Letters

Energy and Environmental Costs

Environmentally speaking, the nation is today reaping the harvest from our previous sins of omission—we have introduced so much technology and altered so much landscape with only the vaguest notions of the ecological and social implications. We are now heading toward a vast increase in technological innovation to meet a real, but also politically exacerbated, energy crisis.

Every proposed "solution" to the energy crisis carries with it environmental costs that in some cases might obviate the proposed solution. Environmental costs are fairly obvious, but only partially known, for various kinds of nuclear energy, coal, gas, oil, and coal gasification. In terms of cost-benefit analysis, we are still fairly innocent about the totality of environmental costs. For geothermal power, solar energy, oceanic thermal gradients, fusion power, and the like, practically nothing is known of environmental costs.

In analyzing the problem, one conclusion is certain. The research and development (R & D) side of the energy question is infinitely simpler than the environmental side, where quantification of complex meteorological, oceanographic, and ecological questions is involved. Yet there has been little mention of coordinate programs to examine environmental and social costs associated with our search for new supplies of energy. President Nixon's energy messages have almost wholly skirted this issue. Such coordinate programs are not only desirable, but absolutely necessary, if we are to survive the coming period of social and economic readjustment.

One approach to this critical problem is to assume that each R & D team working on particular solutions to the energy problem will cope with environmental impact. This approach, while having the value of allowing close cooperation between technology developers and environmental scientists, has some grave faults. One such fault is that managers of R & D programs will be more inclined to favor the "positive" rather than the "negative" side of their mission. The record in atomic energy development is all too clear in this regard. Another factor is that, regardless of the kind of technology involved, end products like heat, radio nuclides, or other pollutants end up in the same atmosphere, the same ocean, the same biogeochemical cycles, and the same food chains.

As a solution to this problem, I suggest the following approaches. Each R & D team should work with a closely associated environmental group whose task would be to study and predict direct effects, including social effects, of the particular technology on local and regional environments. In addition, there should be a group charged with responsibility for overall atmospheric, oceanic, biogeochemical, and ecological effects. Both environmental groups should be organized under some environmental task force funded independently from the R & D groups.

I suggest that environmental task forces be organized under the aegis of the National Academy of Sciences–National Research Council. It is imperative that funds sufficient to match the task be made available. The goal would be to guarantee the environmental acceptability of any new technology at the time that it is implemented. An investment of 10 percent of the total R & D funds for that purpose would seem most reasonable.

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Injuries Related to Cosmetics

In his letter on the safety of cosmetics (14 Dec. 1973, p. 1081), Murray Berdick comments on the validity of available information on injuries related to the use of cosmetics. He cites the National Commission on Product Safety as misrepresenting the situation in its citation of 60,000 injuries annually. He then refutes this estimate using extrapolations of data from the National Electronic Injury Surveillance System (NEISS).

Berdick cites as the basis for his projections a statement in *NEISS News*, "Statistically valid projections of all data may be made . . ." (*1*). However, in this case valid projections are those made from the number of injuries reported in the NEISS sample of data from hospital emergency rooms to injury data from all such emergency rooms. The NEISS sample does not include data on injuries treated in homes, doctors' offices, or poison control centers.

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References

1. *NEISS* (*Natl. Electron. Inj. Surveil. Syst.*) *News* 1, No. 5 (July 1973).

Publishing Ethics

An important but seldom discussed aspect of the ethics of science is concerned with the integrity of the medium which conveys reports to the scientific community at large. A widespread implicit assumption is that the results and interpretations attributed to authors in articles published over their names are in fact theirs, and that any editing or rewriting introduced by editors has been done only with the explicit permission of the authors. One would imagine and hope that a journal which violated this basic canon would quickly lose both contributors, subscribers, and advertisers.

Certainly a journal run by and responsible to a scientific society would in all probability be quickly brought to account by its board of directors. But a scientific journal that is owned by a profit-making corporation is ultimately accountable only to stockholders who may care much more for profit than for the expense involved in running a journal efficiently or ethically. Eventually they can only be brought to task if the scientific community as a whole acts in concert.

An experience with an internationally prominent journal owned by a private corporation has forcefully made me aware of this problem. An article I coauthored was rewritten by the journal to which it had been submitted, errors were introduced, and the unauthorized text was published only 10 days after galley proofs had been sent out from the printer to me. I have, purely by chance, learned that other individuals have had similar experiences with the same journal. This practice raises serious questions concerning publishing ethics. Over and above the injustice to particular authors is the problem of journal credibility in general. Historians of science in particular must find this practice unsettling, since it raises questions as to which misinterpretations or mistaken nuances in an article are those of the author in question and which are those of an anonymous editorial assistant.

It is difficult for individuals to monitor such problems of publishing ethics or to alert the scientific community to this or similar problems of which it may be unaware. It would appear there is a real need for some scientific organization to establish a mechanism for the investigation of problems in the ethics of scientific communication.

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Rabies Shots

In his Research News report of 28 December 1973 (p. 1329), Thomas H. Maugh II writes that "individuals who have been exposed to rabies or whose jobs or hobbies open them to exposure (veterinarians and spelunkers, for example) normally require a series of 14 to 21 daily injections of rabies vaccine to produce immunity. . . ."

It is true that authorities urge "high-risk" individuals, such as animal handlers, to get preexposure rabies vaccinations. However, this initial series of injections involves only two to four shots spread out over 2 weeks to 6 months. Anyone who has had preexposure vaccinations and who possesses sufficient antibodies need only receive one to six injections if subsequently bitten by a known rabid animal. It is neither recommended nor necessary for anyone except unvaccinated persons who have been significantly exposed to rabies to have "14 to 21 daily injections."

The advisability of preexposure rabies vaccination has not been widely accepted by scientists and by others who work with animal species that could potentially expose them to rabies. Part of this reluctance is because of the misconception that the initial series involves 14 to 21 daily injections.

As Maugh states, the new Wistar vaccine will probably reduce the vaccine side effects and may someday allow even further reduction in the number of injections necessary both before and after exposure to rabies.

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Definition of the Meter

It may be useful to follow up on my letter (29 June 1973, p. 1321) on the speed of light and its implications, or lack thereof, for the study of the solar system. The following passage is excerpted from a resolution adopted by the International Astronomical Union (IAU) at its General Assembly in 1973 (*1*).

> The International Astronomical Union . . . recommends that when the most precise value of the speed of propagation of electromagnetic radiation in vacuum is required, the value proposed by the Consultative Committee for the Definition of the Meter . . . , namely $c = 299\ 792\ 458$ meters per second, should be employed, . . . and that the International Committee of Weights and Measures *maintain this value in any redefinition of the meter* [italics mine].

The last phrase carries the clear implication that the meter is to be redefined as a specified number of light-seconds, thereby reducing it to a secondary unit. There has been some confusion over the motivation, even the propriety, of doing this. The lone negative vote cast among the IAU members present was due to concern over the "legislation of constants of nature."

Of course, there is nothing of the constant of nature about the meter or any measure related to it. It was originally defined, after all, as an arbitrary fraction of the circumference of a small planet whose primary astronomical importance consisted of its being the habitation of all known astronomers. Nothing could be more ad hoc. The present conventional definition is based on a transition wavelength of krypton, which may be more accessible, but is hardly an improvement in principle. At the time of its adoption, this definition seemed safe enough, but its freedom from ambiguity was only assumed. It apparently did not seem important that both the meter and the