Letters

Hornig's Accomplishments

I was distressed to read "The Hornig years: Did LBJ neglect his science adviser?" (31 Jan., p. 453) which purported to evaluate the performance of Donald F. Hornig as Special Assistant to the President for Science and Technology. The article was both inadequate and unfair and gave a distorted view of Hornig's years of fine service to his country.

The basic error of the article was the implied assumption that Hornig's effectiveness and success could be judged either by the public record or by the comments of those staff members or other scientists who are willing to talk. Hornig was an adviser to the President, and most of his advice is necessarily not on the record. Only the President himself can judge whether the advice of one of his counselors was adequate to meet his needs.

As I have stepped into Hornig's position, I have become tremendously impressed with the wide range of activities which he and the President's Science Advisory Committee initiated and carried out, and with the keen insight which he showed in preparing recommendations for the President and for many other agencies of government. He aided in the initiation of many international scientific and technological activities, prepared recommendations on various defense problems, on problems of housing and urban development, transportation, civilian technology, academic science, and many others. It is not true that he neglected the technological problems of the Vietnam war. He set up a talented task force to study this problem and conveyed to suitable authorities important recommendations on this situation.

Hornig served as Special Assistant during a very difficult period in our nation's history. I am proud to follow in the footsteps of a man who served his country so long, so faithfully and so well, and at such great personal sacrifice.

LEE A. DUBRIDGE
The White House, Washington, D.C.

Federal Funding: What Are the Priorities?

Two items in the 3 January issue illustrate conflicting approaches to federal funding of science—the editorial by William Carey, assistant director of the Bureau of the Budget, page 23, and recommendations from the New York Academy of Sciences, page 57.

Carey suggests using some reasonable test of social return for public investment in R & D, as a possible way of setting priorities. In apparent contrast, the New York Academy, in its recent report entitled "The Crisis Facing American Science," recommends, in part, that federal spending on scientific research grow at a rate of 15 to 20 percent per annum, "because the growth of the economy can well sustain such a rate," and "because existing programs do not use available scientific knowledge and manpower to the fullest extent." The report adds, parenthetically, the qualification that "*ideally*, spending on science should be defined by human needs—social, economic and cultural . . ." (italics mine).

Evidently Carey is talking mainly about *mission-oriented* R & D—that which enhances socially useful goals, such as national security, better health care, clean water at lower costs, or more rapid, safer transportation—and the New York Academy is talking mainly about *pure* research—which does not serve immediate needs, but the longer-range missions of enriching education, developing trained scientific manpower, or simply expanding the frontiers of science.

Each type of research has a role, but can priorities for spending on each type be subject to similar criteria? And can they be set at a centralized point in the government for both? As a second point in his editorial, Carey implies that the current, decentralized, pluralistic decision-making patterns for R & D are not good. But *mission-oriented* R & D can well be decentralized in the same manner in which the missions themselves are assigned to different federal agencies.

It is most appropriate that a water resource agency does the water R & D and that a transportation agency develops the programs and funding for transportation R & D. One should not apply standards of balance or priorities to water R & D versus transportation R & D, for example. On the other hand, one should apply standards of balance and priority to water resource development vs. transportation development; that is, to the total package, including R & D. But once that package has been agreed on and its level of support defined at the top echelon of government, then the specific R & D investment can be measured by the mission agencies in terms of the return for that particular goal.

As an example, the federal government is spending approximately $149 million in FY '69 on water resources research, ranging from artificial rainmaking to soil conservation practices, desalting, and public health aspects. (It includes, quite properly, a small amount of money for "basic," mission-*relevant* rather than mission-oriented research.) The research involves 11 agencies, and this is so because water research touches on the statutory missions of all these agencies. (Actually, about 75 percent of the research is done by the Department of the Interior.) The White House Science Office acts as a coordinating body which allows agencies to compare programs, eliminate overlaps, and define priorities and new initiatives. Now it turns out, within the water resources field, that the national R & D effort is responsive to a total national investment need of well over $100 billion over the next 10 to 15 years, for municipal and industrial water facilities alone (*1*); agricultural investment increases this figure substantially.

In the water case, then, a test for a return on the R & D investment is fairly simple. If we can save, say, 2 percent in the total national investment, we will have recovered fully the cost of the research. In general, then, it is necessary to show Congress that mission-related R & D will produce a return well in excess of the cost of investment, and to demonstrate that additional investments will increase the return, and perhaps even the rate of return.

In the case of pure science, the "social return" criterion still applies but the metric is more difficult to define. There is abundant diversity regarding methodology for arriving at such a metric, but there is no generally ac-