

Meetings

Science and Engineering Policies in Transition

On 18 and 19 December the Carnegie Institution of Washington held a seminar* on "Science and Engineering Policies in Transition." Three topics made up the agenda: policy problems of federal government support of science and technology in a period of major transition; some shortcomings of present institutions for the federal support of science; and some possible improvements in current institutional arrangements.

The impending change in the presidency and recent and imminent changes in a number of other positions of responsibility for federally supported scientific and technological activities made the time an appropriate one for a review of science policy problems. Other transitions, however, are of even greater moment. The faith that sustained federal support of science from the end of World War II until 1957, and the fear that brought added support from 1957 into the 1960's, have been pretty well exhausted as justifications for steadily increasing financial support. In recent years, Congress has taken greater interest in the size and justification for R & D appropriations, congressmen have become more knowledgeable about such matters, and Congress has given increasingly critical examination to R & D proposals and budgets. During the period of rapid growth in federal R & D expenditures, problems of priority were much less pressing than they

have become since growth rates leveled off.

For all of these reasons, the seminar agreed, scientists and engineers must pay more attention to congressional and public understanding of research and development objectives, opportunities, and problems. For the same reasons, better advocacy of research and development programs and more effective utilization, in their support, of existing political and bureaucratic machinery were agreed to be necessary.

But a prior need is to know more clearly what we want to advocate, and on this point the group agreed on three changes that seemed desirable: (i) greater flexibility in the use of federal and contract laboratories to adapt their facilities and skills to changing needs; (ii) less separation between fundamental and applied research in an area; and (iii) stronger efforts to develop priorities in the allocation of limited financial support.

Three generalizations were agreed upon in the discussion of priorities.

1) The processes by which priorities are established, evaluated, and changed need to be more clearly analyzed and understood.

2) More of the planning should be on a broader basis, and less in terms of individual fields or individual agencies. The value of individual field studies, such as those that have been conducted under the auspices of the National Academy of Sciences Committee on Science and Public Policy, was recognized, and so was the need for planning by individual agencies. Nevertheless, more government-wide coordination of planning activities would be desirable.

3) The establishment of priorities is a multidimensional process. More than one criterion or set of criteria are often appropriate in judging the same set of alternatives. In comparing individual projects—particularly for fundamental research—the logic of the scientific field itself, the quality of the proposed studies, and the criteria that Alvin Weinberg has proposed are appropriate. In comparing one area of fundamental research with another, the judgment of

knowledgeable scientists, and some of the criteria proposed by Alvin Weinberg, may be used. Choices must also be made among the types of support to be given, for example, project grants, block grants, support of facilities, or fellowships.

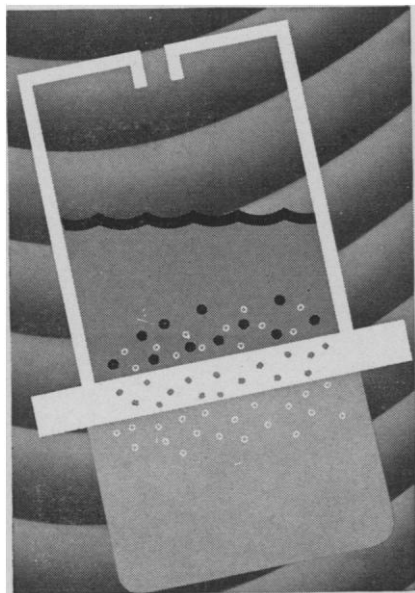
Priorities may also be determined by larger objectives; decisions concerning military objectives, space exploration, health goals, and social problems to an extent predetermine the amounts of emphasis to be given to different fields and kinds of research.

At the development end of the research and development continuum, the necessity for establishing priorities and allocating resources has long been recognized. At the fundamental research end, there has been much reluctance to attempt to establish priorities, and even a number of contentions that to do so is impossible. Yet individual scientists make priority decisions in selecting the problems they consider most interesting, most ready for attack, or most likely to bring rewarding results. In order to avoid scattering their limited resources private foundations regularly select, and from time to time change, the areas in which they wish to concentrate support. Despite the difficulties involved and the general reluctance of scientists to try to compare one type of research with another or one area of science with another, the seminar agreed that such judgments and decisions have to be made. Different agencies will reach different decisions, but none can avoid the responsibility for selecting its own priority goals. The alternative to trying to make those choices on the basis of the best judgment and reason that can be brought to the task is to have them made on the basis of executive and congressional intuition.

On the second topic of the agenda, the identification of shortcomings of present institutions for the planning and management of the federally supported research and development activities, time permitted detailed consideration of only one agency—the National Science Foundation. With all of the advantages of a retrospective view, there was general regret that the National Science Foundation had not developed early in its life a sharper definition of its own individual mission among the agencies of government that support scientific activities, and that it had not developed sufficient political muscle to achieve as strong a position in the whole scientific enterprise as the seminar participants wished for it.

* Participants were Philip H. Abelson, Geophysical Laboratory of the Carnegie Institution of Washington and Editor of *Science*, chairman and arranger; Richard A. Carpenter, Library of Congress; Paul F. Chenea, General Motors Corporation; Milton Harris, Chairman of the Board, American Chemical Society; William J. Harris, Jr., Battelle Memorial Institute; Charles V. Kidd, Office of Science and Technology; Willard F. Libby, University of California, Los Angeles; Frank T. McClure, Applied Physics Laboratory, Johns Hopkins University; Congressman Charles A. Mosher (R-Ohio); Harold Orlans, Brookings Institution; Herbert Roback, House of Representatives Committee on Government Operations; James A. Shannon, National Academy of Sciences; Eugene B. Skolnikoff, Massachusetts Institute of Technology; Ronald Smelt, Lockheed Aircraft Corporation; Russell I. Thackery, National Association of State Universities and Land Grant Colleges; Edward Wenk, Jr., National Council of Marine Resources and Engineering Development; Dael Wolfe, American Association for the Advancement of Science; and, for 19 December only, Congressman Emilio Q. Daddario (D-Conn.).

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At the same time, however, it was recognized that two great barriers stood in the way of these achievements. One was the fact that the surveillance authority originally given by Congress to the National Science Foundation was seen as a threat by other already established agencies which were larger and stronger and which, in a number of cases, had well-developed congressional support. The other barrier is the fact that, by and large, scientists have wanted the National Science Foundation to be "above politics," and have wanted its programs and activities to be determined by the needs and wishes of research scientists—the clients of NSF—rather than by the needs and wishes of the national scientific effort, as interpreted by the federal government—the Foundation's sponsor and supporter.

Looking toward the future, one participant proposed killing the Foundation on the grounds that under current budgetary pressures its existence is too much of a threat to the research appropriations that should be made to other agencies. That proposal got no support, but there was emphatic agreement that any pressure to make the National Science Foundation the one agency of government that supports fundamental research should be resisted. Other agencies with scientific and technological interests should continue to engage in or support fundamental research, both for their own welfare and for the welfare of science.

The legislative changes made last year, which now require the National Science Foundation to appear before congressional committees in authorization hearings as well as in appropriation hearings, can provide the Foundation with new opportunities to develop political strength in Congress and new opportunities to debate and secure agreement on its own priorities in the ways in which it supports scientific activities.

In considering possible new and better institutional arrangements, two possibilities were considered: the proposed Department of Science and the possibility of establishing competing sources of policy studies and ideas.

In one form or another, the idea of a Department of Science has been suggested to Congress often and over a period of many years. After a comparatively dormant period, the idea has been revived recently and given new attention. One advocate of such a department argued that it offers opportunities for better governmental manage-

ment. Independent agencies have often led a precarious life; collecting appropriate ones together into a department would offer greater strength and continuity to all and make possible better management of their programs. He also suggested that there are sometimes advantages in reorganization for its own sake, in revivifying an agency or in changing or increasing its responsibilities.

There was no agreement among the participants as to whether they favored a Department of Science, but it was generally agreed that the decision would probably be made on the basis of practical political reasons rather than on the basis of the wishes of scientists. And it was also agreed that thus far the debate had not given sufficient attention to an analysis of what would be done better in a department than under present arrangements. In fact, there was not even agreement—either among the seminar participants or among others who have discussed the idea—of which existing agencies or parts of agencies could most usefully be brought together into a single department.

Although there was not agreement on whether a department is desirable, there was clear agreement that if a Department of Science or a Department of Science and Technology or a Department of Science and Higher Education is established, it should not be comprehensive—that is, it should not include all scientific activities, for much scientific work needs to be done by and in other agencies. For the same reasons, it was agreed that no department should be the sole sponsor of fundamental research. Finally, although under some arrangements a Department of Science might assume responsibility for some of the special councils that are now attached to the Office of the President, the department itself should be responsible for operations and should be clearly separated from the agencies which are responsible for advising the President on scientific and technological matters, the President's Science Advisory Committee and the Office of Science and Technology.

Competition is valuable in research and development and valuable in business and commerce. Would not competition also be valuable, the seminar asked, in the analysis and recommendation of science policy? The need for better policy-oriented studies was recognized, and various alternative sources were considered: universities, professional societies, nonprofit institutions, and ad hoc groups.

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A number of models were cited from other areas in which privately sponsored studies and recommendations had competed successfully with and had supplemented the work of government agencies, for example, studies of education supported by the Carnegie Corporation and economic studies conducted by the National Bureau of Economic Research or the Committee on Economic Development.

Approximately 50 universities have established or are developing programs on science and society, science and public policy, research and development management, or similar topics. Thus far, the university programs have been of most interest to social scientists, and the typical approach has been historical or retrospective rather than being directed toward the analysis of current issues and the formulation of policy for new or future problems. Some university groups might emphasize current and foreseen problems, but universities are probably more likely to contribute to the whole area by training students and by serving as critics of past and present performance.

Nonprofit or profit-making organizations with appropriate staffs and interests could be used for a variety of analyses and studies, and the wider use of such institutions offers an attractive way of increasing the capacity of the science advisory apparatus in the President's office without increasing the size of the staff.

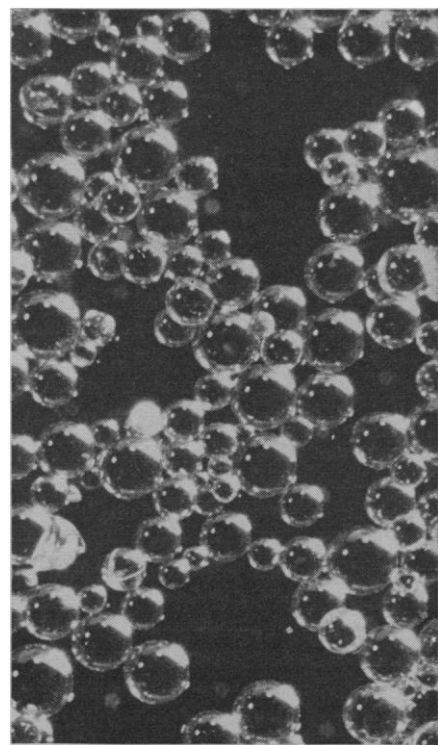
Often, however, it will probably continue to be desirable to organize ad hoc commissions or groups that can bring together the talents of persons and organizations particularly chosen for a particular purpose.

Whatever the mixture of these kinds of agencies, the group agreed on the desirability of having alternative and sometimes competing sources of policy analysis and advice. Congressional hearings with their probing and sometimes adversary tactics have their role, and so do the internal and sometimes confidential councils of government, in the President's office and elsewhere. But as is true in the formulation of economic and educational and social policy for the nation, it is desirable that analyses and recommendations come from a variety of sources, that there be several forums for their debate, and that national science policies result from a broad base of informed consideration.

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