A letter writer points out that … A reader … discusses the physics of … A report on postdoctoral education finds that postdocs … And a representative of the petroleum industry squares off against what he calls …

Scientific Literacy

In his excellent Policy commentary "The interdependence of science and law" (*Science*'s Compass. 24 Apr., p. 537), Justice Stephen Breyer incidentally exemplifies the definition of "scientific literacy" proposed by James B. Conant over four decades ago: the ability to choose one's experts wisely, being able to "communicate intelligently with men who were advancing science and applying it" (*1*). Knowing how to choose experts and to understand the limitations, uncertainties, and likely bias of their expressed opinions does not require knowledge of science itself. Rather, it is the capability of any intelligent person who has learned to reason well and to judge character. One develops this capability in many settings. Justice Breyer mentions that Presidents, the Congress, and regulatory agencies seek expert advice on a regular basis. It should be added that the chief executives of most major corporations also retain by necessity trusted science advisers on their inner councils. Consultation is a daily part of successful corporate management and is a key activity at many other levels in business, government, and educational organizations.

The National Science Education Standards (NSES) defines scientific literacy in part as the ability to develop and express reasoned positions on national issues that are scientifically and technologically informed. It proposes that this can be achieved through mastery of a large dose of science content, leavened with understanding of the process of scientific inquiry. Establishing national standards is important for improving and equalizing science education across the nation. But for those who do not follow the path laid out by the NSES, Justice Breyer sets a different and, I submit, equally valid standard for the "scientifically literate" individual.

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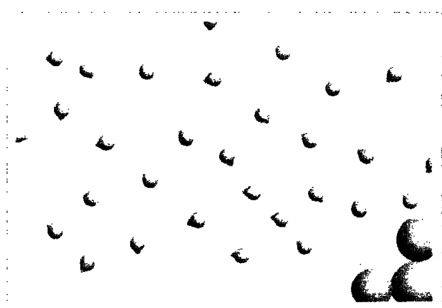
1. J. B. Conant, in *General Education in Science* (Harvard Univ. Press, Cambridge, MA, 1952), p. 19.
2. *National Science Education Standards*, (National Academy Press, Washington, DC, 1996), p. ix.



Big spheres cluster together in a corner.

ILLUSTRATION: LIZ CARROLL SOURCE: *NATURE*

That Corner Office

As a reader in the business world, I feel compelled to share a striking example of the "entropic force" reported to group larger particles against boundaries (D. Kestenbaum, Research News, 20 Mar., p. 1849). I speak, of course, of executives who, across every industry, end up in corner offices. And occasionally executives are forced right out, precisely as predicted by physicists' findings! What I can't explain is the curious pleasure I feel in viewing my favorite executive's office in this new light.

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The Plight of Postdocs

The *Report and Recommendations of the Committee on Postdoctoral Education* was published by the Association of American Universities (AAU) on 31 March. It takes a hard look at how U.S. universities treat and train postdoctoral researchers in science and engineering, of whom it is estimated there are at least 35,000 nationwide. The report concludes that postdocs perform a significant portion of the nation's research and enhance the success of tenured faculty, yet often are a forgotten community for whom there are few appointment or training standards. In several universities, postdocs have organized to form associations as a voice for change. The School of Medicine at the University of Pennsylvania has established an Office for Postdoctoral Programs (OPP) to oversee its appointments and training programs. The OPP currently serves 650 postdocs and ensures compliance with an institution-wide "Policy for Postdoctoral Fellows in the Physical, Biological and Health Sciences and Engineering" that was adopted in April 1996. This policy established the rights and obligations of postdoctoral researchers. The OPP has established a standardized appointment procedure that includes initial appointment letters that address the policy, stipend levels, and benefits. Such letters were recommended by the AAU report. We enforce a limit on the length of the postdoctoral appointment of 5 years so that individuals move to the next stage of their careers. We run orientation sessions for all incoming postdocs and hold roundtable discussions with them later to set new priorities. We have also established a web page (www.med.upenn.edu/postdoc) that includes funding information and a postdoctoral directory. Our hope is that the OPP is establishing policies and training for postdocs that may be emulated elsewhere.

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Strategies for Carbon Reduction

In their Policy commentary "A road map for U.S. carbon reductions" (*Science*'s Compass, 30 Jan., p. 669), Joseph Romm *et al.* make the case that the Kyoto commitments (*1*) can be a achieved with a substantial research and development (R&D) effort and a "carbon permit fee" (which is another way of saying "a tax") of $50 per ton of carbon emitted. Their conclusions come from a rosy interpretation of a study on carbon emission reductions done by five national laboratories for the Department of Energy (DOE) (*2*), but a close examination of the data available on this topic leads one to the opposite conclusion.

The conclusions stated by Romm *et al.* about the benefits of a $50 fee are based on assumptions about three sectors of the economy (industrial, transportation, and buildings), but these assumptions are not supported by a modeling analysis. The U.S. Energy Information Administration (EIA) calculates (*3*) that U.S. carbon emissions will increase at 1.5% per year, reaching 1803.2 million metric tonnes (mmt) in 2010. The Kyoto target is 1250 mmt, which would require emissions reductions of 553 mmt, far more that the 400-mmt reduction cited by Romm *et al.*

With use of the data from the EIA (*3*) and the paper by Romm *et al.*, I have estimated carbon emission trends through the year 2010 (*4*); these data include reductions in carbon emissions that should result from