"Nuclear Winter" Feels Budgetary Chill

The Reagan Administration fails to follow the budget advice of a special White House scientific panel

Although recent publicity surrounding the phenomenon of "nuclear winter" offered the public a bleak vision of the future, it brought a clear ray of hope to atmospheric scientists and others who favor additional research on the topic. The federal government, as recently as last December, was apparently contemplating an allocation of as much as $50 million in new research funds over a period of 5 years, in order to determine whether dust and soot from nuclear explosions might actually lead to a dramatic loss of heat and light on the earth's surface.

According to the budget figures released a few weeks ago, however, the Reagan Administration has agreed to allocate only $2 million in new "nuclear winter" research funds for fiscal 1986, to reach a total of $5.5 million. No commitment has been made to extend the effort further. Many of those involved don't know—or won't say—what happened on the way to the Treasury. But hardly anyone is enthusiastic about the outcome.

Michael May, an assistant director of the Lawrence Livermore Laboratory, where much of the government's research on the topic is to be conducted, says it diplomatically. "More money could usefully be spent in the first year," he claims. "It could well have been a few million dollars higher." More directly, John Birks, a chemistry professor at the University of Colorado, complains that "there will not be enough new money to make a qualitative difference in the work that's going on now." Eugene Bierly, director of the division of atmospheric sciences at the National Science Foundation (NSF), agrees. "Under this budget, it'll be tough to do a lot more than is being done now," he says.

All three scientists served on a special White House "nuclear winter" panel last summer that supported expenditures of between $3 million and $10 million annually in new research funds each year for 5 years. While emphasizing the enormous uncertainties involved in the "nuclear winter" hypothesis at present, the panel determined that with the additional funds it would be possible "to considerably improve knowledge of the climatic consequences of nuclear war and thus put decision-making at all levels on a firmer scientific basis."*

Officials in the White House Office of Science and Technology Policy (OSTP), which organized the panel, declined to explain why the budget allocation was $1 million less than the minimum amount recommended by the panel. But others suggested that the proposal fell prey to a reluctance by various bureaucracies to extract the new funds from ongoing programs and to a reluctance on the part of OSTP to press the issue hard enough.

As best the story can be pieced together, George Keyworth, II, the President's science adviser, first sought to extract roughly $5 million in new funds entirely from the Department of Defense (DOD), reasoning that it would be a small bite out of an overall weapons research and development budget of $39.3 billion. But DOD officials turned him down. A similar request was then made to officials at the Department of Energy (DOE), but they too balked. Both agencies argued that it was unreasonable to support work that would be performed in part by others within the government. They also feared that the Office of Management and Budget, then in the midst of a budget-cutting binge, would inevitably insist that the funds be transferred from other programs. In the end, DOD and DOE each coughed up only $2.5 million, NSF offered only $500,000, and the National Oceanic and Atmospheric Administration, which suffered a substantial overall budget cut, offered nothing.

Some scientists fault OSTP for not working harder to obtain the new funds from OMB. "Keyworth didn't go high enough in the system, even though his intentions were good," one source claimed. But others said that the blame lies with officials of various agencies, who were unwilling to donate more at the office. Keyworth was traveling and could not be reached for comment.

The significance of the shortfall is that the Administration may not be able to meet the primary goal set by the special White House panel, according to several scientists. "It is the recommendation of the drafting committee for the research plan that highest priority be given to (i) implementation of a suite of carefully planned laboratory and field fire experiments and (ii) modeling studies to better describe the properties of potential source inputs to the atmosphere and their subsequent radiative, cloud, and chemical interactions," the panel said in its final report, dated 5 February. The principal concern is that under such a constrained budget, laboratory experiments will remain limited, and field experiments will be precluded entirely.

"It will be extremely difficult to carry out much of an experimental program at that level," explains Richard Turco, an atmospheric scientist with R&D Associates in California. Similarly, Robert Cess, an atmospheric scientist at the State University of New York in Stony Brook, says that "realistically, it's a damn small amount of money, when you start talking about field studies."

They are particularly concerned that experiments involving fires—or planning for such experiments—will be forestalled. "What we really needed was data from some really large fires," Birks said. "Such studies may cost as much as $1 million to $2 million. We can't begin to do even one at this budget level." According to the report of the White House panel, such studies are necessary to estimate the amount of smoke generated by nuclear detonations, the probable height and stability of smoke plumes, and the extent to which clouds and smoke interact, each a key variable in existing "nuclear winter" climatic models.

John McTague, deputy director of the White House science office, denies a widespread rumor that most of the new funds will be expended instead on studies of the climate models themselves. "The major component of the research program will indeed be experimental," he said. "This could include both laboratory and field work." He noted, however, that the details have not yet been hammered out and that all decisions will be made by a new interagency committee to be chaired by Keyworth, with representatives from all of the relevant major federal agencies.

Another major concern among academic scientists is that most of the new

Interagency Research Report for Assessing Climatic Effects of Nuclear War, 5 February 1985, available from the Executive Office of the President, Office of Science and Technology Policy, Washington, D.C. 20506.

funds have been allocated to government laboratories. "If university people or private sector groups think there's a lot of money there, they're wrong," Bierly of NSF says bluntly. Carl Sagan, a planetary scientist at Cornell who has labored to publicize the "nuclear winter" hypothesis, says this raises questions about "the degree of independence" of those conducting the research. "I fear that only a small fraction of the funds—10 percent—may be given to independent researchers through NSF, and the rest of the money will be spent by DOE and DOD. If this actually occurs, it would run the risk of appearing as if the government was afraid of an independent assessment." Again, OSTP officials say that it is too soon to say whether DOD and DOE will also make grants to outside scientists.

Finally, some scientists are concerned that the Administration has made no commitment to research beyond next year. May says that "although you can make a very good start at understanding the problem, it is important to have in mind a multiyear program." George Carrier, a professor of applied mathematics at Harvard University who chaired a recent National Academy of Sciences' panel on "nuclear winter," agrees. "You won't get it done in one year, and I'd be surprised if you could do an adequate job in three. You simply just can't quit after one."—**R. Jeffrey Smith**

Carnegie Launches Education Forum

A long-term look at science education policy and the economy is intended to sustain current interest in education issues

How are economies transformed by advancing technology? Some scholars predict that the march of technology will mean fewer jobs a quarter century from now for unskilled laborers but a rising demand for workers with science or mathematics-based education. Others predict the opposite, saying that the workforce of the future will be one in which a small cadre of highly skilled, well-educated people at the top are supported by a vast structure of unskilled workers who barely earn more than minimum wage. A third school of economists foresees the day when machines will do so much of the work that only a small percentage of the adult population will work at all.

"What you think about these schools of thought, and whether you believe any of them, affects what you think about science education," says Marc Tucker, executive director of the new Carnegie Forum on Education and the Economy. With start-up funds of $600,000, the Carnegie Forum has just been launched as a 10-year examination of education policy that "reflects a world transformed by science and technology."

During the past couple of years, there have been a number of prominent reports on the state of science education in the United States, and Congress has responded with controversial legislation that authorized spending more than $2 billion for improved instruction in science and math, although experts doubt that anything approaching that sum will actually be spent (*Science*, 28 September 1984, p. 1453).

The Carnegie Forum is in part a response to the current enthusiasm for science education, an attempt, as David A. Hamburg puts it, "to keep the nation's attention focused on long-term educational improvement." As president of the Carnegie Corporation of New York, Hamburg will head the forum. "Most of the recent reports have, with good reason, linked education to the changing economy. The ability of the advanced industrial countries to compete effectively in the new world economy has increasingly depended on a skilled workforce," Hamburg observes. "We need a reevaluation of the arrangements for education," he states. "More money is surely needed, but we must create new sources of teaching talent, new ways to teach and learn, new curricula."

New York Times News Service

David A. Hamburg

The nation must focus on long-term educational improvement.

One goal of the Carnegie Forum, according to Tucker, will be to foster sustained, original research to blend social science and economic study so that better judgments can be made about the relationship between education and the economy. Another will be to look at more immediate questions, such as the quality of public school teachers and ways to deal with a predicted teacher shortage coming in the face of a minor baby boom.

The idea for the Forum originated 2 years ago when the Carnegie Corporation sponsored a meeting of business, labor, and education leaders, chaired jointly by Hamburg and former North Carolina governor James B. Hunt, whose state is at the forefront of education innovation in the sciences. That meeting convened a "group of 50" men and women who agreed that the needs of the economy are the primary concern driving education policy. The Carnegie Forum will be double that size, with an