

ISSUES OF FEDERAL SCIENCE POLICY

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The main burden of the following paper is that if there is to be developed a sensible set of Federal expenditure policies for scientific research and development a change is required in the organization of the executive branch with respect to the locus of responsibility for the development of national science policies. The rationale for making such a presentation to the Subcommittee on Fiscal Policy is that in the absence of effective organization for science policy development it is impossible to get issues clearly defined, analyses made of the issues, and recommendations formulated which can be transmitted to appropriate political officials for their consideration. Organizational arrangements which serve a useful purpose act as the means of focusing, integrating, and releasing knowledge and judgments of informed persons. Ineffective organization of the kind which exists for the development of Federal science policies results in inadequate attention to important issues, the discouragement of the serious study of such issues, and a vitiating of the Government's capacity to deal with them.

THE BACKGROUND

Federal expenditures for scientific research and development have shown a spectacular growth. In 1940, they amounted to \$74 million; in 1958, under definitions used by the National Science Foundation, over \$3,100 million. During the past decade, there has been more than a threefold increase in research and development expenditures—a greater increase than in the Federal budget for all purposes during this period. As a percentage of total budget expenditures, research and development expenditures have risen from about 1 percent in 1940 to over 4 percent in 1958.

If somewhat broader definitions are used, the current Federal research and development budget is considerably more sizable, being about \$3.2 billion higher. The increase occurs if one includes defense procurement programs in support of research, development, test, and evaluation activities. These programs included, the total Federal outlay for research and development in fiscal year 1958 may be well over \$6 billion.

Under either the narrow or broad definitions as to what should be counted in the Federal research and development budget, it can be seen that expenditures for research and development are big business and have been for some time.

However, sheer dollar volume alone has not been the principal cause of interest in Federal expenditures for research and development over the years. Even in the 1930's, when the outlay was small, there was recognition of the importance of research to the national economy.

For example, the National Planning Board produced a report, *Research—A National Resource*, as well as a separate study of industrial research, which emphasized the stimulating influence of research and innovation on the economy.

The Second World War resulted, of course, in a tremendous rise in Government expenditures for defense-related research. It is safe to say that most, if not all, of the problems which have since risen in connection with the Federal research and development effort had their origins in the war years—problems of allocation of Federal moneys for research among functional activities, among fields of science, among the broad categories of research; namely, basic, applied, and development. Equally, the questions of appropriate allocation among the performers of the Federal research effort—the universities, industrial laboratories, and the Government's own laboratories—were sharpened by the war experience. Needless to say, problems of education for the sciences, the supply and demand of scientific talent, and indeed, the organization of the Government itself with respect to research matters, were all deeply influenced by the war.

There was barely time for the Government's wartime research effort to subside before the cold war and the Korean crisis were upon the country. The new expansion of federally financed research and development which then began has continued since, with the same problems of allocation of resources demanding attention.

THE ISSUES

While it is true that diffusion of responsibility characterizes many, perhaps most, Government functions (e. g., natural-resource programs are administered principally by the Department of the Interior, but the Corps of Engineers, the Department of Agriculture, and the Federal Power Commission, among other agencies, also have important resource management or development responsibilities), in recent years there has been improved coordination and/or centralization in many functional areas. This has permitted a readier identification of policy issues, and better coordinated programing and budgeting.

In the case of the Government's scientific research and development programs, however, diffusion of responsibility is a built-in and essential phenomenon. About 92 cents out of every Federal research dollar in fiscal year 1958 is being spent for applied and developmental work—research designed to meet the practical public problems which are the responsibility of roughly 40 different agencies having research programs. It is obvious that if research is to be kept relevant to the problems it is attempting to solve, it must be carried on in association with the responsible agencies.

But this is not to say that decisions about research made in one agency—decisions as to the volume of research to be carried on, the types of research programs, the locus of these programs, and so on—are not of great importance and interest to several parts of the Federal Government.

The principal interest in these questions lies, of course, with those centers of decision making which must act in consideration of the widest possible range of facts and the broadest political and public interests—the White House and Executive Office of the President (including, among others, the Bureau of the Budget, the Council of

Economic Advisers, and the Office of Defense Mobilization) and the Congress, especially in appropriations subcommittees. The most trenchant questions which are raised about the issues of allocation of Federal resources for research and development come not from the individual research agencies and not from those bodies having statutory or Executive authority for the development of national-science policies, such as the National Science Foundation and the Interdepartmental Committee for Scientific Research and Development, but rather from those at the apex of responsibility in the Government. In such quarters, the identification of issues, of the problems of coordination, of merging fact and judgment, and of deciding finally how resources will be allocated are ever pressing.

As for the specific issues surrounding the Federal research and development programs, six can be identified as of major importance for the present purpose:

- (1) *What is the appropriate distribution of research and development funds among and within functional fields? Is there an imbalance between outlays for military-oriented and nonmilitary research? Are we spending too much for health-related research as compared, for example, with research on education? Are functional areas of less dramatic appeal than health, such, perhaps, as transportation, resources development, or communications, being undersupported in terms of research? Within specific functions, e. g., public health, are the Federal emphases in research satisfactory? Should more or less go into mental-health research than into research on heart disease and cancer, etc.?*

At present these questions are at best rather uncritically considered at the highest levels. Summary expenditures and obligations data for research and development, functionally organized, are contained in special analysis I of the Budget of the United States. The factual information offers no guides for judging adequacy, however. Each department and agency presents its case to the Executive Office of the President, where for the most part decisions are made on an individual agency basis. Too often the guideline for research and development programs is no more than a comparison with whether a budget is up or down from the preceding year. The Department of Defense has on occasion set up special ad hoc committees or task forces composed of disinterested persons to appraise the status of given research programs. In the not too distant past the National Science Foundation, at the request of the Department of Health, Education, and Welfare and the Bureau of the Budget set up a committee to review the medical research programs of the former agency. In this case the committee, drawn largely from the universities (and subsequently criticized on that score) produced a report which in the main affirmed the appropriateness of the existing levels and nature of HEW's medical research programs. The report was apparently not seriously taken by either the Secretary of the Department in question or by Executive Office of the President in that the next budget requested sums for medical research far beyond those which the committee had indicated were adequate.

While it is obvious that inter- and intraprogram comparisons of research activities by functional field are extremely difficult to

make and will always involve a substantial measure of judgment, some sensible efforts are possible under proper conditions of leadership and direction such as are not now available. Program-budget proposals for research and development should (a) identify the segments of program which are particularly in need of research and, generally, the nature of this research as well as the anticipated values to be derived from it; (b) estimate the approximate technical manpower requirements for accomplishing the research program; (c) identify areas of related research being carried on elsewhere in and outside the Government and the coordination which has taken place, if any, with these areas; and (d) assess the demands on large and/or scarce research facilities which new programs will entail.

Such an exercise in program-budget preparation would do two things: First, it could force more thoughtful and better coordinated research programing; and second, it would provide, at the highest levels in the Government information which could be used for more critically informed allocations among research programs.

- (2) *To what extent should the Federal research effort seek to counteract the cultural tendency toward utilitarian research, and the normal governmental requirement for research of an applied and developmental character? Is the mandate to the National Science Foundation to support basic research an adequate or an excessive one? Are we taking sufficient advantage of the fact that in some friendly western nations, particularly Great Britain, the national research bent is to fundamental research rather than to applied and developmental work?*

The several studies of Federal research activities which have been made during the past 15 years have all acknowledged the extreme importance of basic research. The Steelman report urged that the Federal outlay for basic research be increased to, at least, \$250 million by 1957 (an arbitrarily selected figure). The National Science Foundation was established in good measure for the purpose of supporting basic research. The Foundation has for the most part had increasing budgets, and other agencies too have had additional money in recent years for basic research. Federal obligations for basic research have doubled from fiscal year 1952 to fiscal year 1958, being estimated at \$233 million. The National Science Foundation, which is looked on as the Government's leader with respect to basic research has always maintained that more funds are needed than in the past. It has never taken a strong position as to the optimum ratio between basic research and the rest of the Federal or national research effort, the Federal budget, or the gross national product, undoubtedly to its credit.

One may question the capacity of the National Science Foundation, however, for disinterested appraisal of the Federal needs for basic research in view of its own deep involvement as a major dispenser of Federal basic research moneys. An agency whose staff is almost entirely devoted to making grants of Federal funds for a given purpose will understandably find it difficult to institute studies or inquiries which might reach conclusions unfavorable to the expansion of its program.

There is, at present, need to seek out some guides for use in deciding at what levels, dollarwise, basic research should be supported. Are there, as has sometimes been contended, sizable numbers of scien-

tists in the universities who would like to be doing basic work, but who have been lured away by the flood of Federal dollars for applied and developmental investigation? Or is there a scarcity of true talent which should put a ceiling on Federal moneys for basic work, and should perhaps suggest a more extensive and intensive talent hunt for the very bright youngster who is not planning to go to college? Is it true that we have to do some basic research in Government research installations in order to keep and attract able people, and is enough or too much being done in such labs at present?

These and several other similar problems need top-level study if we are to have sounder judgments brought to decisions regarding the allocation of Federal moneys among the various types of research.

- (3) *Is the Federal and the national research effort appropriately distributed among the fields of science, life, physical and social, and among the many subfields within each, e. g., within the life sciences, the medical, agricultural, and biological sciences? Does imbalance exist in the fact that out of \$964 million obligated for research alone in 1957 (virtually all of the \$1,671 million on the developmental side was in the physical sciences) \$647 million was for physical science research; \$281 million for life science research and only \$35 million for social science research? What are the criteria for judgment? Are they the opinions of scientists? Are they found in the need for research moneys as evidenced by scholars and ideas seeking funds to support their own scientific efforts? Are they the views of social and political leaders who have accepted the responsibility of trying to assess very broadly, research requirements as related to human and national needs?*

At present the distribution of Federal research by fields is for practical purposes determined in the "market place." Agencies prepare their programs with little concern for achieving an appropriate balance. In the National Science Foundation, where some attention has been paid to the matter, it would appear that the only guide of any real substance which is followed is the number and dollar volume of meritorious basic research proposals which are received or stimulated by the agency. Since more support is requested for basic research in the physical sciences more funds are requested by the NSF for that field.

An interesting attempt has been made to appraise the status of knowledge in selected subfields by the NSF. For example broad studies have been made of the fields of psychology and physiology with a view to identifying both the promising areas for future research and the resources available to do research. Whether such studies have, in fact, proved useful in programing research by the NSF is not known, but the idea is undoubtedly a useful one. The question may be asked as to whether this approach could profitably be pursued for other subfields.

- (4) *Is the present pattern of allocation of Federal research funds among the various performers of research in the Nation, principally, the universities, industry, and the Government's own laboratories a satisfactory one? Are the universities as social institutions with responsibilities for education and research being strengthened or weakened by the Government's research practices and policies? Are the Government's own laboratories effective producers of research? Should more or less research go to industrial labs? What are the criteria for allocation? Are these criteria found in the nature of the work (e. g., some research for security and safety reasons, such as chemical and biological warfare research, is conducted in good measure within Government installations); the character of the work (it is sometimes argued that all basic research supported by the Government should be allocated to the universities). Is the criterion the prevailing political philosophy of a given administration? Should the Government use more industry- or university-managed research centers of the Los Alamos type in lieu of establishing new labs of its own?*

There has been some continuing interest at highest levels in the Department of Defense in, at least, observing the patterns of distribution among the performing components, presumably because of a desire to make allocations in such a way as to strengthen the several types of research institutions as well as to get the best research possible per dollar expended. The National Science Foundation also regularly develops data on the distribution of Federal Research and Development moneys by performers in its Federal funds for science series. But no critical studies have been made which could provide guides as to the conditions under which the Government should conduct its research in-house or have it conducted elsewhere.

The National Science Foundation, in 1954, appointed a committee, largely of university people, to study Government-university research relations. If the report of that committee produced useful information on this problem it has not yet been made available. From time to time the National Science Foundation has considered looking into the Government's past decisions about where research should be conducted with the thought that some guides might be culled from this experience. However, such inquiries have not moved forward. Nor have proposed studies of the research center and its values and limitations as an organizational arrangement for the conduct of the Government's research. It is clear that in this area some reasonably useful guides could be developed given sufficient interest and leadership at appropriate levels. Since the welfare of vital institutions such as the universities are at stake, as well as the efficient and economical conduct of Government research, it would appear that this allocation problem should have a high priority.

- (5) *What is the impact on the stability and future growth of the national economy of the Government's research and development programs? Are there ways in which the Federal research effort can be used to strengthen the economy at times and places when soft spots appear? Are there measures, e. g., changes in tax and patent laws perhaps, which the Government can take to encourage the sound development of industrial research?*

While the Council of Economic Advisers acknowledge the importance of science to the economy and is deeply interested in the subject, and similarly the National Science Foundation has expressed an interest and indeed at one time made a minor effort to inaugurate some studies, this whole area is at present badly neglected. To understand the relationship between research and economic stability and growth is admittedly extremely difficult. Definitive studies need to be made on an industry or subindustry basis, and to approach a useful level of sophistication such studies would in all likelihood become quite complex. Interesting speculative writing has been done on the subject, but it has not met the requirements for more definitive knowledge upon which the Government could base action. It is apparent that funds must be provided for a research program on this subject, probably to be carried on by economists not now in the Government, but under the guidance of the Council of Economic Advisers, the National Science Foundation, or some other highly placed agency.

- (6) *What is the role of the States in research? Should the States be encouraged by the Federal Government to undertake more research and development or different types of research and development than they now characteristically carry on? Should the Federal Government employ the grant-in-aid device or other forms of incentive to encourage the States in their research endeavors? Behind these questions lie ones which relate to the diversification of scientific activity; the wisdom of encouraging lesser-known and less well-staffed and equipped public educational institutions to strengthen their scientific research and training activities; and the problem of centralization of financial responsibility and control for a very great segment of the national research economy in the Federal Government.*

A unique study of scientific research activities in six States, selected for their differing economies and regional locations, has been prepared, under contract, for the National Science Foundation. This study reveals that considerable research, largely of an applied character, and running into millions of dollars in value, is carried on by some of our more populous States. The President's Commission on Intergovernmental Relations refrained from deeply exploring the research relationships between Federal Government and States on the grounds that the National Science Foundation is moving in this area. A number of the conclusions of the aforementioned study, as, for example, that the grant-in-aid has acted as a strong stimulus to the States to undertake research, warrant careful attention in the formulation of Federal policies affecting science.

The six issues considered above are only a few of the problems confronting the Government in its scientific endeavors—perhaps the most important in terms of the allocation of scientific resources. One may

simply note that, in addition to these, are urgent questions with respect to the organization and programs of the Federal Government for international science; the problem of adequately informing the American public about the Government's scientific research programs; the scientific manpower problem and the supply-demand situation with respect to skilled personnel; the training of scientists and engineers and the burdens placed on our educational facilities by the requirements for more and more such persons. The list could be considerably expanded.

Having identified issues of science policy calling for high-level attention, we may now look briefly at the agencies or committees within whose responsibility falls the development or furtherance of national science policies.

THE SCIENCE POLICY AGENCIES

At present there are four organizations which have statutory or executive authority to provide broad policy direction to the Government's research and development effort. They include the quasi-governmental National Academy of Sciences-National Research Council, the National Science Foundation, the Interdepartmental Committee for Scientific Research and Development, and the Science Advisory Committee of the Office of Defense Mobilization.

The National Academy of Sciences was created by act of Congress during the Civil War as a nonprofit organization devoted to the furtherance of science. Its charter requires it to act as an adviser to the Federal Government on scientific matters when requested to do so. It is compensated for services rendered to the Government but is not otherwise federally supported. The National Research Council was organized by the Academy in 1916 to bring to bear the talents of the scientific community on the technical problems generated by the First World War. The Academy-Research Council operates largely through boards and committees. It does not usually engage directly in research but makes its contribution through conferences, surveys, the sponsorship of research, and so forth. As a policyguiding body, the Academy-Research Council cannot be said to play a vital role since it is generally more concerned with arranging for the solution of specific technical problems than in advising on broad scientific issues. An illustrative exception to this situation, however, occurred when the Academy was asked by the White House in 1955 to provide counsel on the Government's loyalty policies in relation to Federal support of unclassified research. The subsequent report was in most respects a policy-oriented document.

The National Science Foundation was created by act of Congress in 1950. Its responsibilities include, among others, the development and encouragement of a national policy for the promotion of basic research and education in the sciences; recommending to the President policies for the Federal Government which will strengthen the national scientific effort; appraising the impact of research upon industrial development and the general welfare; and reviewing the scientific research activities of the Government in order to improve their coordination and administration. The nonpolicy responsibilities of the Foundation which consume most of its fiscal and staff resources include the making of grants for basic research, largely to colleges

and universities; the furtherance of education in the sciences through fellowship programs, science teacher-training programs, and so forth; and the dissemination of scientific information through a variety of activities designed to improve communication throughout the scientific world.

The National Science Foundation has, to date, played a modest role with respect to national science policies. It has advised on Government policy for the payment of overhead to colleges and universities in connection with research grants and contracts; has developed advisory papers on selected other issues; and has indirectly implied policy through the sorts of decisions it makes in connection with its own grant and other ongoing programs.

The Interdepartmental Committee on Scientific Research and Development (ICSRD) was established by Executive order in 1947. Its membership is made up of persons designated by the heads of the principal departments and agencies having research and development activities. Its secretariat is located in the National Science Foundation. Among other duties it is directed to recommend steps to make the Government's research programs effective in promoting the national welfare; to make recommendations on administrative policies and procedures affecting Federal research; and to study and report on current policies and administrative practices related to Federal support of research.

In practice the ICSRD has concerned itself largely with administrative problems affecting Federal research and has tended not to be a policy forum.

The Science Advisory Committee of the Office of Defense Mobilization offers policy advice on scientific matters affecting the national security. It is made up of several non-Federal and four Federal members. Its secretariat is located in the Office of Defense Mobilization and it reports to the Director of that organization. Its advisory responsibilities cover guidance on effective utilization for security purposes of scientific resources in the Nation. It also advises on scientific aspects of the ODM program, and, as requested, undertakes special studies on problems of science and the national security.

The organizational problem

With such an array of agencies to deal with science policies, query can be made as to why so many major issues lie virtually unattended. Clearly if as suggested above, the issues of science resource allocation are to receive governmentwide consideration they must be handled at a level which will provide this perspective. And they must be handled at a level which is close to the ultimate decisionmakers, if considerations of a parochial nature are to be avoided. An organization like the National Academy of Sciences-National Research Council, since it is outside of the governmental structure is not able to take the governmentwide view with ease. In addition, as it has evolved over the years it is a body especially capable of seeking out technical competence for the solution of specific scientific problems, rather than an organization adopted to handling broad policy issues.

The National Science Foundation, which was created amid high hopes that it would provide policy leadership, has in fact done so in a most limited manner. Why is this the case? One may find the answers in several directions. First the agency was given not only

a policy job to do but also several "operating" tasks such as administering a basic research grant program, maintaining a national roster of scientific personnel, administering a fellowship program, developing programs and projects to aid science teachers and to improve the teaching of science, etc. The operating tasks were relatively clear and were naturally tackled first. The staff which was recruited for these purposes was oriented to specific fields of science, to universities and to university teaching. The interests of the National Science Board seem to have been in similar directions. Both staff and Board continue to make an admirable contribution to the Government's scientific responsibilities through expertly administering the foundation's "operating" tasks.

It must be observed, however, that the perspectives needed for the successful performance of such work are quite different from those needed for working out the leadership role which the Government's central science agency will play. The knowledge of how Government works, of the value of conflict in the political environment, of strategy in stimulating interagency consultation for ultimate resolution of policy problems, tend to be foreign to the university-minded scientist.

Second, the foundation in its policy mandate under the act creating it (Public Law 507, 81st Cong.) was provided with vague language. The subsequent Executive order (No. 10521, dated March 17, 1954) which was intended to clarify the foundation's policy responsibilities, hardly did so. Nonetheless, in fairness to the situation it must be observed that understanding and firm leadership on the part of the foundation could have made good use of the policy authority under the act and Executive order, despite some lack of clarity.

Third, the foundation as a policy agency was misplaced in the organizational structure of the Government. A policy body should not be a peer among agencies for which it is formulating policy. Coupled with this is the fact that as an operating agency the foundation competes for research talent in its grant and fellowship programs with many other Federal organizations. Its objectivity naturally comes under suspicion. (For an excellent appraisal of the National Science Foundation see *The National Science Foundation: The First Six Years*, by Dael Wolfe, in *Science*, August 23, 1957, vol. 126, No. 3269, pp. 335-343.)

The limited policy role of the ICSR is yet another story. The committee came into being as a result of a recommendation in the 1947 Steelman Report. In theory it was to go out of existence when and if a National Science Foundation were created. There is some evidence that certain agency research heads who were fearful that the National Science Foundation might become too strong a force, were instrumental in keeping the ICSR alive after 1950. In addition, the Bureau of the Budget has tended at times to talk of a built-up role of the ICSR to fill the vacuum left by the National Science Foundation's inaction in the public policy area.

Whatever other reasons there may be for the continued existence of the ICSR, this much is certain: It is invaluable to have in Government research councils the kind of advice which can only be obtained from the collective judgment of the research heads of Government agencies. The ICSR has tended over the years to deal with administrative problems rather than with broad issues of science policy. Its sessions increasingly have been attended by persons in second- and

third-level positions rather than by agency research heads themselves. The consequence is that the policy guidance which Government needs from its own research directors has not been forthcoming—or at least has been available only sporadically.

The greatest success story among the science policy agencies is to be found in the Science Advisory Committee of the Office of Defense Mobilization. However, it must be remembered that the Science Advisory Committee in advising on scientific matter related to the national security is influenced by several factors. It has had a reasonably clear sense of purpose, a firm and imaginative leadership, good support from the Director of the Office of Defense Mobilization and, through him, access to the highest councils in the Government. It has shown ingenuity in the arrangements developed for the conduct of some of its policy-oriented studies and it has given evidence of sophistication in its manner of operating in the administrative-political environment of the Executive Office of the President.

POSSIBLE DIRECTIONS FOR THE FUTURE

Over the past century numerous proposals have been developed with respect to organization which could be created to give the Federal Government top policy leadership in science. (See A. Hunter Dupree's *Science in the Federal Government*; the Belknap Press, 1957.) For example, that there be a Department of Science has from time to time been suggested. It seems safe to say that no one today who is cognizant of the complexity of Federal research, and of its need to be kept close to the functional problems it is attempting to solve, gives serious attention to the idea of placing all scientific activities within a single department.

Such current thinking as exists on the problem of reorganization for improved science policy leadership runs in fairly obvious directions. There is some argument for attempting to strengthen the role and the hand of the National Science Foundation. However, to do this would require a separation from the Foundation of the operating program which it handles so effectively, since otherwise the basic dilemma of the Foundation would remain. It would also call for elevating the Foundation to a position in the Executive Office of the President.

At least limited sentiment has existed for attempting to create of the Interdepartmental Committee for Scientific Research and Development of the ODM's Science Advisory Committee, a central science policy body. In the case of the former, its stature as a committee created by Executive order and as a spokesman for the Government's own research establishment would seem to raise serious doubts. A science policy body should have congressional sanction. Its composition should be such as to make it a spokesman for the national interest in science and not solely for the interests of the Government's own laboratories. As for the Science Advisory Committee, its mandate to be concerned with scientific problems related to the national security precludes it from the generality of interest which is essential to a science policy body.

While the various defects noted above could be corrected through legislation (theoretically even the National Academy of Sciences' National Research Council could be transformed into a Federal agency

and made the central policy body) much would be lost in each case. The National Science Foundation has important operating work to do, especially in supporting basic research and in aiding the development of new scientific talent. The ICSR, as a forum for the research heads of government agencies, is needed; indeed, its role in this respect should be greatly strengthened. The Science Advisory Committee, in the science-national security area, is invaluable. It should not be reoriented to deal with all the issues of science and government since its present work might then become secondary to the handling of more general issues.

The answer rather clearly seems to lie on the creation of either an Office of Science Adviser to the President or a small Council of Science Advisers in the Executive Office of the President. In view of the oft-repeated fear of the scientific community that no one man should be allowed to represent science, the council concept, which has worked so admirably on the economic front, is probably more tenable.

Such a Council of Science Advisers should be appointed by the President, who also should designate a chairman from among the committee members. The importance of the issues at stake, not only those problems of allocation which have been discussed above, but the many more which have been alluded to, suggest that the Council should be a full-time body and that therefore the membership should be limited to perhaps three persons. These individuals must, of course, have the respect of the scientific community. But of even greater importance than, for example, past evidence of creative scientific ability, would be present evidence of a capacity to elevate the interests of the Nation above specific issues of a technical character, an awareness of the tremendously important, if sometimes submerged, role which science plays in contemporary life, a capacity for working effectively in the political environment, and a willingness to assume the risks which leadership implies.

The Council should be supplied with funds for a small staff; funds for some research on problems of science and government probably to be done under contractual arrangements; and authority to request the assistance of the National Science Foundation, the Science Advisory Committee, and other Federal agencies with research programs and responsibilities, in the analysis of the many unresolved issues related to science and government.

In addition, the Council should have regular access to the ICSR, probably through some formal association, in order that it be kept privy to both technical and administrative problems arising in the Government's own research endeavors.

To complement this strengthened arrangement in the executive branch, it would appear wise for the Congress to create a Joint Committee on Science. The problems of diffusion of responsibility for scientific affairs which characterize the Executive have their counterpart in the Congress, where scientific programs and problems must ordinarily be viewed piecemeal rather than in relationship one to another.

The issues of science are frequently undramatic. If, as a nation, we are failing to educate substantial numbers of our most talented youth to careers in science, or if we are insufficiently encouraging basic research or research in certain fields of science, the losses to society are

not now easily discernible. The failures will become apparent in the future, perhaps the distant future, when consequences are felt in ways now unpredictable. Should the national economy seriously falter, should the national defense prove disastrously inadequate, citizens of a later time could look back to fix the blame.

In a sense, we are at a fortunate moment in history to be considering this problem. We have recently learned what a society—one long considered backward—can do, even under fearful conditions of political control, when it wishes to further science. Given all of the favorable attributes of the American environment, freedom of thought and freedom for dissension, educational and physical resources in abundance, and a cultural climate of great vigor, it would seem astonishing if we cannot get our house in order in the interest of strengthening science for the Nation.

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