LETTERS

Gatekeepers in Science Stifle Individual Creativity, Those in Legal System Should Study Science

I think John R. Fanchi ("Letters," August 1996, page 15) is correct in his analysis of the role of gatekeepers in enforcing scientific orthodoxy. They include not only journal reviewers but also senior faculty members at elite universities who determine who gets tenure and who gets fired, persons who serve on review panels that determine who receives government funding and members of elite government advisory panels—such as the High Energy Physics Advisory Panel to the Department of Energy—who determine the general directions of government support for science. Not surprisingly, one often finds the same person serving in several of these key positions. The referees (except for those of some elite journals like *Physical Review Letters*) are often the easiest gatekeepers to pass, but these days, even if you do publish, you will perish anyway if your work is not funded.

In the past, a few eccentric loners were able to make their contributions to science despite the opposition or indifference of the gatekeepers. Albert Einstein, Louis de Broglie, Erwin Schrödinger, Ludwig Boltzmann and Alfred Wegener come to mind. Today, such people would probably be ignored. Can you imagine what a *Physical Review Letters* reviewer would do with a revolutionary paper on relativity, submitted by an obscure patent clerk? Do you suppose that the clerk would be funded by DOE or the National Science Foundation?

Today, everyone is interested in playing it safe, which means doing "fundable" research, which usually means doing pretty much what everybody else is doing. We thus develop a never-ending series of fads and fashions, and help ensure that the day of the individual creative genius in science is past.

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I am inclined to agree with John Fanchi in calling for "all physicists to study the history and philosophy of science," but I would go further in preparing a broader society to cope with scientific issues.

Increasingly, our legal system is being called upon to make decisions about scientific matters, and judges are being required to assume gatekeeping responsibilities very roughly comparable to those of science referees. This legal system is beginning to contend, explicitly and implicitly, with the complex issues associated with peer review and publication in the sciences.

How well is the legal system currently equipped to play the gatekeeper role effectively? How well can judges and lawyers grapple with the science-based testimony of expert witnesses? In the US Supreme Court case of *Daubert* v. *Merrell Dow*, Chief Justice William H. Rehnquist recognized the need to address these questions. He wrote, "I do not doubt that Rule 702 [of the Federal Rules of Evidence] confides to the judge[s] some gatekeeping responsibility in deciding questions of the admissibility of proffered expert testimony. But I do not think it imposes on them either the obligation or the authority to become amateur scientists in order to perform that role. . . . I defer to no one in my confidence in federal judges; but I am at a loss to know what is meant when it is said that the scientific status of a theory depends on its 'falsifiability,' and I suspect that some of them will be, too."[1]

Scientists may decline to serve as referees, and thus opt out of a gatekeeping responsibility, but judges, according to the majority opinion in *Daubert*, may not.

Accordingly, as someone practicing professionally in both physics and law, I would augment Fanchi's recommendation by urging that judges and lawyers be required to study not only the history and philosophy of science but also the practice of science, together with its variations in standards and rigor of peer review. That way, they—like scientists—will be better prepared, in Fanchi's words, "as seekers of truth."

Reference

1. *Daubert* v. *Merrell Dow*, *Official Reports of the Supreme Court* **509**, 579 (1993).

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Reprint Pact Proposed for Saving Time, Effort When Reusing Figures

I wonder how many authors have encountered the kind of problem that recently arose with publication of a long review of mine that cited many relevant articles and included illustrations from some of them. My publisher demanded that I obtain a formal release for using any figure from any journal produced by another publisher.

That requirement became a hassle. I had to correspond with journals as far away as England, and, as it turned out, to secure the permission of authors as well. Some authors failed to reply. Publication of my paper was delayed and, in the end, figures had to be dropped or replaced with less appropriate ones. Yet the whole arduous task seemed no more than a formality: When authors or journals were reached, they always gladly gave their consent. My greatest difficulty was the extra paperwork.

Who needs it? All authors I have ever known are happy to have their figures used and cited. I certainly feel that way, and am glad that no extra paperwork is needed in my case because all articles produced in my regular work as a Federal employee are in the public domain. And as scientifically valuable as my agency's work may be, its commercial value

seems minimal. Requiring consent for republication just adds one more paper formality to the many with which a scientist's work is already burdened.

I propose, therefore, that the time is ripe for scientific societies and publishers of scientific literature to reach a formal agreement by which illustrations in scientific articles and texts can be freely copied by members or authors of all parties to the agreement, subject only to explicit acknowledgment of the sources. Any possible adverse consequence of implementing this proposal would be outweighed by the advantages. But, if doubts remain, the agreement could start out as a five-year experiment, and future authors could retain the option of limiting use of specified material.

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Gap Filled in History of Ladder Compounds

In reading Barbara Goss Levi's excellent piece about the theoretical work on the fascinating new ladder compounds (PHYSICS TODAY, October 1996, page 17), I was surprised that the connection of the undoped compounds to the Haldane gap of integer spin chains was not mentioned. In my view, the connection is quite direct and enlightening.

Consider, for example, the result that a two-leg Heisenberg ladder is gapped for arbitrarily weak coupling between the legs of the ladder. To my knowledge, this result was first obtained in 1992 by Andy Millis and myself using Abelian and non-Abelian bosonization.[1] We determined that the ladder has a gap growing linearly with the strength of the interleg coupling, but after obtaining the results, we discovered that the exact operators responsible for the gap had been analyzed in 1982 by Marcel den Nijs in the context of the spin-1 chain[2] and in 1986 by Heinz Schulz[3] for general S spin chains.[4]

Their studies demonstrated that, in Abelian bosonization, the spin-1 chain could be expected to have a gap for all excitations, rather than arbitrarily low-lying, spin-wave–like excitations. Schulz further showed that this behavior occurs in bosonization for all integer spin chains, but not half-integer spin chains. His work thus confirmed Haldane's conjecture of the now well accepted Haldane gap[4] for integer, and only integer, spin chains. The Haldane gap behavior found by Schulz should be considered together with the fact that, as I mentioned, the operators that Andy and I found to gap the two-leg spin ladder are identical to those argued to gap the spin-1 chain. Since the same correspondence occurs for all spin S chains and $2S$ leg ladders, with the only differences between the ladders and the spin chains being the signs with which the relevant operators appear, it follows immediately that even-leg, but not odd-leg, spin ladders should be fully gapped.

In fact, it is interesting to note that historically the Haldane gap appears to have been discovered by the reverse argument: Haldane himself applied Abelian bosonization to the study of the spin-½ chain in reference 5 and mentioned in a subsequent work[6] that future research efforts would study higher S spin chains by means of the bosonization of coupled, spin-½ chains. Although those works never materialized, the Haldane conjecture of a gap for integer, but not half-integer, spin chains, followed immediately thereafter. It appears that, historically, it was an unpublished study of spin ladders and their peculiar odd-even alternation that led to the Haldane gap proposal, and that a particularly uncomplicated way to understand the undoped ladder compounds is to turn that approach on its head.

References

1. S. P. Strong, A. J. Millis, Phys. Rev. Lett. **69**, 2419 (1992); Phys. Rev. B **50**, 9911 (1994).
2. M. P. M. den Nijs, Physica A **111**, 273 (1982).
3. H. J. Schulz, Phys. Rev. B **34**, 6372 (1986).
4. F. D. M. Haldane, Phys. Rev. Lett. **50**, 1153 (1983).
5. F. D. M. Haldane, Phys. Rev. Lett. **45**, 1358 (1980).
6. F. D. M. Haldane, Phys. Rev. Lett. **47**, 1840 (1981).

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Jeffersonian Approach to Renaming CEBAF Decried; Lincoln Next?

The US Department of Energy followed scientific tradition when it created and named the Fermi National Accelerator Laboratory (Fermilab) and the Fermi Prize. But in changing the name of the Continuous Electron Beam Accelerator Facility (CEBAF) to the Thomas Jefferson National Accelerator Facility, it has fol-