## LETTERS

### Paul Erdös: Addenda

The portrait by Gina Bari Kolata of mathematician Paul Erdös (News and Comment, 8 Apr., p. 144) as a man totally devoted to his subject is very well done but lacks a few important details. Although Erdös' devotion to his subject is unlimited, it is not correct to say that his entire attention is given to mathematics. Those who know Erdös well would probably agree that he is also eternally inquisitive and well informed about social, political, cultural, and general scientific matters. All these interests do not detract from his constant preoccupation with mathematics. I recall a long-past incident that illustrates the point. It occurred during a chess game between Erdös and a colleague, who was known as a masterful chess player. As I walked by I saw Erdös' opponent in deep thought about his next move, while Erdös himself seemed to pore over an encyclopedia of medicine that he was holding in his lap. When I asked him what he was studying, he answered, "Please, do not interrupt. I am proving a theorem."

Kolata says that Erdös has never had a regular appointment at a university. However, he did have a research instructorship at Purdue from 1943 to 1945, and later he was a member of the mathematics department at Notre Dame. The scientific community should be informed why his affiliation with Notre Dame was terminated. Late in the summer of 1954, Erdös wished to attend the International Congress of Mathematicians (a quadrennial event), which was meeting in Amsterdam that year. As an alien resident he had to apply for a reentry visa that would allow him to return to the United States after the congress. His request for the visa was rejected, although the administration of Notre Dame claimed him as an essential member of its faculty. He had lengthy hearings with immigration and FBI officials and learned that a voluminous file had been accumulated on his occasional expressions of sympathy for and monetary contributions to various causes, his signing of petitions, his correspondence with foreign mathematicians, and other matters. Erdös decided that he would rather give up the security that he enjoyed at that time than to have his right to travel so arbitrarily restricted. He left the United States officially still on leave from Notre Dame but was not permitted to return. In subsequent years he tried to get a visitor's visa to attend meetings, symposia, and conferences in the United States; his requests were supported by frequent petitions of colleagues, professional organizations, and even U.S. senators. His requests were rejected again and again. I received a letter from him (in 1961 or 1962) saying that he had at last obtained the promise of an American consul that he would receive the visa shortly, but a few weeks later he had to cancel his visit; the promise was disavowed. In his typical style he wrote that the foreign policy of the State Department was adamant on two points: nonadmission of Red China to the United Nations and of Paul Erdös to the United States. Finally, in 1963, he was allowed to attend the annual meeting of the American Mathematical Society in Boulder, Colorado, and to visit several campuses. He also came to Purdue to give a colloquium lecture. The audience included an unusually large number of students who had came to see and greet the famous man. Erdös prefaced his talk with the words: "Sam [the United States] finally admitted me because he thinks I am too old and decrepit now to overthrow him."

It is a sad commentary on our time and country that this man—so totally immersed in scholarly work, so remote from the political arena, a free spirit who lives by the highest moral standards—could be harassed by bureaucrats in high positions whose duty it is to protect our freedoms.

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### World Hunger

Deborah Shapley's article about the Antarctic krill (News and Comment, 29 Apr., p. 503) is welcome, and one hopes a new treaty to provide sound management of this marine resource will be concluded *before* commercial fishing for krill gets under way.

It would help greatly, however, if all of us who discuss these needs were more alert to the presumably unconscious determinism involved in such phraseology as Shapley's "the realities of a resource-hungry world" or Gerard Bertrand's "The world need for protein will require the utilization of krill."

These "givens" obscure more significant underlying realities in need of institutional analysis and modification. Why this world hunger? Overpopulation as an answer has become a cliché; it subverts deeper probes. The most neglected sig-

nificant cause of this imbalance between numbers of people and food supplies seems to be the dispossession of the world peasantry by capital-intensive agriculture that produces for export, not to feed local people (*1*). We cannot manage krill wisely in a socioeconomic vacuum.

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**References**

1. J. J. Parsons, *Rev. Biol. Trop.* **24** (Suppl. 1), **121** (1976); J. Belden and G. Forte, *Toward a National Food Policy* (Exploratory Project for Economic Alternatives, Washington, D.C., 1976); E. Feder, *The Rape of the Peasantry: Latin America's Landholding System* (Doubleday Anchor, New York, 1971).

## Social Cost

The article by Earl Cook, "Limits to exploitation of nonrenewable resources" (20 Feb. 1976, p. 677), is extremely informative. In fact, I should like to assign it to my class except that it is marred by an egregious fallacy. Since this fallacy has been turning up repeatedly in writings about environmental and natural resource problems, I wish to call it to the attention of *Science* readers.

The mistake has to do with the nature of social cost. Cook, for example, writes "To society . . . the profit from mining (including oil and gas extraction) can be defined either as an energy surplus, as from the exploitation of fossil and nuclear fuel deposits, or as a work saving, as in the lessened expenditure of human energy and time when steel is used in place of wood. . . ." A number of other authors also equate social cost with the expenditure of energy.

For better or for worse, neither kilocalories nor man-hours nor any other directly observable, unidimensional, physical input is an adequate measure of social cost. A moment's thought should make this compelling. Consider a very simple self-contained economy where coal is extracted by surface mining and the coal seams lie under the only land suitable for growing hops. The greater the amount of coal that is surface-mined the less the amount of beer that can be brewed. In these circumstances surface mining may be a loser, socially speaking, even though it requires the expenditure of far less than 12,000 Btu's per pound of coal; and subsurface mining may be advisable even though it requires more energy per pound extracted than surface mining, particularly if there is a beer shortage. The social cost of surface-mined coal includes the reduction in the availability of beer along with the expenditure of man-hours, capital investment, and other things too numerous to mention.

Clearly, then, social costs cannot be measured in calories or any other simple physical units. The only adequate measure is what economists call "social opportunity costs," meaning the social value of the alternative commodities that have to be foregone in order to obtain the commodity being produced. Under certain idealized conditions this opportunity cost is measured by the dollars-and-cents cost of producing the commodity. Under realistic conditions the dollars-and-cents production cost is a fair approximation to the social cost. Under almost any conceivable conditions the dollars-and-cents cost is a much better approximation to social cost than the amounts of energy expended or any other simple physical measure.

Huettner, in his article, "Net energy analysis: An economic assessment" (9 Apr. 1976, p. 101), points out at greater length the inadequacy of energy costs and surpluses as measures of social or economic worth.

It is a great pity that so much valuable work, including Cook's article on the exploitation of mineral resources, is hung up on the fascination with energy problems. Energy is indeed a scarce and valuable resource; but it is only one of many, and there is a good deal more to life and the economy than British thermal units.

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The assault of outraged economist Dorfman leaves me unabashed in my "egregious fallacy." I wrote of energy surplus and worksaving, not of social cost. Energy surplus can be measured in kilojoules. Worksaving can be measured in man-hours. Social cost can be measured adequately in neither, nor even by "social opportunity costs," because the sound of wild birds at dawn and the dignity of man are not measurable commodities.

What is a social benefit to one society may be a social cost to another. If mining is allowed at all, there is an anticipated social profit, an excess of benefits over costs. The primary benefits—unlike the primary costs—are those of energy, whether surplus or saving.

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