

ered elements.

Ernest Rutherford and Niels Bohr are well remembered for their contributions and might even be offended that ephemeral, man-made elements invoke their names. I hope scientists can reign in their egos and let their achievements speak for themselves. I also hope that when I read the May 2002 issue of *PHYSICS TODAY*, there will be a story on the creation of, say, element 115 that will commend the work of all involved.

GREG ROOT

(groot@ma.ultranet.com)
Massachusetts Department of
Environmental Protection
Worcester, Massachusetts

Science Arms Us with Facts, Sometimes Is Disarmed by Authority

In reference to the ongoing debate in *PHYSICS TODAY* and other publications regarding the scientific method, I find it difficult to understand the great difficulties that consideration of the method seems to raise.

Succinctly stated, the scientific method has always been: Valid, reproducible data taken in context is truth, and the simplest theory that agrees with all the data and that permits predictions of reality is the best explanation of truth. In an ideal world, science reaches the truth by a planned and systematic series of measurements that decided between dispassionately proposed, opposing theories. In practice, however, the process is human—that is, intuitive, ingenious, democratic, autocratic, complex, slow, chaotic, argumentative, sometimes spiteful, etc. This reality is greatly oversimplified by historians who seem to prefer the ideal. What is important is not the detailed process that occurs, but that the final state reached meets the two proper criteria of truth: agreement of theory with data, and simplicity. Of course the process cannot be too inefficient or society cannot afford it.

In their much-discussed-in-your-columns book *The Golem: What Everyone Should Know about Science* (see, for example, *PHYSICS TODAY*, January, page 11), Harry Collins and Trevor Pinch seem to believe that the opinions of authorities play a far bigger role in the consensus process than does the existence of valid data. That is often the case in the early formative part of the process pertaining to a specific issue, but I doubt that it is true in the final stages, when truth is ascertained on the basis of a wide

web of evidence, as David Mermin has so ably contended.

I also note that the true authorities that carry the most weight seem armed with a lot of facts (namely, data) and knowledge of the relationships between those facts. It is very important to science that the proper authorities—that is, an open peer group—conduct this process. Nevertheless, the history of science is replete with other authorities, such as religious leaders, governments and deified individuals, declaring “truth” and imposing it on the system, usually with its eventual removal taking between one and sixteen centuries.

The danger to science from a book such as *The Golem* is indirect, in that the book gives solace and support to other authorities.

ALFRED A. BROOKS
Oak Ridge, Tennessee

NSF Review Process Should Be Revamped, Not Taken for Granted

Having been busier than usual conducting my research program on the molecular-level understanding of liquid water (see *PHYSICS TODAY*, April 1996, page 9) with no National Science Foundation funding whatsoever, I have only recently seen the brief story in your January 1997 issue (page 52) on the NSF’s then-proposed guidelines for judging proposals.

For those of us who have struggled in second-tier research institutions trying to promote new scientific ideas, the since-adopted changes (to go into effect in October) are laughable. Any scoring procedure, whether based on two or four criteria, is a trivialization of the review process. And it is much easier for the NSF staff simply to average the scores than actually evaluate the science.

By definition, a reviewer of a proposal, and certainly the NSF staff itself, simply cannot know more about a new research idea (as opposed to an ongoing or derivative one) than the



JOAN CARTIER

We had better publish this quick before our numbers change again

author, particularly an author who has had a history of creating new ideas. The term “peer reviewer” seems to imply that there is a group of other scientists “out there” who, if they so desire, can duplicate what the author of a proposal wants to do—again, a trivialization of the development of scientific ideas. The word “gatekeepers” used by John Fanchi in his letter to the editor criticizing scientific refereeing (*PHYSICS TODAY*, August 1996, page 15) seems closer to the truth, since one doesn’t need to know much to guard a gate. Unlike the author of a scientific paper, the author of a proposal has no means of addressing a reviewer’s criticisms directly. A new proposal must be written, a year goes by, and it is never clear that the same reviewer or the same hollow criticisms will emerge anyway.

History has shown that criticism of a really new idea can very often be wrong. Guglielmo Marconi could not obtain financial support for his wireless, believed to be line of sight by the nonionosphere-thinking experts of the day, and the Wright brothers were actually ridiculed (“flyers or liars?”) even after demonstrating the validity of their ideas. Throughout its existence, the NSF has based its choices for research funding on the narrow perspectives of often short-sighted, prejudiced or microscopically focused self-serving reviewers. This situation is hurting American frontier science, especially now that research funds have become so limited that a