statement because meteorites alone are not used to establish Earth's age. Because I anticipated future problems brought on by that problematic description, I asked the *Times* to clarify the record. It declined, opting to avoid the issue. (Ironically, the error appeared in an article critiquing Senator Marco Rubio for dodging a question on Earth’s age.) Now there were two issues that concerned me: a misleading explanation for determining Earth’s age remained on the record for creationists to misuse, and an authoritative paper had surprisingly refused to change it.

The *Times*’s statement is misleading because meteorites *alone* are not used to establish Earth’s age. The uranium-lead studies that determined that age (Patterson 1956, slightly modified by Tera 1981) required the use of radiometric data from both Earth and meteorites. Patterson established Earth's age by first determining the age of meteorites using the uranium-lead method, a technique that relies on the decay of uranium to lead at a predictable rate. To do so, he assumed that all meteorites formed during the birth of the solar system and originally contained lead of the same isotopic composition. As time elapsed, the lead isotopic composition of the meteorites changed as the result of uranium decay.

The amount of that change depends both on how much time elapses and on the amount of uranium in the meteorite. Although the meteorites that Patterson analyzed varied in uranium content, he showed that they all defined a single line (called an isochron) on a plot used in such isotopic studies. That alignment indicated that the entire meteorite group had the same age—and the age for that particular line was 4.55 billion years.

Patterson then analyzed modern ocean sediment to determine Earth's current lead isotopic composition (a value that reflects growth over the time since Earth's formation because Earth is a uranium-bearing body). He found that Earth's lead isotopic composition fell on the same isochron line that was defined by the meteorite data, an indication that Earth and meteorites formed from the same material and at the same time. Patterson concluded that
if the meteorites were 4.55 billion years old, then Earth must also be that age. Simply put, Patterson's age determination for Earth rests entirely on his demonstration that isotopic data from Earth fall on the same isochron defined by a group of meteorites.

Thus, the Times's statement that Earth's age was based on the radiometric dating of meteorites is misleading because it excludes the essential element of Patterson's age determination—the use of data from Earth itself. Absent data from Earth, Patterson's paper would be reporting only the ages of meteorites.

That explanation did not convince the Times to publish a clarification on how Earth's age was determined. The corrections staff, after consulting with the science desk, stated, “...we do not think it is wrong to say that the 'age is based on radiometric dating of meteorites'” (2012 Dec 19 e-mail from Z Johnk of The New York Times to me). Was the Times's assertion about dating Earth wrong? That's arguable, because the age was partly based on meteorite dating. But the paper's assertion is certainly misleading. As I explained above, dating Earth requires analyzing Earth material. When you date only meteorites, you get only the ages of meteorites.

The fact that the Times refused to clarify misleading information was particularly surprising because it would have been very easy to do so by adding three words to its original statement, that is, stating that Earth's age was based on radiometric data from meteorites and from Earth.

In the year after my failed attempt to convince the Times to publish a clarification of the aforementioned item, history repeated itself. This time, there were clear errors in a Times article about the origin of gold on Earth. The paper claimed that Earth's gold formed in ancient stars during their collision 4.5 billion years ago, and that it was still anyone's guess how that element (and other metals) arrived on Earth (Quenqua 2013). Both those claims are wrong.

The paper's first claim cannot be true. Considerable time must have elapsed between the time stars collided and formed gold to when the gold accumulated on Earth. For one, the gold had to have been distributed to the vicinity of the Solar System by stellar explosions (or collisions), and then, of course, there had to be enough time for the gold to accumulate. As Earth was still forming 4.5 billion years ago, the stellar collisions from which gold was formed must have occurred well before then, not simultaneously as the Times had asserted. The second claim—that no one knows how gold and other heavy metals arrived on Earth—is also flat-out wrong. There has been a consensus in the scientific community for decades about the creation of elements in stars, the mechanisms by which they are distributed in space, and how they accumulated to form Earth and other bodies of the Solar System (for example, see Nuth and others 2006).

I once again requested that the Times publish a correction, and it once again refused, stating that because the article was only an introduction there was no need to delve into specifics. It acknowledged that its writers could have been more precise and promised that they would try to be so in the future (2013 Dec 23 e-mail from S Graham of The New York Times to me).
Dissatisfied with that response, I tried once again to persuade the *Times* that its claims were factually incorrect. The paper relented on the first error, acknowledging that Earth’s gold was formed in stars well before Earth formed. However, it refused to retract the statement that it was “still anybody’s guess” how gold arrived on Earth, although it admitted that characterization may have been too flip (2014 Jan 8 e-mail from S Graham of The New York Times to me).

Why was the paper so reluctant to correct obvious errors? Does my experience reflect a systematic problem at the *Times*? An observation by the newspaper’s Public Editor in a 2013 article in that paper suggests that the answer to the second question is yes.

Although the Public Editor stated that the *Times* usually corrects factual errors quickly, she identified traits in the paper's staff that I believe explain their resistance to correcting or clarifying the items I cited: “[the paper] is not quick to admit that matters of tone or practice could be better, or that a decision needs to be reconsidered; when questioned, some of its journalists shift reflexively into a defensive crouch”; “… some Times staff members are more inclined to mount an elaborate argument than to accept the value of someone else’s point of view”; “That’s not everyone, of course. But it’s typical enough behavior that the opposite—openness and the desire to seek improvement—seems like the exception to the rule” (Sullivan 2013).

In sum, many on the paper’s staff are closed to others’ views, defensive when challenged, and slow to reconsider decisions. And when they are challenged about stories that don’t generally grab headlines—for example, how gold arrived on Earth—it would, I think, be that much easier for them to refuse to acknowledge the need for a correction. Had the analogous error been made on a controversial issue, especially if it had been made by a different news organization, I would bet that the *Times* would be first in line to call for a correction.

To test that notion, imagine a scenario in which Fox News claimed that it was “anyone’s guess” as to what is currently causing Earth’s temperatures to rise. The *Times* editorial board would likely chastise Fox for ignoring the consensus among scientists that anthropogenic addition of CO₂ is the likely cause. But the *Times* makes precisely the same type of error in claiming that it is unknown how gold and heavy metals arrive on Earth despite the long-settled science on that issue.

It’s very human to resist admitting errors. But that trait is antithetical to both good journalism and good science. And based on the view of its own Public Editor (and in my experience), the *Times* has a major problem in that regard: an entrenched culture in which openness to other views is an exception.

That’s precisely the opposite of the culture that I encountered in my decades as a researcher in a geochemical research group at Yale University headed by the renowned geochemist Karl Turekian. Aggressive self-evaluation was the norm in Turekian’s group—and I dare say at other premier research labs. But I can’t characterize that culture any better than the man who led the lab. Here’s how Turekian, in a 1983 profile (McKelway 1983), described the famous (in geochemical circles) coffee seminars that epitomized the philosophy that reigned in his group:
Anybody who is involved is stripped of any special role. Everybody is subject to attack. And you're absolutely required, if not automatically able, to show ignorance on the subject, which is very important. There is too much of a tendency for professors and students to masquerade behind appearing to know, and the greatest breakthroughs are when you don't know, or when you thought you knew and all of a sudden someone says something that shatters what you thought you knew was correct. And that's the most productive part of that free-for-all, the exchange that goes on. (McKelway 1983:63–64)

The goals of science and journalism are similar: get as close to the truth as possible. Achieving that goal becomes more difficult when—as the Times's own Public Editor acknowledges—the paper often meets challenges to its views with defensive crouches, elaborate arguments, and a lack of openness to improvement. The Times's staff would do well to adopt the philosophy of the Turekian research group: confessed ignorance and habitual reevaluation are, ironically, the quickest path to truth.

REFERENCES


ABOUT THE AUTHOR

David Seidemann is Professor of Earth and Environmental Sciences at Brooklyn College. His publications include several that use radiometric dating to determine the ages of geologic materials. He authored, with David J Leveson, an article entitled “Richard Milton: A non-religious creationist ally” (Journal of Geoscience Education 1996;44:428–438).

AUTHOR’S ADDRESS

David Seidemann
Department of Earth and Environmental Sciences
Brooklyn College
Brooklyn NY 11210
deseidemann@comcast.net

Copyright 2014 David Seidemann; licensed under a Creative Commons Attribution-Non-Commercial-NoDerivs 3.0 Unported License. http://creativecommons.org/licenses/by-nc-nd/3.0/