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Information for Contributors appears on pages 40–42 of the 1 January 1993 issue. Editorial correspondence, including requests for permission to reprint and reprint orders, should be sent to 1333 H Street, NW, Washington, DC 20005.

LETTERS

Mind and Brain

It is ironic in an issue focused on Frontiers in Neuroscience that the editorial introduction by Daniel E. Koshland Jr. (29 Oct., p. 635) does not reflect our current understanding of the relationship between mind and brain. Koshland appears to equate bad parenting and the effects of a poor environment with those of "evil spirits" and suggests that only nonscientists might put these forth as causations in situations of brain malfunction. Is it really possible to be unaware of the rather large literature demonstrating environmental and rearing influences on gene expression and neural development? The false dichotomy that is put forth is perpetuated in the subsequent statement that manic-depressive illness "cannot be successfully treated by counseling or psychiatry," but is responsive to the chemical lithium. Aside from erroneously limiting the profession of psychiatry to the practice of psychotherapy (one wonders who actually prescribes the lithium), the statement discounts the enormous psychological and social costs associated with manic-depressive illness that are not adequately addressed by medication alone. The criticism of social interventions continues in other observations, such as the statement that retraining programs are not likely to help homeless individuals who are mentally ill. It would be interesting to know from what scientific data base this point of view is extracted, as even individuals with profound and documented organic deficits (for example, stroke) may benefit from retraining programs.

Furthermore, what is the evidence for brain disease in the criminal who stabbed the tennis star? Is a world in which individuals are deprived of individual rights as a result of vague diagnoses of brain malfunction really a societal advance? Koshland might review 300 years of English common law before asserting that forensic evaluations of mental status simply involve brain-damaged criminals being designated as cured by their being "nice to a psychiatrist."

The scientific method requires both an informed knowledge of the data base and openness to the possibility that one is incorrect in one's assumption; Koshland's editorial consists more of dogma and dialectic than of science.

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Response: I have never said, nor do I believe, that counseling or psychiatry are valueless or that environment and bad parenting are without effect on the mind and behavior. I do believe that modern neurobiology has shown that some brain malfunction can be present at birth and that some illnesses, such as manic depression, are far more susceptible to drug therapy than to counseling therapy. There are many psychiatrists who welcome the new knowledge, use it in their practice, and understand its implications and limitations. There are others who resent the new advances and misquote those who see the complexity of nature and nurture. I do not lump all psychiatrists in a single group any more than I lump all homeless in a single group or attribute all brain influences to either nature or nurture.—***Daniel E. Koshland Jr.***

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Scientific Evidence and the Courts

The Policy Forum by Kenneth R. Foster, David E. Bernstein, and Peter W. Huber, "Science and the toxic tort" (17 Sept., p. 1509) glosses over matters that severely limit the reach of the U.S. Supreme Court's decision in the case of *Daubert* v. *Merrell Dow Pharmaceuticals* (*1*). First, as is true of most product liability cases (or tort cases generally), Merrell Dow's liability was governed by state, not federal, substantive law. The case was allowed in federal court only because of the parties' diversity of citizenship. Second, the Supreme Court's interpretation of federal evidentiary (and other procedural) rules binds only *federal* courts. Even states that adopt those rules verbatim are free to interpret them as they see fit.

Beyond this, the Policy Forum seems based on two unstated premises. First, it encourages readers to believe that many verdicts in favor of plaintiffs may be too large and are often wrong. No doubt verdicts are sometimes larger than newspaper readers might find warranted, and some are sure to favor plaintiffs erroneously. Yet, given, for example, that sympathy for plaintiffs is offset by more resources being available to defendants, can one assume that erroneous verdicts more often favor plaintiffs? Second, the article seems to assume that, because most judges and jurors are largely untutored in math or

science, many are ineducable or irresponsible. I am aware of no support for this proposition.

If the problem of mavericks and quacks could somehow be addressed by a concensus process (*2*), as Foster *et al.* suggest, resources might be better directed elsewhere. We ought to ponder, for example, whether the efforts of professional societies might be better focused on developing and testing materials useful for helping judges and juries, or most lawyers for that matter (*3*), distinguish science from pseudoscience (*4*, pp. 438 and 441). Indeed, if scientists, physicians, and engineers invested more time and energy in pursuit of deeper scientific literacy in the general population, potential benefits could vastly exceed those contemplated by Foster *et al.*

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References

1. *Daubert* v. *Merrell Dow Pharmaceuticals, Inc.* 61 U.S.L.W. 4805 (1993).
2. I. Jacoby, *Risk* **4**, 133 (1993).
3. T. G. Field, *ibid.*, p. 95.
4. T. Gilovich, *How We Know What Isn't So: The Fallibility of Reason in Everyday Life* (Free Press, New York, 1991); D. R. Lehman, R. O. Lempert, R. E. Nisbett, *Am. Psychol.* **43**, 431 (1988).

In their Policy Forum about the Supreme Court's *Daubert* decision, Foster *et al.* appear to advocate the use of tests of statistical significance where $p < 0.05$. They argue that, were a less restrictive criterion to be used, even more spurious positive findings would result. What the authors do not say is that the trade-off for avoiding false-positive error is increased false-negative error. Biostatisticians have recognized that this choice is one that must be made in light of the circumstances and consequences under which a decision is made (*1*). In the context of toxic substances lawsuits, there are good grounds to attempt to balance the chances of false-positive and false-negative error (*2*).

Foster *et al.* correctly observe that epidemiology is far more salient evidence of causation than animal toxicology studies. But their argument that animal studies should not be admitted as evidence ignores the reality that epidemiologic studies exist for only a tiny fraction of the synthetic agents in common use today (*3*). Extrapolating from animal studies may not be easy, but the case for barring them in court is a weak one (*4*).

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References

1. K. Rothman, *Modern Epidemiology* (Little Brown, Boston, MA, 1986), pp. 115–125.

2. M. Green, *Northwest. Univ. Law Rev.* **86**, 643 (1992).
3. L. Tomatis *et al.*, *Cancer Res.* **38**, 877 (1978).
4. National Research Council, *Risk Assessment in the Federal Government* (National Academy Press, Washington, DC, 1983), p. 22.

Foster *et al.* suggest an intuitively appealing method for dealing with scientific evidence. Because scientists are comfortable with the truth-finding mechanism of their own community and agnostic (or skeptical) about the truth-finding capacity of the adversarial system, it follows that they would want courts to rely on peer review, court-appointed experts, professional organizations, and the reports of scientific consensus groups. But it is worth thinking about whether such a reliance of scientists is good for the nation or for science.

Daniel E. Koshland Jr. notes in his editorial of 10 September (p. 1371) that early environmentalists alerted us to pollution problems without the benefit of expert opinion and peer review. If professional consensus had been necessary, the inherent conservatism of science would have delayed action within the legal system at significant social cost. To be effective, law must be structured to deal with problems as they arise, sometimes before full data are available.

Furthermore, the research agendas of scientists are necessarily selective. If courts were largely confined to consulting scientific materials previously investigated and agreed upon by science, scientists would bear a considerable responsibility to orient their research toward every potential social problem. In short, the approach of Foster *et al.* might require scientists to give up a great deal of the autonomy they now enjoy.

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Transportation Costs

Should the fruits of technology be served up to the inventors, the public, or the government? Vladimir Haensel's analysis of transportation costs (Letters, 8 Oct., p. 163) suggests that the government is the winner. Haensel advocates accepting the concept of total cost of transportation per mile as a guideline for deciding if and how much gasoline tax should be increased to reduce the national debt. This line of reasoning would make a Madison Avenue copy writer proud. The gist of it is that because gasoline is a small percentage (about 10%) of the total cost of automobile transportation, one could increase its cost by a large amount ($0.50 per gallon or about 50%) and only increase the cost of transportation by a small 5%. Somehow the small percentage increase of the larger category is supposed to make the large tax increase of $60 billion more palatable. The illusion is a property of arithmetic, not of transportation costs. I have mixed feelings about this suggestion. Reduction of the national debt by increased taxation may be the best use of taxes, and getting more tax may require new tricks, but increasing taxes is not the only way to reduce the debt. The main problem with the scheme is that it provides a model that can be generalized to other categories, such as housing or food or indeed anything else. Gasoline seems like a good choice now because increased engine efficiencies yield better gas mileage, which slightly mitigates the total transportation cost. But suppose science and technology produce a significant improvement in a component of building construction. One could then argue that the cost of the component improved should be increased by adding a tax. After all, housing cost, the larger category, would be increased only slightly. Now we have a model for placing government rather than the public or the inventor first in line for receiving the benefits of scientific progress.

Legislators and bureaucrats are already quite good at discovering ways to foster that end. Let's not offer a scientific imprimatur in the form of clever math.

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I do not dispute Haensel's numbers, but I do question some of his assumptions. While there are drivers who are fortunate enough to have excess disposable income, many people who drive to work (and thus cannot afford to stop driving their cars) would have to give up another necessity were Haensel's proposed gasoline tax to be imposed. Also, in many parts of the United States, drivers must commute long distances, and the burden of the proposed tax would be greater on these drivers than on those who need only go short distances.

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Idolizing Wolves

Daniel E. Koshland Jr.'s editorial "Making wolves lovable" (30 July, p. 531) leaves some misunderstandings about the wolf that I would