Letters

Defining Death

Sheila Jasanoff and Dorothy Nelkin are right to raise questions (11 Dec., p. 1211) about "the limits of judicial competence" in resolving scientific and technological questions and to identify "right to die" cases as particularly problematic. These cases, such as the Saikewicz case they discuss (*1*), do not, however, seek to have the courts "define" death. The issue involved is the more difficult one of deciding when treatment may legitimately be forgone for a patient who, though dying, is *not* dead.

The law, has, nevertheless, come to recognize a need to "redefine" the standards for determining that a person has died, in light of artificial means of supporting respiration and circulation, the cessation of which have been the traditional signs of death. This recognition has come about largely through legislative action, although also through a few judicial decisions, almost all of which involve after-the-fact issues of when and how a person (such as the victim of an assault) died.

The President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research was asked by Congress to make recommendations "on the matter of defining death." In a report to the President and Congress in July 1981, the Commission recommended a statute (for state adoption, and for congressional action solely for areas under federal jurisdiction) that would base a determination of death on either "(1) irreversible cessation of circulatory and respiratory functions, or (2) irreversible cessation of all functions of the entire brain, including the brain stem" (*2*). Because the Commission concluded, as Jasanoff and Nelkin have, that sporadic litigation is not the way for the necessary "scientific consensus" to emerge on the criteria for determining death, the Commission facilitated the development by a group of medical specialists of "Guidelines for the determination of death" (*3*). Although this document (signed by 56 of the country's leading neurologists, neurosurgeons, cardiologists, anesthesiologists, and other physicians) does not resolve every complex clinical situation, it does provide both a conceptual and a practical framework for determining when a person has died.

Through its hearings and deliberations, the President's Commission was able to attend not only to the medical considerations but to ethical and social questions, which, as Jasanoff and Nelkin note, are often excluded from courtroom debate.

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References

1. *Superintendent of Belchertown State School* v. *Saikewicz*, 373 Mass. 728 (1977).
2. President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research, *Defining Death: A Report on the Medical, Legal and Ethical Issues in the Determination of Death* (Government Printing Office, Washington, D.C., 1981).
3. Medical Consultants on the Diagnosis of Death to the President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research, *J. Am. Med. Assoc.* **246**, 2184 (1981).

Confronting Creationism

For too long now the majority of evolutionists have remained quiescent, complacent in presenting their version of The Truth to students and confident that "logic will out." Alas, this policy has been the major hindrance to the dissemination of evolutionary principles to the general public. Scientific literature is characterized by the use of jargon, $10 phrases, and circumlocutions, whereas creationists appeal to the masses on the grass-roots level using simple language, directness, and faith. The creationists use their own brand of logic, but it is a logic directed *at the public* and only indirectly at evolutionists per se. . . .

A national, integrated community of scientists must step forward. Their voices must be heard from the halls of Congress to the National Science Board to the cloakrooms of the grammar schools across the nation. Major organizations (such as the AAAS, the National Academy of Sciences, the American Chemical Society, and so forth) should contribute a fraction of their assets to initiate a major media assault on the creationists now—before the cracks in the dike turn to fissures.

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I have checked the American Heritage Dictionary and the Oxford English Dictionary. Both give the word "faith" as an equivalent in the first definition of the word "belief." It is, then, exceedingly difficult to understand how Roger Lewin could describe as unchallengeable (News and Comment, 11 Dec., p. 1224) the statement "The citizens of this State have many different philosophical, religious, *scientific*, ethical, and other *beliefs* about the origin of the universe, earth, life, and man" (*italics* mine). The crux of the current debate about legislation requiring the teaching of creationism is that creationism is not science. It is precisely on the matter of faith that the two can be distinguished. Contrary to Lewin, the statement must be challenged.

The one thing that everyone involved in this problem learns early is that extreme care in language is essential. The need for rigor is of special importance in the pages of *Science*.

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Tritium Production

Richard L. Garwin's letter "Plutonium production" (1 Jan., p. 6) is completely on target with regard to plutonium requirements for our nation's nuclear weapons stockpile, but he neglects to mention the real issue, namely tritium production. Unlike plutonium, tritium has a relatively short half-life, which requires that one produce approximately 10 percent of the nation's stockpile every year simply to maintain the status quo.

At present, the primary source of this material is from the production reactors at Savannah River. These reactors are now almost 30 years old and were built at a time when the safety and environmental standards were substantially less stringent than they are today. Further, the design of these systems, which

wastes some 4000 megawatts of thermal energy, leads to annual operating expenses of more than $100 million. The Savannah River reactors are slated for upgrading over the next several years at an estimated more than $1 billion; however, even with this expenditure the reliability of these aging reactors in the decades beyond is questionable.

What this nation needs is a new production reactor utilizing modern technology and operating at high temperatures that could produce tritium and electricity. Instead of wasting the thermal energy, as is now done, the new reactor by producing and receiving credit for the electricity could yield positive cash flows of more than $200 million a year, meet all present and future safety standards, and ensure our nation the tritium it requires for defense and fusion needs in the future. Planning, budgeting, and design for such a reactor are long overdue.

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Fixed Amount Awards

Numerous letters and articles in *Science* (*1*, *2*) have addressed the controversy surrounding the Office of Management and Budget's Circular A-21. One can hope that the National Science Foundation (NSF) has taken a step toward alleviating academe's problem of coping with A-21's "demands for unrealistic accountability" (*3*) and its inability to "provide the optimal principles for federally sponsored research agreements with universities" (*1*). If the trend continues, perhaps the pages of *Science* will be replete with the fruits of its namesake rather than the equally important but less stimulating dialogue over the merits of this bureaucratic burden on academic research.

I am referring to the NSF's use of a "fixed amount award" for at least one of its programs—New Engineering Faculty Research Incentive Grants–1982. The NSF, in a parenthetical yet far reaching note to institutional research administrators, states in its program announcement that "grants awarded on a fixed amount basis will not be subject to Federal cost principles [for example] OMB Circular A-21" (*4*). Since a fixed amount award represents a predetermined amount for NSF support of proposed research without regard to the subsequent costs of the