Letters

Scientific Evidence

Although I agree with Bert Black's premise in his article "Evolving legal standards for the admissibility of scientific evidence" (25 Mar., p. 1508), I feel that his definition of the problem is incomplete. It causes his analysis to be skewed and ultimately leads him to a flawed conclusion. Specifically, Black postulates that the reason our recent judicial decisions in the toxic tort field are "wholly out of keeping with accepted scientific knowledge" is because "[t]he law looks to science for answers to factual questions that lie beyond the understanding and knowledge of *non*scientists" (emphasis added). While such a statement, standing alone, is accurate, Black does not consider the more important fact that the scientific "answers" to most toxic tort problems lie beyond the understanding and knowledge of scientists as well as nonscientists. More simply, the nonscientists' primary problem is not in their miscomprehension of established science, but in their failure to understand the limitations of what science can prove. Alvin Weinberg recognized this fundamental problem more than 17 years ago (*1*).

> The point missed . . . is that the seemingly simple question 'What is the effect on human health of very low levels of physical insult?' can be stated in scientific terms; it can, so to speak, be asked of science, yet it cannot be answered by science. I have . . . proposed the name *trans-scientific* for such questions that seemingly are part of science yet in fact transcend science.

Thus, when judges do rule rigidly as Black advocates, they exclude much of the relevant research and chip away many of the larger pieces in the overall scientific puzzle, leaving the jury with virtually no evidence to consider. While Black appears to appreciate that the courts' "refusal to judge an expert's opinions according to the criteria of [that expert's] profession can lead to results that clearly conflict with accepted scientific knowledge," he nevertheless commends judges who take science into their own hands. Specifically, Black cites the Agent Orange case as exemplifying correct judicial declarations of what scientific knowledge is. He applauds New York Federal Judge Jack Weinstein's exclusion of all toxicity studies done on animals since "[t]here was no evidence that the plaintiffs had been exposed to the high animal study concentrations, and in any event the differences between humans and other species meant the studies were more likely to mislead than to help the jury [and thus their prejudicial effect outweighed their relevancy]."

As our experiences with asbestos, the Dalkon Shield, diethylstilbesterol, and the swine flu vaccination have demonstrated, the court's insistence on quantitative, definitive, scientific answers for complex causation questions not only neglects the overwhelming experimental evidence, but necessitates that a statistically significant number of persons be exposed to the hazard, and die or be injured as a result of their exposure. A successful epidemiological study must then be published documenting these deaths and injuries. Rather than encourage a nonscientist judge to exclude scientific experimentation simply because the experiments cannot provide definitive answers, then, the standards for admitting evidence should be loosened in accordance with the limits and practices of science. The jury should be the ultimate arbiter, considering and weighing all evidence relevant to the causation question, including inherently less definitive trans-scientific research.

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REFERENCES

1. A. M. Weinberg, *Science* **174**, 546 (1971).

Black argues that the judicial system frequently misuses science. He believes judges often have not examined the underlying methodology to verify that expert testimony truly represented expert consensus. His solution is to have judges "delve into the reasoning behind an expert's conclusions and require that this reasoning reflect accepted scientific practice." Black's objective is for "verdicts consistent with scientific reality."

While agreeing with Black's basic concern, I believe his solution is likely to exacerbate the problem. Judges are not trained in science, and the cross-examination advocacy system is a poor process with which to establish scientific conclusions. Black illustrates the inherent difficulties a scientist faces in the judicial system by his example of the meaning of a 90% chance. As judges conclude they must delve into science, they become activists in determining the meaning of the science (*1*). This can be seen in an article (*2*) by a judge of the U.S. Court of Appeals for the District of Columbia Circuit (where many appeals of federal agency decisions are taken).

> [T]he judicial responsibility is . . . to ensure that the agency's decision-making is thorough and within the bounds of reason. The agency's decisional record must disclose . . . the agency's precise reasons for resolving conflicts in the evidence. This includes the basis for selecting one scientific point of view rather than another.

A better solution might be for professional societies to establish a "friend of the court" system. The AAAS, the American Physical Society, the Institute of Electrical and Electronics Engineers, and so forth could set up panels that would use consensus agreement to address issues raised by courts. Then when a technical issue arose in a court, a representative of the "friend of the court" panel from the pertinent society could provide the consensus technical judgment. The witness and the associated panel would be paid for by the court (*3*). This approach would lay the responsibility for presenting science credibly directly on the scientists, where it belongs.

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REFERENCES AND NOTES

1. J. F. Ahearne, *Prog. Nucl. Energy* 7, 77 (1981).
2. D. L. Bazelon, *Science* **208**, 661 (1980).
3. Individuals would not be precluded from appearing as witnesses for either side, but should be labeled "advocacy" rather than "expert" witnesses.

Response: In my article, I argued that courts should more actively examine the way in which scientists reach the conclusions about which they testify. The comments of Wagner and Ahearne essentially bracket my position. Wagner would abandon scientific standards, while Ahearne would have scientific professional societies become more involved in the judicial process.

Ahearne's suggestion relates to the crucial question of where courts should turn for advice when faced with disputed scientific testimony, and I do not think that it is necessarily inconsistent with my article. His discussion, however, focuses more on disputes about regulations than on tort litigation. Because the existing Federal Rules of Evidence empower a court to appoint its own expert (*1*), judges could to a large extent already take the Ahearne approach in appropriate tort litigation cases.

In contrast to Ahearne, Wagner advances an argument that is logically inconsistent and fundamentally wrong. She wants juries to answer questions admittedly beyond the understanding of either scientists or nonscientists. On the issue of causation in a toxic tort case, the basic question is whether or not the exposure for which the defendant is responsible more likely than not caused the plaintiff's disease or injury (*2*, pp. 764–766); and if the plaintiff cannot introduce admissible evidence sufficient to answer this question, he or she should lose as a matter of