Letters

The Ice-Minus Case and a Scientifically Informed Judiciary

In support of the laudable goals of a scientifically informed judiciary and regulatory efficiency, Daniel E. Koshland, Jr.'s editorial "Ice minus and jobs minus" (15 May, p. 761) presents a version of the history of the ice-minus case that reveals as much about the prejudices of scientists as the scientific ignorance of judges. It is true that a National Institutes of Health "committee of experts" (the Recombinant DNA Advisory Committee—RAC) approved the ecological safety of an early version of Steen Lindow's plans for field-testing ice minus more than 4 years ago. At the time, however, the RAC did not include a single scientific expert on ecology or evolutionary biology, and the group had not yet begun to draft guidelines for proposals involving the intentional release of recombinant microbes. The existing RAC guidelines dealt exclusively with *laboratory* safety.

Koshland's implication that the RAC's original review was sufficient appears to arise from the same viewpoint that motivated the original approval—the belief that a deep understanding of the workings of molecules and cells by a distinguished group of laboratory scientists somehow provides the wisdom and experience required to make ecological judgments about populations in complex natural and agricultural ecosystems.

However outlandish the fears or ulterior the motives of those who brought suit against the RAC's approval of the tests, the district court injunction that followed correctly insisted on proper environmental risk assessment by scientists expert in ecology, plant pathology, and atmospheric microbiology. Koshland's assertion that "not one serious scientific fact" was added in the process is mistaken.

In fact, the Environmental Protection Agency's review of the initial proposals [by Lindow and by Advanced Genetic Sciences (AGS)], after EPA asserted jurisdiction, raised a number of legitimate questions concerning potential pathogenicity to nontarget plants, competitiveness of the engineered strains, and plans for monitoring and mitigation. Lindow and AGS produced new, "serious scientific facts" by additional laboratory and greenhouse tests, at the request of EPA, that made it possible to conclude confidently that the tests posed negligible risk. Some of this new evidence came from tests for pathogenicity on crops, weeds, and *local* native plants (for example, wild strawberries, in the AGS case). (Some strains of *Pseudomonas syringae* are serious plant pathogens.) Further, EPA-mandated post-release monitoring promises to provide data of intrinsic scientific interest that will also be essential in future risk assessment.

Indirectly, the court's decision impelled the ongoing development of risk assessment guidelines, delineation of regulatory authority, continuing efforts to streamline the regulatory process, and a healthy and genuine scientific debate about how best to regulate biotechnology in order to promote the fulfillment of its promise while minimizing risks to the environment, to agriculture, and to human health. Ice minus has, indeed, paid an unfairly high price to get into the field, but the protection of the environment—and biotechnology—from future ecological mishaps may prove to be of greater economic benefit than protection of crops from frost.

ROBERT K. COLWELL
Department of Zoology,
University of California,
Berkeley, CA 94720

I share the concern Koshland expresses in his editorial of 15 May regarding the problems with our judicial system vis-à-vis scientific progress. All too often, worthwhile experiments get bogged down in trivial legal matters.

I am also concerned, however, about a solution Koshland proposes: releasing specialized judges with scientific training into this fragile environment of ours. Although the solution appears, at first glance, to be a helpful one, the prospect of judicial decisions written in hybridoma style (legalese fused with scientific jargon) could be disastrous, if not uninterpretable. I suggest forming a committee to conduct an environmental impact study.

I was going to close with "Sincerely yours," but on second reading, I think I'd be stretching things a bit.

STAN EISEN
Department of Biology,
Division of Sciences and Mathematics,
Christian Brothers College,
Memphis, TN 38104-5581

Response: Colwell and Eisen make good points. One question involves the significance of the additional findings after the initial RAC review. At the time of the district court injunctions, it was already known that a strain existed in the environment with the same defect as the strain engineered by recombinant DNA techniques. That naturally occurring mutant did not cause damage to other plants, and the further study added little to the assessment that was initially presented. An "ecological expert" is a very general term that includes individuals all the way from engineers who are experts on smog to population geneticists concerned about predator-prey relationships. Microbiologists and "laboratory scientists" can be experts in eutrophication and many ecological problems. If the original RAC lacked the expertise that Colwell mentions, then they did quite well without it, since their initial decision has been upheld and has turned out not to pose a threat to the environment. Moreover, there were considerable further delays in other localities even after the district court judges' objections were satisfied. I am concerned that crying "Wolf!" over organisms as innocuous as ice minus will not only delay industry, but will also lead to a backlash that could prevent the serious consideration of more threatening organisms. If the "unfairly high price" that ice minus paid in this case is a precedent for more competent and more streamlined procedures in the future, it is, as Colwell says, a price worth paying. If it is a precedent for interminable delays, we may be both jobs minus and environment minus.

Eisen is too pessimistic. Hybridomas have produced pure, clean, monoclonal antibodies. Possibly they will produce logical, mono-interpretable judicial decisions.

—DANIEL E. KOSHLAND, JR.

Availability of Human Tissues for Research in Cancer

Investigators wishing to perform research using human tissues have often had difficulty obtaining adequate supplies of these tissues. For the last several years, a few pilot programs have provided investigators with high quality and histopathologically well characterized benign and malignant human tissues for research. However, currently only a small proportion of the national need for human tissues for cancer research is being met. To aid in supplying adequate quantities of research grade human tissues, the National Cancer Institute has recently funded three centers to provide investigators with human tissues for cancer research. The principal investigators of the new Cooperative Human Tissue Network (CHTN) wish to alert the research community that a service to provide normal and malignant human tissue to cancer researchers throughout the United States is now in operation.

After local Institutional Review (Human Use) Committee approval and certification that tissues will not be used for commercial

product development, the CHTN will aid investigators in developing protocols for collection, proper tissue handling, and shipping. The division of the CHTN responsible for the investigator's geographical location will also provide investigators developing new grant proposals with documentation that tissues will be available through this service. Further information can be obtained from us at the regional centers listed below.

K. P. CLAUSEN
Midwestern and Western Division, c/o Department of Pathology, Ohio State University, Columbus, OH 43210 (614) 292-0890
W. E. GRIZZLE
Southern and Southwestern Division (including California), c/o Department of Pathology, University of Alabama at Birmingham and *Veteran's Administration Medical Center, Birmingham, AL 35294 (205) 934-6071*
V. A. LIVOLSI
Eastern Division (including Alaska and Hawaii), c/o Department of Pathology, University of Pennsylvania, and *National Disease Research Interchange, Philadelphia, PA 19104 (215) 557-7361*
WILLIAM E. NEWTON
Pediatric Division, c/o Children's Cancer Study Group, Tissue Procurement Center, Children's Hospital, Columbus, OH 43205 (614) 461-2205

Water Quality

In their article "Water-quality trends in the nation's rivers" (27 Mar., p. 1607), Richard A. Smith *et al.* make a basic assumption and draw a major conclusion that are not supported by our experience in North Carolina. They assume (p. 1607) that data from the approximately 300 National Stream Quality Accounting Network (NASQAN) and National Water Quality Surveillance System stations "permit a more detailed and objective assessment of the effects on water quality of point-source pollution controls." In North Carolina the eight NASQAN station sites are generally located at the downstream ends of U.S. Geological Survey hydrologic accounting units (*1*), a placement that has no consistent relation with municipal wastewater treatment plant (WWTP) outfalls and the oxygen sags they create.

The conclusion drawn by Smith *et al.* about the causes of the increase in total nitrate (p. 1612) may overlook a mechanism that seems important in North Carolina. The improvement in water quality caused by municipal WWTP improvements since 1972 has reduced the extent of reducing zones in North Carolina streams. Less instream nitrogen from all sources seems to be lost to the atmosphere through denitrification in reducing zones. This mechanism could explain the association between WWTP effluent improvements (as measured by dissolved oxygen deficit and fecal coliform bacteria) and increased total nitrate found by Smith *et al.* The mechanism may be obscured in the Midwest by the greater nonpoint-source runoff of nitrate from agriculture. It would be interesting to look for trends in total nitrogen.

Increased instream nitrification could also account for the increased delivery of nitrate to estuaries, as seen in North Carolina's Albemarle and Pamlico sounds (*2, 3*). We might also note that our analysis of North Carolina data has indicated an increase in total phosphorus loading to the Albemarle Sound system during the 1970s (*2*).

JAMES F. SMITH
WILLIAM A. KREUTZBERGER
Planning Branch, Water Quality Section, North Carolina Division of Environmental Management, Raleigh, NC 27611-7687

REFERENCES

1. *Water Resources Data Water Year 1985 North Carolina* (USGS Report NC-85-1, U.S. Geological Survey, Raleigh, NC, 1985).
2. Division of Environmental Management, *Chowan/Albemarle Action Plan* (DEM Report 82-02, North Carolina Department of Natural Resources and Community Development, Raleigh, NC, 1982).
3. Division of Environmental Management, *Nutrient Management Strategy for the Neuse River Basin* (DEM Report 83-05, North Carolina Department of Natural Resources and Community Development, Raleigh, NC, 1983).

Response: Smith and Kreutzberger are correct in saying the locations of NASQAN stations in North Carolina (and elsewhere) have "no consistent relation with municipal wastewater treatment plant (WWTP) outfalls and the oxygen sags they create." As we point out in our article, NASQAN stations were sited to provide broad geographic coverage of conditions in the nation's rivers and streams and do not focus on specific sources of pollution. We also note that a number of case studies (*1*) conducted over the past decade have clearly demonstrated beneficial effects of WWTP upgrading in the vicinity of point sources. The lingering question has been, How far do observable effects of improved treatment extend when expressed as a fraction of the total mileage of rivers in the nation? Our results suggest that with respect to dissolved oxygen concentrations (in contrast with effects on bacteria counts) the spatial extent of beneficial effects is probably less than 2 percent of total river miles, and considerably less than previous estimates based on surveys of pollution control officials (*2*).

We appreciate the suggestion that nitrate increases may have resulted from a decline in nitrate reduction stemming from WWTP upgrading. There was a modest association between nitrate trends and WWTP improvements, and changes in nitrate reduction may help explain this relation. However, nitrate increases were extremely frequent nationwide, and were most strongly associated statistically with nitrogen inputs from agriculture and from the atmosphere. Since these inputs occur in the form of ammonia as well as nitrate, they would likely result in increased instream nitrification. As Smith and Kreutzberger suggest, total nitrogen data would help quantify this effect.

RICHARD A. SMITH
RICHARD B. ALEXANDER
M. GORDON WOLMAN

REFERENCES

1. W. M. Leo, R. V. Thomann, T. W. Gallagher, *Before and After Case Studies: Comparisons of Water Quality Following Municipal Treatment Plant Improvements* (EPA-430/9-007, Environmental Protection Agency, Washington, DC, 1984).
2. *America's Clean Water: The State's Evaluation of Progress: 1972–1982* (Association of State and Interstate Water Pollution Control Administrators, Washington, DC, 1984).

Erratum: Reference 25 (p. 1080) in the article "Freezing" by A. D. J. Haymet (29 May, p. 1076) contains an incorrect date. This reference is to an article by W. Sutherland that appeared in the *Philosophical Magazine* in 1890, not 1980, as printed. In particular, this early report shows that the subject of melting and freezing is one that has puzzled scientists for almost 100 years.

Erratum: Louis Lanzerotti, a researcher in electromagnetic phenomena at AT&T Bell Laboratories, was incorrectly identified as a company vice president in "Science and the space station" by Eliot Marshall (News & Comment, 5 June, p. 1176).

Erratum: In Mark Crawford's News & Comment article "Ozone plan splits Administration" (29 May, p. 1052), the last two sentences of the third-to-the-last paragraph were printed incorrectly. They should have read, "Increased exposure to ultraviolet light poses risks for visitors to the country's national parks, he says. And, because Interior leases offshore oil resources, the department is concerned about the availability of Halon gases to extinguish oil-rig fires, Smith adds."

Erratum: The article by Jean L. Marx on "Human trials of new cancer therapy begin" (Research News, 15 May, p. 778) should have noted that the Sloan-Kettering group collaborated with Ronald Breslow of Columbia University on the discovery that the drug hexamethylene bisacetamide induces the differentiation of mouse leukemia cells, and that it is Breslow who is currently trying to redesign the drug to decrease its side effects in human patients without diminishing its effectiveness.