butions of most geologists.

However, I would go further and suggest that physicists interested in dipping their feet in the waters of Earth science would be well advised to start off with more mathematically rigorous textbooks, as well as geophysics journals. *Geodynamics: Applications of Continuum Physics to Geological Problems*, a graduate-level text by Donald L. Turcotte and Gerald Schubert (Wiley, 1982), is a good starting point, although only a handful of pages are specifically devoted to volcanism. Unlike the books reviewed by Anderson, this text certainly does contain "words such as energy, velocity, . . . pressure, thermodynamics [and] conductivity."

A host of other geophysical journals, including the *Journal of Geophysical Research*, can also provide interested physicists with not only a starting point but also a state-of-the-art understanding of the applications of physics to Earth science.

They should be forewarned, however, that, as Anderson points out, "Earth scientists are presented with a completed experiment and must infer what happened." In many instances, geophysics (and Earth science in general) is unavoidably as much art as science.

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A Sum of Scientists Get Science Right by Writing Fiction

Jean Kumagai's article on Alan Lightman's career shift from astrophysics to writing (February, page 50) prompts me to comment briefly on other scientists who also write fiction.

Many nonscientists will not read even a popularized scientific book or article, no matter how well written. Consequently, to reach that audience, scientists have to write speculative fiction, weaving real science into an exciting plot. They also have to meet the challenge posed by the fact that, in such "hard" science fiction (as opposed to fantasies like *Star Wars*), the plot is constrained by the science, which the reader has to be able to understand, or at least follow.

The very few professional scientists who have become full-time writers include such giants in the SF field as Isaac Asimov, a professor of biochemistry whose 500 nonfiction and fiction books included *I, Robot* and other SF classics, and Arthur C. Clarke, a physicist and mathematician by training, whose 60-plus books include *2001: A Space Odyssey* and about 30 other SF novels.

More scientists have been part-time SF writers. Astronomer Fred Hoyle has written a dozen novels, and physicist John Cramer has written two. In addition to turning out many popularized science books, Carl Sagan was the author of the SF novel *Contact*. Earlier, George Gaylord Simpson, the grand master of evolutionary animal structure, wrote a time-travel novel, *The Dechronization of Sam Magruder*; Gerolf Steiner, a University of Heidelberg zoologist writing under the pseudonym Harald Stümpke, described the evolutionary radiation of imaginary animals in a delightful fictional monograph, *The Snouters*; and J. B. S. Haldane, Leo Szilard, Julian Huxley, Norbert Wiener and others wrote an occasional SF story.

Also worth mentioning is Gregory Benford, a working astrophysicist who has won several literary prizes (one was announced in your "We Hear That" section last year). His 19 books include *Timescape*, a non-SF novel widely regarded as our best depiction of real physicists at work.

If scientists don't write realistic science fiction, who will? Unfortunately, we have left it to the scientifically illiterate to produce most of the novels, movies and TV shows that feed the public's appetite for space sagas, UFOs, dinosaurs, asteroid collisions and unexplained phenomena. The unalloyed nonsense that passes for science in the entertainment world is ultimately our own fault, and I believe we owe a debt to all of the writers I've mentioned above for trying to reach an undereducated public.

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Relationship between Natural and Man-Made Elements Is Platonic

In his letter about naming new elements (August, page 80), Greg Root draws a false distinction between anthropogenic and theogenic elements. Such a distinction runs contrary to the Platonic tradition of chemistry, which regards all appearances of new substances as discoveries. Undiscovered but theoretically possible compounds are said to exist in a Platonic sense.[1]

Reference

1. R. C. Tompkins, Am. Scientist **78** (4), 299 (1991).

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Corrections

August, page 18—Earth's age should have been given as 4.5 billion years, not 4.5 million years.

August, page 48—The sentence about the operational design of the National Ignition Facility was garbled. It should have read: DOE proposes to build a 192-beam glass laser system capable of routinely delivering 1.8 MJ of 350 nm light at a power of 500 TW.

June, page 9—The first experimental proof of principle for a superfluid gyroscope was given by the French team of Olivier Avenel and Eric Varoquaux at the 21st International Conference on Low Temperature Physics, held in Prague on 8–14 August 1996 (O. Avenel, E. Varoquaux, *Czech J. Phys.* **48**, suppl. S6, p. 3319, 1996; see also O. Avenel, P. Hakonen, E. Varoquaux, *Phys. Rev. Lett.* **78**, 3602, 1997.) ■