Science and Technology in Foreign Affairs

James D. Watkins

"Overall, U.S. international relations have suffered from the absence of a long-term, balanced strategy for issues at the intersection of science and technology with foreign affairs. Sometimes this absence of analysis and policy leads to unpreparedness for major issues, bitter interagency disputes, and inadequate last-minute preparations for an international meeting. On other occasions, when diplomatic stalemates occur, American science may be used merely as a bargaining chip to achieve an underfunded, cobbled-together, disappointing technical exchange" (*1*).

Although this rather tough assessment by the prestigious Carnegie Commission is 5 years old, there is no evidence of any change for the better in the intervening period. If anything, the situation has worsened. In fact, in a recent article in *Science and Government Report* (*2*), the author states that although a "State Department spokesman" denied the reported degradation of the importance of science and technology (S&T) in foreign affairs, senior researchers are increasingly concerned that "the Department has little knowledge of or interest in science and technology and their impact on American interests abroad." My experience over the past 8 years confirms this evaluation.

While secretary of the Department of Energy (DOE) from 1989 to 1993, I witnessed this situation in many start-up research endeavors, including the U.S. space station, the Superconducting Super Collider (SSC) and its lower-energy European counterpart collider at CERN, the thermonuclear experimental reactor, research and development of new renewable energy technologies, and others. Since leaving DOE, I have witnessed the same situation from my vantage point of 4 years as president of a consortium of academic oceanographic institutions. The United States cannot afford to perpetuate its lack of connectivity between scientific research and foreign affairs. Exciting research outcomes, accentuated in both number and quality by the explosion in new scientific tools and discoveries, are presenting opportunities which are too often lost because of this long-standing disconnect.

The author is president of the Consortium for Oceanographic Research and Education, 1755 Massachusetts Avenue, NW, Washington, DC 20036–2102, USA.

To make the point, let me now elaborate on several of the aforementioned examples of the disconnect with foreign affairs that I observed while at DOE. These involved participation in or initiation of a number of important S&T bilateral and multilateral efforts with other nations. Specifically, I have selected the now canceled SSC, the still elusive but important International Thermonuclear Experimental Reactor (ITER), and DOE's contribution to U.S. intergovernmental agency preparations for the global climate and biodiversity conventions at the U.N. Conference on Environment and Development, held in Rio de Janeiro in 1992, which were attended by nearly all U.N. member nations.

In the case of the SSC, despite legislative admonition that significant shared funding by other nations was essential for continued congressional support, virtually none had been secured for the SSC by the time I took over as secretary in 1989. This posed significant obstacles to potential partnering, because other nations, whose fiscal support we sought, had not been seriously recruited to participate in the project from the outset. Hence, most scientific and technical decisions had already been made by the time construction was to commence about 1989. As a result, the perception of foreign nations was that we only wanted their money, not their scientific involvement! I could not blame them for turning their backs on us. Moreover, program costs were then projected to increase markedly with commencement of construction of the 53-mile circular tunnel in Texas, making the United States' pleas for support appear disingenuous and the financial shock to any late comer particularly high. Apparently, Congress and the White House assumed that DOE alone had the responsibility to inspire a few billion dollars of international contributions. Because this was not a trivial amount to seek through "inspiration," there should have been years of groundwork laid with anticipated partners. DOE alone was ill-equipped to seek this level of support from non-U.S. sources.

Further, placing SSC funding early enough or high enough on the president's or secretary of state's agendas for bilateral talks with their Japanese counterparts was difficult, if not impossible. Only an impending and potentially embarrassing funding crisis seemed to put this on the U.S. agenda, and by then it was far too late. It is not that these two U.S. leaders were not interested; rather, I found that there was seldom any acceptance of the relevance or urgency of S&T to foreign affairs at the level of secretary of state or assistant secretary of state. It is clear that unless White House and State Department giants become integrally involved from the outset, and unless these initiatives appear at appropriate times on either head-of-state or foreign minister agendas for meetings with their U.S. counterparts, large collaborative international S&T initiatives are doomed to failure.

A similar dilemma will soon face ITER as the preliminary engineering design phase winds down and a start is made toward constructing a fusion power demonstration machine. Whenever real money needs to be committed by the United States to start building such a device, our recent track record indicates that we will fold (often without notice to other partner nations). By "real," I mean money outlays that often must ramp up quickly to three or four times what prior project costs were in the early research-and-development phases. DOE continues to manage ITER as best it can, left alone in this case to work with the many international partners from Asia and Europe. But, like the SSC, ITER was never a serious concern of our White House or State Department during my tenure. Their neglect was all the more puzzling given the clear potential for both ITER and the SSC to loom large on the foreign affairs agenda in a few years. State Department involvement, understanding, and support today can offer the best hope of funding success tomorrow, but leadership there always seems to be lacking in both timely enthusiasm and technical qualifications. ITER will probably suffer the same fate as the SSC.

As for the 1992 Rio Convention example, the quote at the beginning from the Carnegie Commission was right on the mark. The Bush Administration was criticized for poor preparation, "politically incorrect" positions taken at the convention, and poor handling of some of the working communications surrounding U.S. positions being formulated. Much of the criticism was warranted. Had we taken advantage, over the previous year or two, of extant S&T underpinnings in both biodiversity and climate-change themes, we could have urged an aggressive collaborative S&T strategy from that point on as an essential outcome of the convention. This would have led to a better delineation of the fundamental science needed to develop sound environmental policies in both the near and long term. For example, oceanographic S&T is key to addressing the two convention themes. Yet,

understanding the natural variability of ocean processes to distinguish it from human-generated variability was neither given high priority nor was it a sought-after outcome of the convention. Consequently, 5 years later, little has changed in nations' behaviors—business is as before, there is little new knowledge, an opportunity has been squandered, and unenlightened rhetoric has been elevated.

So why are S&T in foreign affairs important? As the Carnegie Commission pointed out, "Revolutionary advances in physics have led to diverse applications in weapons, energy, materials, and medicine, with extraordinary impacts on the quality of life and on economic and political relationships among countries. . . ." "Greenhouse gases, the AIDS virus, agricultural biotechnology, advanced energy systems, new pharmaceuticals, information technologies, and a host of other scientific and technological trends shape global competition and cooperation. . . ." "All must take bold and imaginative steps to adapt to a world in which the border between domestic and foreign affairs is crossed everywhere and most particularly by science and technology."

Unfortunately, the State Department today has neither the human resources, organizational structure, culture, nor funds to facilitate major S&T bilateral or multilateral efforts. As mentioned earlier, this situation has deteriorated even further since the commission's report in 1992, despite intentions to improve matters with the appointment of the new under secretary for global affairs. One indicator of this deterioration is the perception, if not the fact, that the State Department continues to undervalue its S&T counselors at our embassies overseas. As an early member of the advisory committee to the Carnegie Commission, my discussions with other participants at that time confirmed my view that S&T counselors assigned to our embassy staffs worldwide are most often not given a serious role in deliberations on important foreign affairs matters that have significant technical content. Many are good people with good intentions, but with poor resource support, often limited training for their assignment, and seen by seniors and peers as serving in noncareer-enhancing billets, their accomplishments are often modest at best.

Another indicator of deterioration and sign of disinterest in S&T is the fact that the number of scientifically qualified personnel at the State Department dedicated to the assistant secretary for oceans and international environmental and scientific affairs has dwindled. In the same *Science and Government Report* referenced earlier (*2*), the point was made that "[a]n unannounced reorganization has eliminated the State Department's senior position for international science, technology, and health, and redistributed those functions within a slimmed-down department bureau that's increasingly focused on global environmental issues." Yet, it is within this office, working under the newly established under secretary for global affairs, that much of the coordination of major S&T initiatives with other nations should be routinely monitored and overseen in close coordination with the appropriate government agencies. So, visible signs that such attention is actually being given to these monitoring and oversight functions, and at a sufficiently high level, are simply not there.

As a consequence of all this inattention, the United States is fast gaining a reputation among other nations as an unreliable S&T partner when launching major new research initiatives of potential benefit to the United States and the world. I question whether others will want to join us again at the start-up of any major collaborative research endeavor until we become more predictable. It is timely to do so now.

For starters, I would urge the White House and Department of State to do what the Carnegie Commission recommended 5 years ago. I heartily endorse these still valid and substantive recommendations. Most important, "The President should clarify the international responsibilities and priorities for S&T among mission agencies and ensure their overall coordination with foreign policy through the Department of State." Additionally, we should "[s]et plans for the long-term nurturing of human resources throughout the government, and especially in State, for work on global issues with a substantial scientific and technological character." The President's Council of Advisors on Science and Technology should catalyze necessary remedial action within the Executive Branch. Further, within the Legislative Branch, congressional committees with jurisdiction over science and foreign relations should help see that the commission's recommendations are carried out. It is time to get serious about S&T in foreign affairs.

REFERENCES AND NOTES

1. Carnegie Commission on Science, Technology, and Government, *Science and Technology in U.S. International Affairs* (Carnegie Commission, New York, 1992).
2. *Sci. Gov. Rep.* **27**, no. 10 (1 June 1997).

Peer Review: The Appropriate GPRA Metric for Research

Ronald N. Kostoff

The federal government is the largest single sponsor of fundamental science research today. Increased scrutiny of federal programs in the drive toward deficit reduction requires increased public accountability for the stewards of the government's research funds. The Government Performance and Results Act (GPRA) of 1993 (*1*) was passed to improve the accountability of government-funded programs by measurements of performance against planned targets. Federal agencies are required to initiate implementation of GPRA in fiscal year 1997; pilot projects (*2*) will help identify performance measures for different types of programs. However, it is extremely important that the tools used to enforce research accountability do not destroy basic research.

There are three major components to GPRA: strategic plans, annual performance plans, and metrics to show how well the annual plans are being met (*1*). Classical strategic planning derives from the military and commercial world, focuses on the application of knowledge toward a predefined goal rather than the search for knowledge, and assumes that the links between plans and targets are understood.

Annual performance plans are derived from production and service industries, where efficiency in the use of known resources to achieve well-defined targets over the performance period is the main goal. Revolutionary basic research, which has historically yielded some of the largest downstream payoffs, has an inherently large uncertainty and failure rate, and may take many years before results are forthcoming. This intrinsic long time scale, characteristic of basic research, conflicts with the short-term emphasis of much of the corporate world, where annual reports and requirements for quarterly financial performance shorten the production period for research results. This near term fo-

The author is with the Office of Naval Research, 800 North Quincy Street, Arlington, VA 22217–5660, USA. E-mail: kostofr@onr.navy.mil