

The value of a good science education

In his Reference Frame commentary, Leo Kadanoff calls attention to published data showing that US high-school students have mediocre achievement test scores in science and related subjects in comparison with other nations (PHYSICS TODAY, September 2006, page 8). To help alleviate the problem, he advocates measures to improve the effectiveness of teacher training.

However, there is a compelling reason to question one aspect of Kadanoff's analysis of causes. The factors he cites are presented as persistent aspects of culture—characteristics of our way of life that he sees as dating back for generations. If those factors had been operative for so long, how could we ever have achieved a position of leadership in science? Since the concern at hand is potential or ongoing loss of leadership, the mere presence of these or other persistent causes cannot be the primary explanation. Either additional impediments to learning have emerged or cultural change has intensified the established impediments. I suggest that we examine the accelerating, ongoing cultural change in the US over the past several decades and that we focus on the core change that impacts science most severely: The nation has shifted in philosophy from the search for truth to the postmodern denial that objective truth exists.¹

Science faculty may feel secure against the threat of postmodernism because they have the authority to instruct concerning the facts of nature—facts that exist independent of opinions and beliefs. Unfortunately, many students arrive in science classrooms and laboratories already committed to the postmodern conception of truth as cul-

turally determined, multiple valued, and continuously subject to undisciplined debate and modification. They are consequently unprepared mentally to accept instruction that conflicts with the postmodern viewpoint. As long as postmodernism continues its onward march, this problem can only grow worse.

Kadanoff says the conflict that science has with religion over evolution is a source of both disinterest and hostility toward science. A more complete analysis would address all the major factors that influence the standing of science in society; one factor, I think, is science's growing complacency about its own reputation for objectivity. Kadanoff characterized that reputation as follows: "[Scientific] observations can provide the hard facts upon which others may build the reliable instruments of our polity, or our economy, or our view of the world." Complacency about science's reputation takes two forms: accepting ideological influences that conflict with objectivity and drawing on the reputation of science to advance policy preferences.

One example of ideological influence is addressed in the work of Karl Reinhard of the University of Nebraska. He describes the adverse impact that the American counterculture of the 1960s and 1970s had on the archaeological and anthropological study of pre-Columbian civilization in North America²—an impact that included publication of invalid conclusions that were accepted uncritically because they supported the sociopolitical views of the scholars and their students. Conflicting results were excluded from consideration, thereby delaying for many years the recognition and correction of bias.

Science institutions and leaders also harm science's reputation for objectivity by endorsing specific policy preferences and participating in institutional alliances intended to advance the endorsed preferences. To sustain the claim of objectivity, science should avoid institutional policy endorsement, emphasize those "hard facts," maintain a clear

distinction between facts and policy recommendations, acknowledge other interests and sources of knowledge as legitimate, and treat other parties engaged in policy discussion with respect rather than condescension. Unwillingness to accept these limitations is evident in debate concerning highly contested policy areas, such as nuclear proliferation, ballistic missile defense, and global warming. Science pays the consequent price of its activism in the form of diminished respect.

References

1. A. Bloom, *The Closing of the American Mind*, Simon & Shuster, New York (1987).
2. K. Reinhard, *Am. Sci.* **94**, 254 (2006).

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Although we agree with the larger point Leo Kadanoff makes—that in this country educational and intellectual accomplishments are insufficiently valued compared with other types of success—we believe that his criticism of *The Wizard of Oz* as an example of an anti-education attitude in American culture is unfounded.

Kadanoff complains that in the movie, "one character morphs from nasty schoolteacher into wicked witch. Another is given a diploma to make up for his lack of brain." However, the occupation of Miss Gulch, the character who morphs into the Wicked Witch, is not even mentioned in the film. The only clue to her background comes from Auntie Em, who tells her, "Almira Gulch, just because you own half the county doesn't mean you have the power to run the rest of us!" It sounds like wealthy landowners are the ones being cast in a bad light, not schoolteachers.

Regarding the Wizard's gift of a diploma to the Scarecrow, who asked him for a brain, we note that the Wizard also gave a medal to the Lion, who asked him for courage, and a heart-shaped watch to the Tin Man, who asked him for a heart. Are we therefore to infer that the film devalues courage and love as well as intelligence?

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