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SENATE

{ REPORT
No. 16 }

ESTABLISHMENT OF A COMMISSION
ON SCIENCE AND TECHNOLOGY

REPORT
OF THE
COMMITTEE ON GOVERNMENT OPERATIONS
UNITED STATES SENATE
ON
S. 816



MARCH 4, 1963.—Ordered to be printed

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Mr. McCLELLAN, from the Committee on Government Operations,
submitted the following

R E P O R T

[To accompany S. 816]

The Committee on Government Operations, to whom was referred the bill (S. 816) for the establishment of a Commission on Science and Technology, having considered the same, report favorably thereon and recommend that the bill do pass.

ANALYSIS OF PROVISIONS OF S. 816

Declaration of policy

This bill proposes the creation of a Commission to be known as the Commission on Science and Technology. *Section 1* of S. 816 declares it to be the policy of the Congress to strengthen American science and technology as an essential resource toward the attainment of the highest potential of Government contribution toward (a) the promotion of the national security; (b) continued national progress in an era of universal scientific and technical development; (c) the procurement and training of the best qualified leadership to maintain and promote world peace; and (d) insuring the maximum utilization of all available scientific know-how and information by coordinating the research and development programs of the Federal departments and agencies with those of American business and industry and with nonprofit organizations, including universities and other educational or technological institutions.

Section 1 also emphasizes the importance of formulating a program for the establishment of national policies which will require coordination of science and technology programs and operations of the Federal Government, through necessary reorganizations of existing departments and agencies which relate directly to Federal science, scientific

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research and technology, increased efficiency in establishing systems for perfecting a scientific information program, and for the improvement of policies for recruiting, training, and utilizing Federal scientific and engineering manpower.

The bill includes, also, a special provision relating to, and assessing, the importance of how the executive and legislative branches can more effectively achieve common objectives for the advancement of science and technology in the legislative process, as recommended by witnesses appearing at the hearings on an identical bill in the 87th Congress, held on May 10 and July 24, 1962.

Objectives

Section 2 sets out precise objectives to which the Commission might direct its attention to include, among other areas of study, the following:

(1) The establishment of programs, methods, and procedures for the effective reorganization of Federal departments and agencies operating, conducting, or financing scientific programs and supporting basic research in science and technology, with the objective of insuring more effective performance of these essential services, activities, and functions;

(2) The elimination of undesirable duplication and overlapping between Government departments and agencies engaged in scientific and technological research, and in information storage, processing and distribution services, activities, and functions, with particular emphasis upon effecting the maximum utilization of the resources of private industry and nonprofit research organizations, including universities and other educational or technological institutions; and

(3) The assurance of the conservation and efficient utilization of scientific and engineering manpower.

The commission would be further authorized and directed under *section 2* to make a determination as to the need for establishing within the executive branch of the Government a Department of Science and Technology, or for the reorganization of existing scientific and technological functions through the transfer of such functions to existing or new executive departments or agencies, to provide more effective and better coordinated Federal science programs and operations. The bill provides that, if such a Department of Science and Technology is deemed necessary, the Commission should, in so recommending, determine what existing functions or agencies should be transferred to the new Department, or to other departments, and which functions and operations, now performed by Federal departments and agencies, can more properly be performed by private industries or nonprofit organizations, including universities and other educational or technological institutions.

The Bureau of the Budget interposed objections to certain committee guidelines contained in *section 2* of the previous bills to create a Commission on a Department of Science and Technology (S. 1581, 86th Cong., and S. 2771, 87th Cong.), on the premise that it might be construed as a directive to the proposed Commission to submit such a recommendation. The committee feels, however, that inasmuch as practically all witnesses, and numerous statements, articles, and extracts from publications and books which were inserted in the record of the hearings, advanced or dealt at length (either for or against), with recommendations that a Cabinet officer for science and

technology should or should not be appointed, the proposed legislation should contain a specific directive that the Commission determine whether such a department is necessary.

Some of the members of this committee have indicated that they were inclined to support the creation of such a department, but have been unable to recommend legislation to achieve this objective. There was no agreement among the expert witnesses who have testified as to what functions or agencies should be included in such a department, if it is established. All witnesses were in agreement that many of the scientific and technological functions of the Government should remain a part of the mission of existing departments, and that certain of those agencies established to perform functions in specialized areas of science, education, or research and development might operate better as independent agencies, or as presently constituted. None made specific proposals as to which agencies or functions should be included or which should continue to operate outside of such a department. Accordingly, the bill also directs that the Commission recommend, if it should determine that such a department is necessary, what functions and operations should be transferred to the new department, which should remain independent, or remain as an essential component of existing departments as essential to the primary mission of the department in which they are presently located.

General provisions

Section 3 of the bill waives the application of conflict-of-interest statutes for members or employees of the Commission while serving on a part-time or full-time basis with or without compensation.

Section 4 provides that the Commission shall be composed of 12 members of whom (a) 4 are to be appointed by the President, 2 from the executive branch of the Government who are participating in Federal scientific or technological activities, and 2 from private life who are eminent in one or more fields of science or engineering, or who are qualified and experienced in policy determination and administration of industrial scientific research and technological activities; (b) 4 to be appointed by the President of the Senate, 2 from the Senate and 2 from private life who are eminent in one or more fields of science or engineering, or who are qualified and experienced in policy determination and administration of industrial scientific research and technological activities; and (c) 4 appointed by the Speaker of the House of Representatives, 2 from the House of Representatives and 2 from private life who are eminent in one or more fields of science or engineering, or who are qualified and experienced in policy determination and administration of industrial scientific research and technological activities.

Sections 5 and 6 provide that the Commission shall elect a Chairman and Vice Chairman from among its members, and that seven members of the Commission shall constitute a quorum.

Section 7 provides that Members of Congress and members of the Commission who are in the executive branch of the Government shall serve without compensation in addition to that now received, but shall be reimbursed for travel, subsistence, and other necessary expenses incurred by them in the performance of the duties vested in the Commission. Other members of the Commission shall receive \$100 per diem when engaged in the actual performance of such duties; plus necessary expenses.

Section 8 authorizes the Commission to appoint and fix the compensation of such personnel as may be required in accordance with provisions of the civil service laws and Classification Act of 1949; and that the Commission may procure, without regard to the civil service laws and the Classification Act, temporary and intermittent services at rates not to exceed \$75 per diem for individuals.

Under this section, the Commission would also be authorized to negotiate and enter into contracts with private business and nonprofit research organizations, including universities and other educational or technological institutes; to conduct such studies and prepare such reports as the Commission feels necessary to discharge its duties; and that financing and administrative services may be provided to the Commission by the General Services Administration.

Establishment of a Science Advisory Panel

Section 9 provides that the Commission shall establish an advisory panel, including competent and experienced members of the scientific and technical communities of the United States, to serve on request as consultants to the Commission or to individual members thereof while performing the duties of the Commission. The panel would consist of such number of qualified persons drawn equally from Government, private industry, and nonprofit organizations, including universities and other educational or technological institutions as the Commission deems to be adequate, who shall be chosen on the basis of competence, experience, integrity, availability, and ability to communicate not only to professional scientists but to laymen.

Reports, hearings, and termination of Commission

Section 10 requires that the Commission shall submit interim reports to the President and the Congress as it deems advisable, and that its final report shall be submitted to the President and the Congress not later than January 1, 1965. The final report of the Commission shall propose such legislation and administrative actions as in its judgment are deemed necessary to achieve its recommendations.

Sections 11, 12, and 13 authorize the Commission to hold hearings and take testimony as may be deemed advisable to secure required information and other data from executive departments or agencies upon request made by the Chairman or Vice Chairman; the necessary appropriations; and that the Commission shall terminate 30 days after submitting its final report.

COMMENTS OF THE DIRECTOR OF THE OFFICE OF SCIENCE AND TECHNOLOGY BEFORE HOUSE SUBCOMMITTEE

Dr. Jerome B. Wiesner, Director, Office of Science and Technology, appeared before the Military Operations Subcommittee of the House Committee on Government Operations on July 31, 1962, approximately 7 weeks after Reorganization Plan No. 2 of 1962, creating that Office became effective, in connection with the subcommittee's inquiry into Government contracting for research and development. The following are extracts from Dr. Wiesner's testimony:

Science and technology not only play a significant role in the making of policy, but are crucial in illuminating choices before us. Yet, we well know that science itself is neutral in the affairs of men and can be used for good or evil. It is

only with wisdom that these potent creative forces can be turned to the benefit of all peoples. In an era of explosive growth and international tensions that evoke an unprecedented demand on our total resources—physical and intellectual—there is need to make most effective use of our total technical resources.

Because of the energy and pervasiveness of science, with our expanded technical efforts, with diffusion of science in every facet of national life, the manner in which we as a Nation arise to the challenge to manage this enterprise is one of the crucial issues of our time. Many institutions are involved—Federal Government, State and local governments, universities, private industry, nonprofit organizations, the scientific and engineering community. And that is why, of course, the problem is complicated.

But as measured either by funds or by the impact of policy decisions, the Federal Government has been increasingly obliged to assume responsibility for identifying those areas needing stimulation and nourishment, for determining the scale and mode of conduct of research, and for setting priorities.

Because it occupies this key role, the Federal Government must take those steps in policy formulation, imaginative long-range planning, and tough management required to meet today's problems. At the same time, it is essential to maintain a sensitive concern for preserving the freedom, strength, and vigor of the nongovernment entities—of the contributions of competitive free enterprise and of the freedom of inquiry of the universities.

We are faced with two major realities:

- (1) The increasing role of science and technology in policy decisionmaking; and
- (2) The increasing Federal support for research and development.

These two aspects are sometimes contrasted as the "role of science in government" and the "role of government in science." While they are clearly related, it is important to recognize that they often pose quite different problems and, in fact, are often confused.

That scientific research and development is a major element in our most excruciating decisions must be clear from the almost daily recital of issues before the President and before the Congress. Not only is there more intimate involvement of science and engineering in many vital national decisions today than in times past, but there is also an accelerating tempo of activity, an increasing complexity of issues involved (most of which are neither black nor white), increasingly numerous alternatives, a growing serious consequence of error. There is unprecedented need for human faculties of critical judgment, and a need for administrative processes that provide for flexibility, innovation, and feedback and processes which amplify the role of fact as compared to that of opinion.

* * * I think there are two problems. There is a problem of correlation. Here you will have a very difficult problem, very similar to the one I have. Second, this is a problem of selection. It is going to be hard for me to discipline myself not to try to second-guess everything that other people are doing, and I think the Congress will have exactly the same problem. My own operation will be restricted in its ability to do too much by the small size of its staff, and I presume this will be the case here, too, because agencies have thousands of technical people available and we have only a dozen or so and are not planning to grow into a large agency. And I am sure that Congress itself will never have a very large technical group. So one has to be concerned in carrying out these functions with making broad overall judgments and with general assessment of the directions rather than with detailed technical study. * * *

There has been concern, first as to whether a Department of Science was needed to centralize science programs and operations that are now integrated in various departments and agencies, perhaps by combining National Science Foundation, Atomic Energy Commission, National Aeronautics and Space Administration, National Bureau of Standards, and so forth; and second, concern expressed in these studies as to whether staff resources in the Office of the President were adequate to meet his needs. * * *

As I have said many people believe that the present system is inevitably evolving toward a Department of Science. However, I don't believe that a single Department of Science with the responsibility for all of the scientific activities of the Federal Government would be a workable arrangement because most of the scientific activities of the individual agencies are carried out in support of their specific missions. If, as has been proposed, a less comprehensive Department of Science were created—by consolidation of the Atomic Energy Commission, National Science Foundation, National Bureau of Standards, and other agencies I talked about earlier—their operations might be made more effective. There would still be need, however, to coordinate and integrate their activities with that of the mission-oriented agencies having related scientific and technical programs. In other words, the OST is neither a substitute for nor in competition with a Federal Department of Science.

This statement by Dr. Wiesner is in accord with the views expressed repeatedly by this committee, and by witnesses testifying at the hearings before the committee, and conforms to the objectives set forth in S. 816. The committee has always taken the view that a comprehensive study must be made by a commission composed of qualified persons who are familiar with the problems relating to the operation and support of science and technological programs by the Federal Government. The committee has also repeatedly pointed out that such a study is vital in order to determine whether there is a need for a Department of Science and Technology. Also, that if such a department is necessary, that the commission should further

recommend what Federal activities should be incorporated therein, and a determination made as to those which would better perform their allocated tasks as independent agencies or as components identified as an important function related to the mission of existing departments. These are among the major objectives of the proposed legislation being submitted to the Congress in the subject bill.

The committee also took the view as stated by Dr. Wiesner, when considering Reorganization Plan No. 2 of 1962, that, even should a Department of Science be created, there would still be need for an Office of Science and Technology in the Executive Office of the President in order to insure that there was proper coordination of its activities with those dealing with science in other agencies.

COMMENTS OF THE EXECUTIVE ASSISTANT DIRECTOR OF THE BUREAU
OF THE BUDGET

In a speech before the Conference for Federal Executives at Williamsburg, Va., January 24, 1962, Mr. William D. Carey, Executive Assistant Director of the Bureau of the Budget, said—

* * * . As useful as the Science Adviser has become to the President, to the Bureau of the Budget, and to the scientific community, it remains an essentially unseen instrument of policy coordination. We have not yet evolved a mechanism which stands vulnerable to the full light of day as a focus for accountable leadership in expressing the nation's goals for the use of its scientific resources. We have no single spokesman to articulate a coherent synthesis of the relation between science and public policy, no advocate, defender or rationalizer of science before Congress and public opinion. Is there, possibly, more that is needed? Are we approaching the day when science must have a surer place in the structure of Government, perhaps in the form of a Department of Science, or alternatively in the shape of a group of wise men whom we might call a Council of Science Advisers, paralleling the Council of Economic Advisers? I am less than sure what the answer should be.

BACKGROUND—COMMITTEE REPORTS, STAFF STUDIES

Science and Technology Act of 1958 (S. 3126)

On January 27, 1958, a bill (S. 3126), entitled the "Science and Technology Act of 1958", was introduced in the Senate under the joint sponsorship of Senators Humphrey, McClellan, and Yarborough.

The bill contained provisions authorizing (a) creation of a Department of Science and Technology; (b) coordination and improvement of Federal functions relating to assembling, translating, collating, retrieving, and distributing scientific information; (c) educational loans for the purpose of encouraging and assisting students beyond the secondary school level in the fields of physical and biological sciences, mathematics, and engineering; (d) establishment of National Institutes of Scientific Research; and (e) establishment of cooperative programs outside the United States for collecting, collating, trans-

lating, abstracting, and disseminating scientific and technological information, and to conduct and support other scientific activities, through the use of foreign currency credits.

Senate Document No. 90, 85th Congress, provides complete information relative to the provisions and objectives of S. 3126, including another title, which was omitted when the bill was introduced in the Senate, providing for the establishment of standing Committees on Science and Technology in the House and Senate (pp. 33-40; 63-66).

Progress report on science programs (S. Rept. 2498, 85th Cong.)

In a report entitled "Progress Report on Science Programs of the Federal Government" (S. Rept. 2498), compiled and issued by the Subcommittee on Reorganization and International Organizations on behalf of the full committee, on September 9, 1958, a résumé was made of all legislation enacted or proposed during the 85th Congress, which was in accord, generally, with the provisions of the Science and Technology Act of 1958, or was in some way interrelated with other science activities of the Federal Government.

This report included recommendations for the establishment of institutes of scientific research (p. 33), along the general lines recommended in the document entitled "Report to the President on Government Contracting for Research and Development" (S. Doc. 94, 87th Cong.), as follows:

As was pointed out in the information developed by the staff in Senate Document 90 (p. 45), the establishment of institutes of scientific research will enable this Nation to meet not only its basic scientific needs, but would make important contributions toward the development of its applied research as well. Since the committee staff originally stressed the point that the institutes which might be created in accordance with the objectives of this title would be operated primarily by educational or other nongovernmental institutions on a nonprofit basis with the funds supplied by the Federal Government, or, in certain instances in part by private industry, this act will permit operations of this nature under contracts or grants from one or more Federal agencies which may have an interest in broad research programs.

As was pointed out by Dr. James R. Killian, at the MIT regional conference on March 1, 1958, "it is increasingly clear that within institutions it is going to be necessary to create groups of a size sufficiently large to be effective in achieving an integrated approach to certain complex scientific and technological problems. We need to think of how we can establish institutes within educational institutions which make possible a multiple-discipline attack on a problem."

Examples of the types of institutes that may be eventually established would be Institutes of Meteorology, Oceanography, and Solar Energy. In these fields the needed effort in the national interest appears to be of such magnitude as to be beyond the existing resources of single universities or presently established research institutes. Also, economic

incentives do not presently exist which would justify the undertaking of large research programs in these fields by industrial firms. Additionally, scientific progress in meteorology and solar energy may have ultimate implications of the highest significance with respect to arid areas of the world which are economically underdeveloped and politically uncommitted.

Science program—86th Congress (S. Rept. 120, 86th Cong.)

A further report, supplementing the information contained in Senate Report 2498, 85th Congress, outlining administrative actions taken to implement the science programs established under authority of legislation approved in the 85th Congress, and by reference to related legislative proposals introduced in the 1st session of the 86th Congress, was compiled by the staff of the committee and filed in the Senate on March 23, 1959 (S. Rept. 120).

This report includes details relative to (1) the operations of the program approved by the Congress directing the National Science Foundation to expand its program for the coordination of Federal activities dealing with gathering, collating, indexing, retrieving, and distributing scientific information, and to contract through private groups, qualified in this field, for the performance of such services as are necessary to perfect a national program to insure that scientific information will be made readily available to scientists and others when required; (2) legislative and administrative actions in other areas of science, such as the effectiveness of programs relating to educational grants; (3) utilization of foreign currencies in assembling, translating, and distributing scientific materials abroad through the use of foreign credits; and (4) establishment of institutes of scientific research, as proposed in the original Science and Technology Act of 1958, in the fields of meteorology, oceanography, and other basic sciences which will require substantial Federal support and appropriations. The report also sets forth other advancements made pursuant to congressional authorizations by executive or administrative actions initiated by the President and other officials following the enactment of the science programs by the 85th Congress.

The information contained in Senate Report 120 indicated the extent to which Government operations expanded in all fields as recommended in the Science and Technology Act of 1958, such as centralizing administrative controls and coordination of Federal science programs, documentation, educational loans or grants, establishment of central institutes of science, and utilization of foreign credits for the development of programs for assembling and distributing scientific information and the advancement of other science programs abroad.

Science and Technology Act of 1959 (S. 676)

On January 23, 1959, a revised bill, S. 676, entitled the "Department of Science and Technology Act of 1959," was introduced in the Senate under the joint sponsorship of Senators Humphrey, McClellan, Ervin, Gruening, Yarborough, and Muskie.

Title I of the Science and Technology Act of 1958, proposing the creation of a Department of Science and Technology was the only section of the original bill which was incorporated in S. 676, with cer-

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tain revisions. In its progress report to the Senate (S. Rept. 2498, 85th Cong.), the committee stated (p. 14) that—

The Committee on Government Operations was not afforded an opportunity to hold hearings on title I during the 85th Congress, due to the rereference of the bill to the Senate Special Committee on Space and Astronautics, but the staff, at the direction of the committee, has maintained a continuing study of the proposal to establish a Department of Science. The response of scientists to the staff proposal, since the release of Senate Document 90, has been most gratifying and helpful. Constructive criticisms in opposition to the proposal, as well as stimulating and cogent alternative suggestions, have been received and will continue to be sought by the committee. * * *

Hearings—85th Congress

Following rereference of the Science and Technology Act of 1958 to the Special Committee on Space and Astronautics, it was agreed by the chairman of the Subcommittee on Reorganization of the Committee on Government Operations and by the chairman of the special committee to permit the Subcommittee on Reorganization to develop certain aspects of the proposed program as set forth in title I, relating to the establishment of a centralized scientific information center. Hearings were held on May 2, 6, and 7, and on June 25 and 26, 1958, to enable the subcommittee to properly evaluate the provisions of S. 3126 and its relation to existing programs dealing with assembling, translating, collating, abstracting, retrieval, and dissemination of scientific information.

The first phase of the hearings was directed toward developing testimony from representatives of various non-Federal agencies, groups, and individuals who are active in this field, in an effort to establish the status of operations of existing private facilities, and to what extent the Federal Government should participate in the formulation of a centralized and coordinated program.

The second phase of the hearings was directed at developing essential facts relative to the present operations of Federal agencies, any deficiencies in existing programs, and the need for improvement of Federal services in the documentation field, including recommendations for the establishment of an adequate program designed to accomplish the essential objectives as developed at the earlier hearings. The chairman of the subcommittee, in opening the hearings, stated that the subcommittee was proceeding on the assumption that many private and industrial abstracting, translating, and research groups can provide most of this type of service to the Federal research programs and scientists in our universities and industries, without the necessity of establishing a centralized dissemination service under the control of the Federal Government. The immediate objective was to develop authentic information as to services now being provided by private facilities engaged in the dissemination of scientific information, and recommendations for Government participation either in the way of establishing a scientific information center, if found to be necessary, or in providing funds in support of existing programs.

The chairman further emphasized that the subcommittee proposed to proceed on the assumption that existing laws are adequate to

permit agencies of the Government operating in this area, to provide the necessary facilities to initiate coordinated Federal programs, without the necessity of enacting further enabling legislation.

Competent witnesses who are actively engaged in various fields of scientific research and documentation, including representatives from universities, research institutes, abstract services, libraries, and private industrial research laboratories, presented detailed testimony at the first hearings. The subcommittee also received testimony from the representatives of the National Academy of Science—National Research Council, and included in the record of the hearings various communications received from scientists, librarians, and others which dealt with all aspects of documentation of scientific information, as well as comments and recommendations relating to provisions of the proposed Science and Technology Act.

The hearings were then channeled into the development of essential facts relative to the present operation of Federal agencies, deficiencies in existing programs, and the need for improvement of the operations of Federal agencies engaged in the documentation field. During the period of approximately 8 weeks that had elapsed between the first phase of the hearings, the respective agencies had been supplied with copies of the previous hearings and requested to examine and study the original testimony and to submit to the subcommittee at its concluding hearings an evaluation of the specific suggestions and recommendations made by representatives of non-Federal groups. Agency representatives were also requested to submit recommendations as to what further legislative action, if any, was necessary to fully implement such proposed programs; or to outline a program that might be developed under existing authority of law, with the objective of solving the scientific information problems and to insure that constructive steps would be taken for the implementation of a comprehensive and effective program.

Hearings—86th Congress—S. 676, to create a Department of Science and Technology

The Subcommittee on Reorganization and International Organizations held further hearings in the 86th Congress on S. 676, to create a Department of Science and Technology, and to transfer certain agencies and functions to such Department, and a related bill, S. 585, introduced by Senator Kefauver, to establish a Department of Science and to prescribe the functions thereof, on April 16 and 17, 1959. In his opening statement the chairman of the subcommittee made it clear that the main objective of the committee in conducting the hearings was to place emphasis upon the need to effect necessary and desirable reorganizations within the Federal Government structure which relate directly to Federal scientific activities, and to promote better centralization and coordination of Federal science programs and operations. It was emphasized that the bill then under consideration should be considered merely as an approach to the problems involved, and did not represent any final conclusions of the committee; that the committee hoped through the hearings to develop testimony which would lead to the approval of legislation which would promote more efficiency in governmental science activities and develop the proper framework under which science and technology can be molded to the greatest common good.

Recommendations for the creation of a Commission on a Department of Science and Technology

Practically every witness who testified at the hearings on S. 676 were in agreement that, in order to insure the establishment of a workable and acceptable program for the proper coordination of Federal science activities, reorganizations in existing Federal agencies dealing with science, technology, or engineering, a comprehensive study would be required. Some of the witnesses supported the objectives of S. 676, and others expressed opposition, at least until more information was available as to what agencies of the Federal Government should be incorporated in the proposed new Department, or in any agency that may be established for the centralization of such activities. The basis for opposition to the proposal for the creation of a Department of Science and Technology is set forth fully in Senate Document 90, 85th Congress, in Senate Report No. 120, 86th Congress, and in the committee hearings.

There was also general agreement, however, that there was an urgent need for the appointment of a Commission, patterned along the lines of the Hoover Commissions, to conduct a study as to whether or not a Department of Science should be created, and, if such a Department was found to be desirable, that the proposed Commission should recommend to the President and to the Congress which functions now being performed by other departments, agencies, and independent establishments of the Government should be transferred to such Department, and those which should remain in an independent status or as an essential part of the mission of existing departments.

It was suggested that the Commission be composed of eminent authorities in the fields of science, engineering, research, and technology, who are recognized leaders of the scientific and technological communities, representatives of the Federal Government who are engaged in basic civilian science activities, and of members of the legislative branch of the Government.

S. 1851, 86th Congress, proposed establishment of a Commission on Science and Technology

At the conclusion of the hearings, the staff of the Committee on Government Operations drafted a bill to accomplish these objectives. The bill, which proposed the establishment of a Commission on a Department of Science and Technology, was introduced in the Senate on May 5, 1959, as S. 1851, under the joint sponsorship of Senators Humphrey, Capehart, Mundt, Gruening, Muskie, Yarborough, and Keating. Further hearings on S. 676, S. 586, and S. 1851 were held on May 28, 1959.

In its report to the Senate on S. 1851 (S. Rept. 408, 86th Cong.) after reviewing the testimony of witnesses, some of whom recommended postponement of legislative action, the committee stated that—

* * * The inevitable conclusion was reached that it is the desire of the present administration to continue to center within the Executive Office of the President all control over civilian science operations. Unless legislative action is taken by the Congress to establish some medium through which reliable information and supporting technical data is made available to Congress by officials who are responsive to its

needs, the committees of the Congress will continue to be denied access to facts and reliable information necessary to the legislative process in establishing policies in the fields of science and technology. Under the present policy, Congress is denied access to such information through the appointment of officials in the Executive Office of the President and Presidential advisory groups composed of the leading scientists and engineers throughout the country. These appointees are responsible only to the President and the field is preempted insofar as the Congress is concerned in its efforts to obtain reliable and factual information which is essential to the legislative branch if it is to perform its normal constitutional functions.

It is the conclusion of this committee, therefore, regardless of the recommendations of administration spokesmen, that there is a real need for a bipartisan commission to study the problems relating to the proposed establishment of a Department of Science and Technology in order that the Congress may have access to officials who are responsive to its requirements, and provided with the necessary information to effect an equitable solution to the present problems relating to Federal science programs as may be determined by the President and the Congress.

As an essential first step in achieving these objectives, the committee recommends the enactment of S. 1851, so that the Congress and the President may have the benefit of the recommendations of qualified experts in the fields of science, engineering, and technology, upon which appropriate legislative action, directed toward the improvement of Federal science programs and operations, may be taken.

Federal and non-Federal science information processing and retrieval program (S. Doc. 113, 86th Cong.)

Pursuant to a directive of the Committee on Government Operations, the staff developed information during the 86th Congress in four areas of scientific documentation and information processing which included—

1. The present status of systems and equipment, relating to assembling, translating, indexing, abstracting, storing, processing, retrieving, and disseminating scientific and technological information, *now in operation or being developed within Federal agencies considered to be most active in science and technology.*
2. Programs already developed or being perfected to modernize systems of mechanized information processing and retrieval, *by recognized authorities operating in this field outside of the Government.*
3. Descriptive data relative to the latest and most proficient mechanized systems and machines now available or being developed for the improvement of Federal scientific information retrieval operations, *from representative designers and manufacturers of automation equipment.*
4. *Reports from certain selected private industries as to progress they have made in perfecting information retrieval systems de-*

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signed to meet their own needs, with recommendations for improvement of Federal operations in this area

A draft of the proposed staff report was prepared, under the committee directive, after consultations with representatives of Federal agencies and private industry who are active in the above-outlined areas. The draft was then submitted to the agencies and industries cooperating in this study for editing and additional comments.

Following a review of the reports submitted to the committee by the cooperating agencies and participating groups and industries, a report was filed in the Senate on June 28, 1960, entitled "Documentation, Indexing, and Retrieval of Scientific Information." (S. Doc. 113, 86th Cong.) The demand for this document was such that it was necessary to reprint the document in the 87th Congress (S. Res. 95; S. Rept. No. 63).

Senate Document 15, 87th Congress

On March 10, 1961, the committee also submitted for printing an addendum to Senate Document 113, which contained an outline of actions taken toward the development of plans for the expansion of technical information programs by NASA and two agencies within the Department of Defense, which were prepared after the original document had been printed. This was printed as Senate Document 15 of the 87th Congress, which also included an outline of further legislative proposals prepared by the staff of the committee with the objective of bringing about better coordination of Federal civilian science programs and for the improvement of science information processing and retrieval programs of the various Federal agencies engaged in science activities.

SUBCOMMITTEE ON NATIONAL POLICY MACHINERY

Organizing for national security (science, technology, and the policy process) (86th Cong.)

The Subcommittee on National Policy Machinery, of which Senator Henry M. Jackson was chairman, held hearings on April 25, 26, and 27, 1960, on the subject of how our Government can best gear science and technology into foreign and defense policymaking. The chairman stated, in opening these hearings, that:

Science and technology are exercising a new and decisive influence on national power, prestige, and policy. The statesman, the soldier, and the scientist must work together as never before. The question now before the subcommittee is this: What is the right way to organize our Government to get the right scientific and technical programs at the right time?

The subcommittee's search for answers to this question represents one part of its broader task. That broader task is to determine whether our Government is now properly organized to meet successfully the challenge of the cold war. The fundamental problem is: How can a free society organize to outthink, outplan, and outperform totalitarianism—and achieve security in freedom?

Based on these hearings and further studies conducted by the staff, the subcommittee issued a report, on June 14, 1961, entitled "Science Organization and the President's Office." In the foreword the chairman set forth the basis of the report as follows:

Free institutions are now being challenged by resourceful and implacable adversaries. Their aim is no less than to write finish to freedom. As Mr. Robert Lovett told our subcommittee:

"If the public statement 'we will bury you' does not carry the message to us, then words have lost their meaning."

In today's world, the tide of political power flows with the tide of scientific and technical power. A decade ago we took our Nation's scientific and technical leadership almost for granted. Today it is being effectively contested.

We must bestir ourselves, lest sputnik and the cosmonaut mark only the beginning of a long list of Soviet firsts, and lest we fall short of our best in putting science to work for peace and welfare and individual freedom.

From the start of its nonpartisan study of how our Government can best organize to formulate and carry out foreign and defense policy, the Subcommittee on National Policy Machinery has given close attention to the impact of science and technology on national policymaking. * * *

The subcommittee staff has profited from discussions and interviews with over 50 distinguished scientists and Government officials who have lived and worked with this problem. The list of those consulted includes scientists familiar with problems of top-level science organization, departmental technical experts, Nobel Prize winners, and outstanding authorities on science and the policy process.

The subcommittee staff in its report concluded that—

In certain high priority areas the Special Assistant and the Science Advisory Committee have recommended steps for meeting long-term scientific needs. They have thus partly filled a gap left by the reluctance of the National Science Foundation to exercise the authority given it to "develop and encourage the pursuit of a national policy for the promotion of basic research and education in the sciences" and to "recommend to the President policies for the Federal Government which will strengthen the national scientific effort. * * *"

The President's own science aids, however, have not been clearly charged with the initiative for sparking across-the-board forward planning. As a practical matter, in addition, they are not now staffed to handle the full span of scientific and technical planning problems requiring Presidential attention. * * *

While the science advisers now give their chief and the Bureau of the Budget technical counsel in a number of areas, this Presidential-level staff assistance is needed on a broader front.

The Federal Council, as an instrument for assisting the President in monitoring agency programs, has been of only

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limited utility. It has worked under the limitations of all interagency coordinating committees of its kind. Where program stakes are high and agency differences deep, departmental heads have traditionally tried to bypass Council-type mechanisms. The balance of bureaucratic power is weighted heavily against the Federal Council. * * *

Many of the members of the Science Advisory Committee, although serving only in a part-time capacity, spend large amounts of time in Washington on Committee business. The Special Assistant, however, is the only science adviser who regularly works full time. The absence of other regular full-time counselors narrows the range and variety of technical judgment immediately available to the President.

The lack of full-time Advisory Committee associates handicaps the Special Assistant as well. He serves not only as adviser to the President but also as Chairman of the Science Advisory Committee and Chairman of the Federal Council. He needs more day-in day-out help.

The staff then proposed that—

The post of Special Assistant to the President for Science and Technology and the President's Science Advisory Committee should be made permanent parts of the Government—with statutory underpinning. The Administration should now consider the desirability of creating an Office of Science and Technology within the Executive Office of the President.

The Office would be headed by the Special Assistant to the President for Science and Technology. He would continue as a Presidential adviser and Chairman of the Federal Council.

The President's Science Advisory Committee would continue in its valued counseling role.

The Office would provide staff support for the President's Science Advisory Committee and the Council.

A science unit in the Executive Office would ratify the institutional and professional advisory role of the Special Assistant and the Science Advisory Committee. It would confirm that their responsibilities to the President correspond to those of Executive Office officials like the Council of Economic Advisers.

As will be noted from the extracts from the remarks of the Deputy Director of the Bureau of the Budget, when testifying on S. 2771 in the 87th Congress, the President's Reorganization Plan No. 2 of 1962, establishing the Office of Science and Technology in the Executive Office of the President, was based upon this subcommittee recommendation (p. 26).

SUBCOMMITTEE ON REORGANIZATION AND INTERNATIONAL
ORGANIZATIONS

The coordination of scientific information was a principal theme of the activities of this subcommittee during the 87th Congress.

It released a series of reports by the chairman and the subcommittee staff, documenting serious weaknesses in information exchange:

(a) Within the largest agencies, such as the Department of Defense, Department of Health, Education, and Welfare, and Department of Agriculture;

(b) Between the principal agencies supporting research and development.

The subcommittee's work may be seen in four hearing-exhibit volumes:

Two on "Inter-Agency Coordination of Drug Research and Regulation," hearings of August 1962;

Two on "Inter-Agency Coordination of Information," hearing of September 1962.

In addition, four mimeographed reports were issued by the subcommittee chairman:

March 1962—on the Department of Defense;

March 1962—on the Agency for International Development (with respect to overseas technical assistance of all types);

April 1962—on the Department of Agriculture;

May 1962—on the Department of Health, Education, and Welfare.

Each of these reports cited deficiencies in existing intra- and inter-agency information, organization, and procedure.

Types of information

The overall series of reports covered information of many types:

(a) On current research and development;

(b) On completed research and development (including research canceled prior to anticipated termination);

(c) In printed form—e.g., in articles, monographs, abstracting and indexing publications, books;

(d) In oral form—at conferences, seminars, symposia, congresses, in personal meetings, over the phone;

(e) In audiovisual forms.

Two printed reports were issued on shortcomings in coordination of information on current research: "Coordination of Information on Current Scientific Research and Development Supported by the United States Government" (S. Rept. 263, 87th Cong., 1st sess., May 18, 1961, 278 pp.); "Coordination of Information on Current Federal Research and Development Projects in the Field of Electronics" (September 20, 1961, 267 pp.).

Significance to proposed Commission on Science and Technology

The chairman of the subcommittee has expressed the view that the shortcomings in science information which the subcommittee has brought to light represent one of the many important reasons for the establishment of a Commission on Science and Technology. He has stated the following:

The evidence which has been compiled by the subcommittee staff and by myself leads to the following conclusions:

(1) This Nation is paying a staggering and largely unnecessary price because of weaknesses in the ramshackle system of scientific and technical information. The price involves a toll in the form of delays and gaps in strengthening of national security, lagging civilian technology, less than attainable services to human health, losses to the Federal Treasury.

(2) While actions by the Federal Government to remedy the shortcomings in information are not the only answer, they can be a decisive answer. The scientific and technical community knows that it is the U.S. Government which pays three-fourths to four-fifths of the research and development bill. Ultimately, it is Federal action, therefore, which must play the largest role.

(3) The agencies of the U.S. Government have made at least some noteworthy improvements in the internal management of their scientific information—i.e., on an intra-agency basis.

(4) However, the agencies have made comparatively little improvement in interagency management of information.

The underlying fact is that most agency systems have evolved along such completely different lines as to be largely incompatible. Moreover, the agencies have, to date, shown little interest in coming to grips with the chaotic conditions which prevail and which resemble a Tower of Babel in information diversity.

(5) The Office of Science Information Service, National Science Foundation, has stimulated numerous information advances within agencies. However, since OSIS has no authority over other agencies, it has had only limited success in fostering teamwork on an interagency basis. The interagency Federal Advisory Committee on Scientific Information, which functioned under its auspices and which is now defunct, accomplished little of genuine importance as regards Government-wide coordination.

(6) A new interagency group—the Information Committee of the Federal Council for Science and Technology—has only begun its efforts. It remains to be seen whether this organization will accomplish anything more than its predecessor, mentioned above.

(7) Commendable interest in improvement of information has been displayed by the Director, Office of Science and Technology. At his behest, an important report was prepared by a panel of the President's Science Advisory Committee ("Science, Government, and Information," January 10, 1963). The report makes numerous important suggestions. Its recommendations, however, fall far short of the bold proposals for a system of Government-wide clearinghouses which had been proposed by a task force to the President's Science Adviser ("Scientific and Technological Communication Within the Government," April 1962).

(8) There is an urgent need for review of the organization and location of major Federal science information organizations. These organizations have tended to grow up in the executive branch in a haphazard, illogical, arbitrary way. For example:

The organization which registers current research—the Science Information Exchange—is located within the Smithsonian Institution, where it bears no organic relationship with any other information activity or agency.

Ambiguity of authority persists between the National Science Foundation's Office of Science Information Service

and the Office of Technical Services, Department of Commerce.

The information programs of the National Bureau of Standards' Data Processing Section are not fulfilling a fraction of their potential contribution to Government needs.

Hundreds of specialized information centers have proliferated throughout the United States and largely under Federal auspices. With but few exceptions, these centers bear little relationship: (a) to one another, (b) to any other Federal agency but the one which directly supports them, or (c) to the regional report depository centers, recently established by the National Science Foundation and the Department of Commerce, or (d) other information activities "in the field."

(The largest sponsor of the centers—the Department of Defense—has yet to take substantive action to bring about a meaningful relationship between the Armed Services Technical Information Agency and the scores of specialized centers.)

Subcommittee conclusions

It was the conclusion of the subcommittee that a Commission on Science and Technology could serve as an important instrument for the examination of problems such as those just mentioned. Only an independent Commission could make the type of root-to-branch analyses of the information confusion which continues to characterize the executive branch.

Experience indicates that no Federal agency is likely to take the initiative of recommending the reduction of its own size. Thus, none is likely to recommend the transfer even of those of its information functions which bear no inherent relationship to the agency's central mission. Yet, some interagency information functions can be consolidated in the interest of economy, efficiency, and service—and without the slightest impairment of individual agency missions.

No one claims that coordinating information is a cure-all for management ills; but few ills will be cured if information is too late, too disuniform, too fragmented, too hard to get, too unreliable.

Five years ago, the doubters looked askance when the Committee on Government Operations and this subcommittee claimed that the information explosion had precipitated an information crisis. Today, most of these doubters are quoting our very words. But today, the doubters deny that a reorganization of information services is necessary. I believe that the future will prove them just as wrong as has the past.

HEARINGS ON S. 2771, 87TH CONGRESS

S. 2771, a bill which is identical to the pending measure, was introduced in the 87th Congress on January 31, 1962, under the joint sponsorship of Senator John L. McClellan, chairman of the committee, Senator Hubert H. Humphrey, chairman of the Subcommittee on Reorganization and International Organizations, and Senator Karl E. Mundt, ranking minority member of the committee. Senators Norris Cotton and Ralph W. Yarborough also joined as cosponsors.

Hearings were held on May 10 and July 24, 1962. In his opening statement, Senator McClellan set forth the objectives as follows:

Ever since the Russian Government put sputnik into orbit, the citizens of this country have become more conscious of the need for an accelerated science program. In 1957, President Eisenhower appointed the first science adviser to the President in the hope that Government science programs could be speeded up and better coordinated. At the present time, President Kennedy is proposing to create an Office of Science and Technology in the White House, which will be headed by a Director who will have responsibility for coordinating Government science policy.

We hope that those experts who appear before the committee will be able to shed some light on the overall problems which we face. These problems have been outlined on numerous occasions before this and other committees of the Congress by various authorities who have stressed the urgent need for improvement in effecting necessary reorganizations and better coordination of existing programs. Emphasis has also been directed toward the need for developing a program for the elimination of duplication in science efforts, where one agency of Government works on programs which are underway in other agencies, or where research is being done on problems which have already been solved by other scientists. There is reason to believe that this occurs extensively, due primarily to serious deficiencies in the science information retrieval programs of the Federal Government.

We must also find ways and means of meeting our scientific manpower needs, which President Kennedy described as one of the most critical problems facing our Nation. There are probably many other critical needs which need study and exploration.

The continued safety and growth of our Nation is the prime concern of the committee. These hearings are being conducted with the sincere hope that suggestions may be developed which will assist us, as a nation, in meeting the challenge of world communism.

The committee received testimony from 10 witnesses. Officials of the Federal Government and representatives of scientific, engineering, industrial organizations, and technological research administrators were included. Eight of these witnesses approved the creation of a Commission on Science and Technology, four of whom opposed the creation of a Department of Science until a study, as proposed by S. 2771, had been completed and the recommendations of the Commission were available. In addition, statements were submitted for the record from a number of others who expressed an interest in the bill.

The Deputy Director of the Bureau of the Budget and the Director of the National Science Foundation, as in the previous hearings on a similar bill proposed in 1959, opposed both the creation of such a study commission or a Department of Science and Technology. Their testimony was of the same import as that which their predecessors presented in 1959; that the President's Office was fully qualified, with the appointment of a Director of Science and Technology in the

Executive Office of the President, to cope with the disorganized Federal science program. Three years previously the representatives of these agencies maintained before this committee that the President's Science Adviser, the Federal Council on Science and Technology, and the President's Advisory Committee on Science and Technology could bring about the necessary organization and coordination of Federal science programs. They now contended that if action is delayed another 2 to 3 years there would be no further need for the Congress to concern itself with these problems, that they could and would be reorganized and coordinated under the new Office of Science and Technology.

The chairman of the committee, in response to this recommendation for a further delay, pointed out to the Director of the NSF that, if action is not taken at this time the Congress will continue to be denied information essential to the legislative process, since the Director of the Office of Science and Technology will furnish only such information as he desires, or which the President permits him to furnish.

While the public witnesses expressed the hope that the Director of the Office of Science and Technology might be able to bring about the necessary improvements in Government operations in these areas, most of them took the view that a study should be made by qualified experts in these fields, as proposed by S. 2771, which study and resulting recommendations should prove to be of great benefit and assistance to the President, the Congress, and to other officials of the Federal Government, including the Director of Science and Technology. No evidence was presented to the committee to indicate if any study had been made of the plan establishing the Office of Science and Technology, in the Executive Office of the President, or what actual changes or improvements, if any, would result from its operations. (See comments of the Director, p. 4.)

The committee strongly urged the Congress to approve S. 2771, in order to obtain essential information to enable it to enact legislation required to develop a properly coordinated program for the efficient and economical administration of Federal programs operating in the fields of science and technology. The Senate approved the bill, under unanimous consent, on August 8, 1962, and it was referred to the House Committee on Science and Astronautics which took no action.

CONCLUSION

In the view of the committee there is a real need for a comprehensive study to be made into Federal activities in the fields of science and technology, in order that the Congress and the President may be fully informed as to the status of these activities, the deficiencies which continue to exist, and prepared to take appropriate steps to bring about better coordination of these important functions.

The continuing annual increase in Federal expenditures for research and development programs, totaling more than \$10 billion in fiscal year 1962, \$12 billion in fiscal year 1963, and budget requests for \$15 billion for fiscal year 1964 makes it imperative that every possible action looking toward the elimination of waste and extravagance in the administration of these programs must be taken without further delay. The committee therefore recommends the enactment of S. 816 as a necessary and important step toward the advancement of the

Government's obligations to the national security and looking toward the promotion of peace throughout the world. This bill is being reported favorably in the Senate in the sincere belief that its enactment into law in the present Congress will greatly contribute toward the improvement of Federal programs in science and technology, thus insuring that they may be better coordinated and more rapidly developed so as to insure that we, as a nation, will successfully meet the challenge of world communism.

APPENDIX

On February 18, 1963, Senator John L. McClellan, chairman of the Committee on Government Operations, in introducing the subject bill, S. 816 (Congressional Record, pp. 2263, 2264) stated, in part, as follows:

Mr. President, on behalf of myself, as chairman of the Committee on Government Operations, and of Senators Humphrey, Mundt, Gruening, Javits, Cotton, Yarborough, and Ribicoff, I introduce, for appropriate reference, a bill proposing the establishment of a Commission on Science and Technology.

This proposed legislation was perfected after 6 years of study by the committee and its subcommittees in an effort to strengthen Federal programs in the fields of science and technology, and to eliminate unnecessary duplication and overlapping between Government departments and agencies engaged in scientific and technological research.

The bill is the result of three separate hearings before the committee, beginning in 1958. In 1959 a somewhat similar bill was reported to the Senate. Further hearings were held on a revised bill, S. 2771, in the 87th Congress, on May 10 and July 24, 1962. These hearings reflected that there is a steady and relentless increase in the cost of research and development programs of the Federal departments and agencies, amounting to \$10 billion in fiscal year 1962, exceeded \$12 billion in fiscal year 1963, or more than the entire expenditures of the Federal Government prior to World War II, and is estimated in the President's budget to total \$15 billion for fiscal year 1964.

The objectives of the proposed Commission provide for a study of all of the programs, methods, and procedures of the Federal departments and agencies which are operating, conducting, and financing scientific programs, with the objective of bringing about more economy and efficiency in the performance of these essential activities and functions. Deficiencies in some of these programs and the problems relating thereto have been outlined on numerous occasions before various committees of the Congress by informed authorities. They have stressed the urgent need for improvements in effecting necessary reorganizations and better coordination of existing programs. Emphasis has also been directed toward the need for developing a program for the elimination of duplication in science efforts, where one agency of Government works on programs which are underway in other agencies, or where research is being done on problems which have already been solved by other scientists. There is reason to believe that this occurs extensively, due primarily to serious deficiencies in the science information retrieval programs of the Federal Government.

In undertaking its studies the Commission would be vested with authority to set up a Science Advisory Panel of

outstanding science, engineering, and technological authorities from all sections of the Nation to assist it in the performance of the functions outlined in the bill. The Commission is further directed to conduct a study of Federal scientific and technical activities, such as the deficiencies in scientific, engineering and technical information programs, including acquisition, processing, documentation, storage, retrieval, and distribution of scientific information; the urgency for accelerating scientific, engineering, and technical progress in a number of Federal agencies which perform some functions in these areas; and to recommend necessary reorganizations of scientific and technological activities of the Federal Government to improve their operations and to better coordinate their activities.

Witnesses at the hearings held last year suggested that a panel of experts in the fields of science and technology should be set up to serve the committees of Congress which deal with those problems. The enactment of the pending bill, and the establishment of the Science Advisory Panel provided for therein would enable the Congress to continue to call upon the experts named to such a panel after the proposed Commission has completed its work and submitted its reports and recommendations.

One of the basic objectives of the bill is to provide a medium through which individual Members and committees of the Congress can obtain information which is not now available to enable them to take appropriate legislative action to establish definite Federal policies in the field of science and technology. The reports and recommendations of the Commission will also provide a basis for an evaluation of programs which are presently in operation as well as those which are being proposed.

Evidence was also submitted at the hearings on S. 2771 in the 87th Congress which indicated that the Bureau of the Budget has reported that a detailed evaluation of existing science and technological operations of the numerous agencies operating in these fields has been found to be too difficult. The result has been that the agencies interested in procuring appropriated funds are not required to submit an evaluation of achievement under existing programs, but merely attempt to justify further appropriations of funds. Under this procedure, it was pointed out that Congress is required to appropriate funds on faith alone, since the appropriate committees and individual Members of Congress have no information which would permit them to evaluate the programs or to take the necessary action to eliminate excessive duplication and waste.

Should the Congress enact this measure, it will be provided with a means of obtaining information and facts that will better enable it to perform its appropriate constitutional function. The Committee on Government Operations is firmly convinced that there is a real need for a bipartisan commission to study all of the science and technological programs of the Federal Government as proposed by this bill. It is further

convinced that its enactment will insure maximum utilization of the resources of private industry and nonprofit research organizations, including universities and other educational or technological institutions, in the formulation of a properly coordinated program with the maximum utilization of the resources of private industry, nonprofit, and other technological institutions at a reduced cost.

The committee in recommending this legislation in past Congresses considered it to be an essential first step in achieving these objectives so that the Congress and the President may have the benefit of the recommendation of qualified experts in the fields of science, engineering and technology upon which appropriate legislative action may be taken to promote more efficiency in the operation of these programs and to effect economies that are essential in conserving Federal funds and technological manpower.

In view of our current fiscal difficulties, I am sure all of my colleagues are sympathetic to any measures which seek a balanced budget. Nevertheless, our science and technological programs must not be hampered or neglected. I submit that this measure should result in material savings through a freer exchange of ideas and a better coordination between the various Federal agencies dealing with science and technology. It should eliminate much of the current duplicity of effort. I, therefore, urge enactment of this measure during the 88th Congress.

EXTRACTS FROM HEARINGS ON S. 2771

Hearings on the bill S. 2771, to provide for the establishment of a Commission on Science and Technology, were held on May 10 (pt. 1) and July 24 (pt. 2), 1962. At those hearings a number of prominent representatives of the Federal Government and of the scientific community were asked to comment on the organization of Federal activities in the field of science and technology and, specifically, on the creation of a commission as proposed in the bill.

Testimony received at those hearings is set forth, in part, as follows:

1. *Elmer B. Staats, Deputy Director, Bureau of the Budget*

Mr. STAATS. It is not necessary to dwell with this committee upon the impact of science and technology on our lives and the programs of our Government. The evidence is all around us. Federal expenditures for research and development, for example, have been increased from \$100 million per year in the late 1930's to over \$12 billion per year at present. The Federal Government's interest in and support of science and technology have affected nearly every aspect of our national life, creating new relationships and dependencies between Government and private educational and industrial organizations. These influences have made themselves felt in the framing of national and international policies and have become a matter of major importance to Government administrators and the Congress. Correspondingly, new and unprecedented demands have been placed on public

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officials to understand and deal with science and technology effectively in its new dimensions.

The Senate Committee on Government Operations was among the first to recognize the far-reaching implications of the rapid changes in the nature and size of Federal scientific and technological programs. The committee has made a most constructive contribution by identifying and focusing public attention on the varied and complex problems of Government organization and management resulting from the emergence of science and technology as major forces in public policy.

The study prepared by the Subcommittee on National Policy Machinery on "Science Organization and the President's Office" stressed the profound effects of these developments on the Office of the President and the need to provide the President with adequate full-time staff advice on matters involving science and technology. The study recommended that an Office of Science and Technology be established in the Executive Office of the President. Reorganization Plan No. 2 which was transmitted to the Congress on March 29, 1962, would carry out this recommendation.

The Special Assistant to the President for Science and Technology now gives the President advice on scientific and technical questions. He and his Office function in much the same way as other professional and institutional advisers to the President such as the Bureau of the Budget and the Council of Economic Advisers. The day-to-day working relationships among the Office of the Special Assistant, the Bureau, and the Council are extremely close. Many of the responsibilities of the Special Assistant are much more like those of officials in the Executive Office of the President than of the White House staff. While moving science into the White House was a necessary and desirable step in 1957, the continued location in the White House inhibits the establishment of satisfactory longrun arrangements for meeting the President's need for professional staff assistance on matters involving science and technology. The President, however, would be free to designate the Director of the Office of Science and Technology as a Special Assistant to advise him on a wide range of matters and President Kennedy expects to do this.

The present location of these responsibilities also has raised problems from the congressional viewpoint. As a personal Presidential adviser, the special assistant has not been available for testimony before congressional committees. We recognize that the Congress at times will desire the testimony of an official who can speak authoritatively on the Government's scientific activities from an overall, rather than departmental, point of view. The Director of the Office of Science and Technology, in the same way as the Budget Director and the Chairman of the Council of Economic Advisers, will be free to appear before congressional committees, thus meeting one of the major needs cited by the sponsors of S. 2771.

Establishment of a Department of Science or similar agency would in no way alter or reduce the need for the staff arrangements to assist the President, provided by Reorganization Plan No. 2 of 1962. Science and technology are aspects of the missions of 20 major Federal agencies, and of scores of constituent bureaus within these agencies. No one has ever seriously proposed that all of these science-related activities be merged into a single all-encompassing executive department. Under any conceivable organizational arrangement, science and technology necessarily will be dispersed widely among Federal agencies. No matter how extensive the authority delegated to the heads of departments and agencies, the President always must assume responsibility for the decisions that are taken and the results that follow. It is the President's view that an Office of Science and Technology will provide the permanent staff resources which he believes are necessary to assist him in carrying out his responsibilities.

We are in agreement with the objectives sought by S. 2771. We concur in the chairman's view that "the Nation must be prepared to carry on comprehensive and advanced scientific and technology programs if it is to successfully meet the challenge of world communism." It is our hope and expectation that the measures already instituted by the President and the Congress will go a long way toward eliminating deficiencies and obtaining required improvements in organization structure. Great progress has been made in the past few years in the coordination of national science policy. While present organizational arrangements appear to be basically sound, we cannot afford to be complacent. We recognize that the search for improvements in Government organization and operations must be never-ending, if our departmental machinery is to function with maximum effectiveness. This is a general responsibility shared by the President and the Congress; it is a particular responsibility of this committee and the Bureau of the Budget.

We believe that the most effective means for accomplishing timely and constructive improvements is through the regular processes of the Congress and the executive branch. Practicable solutions to existing problems are most likely to be found by those with the most intimate knowledge of current programs and operations—the committees of the Congress, the President, and responsible executive officials. We have reservations, as you know, as to whether a special commission would make any major contribution to our knowledge or suggest better ways of carrying out programs which cannot be provided equally well through established agencies working closely with the Congress. If in the judgment of the Congress, however, the present situation calls for special measures of this type, such as the establishment of a Commission on Science and Technology, we would be glad to cooperate in suggesting the type of commission and the timing of its establishment.

I would like to comment on one particular section of S. 2771. Section 2 (4) and (5) unduly restricts the objectives of the Commission by requiring it to make a choice between a Department of Science and Technology, or reorganization through transfers of scientific and technological functions to other executive departments. The possible choices are by no means so limited. Proposals have been made for a Department of Health, Education, and Technology,¹ another proposal for a Department of Environmental Sciences, and there are no doubt other possibilities.

The Congress has been generally very reluctant to establish new executive departments. This step in the past ordinarily has been preceded by the grouping of related activities in a non-Cabinet agency. This was true with the Department of Health, Education, and Welfare, and its predecessor. The Commission should not be barred from considering such an alternative, such as the one I mentioned.

In the United States, the organization and administration of science is based on the premise that freedom of initiative, flexibility, and diversification of support are indispensable. In the long run, free science is the most effective and productive. The search for knowledge is the privilege of free men. At the same time, our acceptance of the Western tradition of scientific initiative and excellence carries with it a responsibility to create and maintain an organizational framework within which the Government and the scientific community can collaborate most effectively. We welcome the opportunity to cooperate with the Congress in this endeavor.

The CHAIRMAN. Do I understand that the administration feels that with the adoption of Reorganization Plan No. 2, that after it has gone into effect, you feel that there possibly might not be a need for this character of legislation at this time?

Mr. STAATS. I would stress the last part of your statement, Mr. Chairman, "at this time." I believe our preference would be to see what progress we can make in the next several months in trying to deal with some of the problems which I think both the committee, as well as we in the executive branch, recognize as important. I do not believe—I think it would be quite fair and accurate to say that I do not believe that we are persuaded at this point that a special commission, with all it involves, may be really necessary to accomplish what the Congress and we have in mind. If we turn out to be wrong, then I think we would be quite willing and happy to work with the Congress and establish an appropriate commission.

The CHAIRMAN. In other words, there is not a firmed-up, irrevocable conviction about it, you just feel that what is now planned under the reorganization plan, when it goes into effect, that there be opportunity given to see how this is going to work, and that it may work so well that it will obviate the necessity for the character of commission here proposed.

¹ See S. Doc. 15, 87th Cong., pp. 7-10.

Mr. STAATS. I think that is a very accurate statement.

The CHAIRMAN. You recognize that the Congress has a need for information in this field that it would be able to obtain through a department that it may not be able to obtain through a representative of the President, in the Office of the President. In other words, Congress cannot require the director of the office that is being designated in the reorganization plan to testify before its committees with respect to any information he might have, except by consent of the President; is that correct?

Mr. STAATS. No, Mr. Chairman, I do not believe that would be quite correct. One of the principal points we have made with respect to the need for Reorganization Plan 2 is to make available an individual who would have responsibility for science all through the whole Government, through the entire spectrum of Government science activities, available for testimony to the Congress. He is not now available.

The CHAIRMAN. You do propose that this office created by the reorganization plan, this office in the Office of the President, be made available to the Congress for all information that it might have?

Mr. STAATS. Yes. The President in his message transmitting plan 2 to Congress called particular attention to this.

The CHAIRMAN. That the administration will undertake under the reorganization plan to overcome a deficiency that the Congress has encountered heretofore?

Mr. STAATS. Yes. Mr. Chairman, I recall very well a statement which you made on the floor of the Senate in which you called attention to the fact that there is not now available anyone in the executive branch who could speak before committees of the Congress on science problems and science administrative difficulties. We feel that this plan does meet that need.

The CHAIRMAN. How would it be overcome if this committee then requested the Director of the Office of Science and Technology to supply information pertinent to the legislative process, or directed him to appear and give testimony with respect to information that he had within his official knowledge, would he be required to do so, or could the President exercise the Presidential privilege and withhold that testimony?

Mr. STAATS. Normally, he would be available.

The CHAIRMAN. I am not talking normally, now. Let us say it has happened. There would be no question about normal. Would he be required to come or not?

Mr. STAATS. I think he would be available on the same basis as the Budget Director or the Chairman of the Council of Economic Advisers, both of which are in the Executive Office of the President.

The CHAIRMAN. I would think so and I would hope so. I am not questioning your statement that he would be available, but I would like to make a record here so that we will know. As you can appreciate, this field has become so enormous, Congress cannot possibly meet intelligently its

duties and responsibilities without having available to it all information within the Government essential to its making an intelligent judgment. I think that is what we are searching for here, a way for the Congress to get this information, and require the President to authorize its submission if need be.

Mr. STAATS. We agree that the Congress should have this information.

The CHAIRMAN. Now, then, you say you think it is not needed at this time, and you emphasize "at this time," that such a commission here proposed not be established. Is there any other real objection on the part of the administration to the enactment of such legislation? What you are saying is that you do not think we need it, but I want to go further now and ask you is there any real objection to the Congress taking this action?

Mr. STAATS. I would like to be very explicit in response to your question. There are many areas of the Government which are very important and represent very important problem areas. Our general hope is that we have the means within the committees of Congress and the executive branch to deal with those problems without going to, we think, a measure which is very time consuming; it is expensive; it takes a lot of time; and it is difficult, as you know, to control the end result of their report in the sense of when they get their job done and whether the result is responsive to the need. They should be independent if they are established. I know that you have had great experience with the Hoover Commissions, as we have had, and realize what a tremendous undertaking it is to establish a commission of this type. So I suppose, to the extent that we have an objection, it is a desire to minimize the amount of Government machinery that is needed to deal with this problem.

The CHAIRMAN. Well, all the way through you emphasize—all the way through your prepared statement—the continuous need for study and for finding methods of improvement.

Mr. STAATS. I did; yes.

The CHAIRMAN. And the Congress, I think, shares that view, and we have heretofore employed this means of getting information and authorizing studies to guide the Congress in its deliberations and to effect proper judgment. Since this field is so vital, a good many of us feel—and I am not irrevocably committed to this procedure relative to this measure—but I may say to you it does have a very strong appeal to me and I think to some other Members of the Congress, that the Congress ought to be doing something, too, to keep itself informed. This is the means that seems feasible and advisable for it to adopt, to establish a commission such as this to make the study and report back to it with recommendations for its consideration.

When you speak of the expense of it, we can only guess as to how much it would cost. Even if it required the appropriation of perhaps one or two millions of dollars, it would not be too great, considering the importance of the task. What good will actually come out of it, whether it will make a

report or studies that Congress will adopt in full or in part, or whether it will remove question marks that appear before us now, whether the Commission will find that arrangements proposed here under the reorganization plan would be acceptable for both the executive branch and the Congress, I do not know. But I think there is going to be a question mark before Members of the Congress, at least a good many of us, that, until some study is made by such a proposed Commission, composed of members who are actually competent to go into this field and come up with some answers, we will be laboring under a serious handicap.

I was hoping there would not be an administration objection—I mean a serious objection.

Mr. STAATS. I think, Mr. Chairman, that your statement a little earlier, in the questioning, does reflect very accurately our view about the matter. Stated in other terms, we feel that before we move forward and establish, in effect, a Hoover-type commission to look at this area, that both the Congress and the Executive ought to be persuaded that it is really necessary to do that to achieve its objective. We at this point have some doubts that that will be required, but if later on, it appears that this is the best way to approach it, I am sure you will find us willing to cooperate with the Congress on it.

The CHAIRMAN. I appreciate that science activities in Government are now scattered and spread in some—how many agencies, did you say?

Mr. STAATS. Some 20 agencies. Sixteen of these represent most of the dollars in the budget, but there are 20.

The CHAIRMAN. It, of course, will not be possible to pull all of these together in one department, I appreciate that, just in the case of the plan to create a Department of Urban Affairs and Housing, you were not pulling all of the housing activities into one department. That proposal certainly, when compared to the importance and need for coordination, there is hardly any comparison between the importance of that and handling our problems with respect to science, to handle them in the best way possible to serve our country. I had thought—I could be wrong—in the course of these hearings we would try to get information that will either firm up my initial beliefs or point out the error of what I am thinking. I had thought that possibly there should be, in view of the vast importance of this subject, a Department of Science and Technology.

2. *Dr. Augustus B. Kinzel, past president, Engineers Joint Council*

Dr. KINZEL. Three years ago, together with Mr. Enoch R. Needles, then president of the council, I was privileged to appear before the Subcommittee on Reorganization and International Organizations of your committee, chaired by Senator Humphrey, in relation to a bill to create a Department of Science and Technology. At that time we suggested that a broad study similar to the Hoover Commission study be undertaken to expose all the facts relevant to the complex science and engineering activities of the Federal Government,

and to make recommendations for optimum orderly reorganization of these activities.

This suggestion was based on our opinion that more effective planning and coordination of the Government's scientific programs could be accomplished by improved organization of governmental functions.

We observed, however, that in any reorganization careful consideration should be given to the need to maintain within existing departments, engineering and scientific activities which by their nature are directly pertinent to the mission of these departments. This emphasized the need for an evaluation of the overall governmental functions in science and engineering. The bill which you are considering, S. 2771, would essentially implement our suggestion.

Since that time certain changes have been instituted to promote increased coordination of scientific activities of the Federal Government, most recently in the Reorganization Plan No. 2 of 1962 proposed by the President.

In our opinion, the changes made since our prior testimony are all in the right direction, but the study proposed by the Commission on Science and Technology would probe the basic problems confronting our organization in science and technology in greater scope and depth and would highlight the fundamental facts that are necessary to arrive at sound conclusions about the future needs in terms of overall organization of the governmental functions. The proposed Commission properly integrates the interest and participation of the executive and legislative branches of the Government as well as provides for the advice and counsel of the scientific and engineering communities.

Again, parenthetically, you have stressed the vital importance of science and engineering in our national effort. I not only concur, but would add that the magnitude of science and engineering in Government is now about 10 percent of the national budget, if my reading of the published figures is correct. This gives it importance in a quantitative sense as well as in a qualitative sense.

In summary, Mr. Chairman, we suggest that the rapidly growing governmental responsibilities and functions in science and engineering have created a vast complex of organizations which cannot be best integrated and managed in the absence of a high-level objective study which will permit the Congress and the administration to consider the broadest approaches to the overall organization. We believe that the proposed commission would provide such an objective approach and Engineers Joint Council would be pleased to cooperate in any appropriate way.

3. Honorable George Meader, Representative in Congress from Michigan

Mr. MEADER. In my view, a bipartisan study commission, similar to the Hoover Commission, offers the best hope of grappling successfully with the problems involved in the Federal Government's activities and expenditures in the field of scientific research and development.

A commission composed of able members representing the executive and legislative branches of the Federal Government, the scientific community and the general public, adequately funded and properly staffed, would possess the perspective and prestige, the freedom from special interest, preconceived predilections and possibly erroneous habits and commitments to enable it to make a penetrating analyses and well-reasoned conclusions. Its stature and the quality of its study would lead to a sympathetic and receptive consideration of its recommendations by the Congress and executive branch of the Government as well as the scientific community.

Of course, in the final analysis, the quality of the Commission's work and its usefulness would depend almost wholly upon the capacity of its members and the skill and ability of its staff.

In my view, the creation of this Commission is urgent. Events are moving, and expenditures are mounting rapidly. Mistaken methods may become congealed into the fabric of the Federal-scientific community relationship. The bureaucracy may move rapidly to carry out the bureaucratic domination of scientific research envisioned by the April 30, 1962, report of the President's Committee. The Congress may proceed with hasty and ill-considered action such as the imposition of a rigid percentage limitation on indirect expenses of research grants and possibly extend it to research contracts.

The need for knowledge to replace false, tacit assumptions, for clarity to replace confusion and for enlightened progressive leadership to promote efficient, effective, and unfettered scientific investigation all indicate that time is of the essence if we are to preserve, perfect and utilize intelligently one of our most valuable national instruments in a rapidly developing civilization beset with conflicts and complexities.

4. *Dr. Alden H. Emery, executive secretary, American Chemical Society*

Dr. EMERY. In April 1959 it was my privilege to appear before the committee, on behalf of the American Chemical Society, and to suggest that a commission be created to investigate thoroughly the merits of a proposal for a Department of Science and Technology.

We also stressed at that time the need to have a competent spokesman in the Government who could be responsible for Federal research and development in science, particularly for those scientific activities which are scattered among various departments whose major interests are nonscientific.

Our recommendations were based upon a formal policy statement, adopted by the society's board of directors in 1958, which was directed to the overall need to strengthen our country's position in the fields of science and technology.

On March 24 of this year, the board again considered this general subject. As a result, it voted to reaffirm the intent of the 1958 recommendation. Hence, we are still in general agreement as to the need for legislation such as S. 2771.

Since the introduction of this bill, however, the Congress has been asked by the President to consider Reorganization

Plan No. 2 of 1962 to establish an Office of Science and Technology as a new unit within the Executive Office of the President. Examination of this proposal shows that it shares some of the general objectives of the committee's bill. We believe both measures have, essentially, two broad purposes; namely, (1) to coordinate Federal science activities within the various operating departments of the Government, and (2) to focus greater attention upon the importance of science and technology to our country's welfare now and in the future.

Both objectives are supported by the American Chemical Society. It then becomes a question of determining whether Reorganization Plan No. 2, S. 2771, or a combination of both, offers the best approach.

S. 2771, for the establishment of a Commission on Science and Technology, also holds promise of developing improved procedures for upgrading Federal science activities. The American Chemical Society was among the first to suggest such a commission and still believes the idea has merit.

If the committee, however, envisions the end product of the Commission's studies as a Federal Department of Science and Technology, we would inject a note of caution. Since the idea of a department was first advanced, it has become evident to me that many scientists and engineers have developed serious reservations about the potential value of a large, bureaucratic agency dedicated to science.

A few years ago, any approach which seemed hopeful of focusing more attention on science would have been welcomed. Today, wise leaders in government have demonstrated a better understanding of the importance of science programs to our national welfare. Hence, I doubt that many of my colleagues today would support the creation of an agency the size and rank of a Federal department unless an investigative commission had determined that such a department is desirable and showed that it could be a means through which Federal science programs might be made more efficient and productive.

That, I may interject, is one of the purposes of this Commission. Of course, also to be determined would be the magnitude and scope of existing science activities, their importance, and whether or not we ought to have a Department of Science.

As you have said, this Commission might well reject that idea of a department after it has made a thorough study. If people are appointed to this Commission who are competent in their particular fields, thereby getting a well-qualified Commission to make this study, I think we would all be inclined to follow its recommendation and it might well eliminate the idea of a department. But, it might confirm the need for it.

I mentioned the Department only because many people feel that the desire for this study is primarily a desire for a department. I wanted to make clear that such is not at all our thinking on this matter. Our thinking would agree with

yours; that is, let us see what the Commission has to recommend.

The CHAIRMAN. I sure feel that way about it. I am not wedded, actually, to any proposal. I think in a field where we know so little, we had better marshal or mobilize the best talents and minds we have to study it and give us some guidance.

Dr. EMERY. Exactly.

Either independently or in conjunction with the proposed Office of Science and Technology, we believe S. 2771 offers a useful mechanism for obtaining a meaningful appraisal of our existing national science program, and for providing sound guidelines for their future development. First of all, the Commission should be able to determine which Government science activities are most likely to benefit from coordination to minimize overlap, thereby improving our technological posture. Secondly, the Commission should be helpful in evaluating the potential of the proposed Office of Science and Technology as a coordinating agency. Lastly, the Commission would be in an excellent position to determine whether any other means might be desirable to support the function of the Science Office.

We shall not comment upon the specific objectives and operational details of S. 2771, all of which merit our full support. In two areas, however, we are in a position to offer assistance. First, if the Commission is formed, we believe the American Chemical Society can make sound recommendations concerning coordination of Federal scientific information activities. Since its inception in 1876, our society has been deeply concerned with the need to handle effectively the mass of chemical knowledge generated by American scientists. Our experience in this field has led to a vast publications program utilizing the most modern mechanical techniques for the acquisition and dissemination of information. We shall gladly make this experience available to the Government.

Secondly, the American Chemical Society can suggest able and interested scientists to serve on the Commission or on its Science Advisory Panel.

5. *Dr. Wallace R. Brode, former president, American Association for the Advancement of Science; former Associate Director, National Bureau of Standards; and former Science Adviser to the Secretary of State*

Dr. BRODE. It is my understanding that this hearing is concerned with two actions before the committee, Senate bill S. 2771 on the establishment of a Commission on Science and Technology and the Presidential Reorganization Plan No. 2 of 1962 to establish an Office of Science and Technology in the Executive Office of the President.

In my opinion these two actions are not mutually exclusive nor is action on either essential to the other. The objectives of the McClellan bill, S. 2771, would appear to be the development of procedures to improve our national science

program. The President's reorganization plan has also the same broad objectives of the improvement of our national science program. The McClellan bill contemplates a careful study from which recommendation for various actions may be made. The President's plan for an Office of Science and Technology is an action plan, which could be one of the actions based on a study such as the McClellan bill proposes.

As an example of the kind of reorganization which might be considered, one might note the article in this week's Sunday Washington Star on a Department of Education in which there is a suggestion that one might move Welfare to the Department of Labor and place the National Science Foundation, the National Bureau of Standards, and the Weather Bureau in with Health and Education to form a Department of Education, Science, and Health. Such a department would encompass the Government's principal basic research and fund granting areas for universities. This is but one of many possibilities of change to consider, but it certainly does not involve placing all of the Government's science in a single department.

Several of the existing groups or agencies such as the National Science Foundation or the President's Science Advisory Office, if given the proper staff and authority, could not only serve as a coordinating body for our science programs but might take on the status of a Department of Science. I felt, however, that the assignment of such coordinating authority should not be made until a reasonable study of adequate scope had been made. If such a study has been made it would seem reasonable that such a study should be provided to the committee for consideration and also to the scientific community so that each can form a considered judgment.

If such a study of adequate scope has not been made, or if the results of such a study cannot be made available to the Congress to guide its decisions, then it would seem highly expedient that the Congress should authorize the study proposed in the McClellan bill.

Unless an exhaustive study of sufficient depth has been made to obviate further commission study, it could well be that another, and perhaps different approach to the very broad problem of our national scientific program, using different experts and concepts, and possibly done independent of the executive branch, might lead to alternative solutions to those proposed by the President. A combination of the best concepts of both studies could lead to an improved national program.

Without knowing the ultimate results to be obtained from the proposed office, or its method of operation, it is not practical to express an opinion or make a direct comment. If there are studies to indicate the reasons for the various recommendations contained in the President's proposal for an Office of Science and Technology, then the release of such studies to the Senate committee and the scientific community would permit a much more direct and useful approach to the proposal.

The CHAIRMAN. In other words, you are not opposing Reorganization Plan No. 2. You are saying, however, that whatever study was made should be brought forward to indicate how and why the administration came to that conclusion, and that any study made upon which this proposed action is based, should be made available not only to Congress but to the scientific community. If no such study was made, there still remains an even greater reason for the purposes of this bill.

Dr. BRODE. And if a study was made, there still is reason for a duplicate or another approach to the same problem to see if we come up with the same answer, or if there are other answers which might be combined. I heartily support that.

The CHAIRMAN. In either event, you think this legislation is appropriate?

Dr. BRODE. Yes. I heartily support the legislation.

6. *Dr. Alan T. Waterman, Director, National Science Foundation*

Dr. WATERMAN. In my opinion, the Office of Science and Technology fills in several respects an important need in the organization for science and technology in the Federal Government. In principle, the functions of this Office seem, in the light of my experience, to contain provision for solution of a most pressing problem which has faced the executive branch with increasing emphasis; namely, an assignment of the responsibility within the Executive Office of the President to a statutory unit accessible to the Congress, which can undertake consideration of broad far-reaching programs and major issues arising in Government concerned with science and technology as affected by and affecting national and international policies, including the overall national security and welfare and which entail large amounts of money and effort. With inputs from the President's Science Advisory Committee, the Federal Council for Science and Technology, the National Science Foundation and individual agencies as appropriate, this Office, through its Director, should prove to be of great value in providing advice to the President on such matters.

The Office of Science and Technology will be the central authoritative body in the executive branch of the Government to deal with important questions concerned with science and technology and through its Director to advise the President accordingly. It will be in position to utilize the full-time services of a group of individuals of broad background and good judgment, highly competent in research and development and representative of major sectors of the economy. Being in the Executive Office of the President its Director will be available to the Congress in a manner similar to the Director of the Bureau of the Budget and the Chairman of the Council of Economic Advisers. Furthermore, the Director of the Office will have clear responsibility and authority for recommending to the President means for resolving major issues in which science and technology are concerned. On other than major issues presumably the Director would

only need to exercise the power of review, as appropriate. Such an Office, in my opinion, will be able to serve a need not fulfilled by any other group as presently constituted.

With regard to the proposed Commission on Science and Technology, the matter of governmental organization for science has received considerable study and analysis over the past 5 years, indeed ever since World War II. In this connection, the Subcommittee on National Policy Machinery of the Committee on Government Operations has rendered valuable service in studying the problems of Government organization for science and making recommendations thereon; establishment of the Office of Science and Technology was one such recommendation.

I have doubts as to whether creation of a commission to study these matters further would be desirable at this time, particularly since the Office of Science and Technology has just been established and we do not, as yet, have experience with its operation. Should such a commission be established, however, I feel it should not be limited to a consideration of whether a Department of Science and Technology is desirable, but should address itself to the broad problems of general Government organization for science.

I would say first it is very important to recognize the role that is played by the existing agencies, which for the most part are mission-oriented, such as health, atomic energy, space, and going beyond that, commerce, and all the rest. These agencies have definite practical missions which they have to pursue and which serve the country. It is very important that they make the maximum use of research and development to serve the mission for which they were created.

In other words research and development is a service which each agency should have, and it should be the first duty in the organization of science in the Government to see that this responsibility is pinned on each agency, that they are organized to do it and do it efficiently.

The CHAIRMAN. Would this bill and what it envisions—the possibility of ultimately establishing a Department of Science—supersede or supplant the real functions now carried on in this field by the separate agencies like the Department of Defense, Department of Commerce, and Department of Health, Education, and Welfare?

Dr. WATERMAN. In my opinion—and I have given this a great deal of thought, because I believe this issue of what we do about science and technology in the country is among the most important we will have to face in future years—there is no question about that—in my view there is danger that the research and development or the science and technology in the individual agencies will be weakened if a department of science and technology is established.

The CHAIRMAN. In your opinion it would interfere with the functions of these separate agencies?

Dr. WATERMAN. Yes. You see, as industry well knows, it has to get research information firsthand, it even has to do

some basic research to understand its problems better. If it tried to depend only upon what was published by scientists elsewhere it would be getting the information secondhand, and that is not good enough. So my first requirement is that each agency have a strong research and development department.

The CHAIRMAN. Each agency have its own research and development programs?

Dr. WATERMAN. Yes. Also, if you had a Department of Science and Technology administratively it would be quite difficult to determine to what extent it should supervise and control research and development in individual agencies. This would not be an easy thing to resolve. Take the Department of Defense. Surely the Department of Defense must be looked upon as the most expert in carrying out its mission for defense of the country. As such it ought to know best what sort of research and development it should do. And it can't continually have someone looking over its shoulder and saying: "You are not doing the right research, you should do something else."

It should itself know, and the administration of the Government should be sure that it does know how to accomplish its objectives efficiently.

The CHAIRMAN. In other words, a great measure of independent judgment must be reserved like, say, in the Department of Defense, which has the best knowledge and upon whom we must rely for the final judgment in that particular field?

Dr. WATERMAN. Yes. At the same time it is clear that there must be some check on this, some power of review to be certain that the agencies are doing an efficient and effective job. I believe that the new Office of Science and Technology should have as one of its major responsibilities, the power of review of the research and development organization and programs of the agencies to be sure that they are doing their job well.

This does not mean that they need to ride herd on the agencies all the time but, if something seems to be going wrong, they should be in a position to recommend to the President that steps be taken.

The CHAIRMAN. Now, have you studied this particular bill? What conclusions have you come to and what recommendations do you make with respect to this pending bill?

Dr. WATERMAN. My conclusion is that it seems premature to start a study about the way science should be organized, and in particular a Department of Science and Technology, for the reason that we have the mechanisms to deal with the requirements that I started to speak about.

The CHAIRMAN. You have used the word "premature" now.

Dr. WATERMAN. Yes, premature because we don't know yet how they are going to work, in particular the new Office of Science and Technology just now started. Now, in principle—I started to speak of these requirements. The

first was to be sure that each agency had a strong research and development department.

The second requirement is that there must be coordination between the Government agencies. And this is taken care of by the Federal Council for Science and Technology, both in the coordination of current programs to be sure there is no unnecessary duplication, and in projections for the future. So coordination problems should be in their hands to study and make recommendations to the President.

Third, there are other questions on very important critical issues that come before the Government, the President in particular, that call for the expert advice of the leading research scientists and engineers in the country. And that is taken care of very well by the present Science Advisory Committee which has a very fine record in dealing with matters involving the national interest where science and technology enter in an important way. That is the body which is available for this purpose. These are people outside the Government, the best experts that can be found.

That leaves three more items, then, on my requirements list. One is, what does one do about science itself and the training of scientists? This is what the National Science Foundation was created for, and I feel that we have made a great deal of progress in handling that particular subject. I believe that the National Science Foundation is very well designed for the purpose and that its record shows that this is the right way for the Government to back science and science training.

As you know in the National Science Foundation we also have a policymaking body, the National Science Board, consisting of 24 distinguished individuals with backgrounds in research, education, and public affairs.

Now, the National Science Board can also serve the President in matters of policy relating to basic research and training, and especially in Government-university relationships, because we deal so largely with colleges and universities. That is one thing which in the long run we must take full advantage of.

Now, what I have just said covers the major requirements, I believe, except for two things. One is, communication with the Congress on these matters. And the other requirement is for a body with the authority and responsibility of overall review and evaluation of major issues that arise. And that is why we in the Foundation, our National Science Board, and others, strongly favored the establishment of the Office of Science and Technology.

This will be the top authoritative body to deal with major issues. I think it should really confine itself to major issues, because otherwise the work would become unmanageable. But this body can receive information, say, from the President's Science Advisory Committee, from the National Science Board, and from the Federal Council on Science and Technology. And it will be the body that can take these things in hand and make recommendations to the President

about their disposition. At the same time the Director will be available to the Congress so that as these plans come along he may be able to explain them to the Congress. To me this last move creating the Office of Science and Technology is the most important one of all. It is what we have missed all along; namely, an authoritative body to take these major issues and handle them systematically and thoroughly and advise the President with regard to them.

The CHAIRMAN. That is the Executive Office of the President?

Dr. WATERMAN. Yes. You see, it is hardly proper for the National Science Foundation to evaluate the work of a sister agency. That is not the right position to be in. As I said before, we are not in a position to understand the missions of other agencies as well as they are. So this is a reason for putting the evaluation function into the new Office according to the reorganization plan. So now that function which had been the responsibility of the National Science Foundation has been transferred to the new Office of Science and Technology.

The CHAIRMAN. I am serious about this, and I am not trying to be too technical. You said it is premature. That implies to me that there will be a time, an appropriate time to do it, and you take the view that it is now premature. Now, when do you foresee would be the appropriate time to do this, to make this study?

Dr. WATERMAN. More correctly, it would seem to me premature to make a decision to have a Commission. If the present committees that I have spoken of and the new Office succeed, then it would seem to me unnecessary to have a study made.

The CHAIRMAN. So, if I get your testimony—I am trying to understand it—you say, well, “Now, since this has been done, we ought to wait and see how it will work before we do anything further,” is that right?

Dr. WATERMAN. Yes.

The CHAIRMAN. And so you would say, “Do nothing now, Congress, sit down, wait a while,” is that what you are saying?

Dr. WATERMAN. I believe so, yes, sir. And then if things do not go well in 2 or 3 years, that would be the time to make the study and find out what the records have been.

The CHAIRMAN. Hold everything in abeyance, let's not move, let's wait a while? I am not trying to put words in your mouth, just to make the record so that I can understand it.

Dr. WATERMAN. Yes, sir.

Senator JAVITS. I gather from the terms of the bill that it might lead to the establishment of a Department of Science and Technology as a Cabinet office. Do you feel that the present office in the executive department would also lead in that direction if the indications were that that is what we ought to do; in other words, that you don't need a special

commission in order to bring you to that point, if that point should be the desirable national objective?

Dr. WATERMAN. It may be. If the Office of Science and Technology can succeed in limiting itself to major decisions, or rather major recommendations to make to the President on the very important issues that arise, then with the other mechanisms I should think that things would be in good order. On the other hand, if this cannot be done, if the Office has to grow markedly to do its job, this might conceivably lead to the move toward a Department of Science and Technology.

My position on the Department of Science and Technology, however, is that this is a risky thing to try because it would tend to take away the responsibility for science, for research, and development from the existing agencies.

Senator JAVITS. Now, the virtue of a commission, of course, is that it will expose research to the winds of discussion, controversy, argument, hearings, and the public's impact. The problem, as I see it, since in a limited way we have gone so far, is that it is all rather insulated in the Office of the President. The science adviser reports to the President and the President hears him, and that is the end of that, if the President wants it that way; whereas a commission is likely to be somewhat more open to public discussion, perhaps even tempestuous.

Now, in the field that needs more stimulation, as my distinguished colleague Senator Gruening says, maybe that is the route we ought to take. What would you think about that, the fact that this boat needs a little rocking?

Dr. WATERMAN. The commission has that great advantage, of course, it gets a full debate on the issues involved, and through study and opinions from all who are interested. That is an excellent mechanism. But I would think that one would want to be very sure that the system of organization in effect is deficient before one goes through such a study, because it does take a great deal of time. One thing in particular that should be remembered is that the Office of Science and Technology is in the Office of the President and would be accessible to Congress. I am setting a great deal of store by that, because it seems to me that this is the way Congress can learn about what is going on.

Senator JAVITS. It is accessible to us if the President wishes it. He can limit its accessibility any time he wants to in his executive departments.

Dr. WATERMAN. Of course, that is an Executive decision.

The CHAIRMAN. Dr. Waterman, you testified before a subcommittee of this committee on May 28, 1959, I believe. Senator Humphrey was chairman of the subcommittee. And at that time the hearings were being held on S. 586, S. 576, and S. 1851. S. 1851, at least, was a bill comparable to the present bill proposing the establishment of a Commission on a Department of Science and Technology. You testified at that time that you believed:

"As a general matter a commission of the type proposed in S. 1851 might be useful in assessing the need for such a department"—speaking of a proposed Department of Science and Technology—"I believe the creation of such a commission at this time would be premature."

Another paragraph or two later in your testimony you said:

"Under these circumstances I believe that the mechanisms already in operation should be given an opportunity for trial, perhaps for a period of 1 or 2 years, after which time the matter of a commission might be reconsidered if it were felt at that time that substantial steps had not been taken toward the solution of the problems at which the proposed Department of Science and Technology is aimed."

Now, it is more than 3 years later. Do you still feel, as you have testified, that it is still premature?

Dr. WATERMAN. Yes, because we have not stood still in the meantime. I believe that, for example, if we had not in the meantime seen the establishment of the Federal Council for Science and Technology, and if we had not come through with an Office of Science and Technology, which to me is a very critical Office, then this would have been very much in order.

The CHAIRMAN. And since we have that now you think we ought to wait another 3 years to determine what it does or will not do, is that your testimony?

Dr. WATERMAN. It seems to me that we should have a chance to see what it could do, but not just that particular time.

The CHAIRMAN. How long do you think it would take?

Dr. WATERMAN. Two or three years.

The CHAIRMAN. You think we should wait that much longer again?

Dr. WATERMAN. I should think so. Of course, if things started going badly it would be another matter.

The CHAIRMAN. In your testimony I think Senator Humphrey questioned you about the Federal Council for Science and Technology which had already been established some 3 months prior to the committee hearings, in 1959. He pointed out that this Council never had made, nor was likely to make, any report to the Congress, isn't that true?

Dr. WATERMAN. Yes, that is true.

The CHAIRMAN. And that is still the case, is it?

Dr. WATERMAN. I believe so. However, the new Office would be able to report the activities of the Council, if this seemed to be desirable to the Director.

The CHAIRMAN. I notice Senator Humphrey expressed his views rather strongly at that point. And Senator Gruening also asked if that wasn't your position there—if it wasn't part of the "trickle-down policy." And Senator Humphrey commented that "it sure is."

Do you have any comment about how that operates at the present time; whether this, as they termed it, "trickle-down policy" has been working effectively?

Dr. WATERMAN. I am not sure what is meant by the term. Do you mean carry on and not really come to grips with something?

The CHAIRMAN. According to the views of members of this committee, the Congress obtained from this source just what little information they wanted it to have. I understand that is what is meant—that Members of Congress didn't have any control over it, except to take whatever the Council or the President wanted to make available to them.

Dr. WATERMAN. I feel strongly myself that Congress is entitled to know about these matters when the time is appropriate.

The CHAIRMAN. How do you suggest we go about knowing more?

Dr. WATERMAN. To establish good contact with the Director of the new Office.

The CHAIRMAN. Not by any law that would require him to do anything, but we should just keep up a contact with him and get what he will let us have, or what the President permits him to give to us?

Dr. WATERMAN. Yes; contact on both sides. As a scientist, I like the idea of experimenting now that we have the Office, to see what it will do.

The CHAIRMAN. You mean that the Congress should make contact with the Director and see what he will let us have?

Dr. WATERMAN. Yes; this is the experimental approach, and see if this doesn't take care of the situation. In the meantime, of course, the individual agencies can always be called before the committees. And we, for example, will always be glad to talk about our problems.

The CHAIRMAN. I don't know whether we can call him or require him to come before committees of Congress or not in this particular Office, since the Office of Science and Technology is under the direct control of the President.

Dr. WATERMAN. I would assume so.

The CHAIRMAN. Wouldn't he be subject to executive privilege if the President so ordered?

Dr. WATERMAN. To the extent that the President ordered. But I would think it would be quite similar to the situation of the Director of the Bureau of the Budget who does appear before Congress regularly. As far as I know, the White House has indicated that the Director would appear before Congress.

7. *James Rand, president, Rand Development Corp.*

Mr. RAND. The first point I would like to make is that I disagree strongly with Dr. Waterman. I think that it is later than we think. I think that we can't afford to wait to have 3 or 4 years pass by. I don't think we will know any more than we do now. My personal impression of the varied Government organizations for research and advisory purposes is that they are so many and so manifold in their purposes and intent that it is impossible for any comprehensive view to be had by Members of Congress or the Senate on

exactly the status of science and technology in the United States or in the world, for that matter.

If we look at the development, now, of retrieval reading machines, information machines, in Russia a few years ago the head of the Academy of Science told me that he considered the information retrieval machine as more important than atomic physics, because for the first time you will be able to press a button and 50,000 or 100,000 abstracts read in an hour by a machine and then brought out automatically so that you don't have to look for them. At the present time most of our scientists spend more time in the libraries than they do in the laboratories. What a tremendous thing that is.

The problems of satellite Telstar—this is an enormous thing. How do we get our information now? How do you people find out what is going on, and the significance of these various things, unless you can have a commission for science and technology, and have them have an open ear to each of the branches, each of the scientific groups, so that they in turn can be heard?

So I think that this Commission on Science and Technology is a must. I don't think it is going to interfere in any way with the existing bodies that we have, but I think it will be a translating body for you, and also make it possible for scientists in one branch to hear those in another branch.

The CHAIRMAN. This Commission is only a temporary Commission, it is designed just to make a study and report back to Congress, this would not be a permanent agency or function.

Mr. RAND. Well, it could be——

The CHAIRMAN. I am not saying it couldn't be, I am trying to find out, Is that what you are recommending?

Mr. RAND. Yes.

The CHAIRMAN. You want something permanent?

Mr. RAND. I am in favor of the experimental approach like Dr. Waterman said, let's see what can be done to translate these things into everyday English.

The CHAIRMAN. One of the purposes of the Commission was to determine whether we should have a Department of Science and Technology.

Mr. RAND. I am in favor of that. But I don't know the form of it. I think you have to have a study before you can have it.

The CHAIRMAN. You think the Commission is vital and that it ought to be established without further delay and start its study?

Mr. RAND. Yes, I do.

The CHAIRMAN. Whether it finally leads to the establishment of a department or some other agency or permanent commission or a director of science and technology or something else, the study, you think, should begin now?

Mr. RAND. Yes, sir. If we don't do it we will never know.

The CHAIRMAN. Dr. Waterman has suggested that we wait another 2 to 3 years. Let me ask you, what do you see that

could develop in that time that would obviate the necessity for a study in this field?

Mr. RAND. I can see nothing. And I can't see any interference a study can make on what we are doing now.

The CHAIRMAN. In other words, the study might proceed along with the experimentation?

Mr. RAND. Why certainly. And it would be an experiment in itself.

Senator MUSKIE. In your judgment, Mr. Rand, as I understand it, you think that at some point we are going to have to have a permanent central agency in this field for the purpose of coordinating, translating, and interpreting the advances in science and technology that are constantly emerging at such an accelerated pace?

Mr. RAND. Yes, sir; I definitely believe that. I don't know what form it should take. That is the reason I am wholly in favor of a study to determine what form it should take. But we must have a way of telling people what is the significance of nucleic acids or sleep machines or surgical instruments, and so on. It makes sense. And also different groups of scientists in different departments and different bureaus can have a place to go if they have their back up in the department they are already in.

Senator MUSKIE. Since you feel, then, that in your judgment the results of this study probably will be some form of central agency, what questions do you think are unresolved that ought to be answered or at least researched by such a study commission?

Mr. RAND. I think one of the main things is how to make known the significance of frontier discoveries, so that the average person can understand it.

Senator MUSKIE. You don't have any idea, I think it is implicit from what you say, that the central department of science and technology ought to bring under one roof all of the research activities of the Federal Government in the science and technology field?

Mr. RAND. Absolutely not.

Senator MUSKIE. I thought that was your point, but I think it ought to be clear in the record. So that this possibility would not be an appropriate field of study by the study commission?

Mr. RAND. That is right.

Senator JAVITS. Now, is another function that you would like to see, sir, the question of priorities and the relationship of one field or research to another? I was struck with what Dr. Waterman said, that the theory of pure research is that you let people just go ahead in their own fields with what they think is important, and if they think it is important, then you assume that it will ultimately perhaps make some contribution, or at least the utilization of the resources will be worthwhile in terms of national interest. Now, is there anything in your views which relates to priorities and the coordination of one field of research with another?

Mr. RAND. I am in research for profit. I have no use for what we call wheel spinning, which is just groping in the

dark on basic philosophies, and so on. I think we have to have practically a priority, and it has to be reviewed from day to day and month to month. And I think that is one of the functions, to find out what we need, is an anti-missile missile of top priority or isn't it? I think we know the answer. But there are things much less distinct, and these require careful review.

And we should keep on adjusting and reviewing as we do in industry, research and development, what are we trying to do? If we were in the typewriter business we don't want to make shoe polish.

I have been trying to find, for example, Russian space literature, and I have gone to several agencies, and I find that there are about a half dozen different agencies translating Russian technical literature. But I can't find out what percentage of available technology is being translated.

It might interest you to know that the Soviet Union has just created a science advisory group to coordinate all science in the Soviet Union with a representative on the Council of Ministers. This happened in the last year.

Senator GRUENING. I just want to ask Mr. Rand, you think rather poorly of what you call wheel-spinning basic research. Haven't there been a lot of important discoveries made by just this wheel-spinning process—the discovery of penicillin, for instance—by accident?

Mr. RAND. I don't think this was the wheel spinning, he was doing something else at the time he considered important, and it was an important piece of work, and he made a chance observation.

Senator GRUENING. But it was incidental to his other work?

Mr. RAND. That isn't wheel spinning, but if you pay a man month for month regardless of what he does you lose control of him. And if he can't explain what he is doing or why he is doing it, forget it, as far as the commercial aspects of the thing are concerned. I think in the university when he is performing a fundamental teaching job, then it is not necessary to control him, because he is being paid for something else. But if he has got an important part of his time devoted to research, he should be able to explain what he is doing and what the significance is, if there is any.

8. *Dr. Roger M. Lueck, chairman, Research Committee, National Association of Manufacturers*

Dr. LUECK. There can be no question of the importance of science and technology in our economy today. This is reflected in the threefold increase in the Nation's research and development expenditures during the last 10 years—a growth, incidentally, that exceeds the rate of increase in the gross national product. In 1953 the total research and development expenditures in the United States were \$5,150 million; in 1962 the total will approach \$16 billion. From 70 to 75 percent of this research and development is performed in the laboratories of industry and is under the direction of the administrators of industrial research.

Now, there has been some reason for concern over the increasing participation of Government in the support of the research and development effort. In 1953 the Government financed 53 percent of the total research and development effort; in 1962 its support will approach 75 percent. In 1961 approximately 58.5 percent of the research performed in industrial laboratories was supported by Federal agencies and it is likely that the percentage will be higher in 1962. This changing situation seems to warrant a closer examination and study of Federal programs than have been given heretofore. The Commission, as proposed in S. 2771, can, therefore, perform a useful service.

Now, the NAM Research Committee supports the principle underlying S. 2771. We feel that a study of the diversified Federal scientific programs will be worthwhile if only to point up the incidence of programs in one agency which overlap others supported by another Federal agency or which can be supported by private funds. I have little doubt that a report from such a Commission will disclose numerous examples of duplicating programs within the different Federal agencies, as well as several for which there exist the incentive for industry to support with private moneys.

However, I wish to be crystal clear that our support of the principle of S. 2771 in no way predisposes the NAM or its Research Committee as to the need for, or lack of need for, a reorganization of Federal departments leading to a Cabinet-level Department of Science and Technology. Our comments and suggestions concerning such a Department would be forthcoming only after a review of the Commission's report.

Although, as I have said, we support the principle of the bill in question, we believe that certain amendments to it would not only clarify its intent, but also would lead to a stronger Commission that could be expected to issue a more meaningful report.

The CHAIRMAN. Dr. Lueck, in principle your group supports the bill. We heard testimony from Dr. Waterman that the establishment of such a commission would be premature. He feels that we should wait 2 or 3 years, to observe the intent and operations of the Office of Science and Technology before making a study of this type.

Do you disagree with his judgment?

Dr. LUECK. Well, as you recall, Dr. Waterman made that same recommendation 2 or 3 years ago. We don't feel that the situation has changed sufficiently in that period of time to alter our feeling about the matter. And we feel that there should be some positive action of this kind taken to really make a study of this thing. We doubt if the Office of Science and Technology as it is currently constituted is fully capable of doing this job.

The CHAIRMAN. Do you think a study along with or simultaneous with the initiation of the functions to be performed by that Office, would necessarily cast any shadow of doubt upon it? Could it be done without doing that, but

with the idea of implementing it in studying and observing its work?

Dr. LUECK. We don't see how the Commission if properly constituted could interfere at all with the work of the Office of Science and Technology.

The CHAIRMAN. In other words, that Office could go on and function?

Dr. LUECK. And some of the information developed by the Commission in its study might turn out to be very useful to this Office of Science and Technology.

The CHAIRMAN. As I understand it, you withhold judgment on whether a Department of Science and Technology should be created, you are not saying it should, and you are not saying it shouldn't.

Dr. LUECK. That is correct. We feel that determination should be made after the results of the Commission study are made.

The CHAIRMAN. In other words, the facts should be assembled and made available for consideration before judgment is made with respect to the establishment of such a department, or as to what other machinery is necessary and needed to handle this problem?

Dr. LUECK. That is right. We do not feel that at the present time we have got the facts before us that would enable us to make an intelligent decision as to whether we need a Department of Science and Technology or not.

Senator MUSKIE. Getting back, Dr. Lueck, to the question I asked you earlier, this prepared statement appears to have one sentence which is responsive to my question. And I read:

"I have little doubt that a report from such a commission will disclose numerous examples of duplicating programs within the different Federal agencies, as well as several for which there exist the incentive for independent industries to support with private moneys."

I wonder if you are prepared to give some illustrations of both of these. I think that such illustrations in the record might very well be an important argument for the creation of a commission to research other examples.

Dr. LUECK. In relation to the overlap between Federal agencies, one comes to mind. The Department of the Interior has been supporting a great deal of research on the desalinization of seawater to produce fresh water. In the course of time the laboratory facilities at Oak Ridge, Tenn. (Oak Ridge National Laboratory) which are operated by the Atomic Energy Commission, have apparently sort of run out of work in the atomic energy field. That laboratory performed a very useful service, obviously, during World War II and right after when an attempt was being made to develop some of the peacetime uses of nuclear energy. But apparently they have run out of good applied research projects in that field, and are now suggesting that they institute a lot of projects in the area of water desalinization.

Not only that, the suggestion has been made that they convert that Laboratory into a Federal university. Apparently they have got a staff there built up of very competent people that they hesitate to disband because of their competence, and yet they do not have enough work to go around for them in the field for which it was intended that the Laboratory should work. And yet at the same time we are running in a situation where the National Aeronautics and Space Administration, which is carrying on this very important work in space exploration, is running out of highly skilled technologists and scientists; in fact they are getting to the point where they are making appropriations for the education of these people.

I see no reason why the excess personnel in Oak Ridge couldn't be transferred to NASA and utilized. But there is a tendency, once a facility has been set up in the Government, to keep it indefinitely.

Senator MUSKIE. So you have struck another point, it seems to me. The commission could undertake this as another avenue of study, increasing the mobility within Federal agencies of scientific personnel.

Dr. LUECK. That is right.

Senator MUSKIE. On this question of duplication, should not we make a distinction between actual duplication on the one hand and, on the other hand, the exploring of a problem from different points of view? I am thinking now, for example, with respect to desalinization—and I don't know what the facts are—that the Interior Department people may be approaching it down one road, and the other group down another road, and these two efforts are not necessarily duplicating, one may be productive of results and the other not, but it is a little difficult to predict in advance.

Dr. LUECK. I will agree with that; providing the approach of the new group is entirely different.

Senator MUSKIE. And so this commission could study that too.

Dr. LUECK. That is correct. I think you will find cases where their approach may not be entirely different, it may be just a further development of some idea that had already been researched.

Senator MUSKIE. Now, on the second point that you make, that is, that there may exist an incentive on the part of industry to support some research projects that are being undertaken in Federal agencies, can you illustrate that? I am all for this if we can get private money to support some of these efforts.

Dr. LUECK. Well, I ran into a project the other day in the Department of Agriculture, a project aimed or oriented to the conversion of wheat to adhesives. To me that is a case of applied research that ought to be undertaken by industry, and I am dead sure that industry would undertake, if it is going to be economic at all, to produce a new adhesive out of wheat or an adhesive out of wheat that can't be produced in anything else, I am sure that industry would undertake that if the Government didn't.

Senator MUSKIE. Do you know whether or not industry is undertaking that particular—

Dr. LUECK. I can't tell you for sure about that.

Senator MUSKIE. Well, suppose that a Government agency such as this one conceives that this project is useful, now what steps could that agency take to solicit activity by industry in research? We couldn't direct industry to do it, that wouldn't be the answer.

I note that in one of your suggestions you have expressed the opinion that this commission should undertake to study only Federal activities in the field and not private ones. It seems to me that this point that you make would require that the commission consider to some extent at least the ways this incentive could be provided for industry to undertake research projects which Government agencies might otherwise undertake.

Dr. LUECK. We have given this matter quite a little thought. We have found it a little difficult for private industry to come down here to Washington, to go to the agencies and get a clearcut picture of what projects are included in their programs.

Senator MUSKIE. As a matter of fact, I suspect it is a little difficult for a Government agency to find out what projects are included.

Dr. LUECK. That may very well be. If there were some kind of a provision set up whereby, at least for the non-classified projects, an abstract could be made of the intent, and the objective of the project and this made available to industry, I think there would be many cases where industry could come back and report they are already doing that work, or they are willing to undertake it.

9. *Dr. John H. Heller, executive director, New England Institute for Medical Research*

Dr. HELLER. I have the impression that this bill derived from the feeling in the Senate that perhaps everything was not going as smoothly or as well as it might in science and in technology, and that this bill is, in effect, an effort to try to put together a commission in order to make recommendations to the Senate so that it may act more effectively in the area.

I would concur with that philosophy without question. There are certain major areas of Federal research, all under the executive branch, that need scrutiny. Indeed, there are some areas wherein I feel that the national security is being severely compromised. A large variety of Federal agencies is handling science, but the Senate seldom knows whether they are doing a good job or not until very egregious errors come to public notice.

Where is our system of checks and balances in this? We have a budget of over \$9 billion for science that you gentlemen must approve. This is a large amount of money. Furthermore, not only is science monetarily significant—it is a matter of our security, and, indeed, affects, every segment of

our economy. Agriculture, mining, transportation, health, and even the clothing we are wearing now have been processed by scientific and technological methods. Science has an impact on practically every congressional committee and every bill which comes to your consideration.

But science isn't a uniform whole; it is divided into many sections. It would seem to me that perhaps the best way the Senate could be completely informed is to have its own senatorial scientific advisory group, responsible to it alone.

Scientists serving on such a group should be free of any political pressures from the executive branch. These pressures exist, whether real or implied; I know of several cases where scientists felt that very serious errors were being committed but were afraid to come forward and say so, because they feared reprisals in terms of not getting grants in the future.

This is why I think it is very important that such a group be responsible only to the Senate.

In a system of checks and balances, if one is to check or balance something one must have as much knowledge about the subject as the group one is checking or balancing. Now, the President has an Office of Science and Technology, which has a Scientific Advisory Board. Why cannot the Senate and/or House have the same kind of group, one which is independent and one which the Senate can have recourse to in order to ask, "Is this right?" or "What is the real situation?" or "Is anything vital being overlooked?"

As you pointed out, Senator McClellan, if the President does not wish the man or men in the Office of Science and Technology to testify before you, they will not so do. But if you have recourse to your own scientists even if they do not have access to all classified material they can give you some very shrewd opinions as to whether or not everything is functioning as it should or whether or not there should be changes. The problems of duplication, overlapping, waste, failures, or omissions you cannot effectively check upon now.

I have no objection to an investigative commission as proposed in this bill. I am a little worried about the composition of the commission, because it seems to be heavily loaded on the executive side, which is the very branch to be checked and balanced. I would be a little disturbed by the fact that the commission would only be in existence until 1963.

The CHAIRMAN. That, of course, is a matter that could be easily corrected, the life of the commission. You say it is heavily balanced on the side of the executive.

Dr. HELLER. Yes, sir.

The CHAIRMAN. I would like to point out that Congress appoints two-thirds of the Commission.

Dr. HELLER. Well, the President appoints four, and the Vice President appoints four, two being Senators. I think you would have a preponderance of scientists chosen on this basis who, in effect, might be chosen because of their known sympathetic attitudes toward the executive. This might not be as dispassionate a group as you seek.

The CHAIRMAN. Dr. Heller, let us think in terms of your suggestion. If the Senate set up an agency just to report to it—when you say Senate of course you mean the Congress.

Dr. HELLER. Surely.

The CHAIRMAN. If the Congress set up an agency to report to it only, and as you have stated, it did not have access to all of the information available to the agencies under the executive departments, it couldn't very well be as effective as we would expect. I appreciate your viewpoint, but what we are trying to do is find a way to coordinate all of this so that the Congress will have the information about all science and technology development.

That is what I think we are trying to do. It was pointed out here in some remarks that I read from Dr. Waterman's previous statement and from Senator Humphrey and Senator Gruening at the hearing in 1959. Today the Congress is in a position of receiving information that is trickling down to us. It has been screened, and we receive only what the executive branch wants us to have.

And maybe that is not adequate. Maybe we are not able to get the facts upon which we can make the checks and get the balances operating that are intended. That is the point.

Dr. HELLER. I agree completely with this point. I believe that if the Senate had three or four scientific advisers, in effect acting as agents of a senatorial committee, they would probably have access to a significant amount of material on work done or proposed in the executive branch which the Senate does not now get.

Now, let us assume that a certain amount of that information would be classified in one way or another, and that that very information might be critical in order to reach a certain decision.

Now, a cardinal point is that science holds very few secrets. For instance, if congressional scientific advisers—say a group of nuclear physicists are asked by you to consider some proposed bomb technology—even if the group does not have direct access to all that is going on in the Government, or classified material—they can make pretty shrewd guesstimates as to the state of the art and what could or should be done, and then present recommendations to a Senate committee.

The CHAIRMAN. On the basis of that we might be able to reach out into the executive branch of the Government and get the information.

Dr. HELLER. Exactly. And if the Senate group of science advisers was about to make recommendations based on insufficient or wrong data, the executive branch would suddenly say, "This is catastrophe." Then, in effect, they would most likely have to give the correct data to the Senate group.

All this would, I think, offer a continuing stream of information, as opposed to the present trickle, directly to you on all conceivable phases of science as it impinges on the Senate business.

I would agree with the declaration of purpose in S. 2771 completely. These things need investigating. They need shoring up. Grievous errors are being committed, of both omission and commission, some directly to my own knowledge. I think they should be looked at. I disagree with my old friend Dr. Waterman that you should wait. We are in a scientific and technological explosion which won't slow down or wait. And therefore I do not think the Senate should wait.

It never hurts to question. It never hurts to get information. It never hurts for the Senate of the United States to get reliable information.

The CHAIRMAN. Then you wouldn't oppose the Commission?

Dr. HELLER. No, sir. But I would prefer to have it as independent as possible, responsible only to the Congress. If such a Commission needs participation of people in the executive branch, call upon them or have them testify. But if you have in the Commission a group of Government scientists or others recommended by them, I think that the psychology of man is such that there is a tendency not to throw rocks lest a rock be thrown back.

I am always happier in a situation such as this if an independent and autonomous group—without fear of hurting the feeling of friends and colleagues—can be the investigators. An independent group might agree item for item with the programs which are now being carried out in the executive branch. But if not, I would think the Senate would like to know about it. And I would think that you would like to have people who would be without prejudice or bias toward the executive branch bringing you information.

The CHAIRMAN. Do you think a study by the Commission, as proposed in this bill, if the Commission is created, might very well come to the same conclusions you have so expressed here and suggest that the Congress establish its own independent agency and source?

Dr. HELLER. Since I bring you this idea I must say of course I hope so. I think it would be most useful to the Senate.

The CHAIRMAN. Therefore the creation of a Commission in no way conflicts with your position?

Dr. HELLER. In no way, provided it is impartial.

The CHAIRMAN. It could very well implement your viewpoint?

Dr. HELLER. Very much so.

The CHAIRMAN. I just wanted the record straight.

Dr. HELLER. That is correct. I think the need for the Congress to know is paramount. We are in a cold war that we hope will preempt the next hot war. I think world war III is being fought today in the laboratories. There are scientific areas where our security is being seriously compromised, as I see it. And when that happens I become very concerned. But to whom can I take this concern today?

The CHAIRMAN. You have no source to go to to make the complaint?

Dr. HELLER. I can go to an individual Senator or Congressman, but the subject is usually too complex for him without scientific help. So he says. "This is pretty technical and complicated, what do I do with it?" Then where can I go with my concern or complaint?

In the previous hearings on a similar subject a statement was quoted from an article in the journal, *Science*, which asked: "Who speaks for science?" No one man can do so is the correct answer.

There is not a unified single entity called science, anymore than there is one entity called law. Just as there are many branches of law, so there are many branches of science. So I hope the Congress will not try to deal with a single unit called science. Science is active in agriculture, and in that area may be quite far away from space and nuclear physics. That is why I feel the Congress sends a top level cadre of scientific advisers representing many different disciplines.

This leads to my final point.

I would be violently opposed to a cabinet level Department of Science and Technology. Of the many reasons, I will cite only one at this time. There are numerous agencies in the Government that have sole cognizance over a certain area, such as the Atomic Energy Commission. Do you truly believe that the Atomic Energy Commission or its scientists have never made a mistake in a decision? I do not, and I think they will agree.

Yet, to research proposals brought to such an agency its scientists must say either: "No, we will not support this area," or "Yes, we will support the other one." There is no recourse from their decisions. If you, as an outsider, still wish to do research which they have decided not to support, you "have had it." But with multiple agencies such as we now have in most areas a good project can go to agency A and be turned, down but then go to agency B and be accepted. This often happens. Unify, and a single refusal can be tantamount to total blockade. This is serious.

I would rather have duplication than any bureaucratic dictation of science of any kind. Freedom, I think, is desperately important in this area.

The CHAIRMAN. Doctor, is this the compromise area you spoke of a while ago? Or is that something different? You spoke of being compromised.

Dr. HELLER. Compromise for security? Yes.

But I also refer to work in certain areas, completely non-classified, where there is a particular enthusiasm of a small group in an agency that has sole cognizance, to push a certain project. Perhaps it isn't a really brisk idea, but they push it because it is their baby. Yet, in another equally promising area where proponents are not vocal or powerful politically, a project may be killed.

As you know, we were late in getting into the rocket field. Long before we did so, a group begged for a green light

on rockets, but it stayed red within a "sole cognizance" agency which almost blocked the building of the hydrogen bomb. Many other projects have never come to light, I can say, because they were barred by an agency having sole jurisdiction in a certain area, and I am sure that some of the buried ideas had merit.

In contrast is an experience in one of the novel and most exciting areas of research in electronics, one with which I am intimately familiar. In this area various agencies exist which might reasonably sponsor such a project. It was turned down by three Federal agencies as being practically on the border of the ludicrous. But a fourth agency supported it. Today this research is not only being carried on in numerous universities, but is also a top priority project within the Defense Department itself. But this is only because there were alternative sources to turn to. Otherwise it would have been aborted.

Whenever you are on a frontier, anything you do that is novel is going to cause raised eyebrows. People in a position of public trust, as you are well aware, tend to be conservative, because it is usually much safer than daring to risk failure with something new.

In science you must not be afraid to dare. If you do not dare to explore the unknown or unfamiliar, you will seldom uncover basic new knowledge.

Senator MUSKIE. Mr. Chairman, I think Dr. Heller has made two important points. The first one that he has just discussed I think has been made very clearly, and that is the importance of multiplicity of alternatives of research; and the second one, the suggestion that the Congress ought to have a sort of watchdog agency. And I wonder if that suggestion might not be incorporated in the appropriate language in section 1, the Declaration of Policy of the Commission.

It may be implicit in what is already stated there, but I think it is so important that we might very well consider such language. This is just a spontaneous reaction to Dr. Heller's suggestion. He has a good one.

10. *Dr. Mortimer Taube, chairman, Documentation Incorporated*

Dr. TAUBE. I am a strong supporter for this bill for the creation of a Commission on Science and Technology. I find myself also in strong disagreement with Dr. Waterman's statement, with his description in particular of the gulf between basic research and technology.

I think that he is fostering a myth about modern science, the myth of the man working quietly in his laboratory, dedicated solely to the pursuit of truth, working alone, you see, in terms of basic research. I think the universities which promulgated this myth, the Government institutions and granting agencies which act upon it, in a sense, have ceased to function as responsible administrative bodies in the field of science.

Science in our time, following Alvin Weinberg, director of the Oak Ridge National Laboratory, is more properly de-

scribed as "big science." And I think just as big business needed and necessitated the growth of new Federal agencies, so big science makes necessary a reexamination of our administration of science.

Now, the interesting thing is, just as in the 1920's and 1930's big business fought against Government regulation, not in their own terms, but in terms of the Jeffersonian stereotype of small, independent farmers, merchants, manufacturers, and a free, mobile labor force, today big science is fighting against reorganization of the Government structure, not in its own terms, you see, but by fostering the myth of the scientist, alone in his laboratory, who needs absolute freedom from Government bureaucrats in order to get done what he has to get done.

I am not saying that big science is bad per se, any more than big business is bad per se. But both big business and big science necessitate, I think, a look at the administration and structure of science in the Nation and the Federal Government.

The designation "big science" is not an exaggeration. The Federal budget that may be mentioned here for research and development science is \$12 billion. It is sometimes not realized that this is as much as the total Federal budget before Pearl Harbor.

Now, I don't think you can run a \$12-billion program on advice from advisory councils, the National Academy, and the 15 or 20 interlocking advisory bodies who really don't have responsibility for the program.

Dean Don K. Price of the Graduate Staff of Public Administration at Harvard University, had an article recently in *Science* in which he used the curious phrase "The Scientific Establishment." Among other things he noted: "The plain fact is that science has become the major establishment in the American political system; the only set of institutions for which tax funds are appropriated almost on faith."

I don't think Congress can do its duty if it continues to do what Dean Price of Harvard said it is doing, namely appropriating money on faith rather than knowledge. And I don't think you can run \$12-billion business on advice from committees who have no responsibility for determining that the Nation gets value for this expenditure.

One of the things which indicates how serious this problem is, and which many of you may have noted, is that a couple of months ago, a number of articles appeared in newspapers and journals on conflict of interest in science. We used to talk about conflict of interest in business, and conflict of interest with reference to lawyers. What was happening was that scientists, unwittingly or not, were getting caught in advising the Government on huge expenditures which perhaps benefited the organizations for which they work.

A defense of the scientist was made in many of these articles on the ground that the conflict-of-interest laws were outmoded; they were laws which were written during the lifetime of the Civil War to protect Government procure-

ment; and that it was too bad that the scientists had gotten caught in these outmoded laws.

But what none of the papers said or none of these defenders said was that the National Academy of Sciences was also founded at the time of the Civil War. In every major crisis there has always been a need to reorganize science. In the First World War you had to have the National Research Council, because the Academy couldn't function. In the Second World War you had to have the Office of Scientific Research and Development because the National Research Council couldn't function. And after the war, we had to have a National Science Foundation and finally, the Office of Science and Technology.

I don't think that these improvisations are the answer to this problem. And therefore I am strongly in favor of this Commission.

Finally, in terms of checks and balances, the basic problem and the most difficult problem is the problem of the evaluation of results of research; namely, answers to the questions: "Is this a worthwhile research program?" and "Is the Government getting what it is paying for?"

I represent an organization which contracts with the Government for research. We are proud of what we do, and we would like to do more of it. On the other hand, we object when the Government contracts out its evaluation function, when it gives up its sovereignty for determining whether it is getting value received for its funds.

And many of our agencies do that. They contract out their evaluation function because there is no place in the Government where they feel competence exists for this evaluation.

The CHAIRMAN. What is the remedy for that?

Dr. TAUBE. One of the remedies, as of course has been said, is better salaries. But this is not enough. You may raise Government salaries, but the contractor will hire away the people and raise the salaries all over again. So there is no remedy this way.

There are two remedies which I would suggest. One is that any nonprofit organization that exists solely on Federal funds, without any capital investment or risk, like Rand, or any other such nonprofit, nonrisk organization should not be allowed to pay its people more for a job than the Government pays them for the same job.

The CHAIRMAN. In other words, the Government in contracting with them will make that a condition of the contract?

Dr. TAUBE. That is right. I believe in the profit system, but these are nonprofit agencies that do not risk capital.

The CHAIRMAN. Do you mean that that would apply only to the nonprofit industries?

Dr. TAUBE. Yes. The nonprofit organizations who don't risk anything. They are, in a sense, extensions of Government. In many cases they have been set up to defeat the Government salary limitations. So it doesn't do any good to raise salaries inside if every time you do that you create

other nonprofit agencies which can leapfrog those salaries and pull these men out of Government. Much of the shortage of scientists in Government, I feel, is artificial; it is competitive, based upon this type of situation.

The second remedy relates to my interest in a science department. I think we need a science career service in Government. We have such a career service in a number of special agencies, and the Government can well be proud of what it has done in its Bureau of Standards, its Coast and Geodetic Survey, and its Geological Survey, its Public Health Service, and its military services, and so forth.

These agencies have done great work, and there is no reason why this great work cannot be extended.

I would like to return for a moment to this word "establishment." Dean Price said—and this is very revealing to me—that the scientist "is a member of a new priesthood allied with military power."

Now, one of the basic reasons why we ought to have a science department is that it will furnish a counterbalance to military control of science. Today the military budget is so large that it dominates your science. But a science department could be a counterforce against that, returning science to a civilian agency in the Government, which it no longer is.

The CHAIRMAN. Why do you state in your prepared statement that "a large part of the Government expenditures for research and development represents sheer waste"?

Dr. TAUBE. This is a field in which I am an expert. I have studied the expenditures in this field, and I am conscious of a great deal of duplication. And this is not knowledgeable duplication; this is sheer waste of expenditure and funds. Now, as I say in my prepared statement, a number of months ago, I did suggest informally to the Bureau of the Budget that what was needed was a method of evaluation. And the answer that I got was, "Evaluation is difficult."

But that doesn't mean it isn't important. In fact, I think one of the purposes of this Commission should be to study how you evaluate the results of the expenditures for the research done.

The CHAIRMAN. You mean how Government should evaluate what it gets?

Dr. TAUBE. If you buy an airplane and it flies, you can tell you have got a good product, and if you buy so many miles of road you can tell you have got a good product, and if you buy so many buildings you can tell whether you have got a good product. But when you buy research and development, how do you know what you have got?

The CHAIRMAN. They say it is difficult.

Dr. TAUBE. All things rare are difficult.

The CHAIRMAN. How do you overcome the difficulty, that is the point?

Dr. TAUBE. One of the things that I would do is measure the performance in terms of objective, even in a research project. In Government, because of the length of time be-

tween the preparation of a budget and the presentation of it, everybody is always interested in justification of estimates.

There are always proposals presented to Congress. And the Budget Bureau evaluates a promise only, before they get it to you. But there is no agency in the Government that looks back and says, "This is what you said you would do with this million dollars. Did you do it?"

The CHAIRMAN. I believe you would support my proposal for a Joint Committee on the Budget, where the Congress could have a staff of experts of its own and follow up on these appropriations and evaluate the results.

Dr. TAUBE. I did a job once in a different field in which something very much like this situation emerged. Once the Ford Foundation, which was getting ready to do some work in Latin America, asked us to do a study of evaluations of the Point 4 program. Here money had been spent for years and there was a desire to know what had been accomplished.

We looked through the total record and we couldn't find any evaluations. All we could find were justifications of estimates, justifications of proposals, arguments about certain things. But an evaluation didn't exist.

The CHAIRMAN. The Government had no evaluation?

Dr. TAUBE. In the State Department files, the Archives, in reports to Congress, and in printed material there were a few minor comments that this man that you sent down wasn't very good, or this one. But as to an answer to the question, "Did the program actually accomplish what you appropriated this money for?" that was no place. We couldn't find it.

The CHAIRMAN. In other words, you didn't even have a progress report on it?

Dr. TAUBE. That is right other than that the next year they justified the estimates.

The CHAIRMAN. Other than an attempt to justify further expenditures?

Dr. TAUBE. Further expenditure. And this is true, I feel, in science.

The CHAIRMAN. Then you think this commission might make an objective study and get constructive results?

Dr. TAUBE. I do. As I said, sir, I don't think this is an easy problem. If it were an easy problem it wouldn't need a commission. You see, we could sit around the table and figure it out. But because it is so difficult and so important, this commission is vitally needed for our welfare and security.

Statement by Carl S. Stover, director of studies in science and technology, Center for the Study of Democratic Institutions ²

As the committee knows well, science and technology are now of central importance to the Nation, not only for defense, national security, and economic growth, but in all aspects of our national life. Where past societies were dependent on agriculture for their survival, we have become dependent on the continued advancement of knowledge and refinement of technique. In the nature of things, we are overwhelmingly

² Author of "The Government of Science"; the Fund for the Republic, March 1962.

committed to the pursuit of new knowledge and technical innovation.

At the same time, we recognize that with the power of modern science and technology we have achieved great authority over nature. If we use this authority badly, in ways that bring social change too rapidly or destroy natural ecological balances, we can do terrible harm. If we use it wisely, we can do much for the enrichment of human life. This situation places significant burdens on those responsible for guiding the growth and use of science in both public and private life.

Although the Federal Government has always been modestly involved in the protection and support of science and technology and in their use to accomplish public purposes, its role has grown significantly since World War II in response to the increased importance of science in national affairs. Instead of simply aiding science and technology, it is now guiding them. Their future has become dependent on the wisdom of Federal action.

In the past, Federal programs for science and technology have grown in response to practical needs. Government has exploited science for its purposes, and the organizational arrangements and policies that have grown up have largely been directed to this end. Now, its powers and those of our scientific technology having enlarged considerably, it is necessary for the Federal Government sometimes to protect science and to guide its use carefully, with due regard to the dangers as well as the opportunities it presents.

In the face of this situation, established policies and organizational patterns, most of which were highly pragmatic responses to particular immediate needs, are not always adequate. There is a need for the kind of fresh thought that a properly conceived and directed Commission on Science and Technology can yield.

It has been argued that such a Commission would be premature. My own conviction is that we must act while there is time for deliberation, not after we reach a crisis that would make it difficult if not impossible for a Commission to do a sound job. In an age of such rapid change and in an area of such profound importance, it is essential that we proceed early, in order to forestall the crises that could develop and might then prove impossible to correct.

The establishment of the Office of Science and Technology within the Executive Office of the President and the strengthening of the Director of the National Science Foundation were salutary steps. Yet I know of no one who regards these modifications as the final answer to our problem. Certainly we will do a better job as a result of these changes. But the more fundamental questions of what our long-range science policy ought to be and what patterns of organization will be most likely to serve that policy remain to be answered. On these issues, the experience under the new administrative arrangements will be helpful, but the deliberations of the proposed Commission would also be of inestimable value.

It is apparent from the record that much of the growth of Federal programs for science and technology has occurred in response to the initiative of the executive branch. Because these programs are highly specialized, it has not always been possible for the Congress to be as well informed about them as would be desirable under our system of government. One of the most important benefits of the proposed Commission would be the opportunity it would provide for congressional involvement and for the Congress to satisfy itself on a great many questions that are now open. It is also vital that in the future Congress have a larger role in setting policies and shaping programs for science and technology. If it is to do so, it must try to educate itself about science and technology and it must insure that the organization patterns in the executive branch and the Congress will make this larger role possible. The Commission could make a contribution to both of these ends.

There are some who believe that any effort to put greater efficiency and effectiveness into the Federal Government's programs related to science will result in greater restrictive control. To me this appears as a specious argument, especially when it is applied to the proposed Commission and the recommendations it would be likely to make. In the first place, any commission made up of men of the caliber indicated in the bill would recognize the importance of freedom for science if science is to have any integrity. They would have this as a fundamental principle underlying their work. In the second place, the argument assumes that more reasonable arrangements must yield more restrictions. Actually, the reverse could just as easily be true. It might even be argued that one of the fruits of the proposed Commission's studies should be the development of programs of support for science that would give outstanding scientists the opportunity to pursue fundamental research with even greater freedom than they now enjoy from the need to demonstrate the practical significance of their work.

My professional judgment is that the proposed Commission would make an important contribution to the improvement of democratic government and to the enlargement of the Nation's scientific and technical capabilities.

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