Letters

USING WOOD FOR FUEL

Denis Hayes' remark in the August *BioScience* (p. 541) that "only a small number of rural poor and [a] handful of self-styled rustics value fuelwood" shows a complete ignorance of the increase in the use of wood for fuel by a great variety of people in all walks of life. Indeed, probably most of the recent converts to wood fuel are the better educated, more affluent people, who are trying to cooperate by saving fossil fuels. Moreover, the use of wood for industry is increasing, and wood-fired electric generating plants are projected.

Curiously enough on the same page that author Hayes dismissed domestic use of wood, he cites Weyerhauser's plans for a $75 million plant to use waste wood for fuel, and the cogeneration of electricity by wood-using industries.

"Wood can be put to more sophisticated uses than cooking and space heating" but not more efficiently? Generate electricity and then transport it long distances to use for cooking and heating?

Meanwhile, the wood stove business promises to exceed the $500 million mark this year.

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Author's Reply

Despite Baldwin's curious editing of my article, I do not think that his views are at wide variance with mine. My point, in context, was a simple one. A century ago, the United States obtained three-quarters of its commercial energy from wood. Today, by comparison, the figure is trifling—certainly less than 2%. This, in my view, is regrettable, but it is not very debatable.

This 2% figure is derived from the forest products industries. On balance, the current domestic use of wood is almost certainly a net energy drain. By far the largest fraction is burned in inefficient fireplaces and serves mainly to accelerate the rate of cold air infiltration. I do not "dismiss" domestic use of wood; I merely observe that its potential is currently not being realized. The rapid proliferation of rather efficient wood stoves in recent years is a most encouraging omen, but it is only that.

I share Baldwin's view that centralized electric plants are dreadfully inefficient sources of energy for space heating and cooking. I have argued strenuously against such thermodynamic foolishness (*Rays of Hope:* W. W. Norton, 1977).

On the other hand, electricity does have legitimate uses, and cogeneration does increase the overall efficiency with which the forest products industry can employ its waste streams. Any papermill that does not employ cogeneration technology is squandering resources.

In general, however, biological energy sources are probably best employed as liquid or gaseous fuels that can be directly substituted for those fossil fuels in most limited supply.

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STEADY STATE AND THERMODYNAMICS

Georgescu-Roegen's article "The Steady State and Ecological Salvation: A Thermodynamic Analysis" (April 1977 *BioScience* 27: 266-270) is a superb piece, and I certainly accept his point that a true steady-state economy in the strict thermodynamic sense is impossible. But an ever-growing economy and an ever-declining economy are also impossible. I do not believe that the goal of a steady-state economy offers ecological salvation—only that it offers a better target and a better paradigm for ordering our policies than the alternatives, that it provides the longest path to extinction (that true steady state with zero wealth and zero population forever maintained by zero throughput!). The steady-state paradigm would seem to better serve Georgescu's ethical dictum "Love thy species as thyself" than would a paradigm aiming at either continuous growth or decline. Incidentally, that basic dictum in my opinion should be "Love God's creation and care for it as His steward," in order to allow some appropriate consideration to subhuman species. A man is worth many sparrows, but a sparrow cannot be worthless.

Georgescu's strictures against my use of the concept of a steady state apply with equal force to the notion of a "stationary population," long used by demographers. In a strict thermodynamic sense a steady-state population of human bodies is as impossible as a steady-state population of human artifacts. Yet demographers use the concept, and many advocate it as a target, without necessarily implying that the human race is immortal. I consider this reasonable usage. Georgescu himself has stated that the human species "must act as if they were immortal."[1] The steady-state paradigm seems to me to offer strategies for acting in just that way.

The steady state thesis does have one thing to say about the size of the population and the level of the standard of living. It says that these are ethical questions, not to be derived from positive analysis, either economic or thermodynamic. Thermodynamic analysis "makes it clear that the desirable size of population is that which can be fed by organic agriculture alone," says Georgescu. If I am not mistaken, thermodynamic analysis tells us only that such a population level will maximize the number of person-years lived from now until extinction. Whether that is the proper quantity to be maximized remains an ethical question, as is the still-unspecified level of living standards.

Also I believe the basic intuitive appeal of Georgescu's concept of the desirable population size is that by living on organic agriculture mankind makes the closest possible approximation to a steady state. Georgescu is right to point out that I have no solution to this question (other than to urge vaguely that some concept of sufficiency be reintroduced into economics[2]), but I am not persuaded that his solution is any more satisfactory.

The degree to which my work has been influenced by the enormous contributions of Georgescu is no secret. Although there are evidently disagreements between us, I would not like readers to be left with the impression

[1] Nicholas Georgescu-Roegen. *Energy and Economic Myths.* Pergamon Press, New York, 1976, p. XIX.

[2] H. E. Daly. *Steady-State Economics: The Economics of Biophysical Equilibrium and Moral Growth.* W. H. Freeman, San Francisco, 1977.