

compensated by a cleaner environment. Ophuls questions society's "political will to reform the market if this will involve personal sacrifice." Is it any more likely that society would have the "political will" to undertake policies deliberately designed to stop economic growth? I doubt it.

I certainly agree with Ophuls that there are certain circumstances under which the market will fail to yield the desired allocation of resources. Indeed, his examples of "common property resources" and "discounting" are precisely the issues I treated in the last section of the article. He is quite right to include cartels in this category as well, though it is important to realize that even the strongest such organizations must be concerned with the degree to which consumption of the product declines as price rises—a fact of which the OPEC (Organization of Petroleum Exporting Countries) is becoming increasingly aware.

In the final analysis, however, the problems raised by Ophuls and Daly are contained in the question of the desirability of further growth. While certainly an important issue for national debate, this question is clearly more difficult to settle since, as Daly puts it, the problem is to evaluate "the real costs and benefits [of growth] at the margin." Unfortunately, in spite of Daly's efforts to devise one, there does not exist a generally accepted nor scientifically defensible standard with which to measure those magnitudes. Consequently, whether one labels these evaluations "personal judgments of fact" or value judgments makes no difference; the crucial point is that reasonable individuals can legitimately differ over their evaluations of the costs and benefits of growth. This is the meaning of my sentence of which Daly quotes only a part at the end of his letter. Obviously there is no problem in distinguishing for ourselves "'poor' from 'rich'" and thus (in Daly's scheme) the point at which further growth becomes "uneconomic." But it is, in my view, the height of arrogance to presume to make that judgment for an individual other than oneself.

One final point of clarification is necessary in response to Leighly. He is quite right to expect a priori that the high pressure steam engine was more economical in fuel use—a point which historians of technology have noted (4). The difficulty arises in the details of the early 19th-century engine. Watt's low pressure engine employed a separate cylinder in which the steam was condensed to form a vacuum below the piston, the power being supplied by the operation of the atmosphere (or of steam at atmospheric pressure) above the piston. The early high pressure engines dispensed with the condenser and used steam at pressures around 50 pounds per square inch, venting

it directly to the atmosphere. It appears that, in the early years of the engine's development, the sacrifice of the vacuum in the condenser reduced the fuel economy relative to the standard low pressure engine (5), although the new, high pressure engines could be considerably smaller per unit of power produced, as Leighly notes. One would expect that the best features of both engines would be combined. This occurred in Cornwall in 1812; and for the next three decades Cornish engines, operating with high pressure steam and a condenser, were widely renowned for their economy of fuel. This event is yet another example of technological advance conditioned by resource availability, for Cornwall was a county with abundant tin and copper (thus requiring steam power for mining operations) but peculiarly lacking in coal or wood for fuel.

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Traditional Tobacco Substitute

I agree with Julia F. Morton (Letters, 16 May, p. 683) that more land should be made available for food crops by eliminating the growing of tobacco. However, we already have a much more suitable alternative than cabbage, lettuce, or papaya leaves, and one which would not make use of food or food-producing materials. I am referring to corn silk, a traditional substitute for tobacco. It should be allowed to dry before harvest, of course, so that its role in seed fertilization would be over.

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Filming of Behavior

The article "Anthropological film: A scientific and humanistic resource" by E. Richard Sorenson (20 Dec. 1974, p. 1079) deserves comment, first because of its rele-

vance not alone to anthropological research but to all behavioral research, and second because Sorenson does not mention very exciting ongoing research in the field of human ethology.

I agree completely with Sorenson about the urgency and need to record human behavior on film, but I would add that his argument holds for many other species as well, particularly those which are endangered by extinction, either through man's wanton slaughter or through the destruction of their habitats. Indeed, students of animal behavior have long recognized the usefulness of motion picture films for the documentation and analysis of behavior patterns. To this end the *Encyclopaedia Cinematographica* was established by G. Wolf, director of the Institute for Scientific Films in Göttingen, West Germany. Each film depicts a single type of behavior and is accompanied by a short descriptive publication. Leslie P. Greenhill at Pennsylvania State University is the director of the American Archive of the *Encyclopaedia Cinematographica*. Films on animal and human behavior are available.

In addition to the film studies which Sorenson mentions, the reader should be aware of the important studies of human ethology by I. Eibl-Eibesfeldt and his co-workers in the Research Unit for Human Ethology, a division of the Max Planck Institute for Behavioral Physiology, Percha, West Germany. They are filming rituals and unstaged social interactions, such as play, greetings, courtship, and child-parent relationships. They are particularly interested in similarities and differences in these behavior patterns in different cultures. By studying populations of cultures which have had minimal contact with outsiders they have attempted to capture on film behavior patterns in their purest form. This is exactly what Sorenson is arguing for. The films are published in the Human Ethological Film Archive of the Max Planck Association (1), and descriptions of the film studies are to be found in such journals as *Anthropos*, *Current Anthropology*, *Homo*, and *Zeitschrift für Tierpsychologie*.

Undoubtedly there are also other groups active in this exciting area of research. Let us hope that Sorenson's timely article will serve as a rallying point to bring together persons working in human ethology and focus their attention on the urgent need for film documentation of behavior.

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