

sition that, even if a project can be expected to create serious new problems, this is not necessarily reason to give it up.

This divergence of views was evident in the discussion of the Aswan Dam project. "This dam is not an asset," said van der Schalie, who in the past has done field work on Egypt's schistosomiasis problem as a leader of a World Health Organization team. "It is bound to be a liability until such time as we know how to control the intermediate [snail] host." However, John F. V. Phillips, an agricultural scientist from the University of Natal in South Africa, said that, despite the schistosomiasis threat, irrigation should be extended, for progress in controlling the disease must eventually come.

In another context, Kenneth E. Boulding, a University of Colorado economist, also expressed the view that it is altogether plausible and defensible to attack one problem even though you are thereby creating new problems for others to solve. "There is a whole school of economics which argues that the way you get growth is to upset things," he said. Though ecologists tend to be too "equilibrium-minded," their approach to development problems may have the virtue of helping the world avoid irremediable disasters, Boulding suggested.

As others observed, the ecological approach generally is not followed, for a variety of reasons. One reason cited is that ecologists often cannot predict with certainty the consequences of following various schemes of development. Conjecture that harmful side effects may result from a proposed development seldom prevails over claims that the project will produce tangible benefits.

And, according to Barry Commoner, a "reductionist" attitude prevails among scientists, hampering the development of ecological understanding. "The assumption is too often made that [a complex system] can be understood simply by looking at the properties of its isolated parts," he said. "This is what leads to the substitution of molecular biology for the biology of natural systems. This is what leads sociologists to become psychologists, what leads psychologists to become physiologists, what makes physiologists cellular biologists, and turns cellular biologists into chemists, and chemists into physicists, and physicists into mathematicians. Everybody is looking for the higher science."

A reductionist bias is apparent in technology, too, Commoner said, suggesting that technology poses a special danger in that its success in accomplishing discrete tasks (for example, building hydropower plants or better automobiles) leads to the illusory idea that, for any problem which arises, a technological solution will be found.

Also, as Lynton K. Caldwell, a political scientist from Indiana University, observed, unwise development plans are often an aspect of political opportunism. To have sound planning, he said, ways must be found to make decision makers apply ecologically relevant criteria and to protect these officials from the temptations and political stresses of their situation.

Such a prescription would be regarded by many as naively idealistic if considered an antidote to pork-barrel politics in the United States, but in the case of the developing nations there may be at least a chance that it will work. The reason is that, for many of their more ambitious public projects, these nations depend on assistance from the industrialized nations and from international institutions such as the World Bank. These donor nations and institutions would seem, therefore, to be in a strong position to insist, as a condition for grants or loans, that ecological factors be considered in all project-selection and preinvestment surveys and in the carrying out of the project itself. Just such use of financial leverage by the assistance-granting nations and agencies was recommended by Kirk P. Rodgers, a natural resources specialist of the Pan American Union.

While the aid-granting agencies and nations have not been indifferent to the environmental effects of projects which they sponsor, it seems clear that they have not exercised their potential influence to anything like the extent Rodgers had in mind.

It might prove easier to persuade the international aid-granting institutions to adopt a tough policy of this kind than to persuade government agencies such as the U.S. Agency for International Development (AID) to do so. From the record it is evident that government aid programs are run at least in part with an eye on political considerations.

In any case, AID apparently seldom puts much pressure on assisted countries to focus their attention on environmental effects of development. John Rothberg, AID's science liaison officer, stressed the point that, while

his agency can withhold assistance from an unsound project, nevertheless the assisted nations for the most part make their own development plans, for better or for worse.

The long-term solution to the problem of reconciling development planning with ecological factors was seen to lie in research and education, a conviction which would seem to find support in the increasing interest in, and influence of, ecology in the United States. The International Biological Program represents a significant research effort to gain further understanding of natural ecosystems, but the IBP has been weakly financed and may not produce all the results originally expected of it. (Meanwhile, at the request of the conferees, the Conservation Foundation and the Center for the Biology of Natural Systems will continue to collect ecological "horror stories.")

In his paper, Caldwell raised the question whether it might be possible to infuse public opinion throughout the world with a simple, valid concept such as "spaceship earth." Later, from the floor of the conference, he observed that, ultimately, science—meaning verifiable knowledge of ecological processes—should prove decisive. "In the long run," he said, "science is a very powerful influence. We don't burn witches any longer. We don't treat the insane as though they were invaded by devils. Science does change human behavior, but to change it massively takes time, and time is rapidly running out."—LUTHER J. CARTER

RECENT DEATHS

Leonard S. Fosdick, 65; professor of biochemistry at Northwestern University Dental School; 31 January.

George Glockler, 78; former chief scientist of the Army Research Office and chairman of the department of physical chemistry at the University of Iowa; 14 January.

Egon A. Hiedemann, 69; research professor emeritus in physics at Michigan State University; 8 February.

James S. Pickering, 71; astronomer emeritus of the Hayden Planetarium; 14 February.

Arthur D. Whedon, 88; former chairman of the department of zoology and physiology at North Dakota State University; 9 January.