
SCIENCE & TECHNOLOGY

with the Soviet Union following the arrest of Moscow computer scientist Anatoly Scharansky. Some 30 U.S. Nobel laureates in science began boycotting UNESCO activities after that organization castigated Israel in 1974 and 1975.

Do American protests and sanctions do any good? Opinions vary, says Seltzer. Some scientists fear that denouncing repression may encourage the very politicization of science they seek to prevent. But advocates argue that defense of scientific freedom and the pursuit of knowledge are—or should be—the primary missions of scientific societies.

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Forecasting a Warmer World

“What Might Man-Induced Climate Change Mean?” by Charles F. Cooper, in *Foreign Affairs* (Apr. 1978), 428 E. Preston St., Baltimore, Md. 21202.

Carbon dioxide makes up only .03 of 1 percent of our global atmosphere, but without this slight CO₂ envelope to keep heat from being radiated out into space, the earth would be 10 degrees centigrade colder. This is known as the “greenhouse effect.” As the burning of oil, gas, and coal increases the level of carbon dioxide in the atmosphere, the temperature of the earth may rise sufficiently to cause major economic and perhaps political consequences by the year 2000.

While all the effects of an increase in atmospheric CO₂ are still a matter of speculation, says Cooper, plant ecologist at San Diego State University, the increase itself is not in question; the upward trend now runs about .7 percent per year. This means that a doubling of the preindustrial CO₂ level (300 parts per million before 1890) may be expected between 2020 and 2040, raising the mean global temperature by 1.5 to 3 degrees centigrade. At the same time, as global warming draws greater water vapor from the land and oceans into the atmosphere, total precipitation will increase by an average of 7 percent.

A rise of as little as 1 degree centigrade in the mean global temperature would significantly affect growing seasons and rainfall patterns. Because temperature increases would be greater at high latitudes than at points near the equator, some nations would be gainers and others losers. Substantial areas of northern Russia, for example, would become available for crop production. Monsoon areas (India, Vietnam) would also benefit. But in the United States, corn production would drop 11 percent for every 1 degree centigrade rise in average temperature during the growing season. Grain-growing states like Kansas and Oklahoma would become dangerously exposed to drought.

How will the affected nations react? Cooper calls for more research to “limit some of the uncertainties which now make informed political

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choice almost impossible." Meanwhile, whatever changes occur will not be of short duration; the excess carbon dioxide may remain in the atmosphere for centuries.

Energy Utopias

"Reflections on the Energy Wars" by Alvin M. Weinberg, in *American Scientist* (Mar.-Apr. 1978), 345 Whitney Ave., New Haven, Ct. 06511.

The great energy debate, like great religious conflicts of the past, stems from two differing conceptions of the future: "the solar utopia and the electrical, i.e., nuclear, utopia." Both utopias, says Weinberg, director of the Institute for Energy Analysis in Oak Ridge, Tenn., are conceivable, and the most prudent planning will aim at some combination of the two.

Radical, pro-solar opponents of nuclear energy have yet to prove that an all-solar system can satisfactorily overcome the handicaps of the sun's intermittency (requiring storage of solar energy in some form) and the sun's diffusion (requiring the collection of solar-derived energy to serve a concentrated, largely urban society).

On the other hand, says Weinberg, an electrical utopia based on nuclear reactors requires the creation of a system "that is both acceptably safe and acceptably proliferation-resistant."

To reduce the danger of catastrophic accident and render the accident-risk rate for breeder reactors (about 1 in 20,000 per reactor per year, according to a 1957 U.S. reactor safety study) acceptable to the public, nuclear energy ought to be confined to as few places as possible—perhaps 100 centers in the United States plus a few waste disposal sites. Such a siting policy, says Weinberg, would limit the area exposed to the risk of contamination. It would permit the formation of strong, professional reactor operating staffs, and would minimize security problems. He also urges that the generation of nuclear electricity be entrusted to powerful industrial entities like the Yankee Atomic Electric Company or Tennessee Valley Authority that can provide long-term management.

The total hostility of the solar proponents to the nuclear option is shortsighted, Weinberg argues, especially when the full economic, social, and political costs of the solar alternative remain obscure.

Promoting Proliferation

"Nuclear Power, Nuclear Weapons and International Stability" by David J. Rose and Richard K. Lester, in *Scientific American* (Apr. 1978), 415 Madison Ave., New York, N.Y. 10017.

There are fundamental tensions between U.S. energy goals and U.S. nonproliferation objectives, say Rose, professor of nuclear engineering at M.I.T., and Lester, a Visiting Research Fellow at the Rockefeller Foundation. Electric utility companies are beset with uncertainties