A BILL TO AMEND THE NATIONAL SCIENCE FOUNDATION ACT OF 1950

HEARINGS

BEFORE THE

SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT

OF THE

COMMITTEE ON SCIENCE AND ASTRONAUTICS

U.S. HOUSE OF REPRESENTATIVES

EIGHTY-NINTH CONGRESS

SECOND SESSION

ON

H.R. 13696

Superseded by H.R. 14838

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A BILL TO AMEND THE NATIONAL SCIENCE FOUNDATION ACT OF 1950

TUESDAY, APRIL 19, 1966

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT,
Washington, D.C.

The subcommittee met, pursuant to call, in room 2325, Rayburn House Office Building, at 10:10 a.m., Hon. Emilio Q. Daddario presiding.

Mr. DADDARIO. The meeting will come to order.

Will you step forward, please, Dr. Haworth, and have any members of your staff sit with you that you would like. We can add additional tables.

Dr. HAWORTH. I would like to have Mr. Hoff, General Counsel of the Foundation, and Dr. Wilson, the Deputy Director, sit at the table.

Mr. DADDARIO. We have come a long way since the Congress established the National Science Foundation some 15 years ago. It was a new concept then and in giving support to it, the Congress showed its ability to look ahead and to move in a direction necessary to fill a national need. Science today is recognized as an essential ingredient in our national life. It is recognized as an innovative force that is both a deep and durable influence on almost every aspect of our social and economic well-being as well as being fundamental to our national security.

The scientific community 15 years past showed its concern and its cooperation. Science and government had developed such close ties during World War II and had come to work even more harmoniously to maintain the health and vigor of science on the one hand and to enhance its availability through Federal programs to accomplish important national objectives. In the years that have intervened science has become increasingly important to the country and the National Science Foundation has confirmed the role and visualized force.

Today it occupies a key position in relationship to support of scientific research and educational facilities. We seek here in these hearings to review and adjust the legislation involved so as to meet the needs which have emerged during these years.

The intent of the bill H.R. 13696 before this committee is to strengthen every element of the Foundation: Its role, its management, and its relationship with the scientific community.

As we commence these hearings on the bill before us, Dr. Haworth, I do want to thank you not only for being here this morning, with

your staff, but for the immense amount of work you have had to do to support this committee in its activities during the course of the hearings which have taken place already and to prepare for these few days of hearings on the legislation itself. We recognize how important your testimony is, and we are extremely anxious to hear you.

(The bill is as follows:)

[H.R. 13696, 89th Cong., 2d sess.]

A BILL To amend the National Science Foundation Act of 1950 to make changes and improvements in the organization and operation of the Foundation, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 3 of the National Science Foundation Act of 1950 is amended to read as follows:

"FUNCTIONS OF THE FOUNDATION

"SEC. 3. (a) The Foundation is authorized and directed—

"(1) to initiate and support basic scientific research and programs to strengthen scientific research potential in the mathematical, physical, medical, biological, engineering, social, and other sciences, by making contracts or other arrangements (including grants, loans, and other forms of assistance) to support such scientific activities and to appraise the impact of research upon industrial development and upon the general welfare;

"(2) at the request of the Secretary of State or the Secretary of Defense, to initiate and support specific scientific research activities in connection with matters relating to international cooperation or national security by making contracts or other arrangements (including grants, loans, and other forms of assistance) for the conduct of such scientific research;

"(3) to award, as provided in section 10, scholarships and graduate fellowships in the mathematical, physical, medical, biological, engineering, social, and other sciences;

"(4) to foster the interchange of scientific information among scientists in the United States and foreign countries;

"(5) to evaluate the status and needs of the various sciences as evidenced by programs, projects, and studies undertaken by agencies of the Federal Government, by individuals, and by public and private research groups, employing by grant or contract such consulting services as it may deem necessary for the purpose of such evaluations; and to take into consideration the results of such evaluations in correlating the research and educational programs undertaken or supported by the Foundation with programs, projects, and studies undertaken by agencies of the Federal Government, by individuals, and by public and private research groups;

"(6) to maintain a current register of scientific and technical personnel, and in other ways to provide a central clearinghouse for the collection, interpretation, and analysis of data on the availability of, and the current and projected need for, scientific and technical manpower in the United States, including its territories and possessions, and to provide a source of information for policy formulation by other agencies of the Federal Government; and

"(7) to initiate and maintain a program for the determination of the total amount of money for scientific research, including money allocated for the construction of the facilities wherein such research is conducted, received by each educational institution, nonprofit organization, and private contractor in the United States, including its territories and possessions, by grant, contract, or other arrangement from agencies of the Federal Government, and to report annually thereon to the President and the Congress.

"(b) In addition to the authority contained in subsection (a), the Foundation is authorized to initiate and support scientific research, including applied research, at academic and other nonprofit institutions and, when directed by the President, at other appropriate organizations, relevant to national problems involving the public interest. In exercising the authority contained in this subsection, the Foundation may employ by grant or contract such consulting services as it deems necessary, and shall coordinate and correlate its activities with respect to any such problem with other agencies of the Federal Government undertaking similar programs in that field.

"(c) The Board shall recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences.

"(d) In exercising the authority and discharging the functions referred to in subsections (a), (b), and (c), it shall be one of the objectives of the Foundation to strengthen research and education in the sciences, including independent research by individuals, throughout the United States, including its territories and possessions, and to avoid undue concentration of such research and education.

"(e) The Foundation shall render an annual report to the President for submission on or before the 15th day of January of each year to the Congress, summarizing the activities of the Foundation and making such recommendations as it may deem appropriate. Such report shall include information as to the acquisition and disposition by the Foundation of any patents and patent rights."

SEC. 2. Section 4 of the National Science Foundation Act of 1950 as amended to read as follows:

"NATIONAL SCIENCE BOARD

"SEC. 4. (a) The Board shall consist of twenty-four members to be appointed by the President, by and with the advice and consent of the Senate, and of the Director ex officio. Except as otherwise specifically provided in this Act, the function of the Board shall be to establish the policies of the Foundation.

"(b) The Board shall have an Executive Committee as provided in section 7, and may delegate to it or to the Director or both such of the powers and functions granted to the Board by this Act as it deems appropriate.

"(c) The persons nominated for appointment as members of the Board (1) shall be eminent in the fields of the basic, medical or social sciences, engineering, agriculture, education, or public affairs; (2) shall be selected solely on the basis of established records of distinguished service; and (3) shall be so selected as to provide representation of the views of scientific leaders in all areas of the Nation. The President is requested, in the making of nominations of persons for appointment as members, to give due consideration to any recommendations for nomination which may be submitted to him by the National Academy of Sciences, the National Association of State Universities and Land Grant Colleges, the Association of American Universities, the Association of American Colleges, or by other scientific or educational organizations.

"(d) The term of office of each member of the Board shall be six years; except that any member appointed to fill a vacancy occurring prior to the expiration of the term for which his predecessor was appointed shall be appointed for the remainder of such term. Any person, other than the Director, who has been a member of the Board for twelve consecutive years shall thereafter be ineligible for appointment during the two-year period following the expiration of such twelfth year.

"(e) The Board shall meet annually on the third Monday in May unless, prior to May 10 in any year, the Chairman has set the annual meeting for a day in May other than the third Monday, and at such other times as the Chairman may determine, but he shall also call a meeting whenever one-third of the members so request in writing. A majority of the members of the Board shall constitute a quorum. Each member shall be given notice, by registered mail or certified mail to his last known address of record not less than fifteen days prior to any meeting, of the call of such meeting.

"(f) The election of the Chairman and Vice Chairman of the Board shall take place every second annual meeting. The Vice Chairman shall perform the duties of the Chairman in his absence. In case a vacancy occurs in the chairmanship or vice chairmanship, the Board shall elect a member to fill such vacancy.

"(g) The Board shall render an annual report to the President, for submission on or before the 31st day of January of each year to the Congress, on the status and health of science and its various disciplines. Such report shall include an assessment of national scientific resources and trained manpower, an assessment of basic scientific progress, and an indication of those aspects of such progress which might have implications for the needs of American society. The report may include such recommendations as the Board may deem appropriate.

"(h) The Board may, with the concurrence of a majority of its members, permit the appointment of a staff consisting of not more than five professional staff members and such clerical staff members as may be necessary. Such staff shall be appointed by the Director and assigned at the direction of the Board. The professional members of such staff may be appointed without regard to the civil service laws or the Classification Act of 1949 and compensated at a rate not exceeding the appropriate rate provided for individuals in grade 15 of the General

Schedule of the Classification Act of 1949, as may be necessary to provide for the performance of such duties as may be prescribed by the Board in connection with the exercise of its powers and functions under this Act. Each appointment under this subsection shall be subject to the same security requirements as those required for personnel of the Foundation appointed under section 14(a).

"(i) The Board is authorized to establish such special commissions as it may from time to time deem necessary for the purposes of this Act.

"(j) The Board is also authorized to appoint from among its members such committees as it deems necessary, and to assign to committees so appointed such survey and advisory functions as the Board deems appropriate to assist it in exercising its powers and functions under this Act."

SEC. 3. Section 5 of the National Science Foundation Act of 1950 is amended to read as follows:

"DIRECTOR OF THE FOUNDATION

"SEC. 5. (a) The Director of the Foundation (referred to in this Act as the 'Director') shall be appointed by the President, by and with the advice and consent of the Senate. Before any person is appointed as Director, the President shall afford the Board an opportunity to make recommendations to him with respect to such appointment. The Director shall receive compensation at the rate provided for level II of the Federal Executive Salary Schedule and shall serve for a term of six years unless sooner removed by the President.

"(b) Except as otherwise specifically provided in this Act (1) the Director shall exercise all of the authority granted to the Foundation by this Act (including any powers and functions which may be delegated to him by the Board, and (2) all actions taken by the Director pursuant to the provisions of this Act (or pursuant to the terms of a delegation from the Board) shall be final and binding upon the Foundation.

"(c) The Director may from time to time make such provisions as he deems appropriate authorizing the performance by any other officer, agency, or employee of the Foundation of any of his functions under this Act, including functions delegated to him by the Board; except that the Director may not redelegate policymaking functions delegated to him by the Board.

"(d) The Director shall not make any contract, grant, or other arrangement pursuant to section 11(e) without the prior approval of the Board if such contract, grant, or other arrangement involves a new program, or involves a total commitment of over $2,000,000, or over $500,000 in any one year, or a total commitment of such higher amount or amounts or subject to such other conditions as the Board in its discretion may determine and publish in the Federal Register.

"(e) The Director, in his capacity as ex officio member of the Board, shall, except with respect to compensation and tenure, be coordinated with the other members of the Board. He shall be a voting member of the Board and shall be eligible for election by the Board as Chairman or Vice Chairman of the Board."

SEC. 4. The National Science Foundation Act of 1950 is further amended by striking out section 8, by redesignating sections 6 and 7 as sections 7 and 8, respectively, and by inserting after section 5 the following new section:

"DEPUTY DIRECTOR AND ASSISTANT DIRECTORS

"SEC. 6. (a) There shall be a Deputy Director of the Foundation (referred to in this Act as the 'Deputy Director'), who shall be appointed by the President, by and with the advice and consent of the Senate. Before any person is appointed as Deputy Director, the President shall afford the Board and the Director an opportunity to make recommendations to him with respect to such appointment. The Deputy Director shall receive compensation at the rate provided for level III of the Federal Executive Salary Schedule and shall perform such duties and exercise such powers as the Director may prescribe. The Deputy Director shall act for, and exercise the powers of, the Director during the absence or disability of the Director or in the event of a vacancy in the office of Director.

"(b) There shall be four Assistant Directors of the Foundation (each referred to in this Act as an 'Assistant Director'), who shall be appointed by the President, by and with the advice and consent of the Senate. Before any person is appointed as an Assistant Director, the President shall afford the Board and the Director an opportunity to make recommendations to him with respect to such appointment. Each Assistant Director shall receive compensation at the rate provided for level V of the Federal Executive Salary Schedule and shall perform such duties and exercise such powers as the Director may prescribe."

SEC. 5. The section of the National Science Foundation Act of 1950 redesignated as section 7 by section 4 of this Act is amended to read as follows:

"EXECUTIVE COMMITTEE

"SEC. 7. (a) There shall be an Executive Committee of the Board (referred to in this Act as the 'Executive Committee'), which shall be composed of five members and shall exercise such powers and functions as may be delegated to it by the Board. Four of the members shall be elected as provided in subsection (b), and the Director ex officio shall be the fifth member and the chairman of the Executive Committee.

"(b) At each of its annual meetings the Board shall elect two of its members as members of the Executive Committee, and the Executive Committee members so elected shall hold office for two years from the date of their election. Any person, other than the Director, who has been a member of the Executive Committee for six consecutive years shall thereafter be ineligible for service as a member thereof during the two-year period following the expiration of such sixth year. For the purposes of this subsection, the period between any two consecutive annual meetings of the Board shall be deemed to be one year.

"(c) Any person elected as a member of the Executive Committee to fill a vacancy occurring prior to the expiration of the term for which his predecessor was elected shall be elected for the remainder of such term.

"(d) The Executive Committee shall render an annual report to the Board, and such other reports as it may deem necessary, summarizing its activities and making such recommendations as it may deem appropriate. Minority views and recommendations, if any, of members of the Executive Committee shall be included in such reports."

SEC. 6. The section of the National Science Foundation Act of 1950 redesignated as section 8 by section 4 of this Act is amended to read as follows:

"DIVISIONS WITHIN THE FOUNDATION

"SEC. 8. There shall be within the Foundation such divisions as the Board may from time to time, after receiving recommendations from the Director, deem necessary."

SEC. 7. Section 9(a) of the National Science Foundation Act of 1950 is amended by striking out "section 3(a)(7)" and inserting in lieu thereof "section 4(i)".

SEC. 8. Section 10 of the National Science Foundation Act of 1950 is amended—

(1) by striking out "section 17" and inserting in lieu thereof "section 16"; and

(2) by inserting "social," after "engineering,".

SEC. 9. Section 11(c) of the National Science Foundation Act of 1950 is amended—

(1) by striking out "basic";

(2) by inserting "Secretary of State or" before "Secretary of Defense"; and

(3) by striking out "the national defense" and inserting in lieu thereof "international cooperation or national security".

SEC. 10. Section 13(a) of the National Science Foundation Act of 1950 is amended—

(1) by striking out ", with the approval of the Board,"; and

(2) by striking out "section 16(d)(2)" and inserting in lieu thereof "section 15(d)(2)".

SEC. 11. Section 14 of the National Science Foundation Act of 1950 is repealed.

SEC. 12. (a) Section 15 of the National Science Foundation Act of 1950 is redesignated as section 14, and subsection (a) of such section as so redesignated is amended by striking out "Such appointments" and inserting in lieu thereof "Except as provided in section 4(h), such appointments".

(b) Subsection (a) of such section as so redesignated is further amended by striking out the last two sentences and inserting in lieu thereof the following: "The members of the special commissions shall be appointed without regard to the civil service laws or regulations."

(c) Subsection (b) of such section as so redesignated is amended to read as follows:

"(b) Neither the Director, the Deputy Director, nor any Assistant Director shall engage in any other business, vocation, or employment while serving in such position; nor shall the Director, the Deputy Director, or any Assistant Director, except with the approval of the Board, hold any office in, or act in any capacity for, any organization, agency, or institution with which the Foundation makes any grant, contract, or other arrangement under this Act."

(d) Subsection (d) of such section as so redesignated is amended—

(1) by striking out "divisional committee, or special commission," and inserting in lieu thereof "special commission"; and

(2) by striking out "$50" and inserting in lieu thereof "$100".

(e) Subsection (e) of such section as so redesignated is amended by striking out "divisional committees and".

(f) Subsection (f) of such section as so redesignated is amended by striking out ", of a divisional committee,".

SEC. 13. Sections 16 and 17 of the National Science Foundation Act of 1950 are redesignated as sections 15 and 16, respectively, and subsection (b) of the section so redesignated as section 15 is amended by striking out "section 15(h)" in paragraph (1) and inserting in lieu thereof "section 14(h)".

SEC. 14. (a)(1) Section 303(b) of the Federal Executive Salary Act of 1964 is amended by adding at the end thereof the following new paragraph:

"(20) Director of the National Science Foundation."

(2) Section 303(c) of such Act is amended by striking out paragraph (41), and by adding at the end thereof the following new paragraph:

"(47) Deputy Director, National Science Foundation."

(3) Section 303(e) of such Act is amended by striking out paragraph (66), and by adding at the end thereof the following new paragraph:

"(100) Assistant Directors, National Science Foundation (4)."

(4) The amendments made by this subsection (and the amendments made by sections 3 and 4 of this Act insofar as they relate to rate of compensation) shall take effect on the first day of the first calendar month which begins on or after the date of the enactment of this Act.

(b) Section 902(c) of the National Defense Education Act of 1958 is amended by striking out "$50" and inserting in lieu thereof "$100".

SEC. 15. Except as otherwise specifically provided therein, the amendments made by this Act are intended to continue in effect under the National Science Foundation Act of 1950 the existing offices, procedures, and organization of the National Science Foundation as provided by such Act, part II of Reorganization Plan Numbered 2 of 1962, and Reorganization Plan Numbered 5 of 1965. From and after the date of the enactment of this Act, part II of Reorganization Plan Numbered 2 of 1962, and Reorganization Plan Numbered 5 of 1965, shall be of no force or effect: but nothing in this Act shall alter or affect any transfers of functions made by part I of such Reorganization Plan Numbered 2 of 1962.

STATEMENT OF DR. LELAND J. HAWORTH, DIRECTOR, NATIONAL SCIENCE FOUNDATION

Dr. HAWORTH. Thank you, Mr. Chairman.

Mr. Chairman, members of the subcommittee, I am happy to have the opportunity to speak to you this morning.

First let me say that the entire National Science Foundation—the National Science Board, the Director, and the staff—is highly appreciative of the intensive efforts and the considered thought that the committee has given for more than a year to the Foundation, its objectives, its problems, the manner in which it works and the statute under which it operates. These have already borne fruit in many ways, including the bill that lies before the Congress, the wisdom and the ideas that you have imparted to the Foundation through our many contacts, and the stimulation that has been provided to us to clarify our thinking and try to improve our operations. We are very grateful to you.

With your permission, Mr. Chairman, I would like, at this point, to read my comments on H.R. 13696. This will probably take 25 or 30 minutes. Having read this document, I would then be happy, of course, to discuss further any of the items covered or any other matters on which the committee might wish to question me. And, from this point, Mr. Chairman, the document will largely follow the letter that I have already forwarded to you.

In general, I heartily endorse most of the provisions of the bill, the enactment of which will, I believe, greatly facilitate the effective operation of the Foundation and permit it to play a larger role in the development of our country. There are, however, some specific provisions in the bill with respect to which I particularly wish to state my views and in some cases to express reservations or suggestions. These observations follow, in general, the order in which the provisions appear in the bill.

First, I strongly support the proposed amendment of section 3(a)(1) to formally add the social sciences to the list of the specific sciences which the Foundation is authorized and directed to support.

Although the Foundation has for some years conducted limited but growing programs in support of certain aspects of the social sciences, it is widely felt that the time has come for these sciences to receive expanded attention from the Foundation. It is fitting that the social sciences should now be recognized by that name in the act itself rather than receive support anonymously as an "other science."

This greater visibility should emphasize the efforts of the Foundation to stimulate and support increased research and improved education in the social sciences in order to help them play an increasingly important role in coping with some of the major problems facing society today.

Second, I welcome the proposed revision of section 3(a)(2) which would broaden the Foundation's authority to participate in international scientific activities. I suggest, however, that the section be changed to include not only scientific research abroad, but also activities designed to strengthen science education, such as appropriately modified course content or curriculum development programs, at the request of the Secretary of State. This could be done by deleting the word "research" on line 8 of page 2 of the bill and substituting the word "activities" for the word "research" on line 12 of the same page.

In addition, I believe that the Foundation should be free to decide itself whether it should undertake an activity which might be requested under this section. I would suggest, therefore, that in place of the phrase "at the request of" on line 6 there be substituted the phrase "at the discretion of the Foundation when requested by", the Secretary of Defense, or the Secretary of State, and so on.

Section 3(a)(2) would then read as follows:

> at the discretion of the Foundation when requested by the Secretary of State or the Secretary of Defense, to initiate and support specific scientific activities in connection with matters relating to international cooperation or national security by making contracts or other arrangements (including grants, loans, and other forms of assistance) for the conduct of such scientific activities;

Third, while endorsing the general purposes of proposed section 3(a)(7) I have some reservations with respect to those of its provisions which would require the Foundation to maintain a program for the determination of the total amount of money spent for research, including construction of facilities, by each educational institution, *nonprofit organization*, and *private contractor* in the United States. I believe that so comprehensive a survey offers almost insurmountable difficulties. While I assume that the language is not intended to apply to funds made available to subcontractors for research, which would be almost impossible ascertainment, nevertheless, the identification of the amount of funds made available for research under procurement

contracts with industry appears to be beyond present capabilities. This would also be true with respect to funds made available to certain nonprofit organizations.

Mr. DADDARIO. Dr. Haworth, on that point do you believe we could overcome your objection if language were to be included which would make it mandatory on the part of the agencies involved to supply you with the necessary information, or do you carry this reservation to their ability as well as to ours?

Dr. HAWORTH. Mr. Chairman, we are informed by some that there are severe difficulties, if one takes this at all literally. One of these is that procurement contracts, by the Department of Defense and by AEC, for example, carry with them in most instances a sort of a research overhead, if I may use that phrase, that the company is allowed to use for company-sponsored research. Where that money is finally used is hard to find out. It doesn't sound like much, a few percent, but procurement contracts are often enormous contracts. Since the money gets all mixed up with other funds that the company has, both of its own and from other contracts, it would be very difficult to trace its ultimate use.

Now, I wouldn't say it couldn't be done. It would have to be done in retrospect rather than at the time of issuance of the contract, and it might well be that it would have to be done by surveying the companies themselves rather than the agencies, which again could be done, but it would be a massive thing, and, quite frankly, I question whether it would be worth the effort.

Now, this depends, of course, on interpretation of this section, how literally one interprets it, how accurate one tries to be and things of that sort.

As I will say a little later on that if this section were modified, as we suggest, we would expect to experiment and look into how we might do this sort of thing.

But, to have it be a legal requirement without more knowledge than we have now, we are somewhat dubious about.

Mr. CONABLE. Mr. Chairman?

Mr. DADDARIO. Mr. Conable?

Mr. CONABLE. Were you suggesting it be mandated on also by these reports? You talked about these agencies when you said should we mandate reporting.

Mr. DADDARIO. We are seeking, Mr. Conable, to establish a formula so that there will be made available to us, to the Congress, more information on this subject than there has been. Dr. Haworth shows his concern, not as to the direction we move, but as to whether we are imposing a requirement which would be "impossible" to accomplish or if accomplished would not be as meaningful as the effort would require.

Dr. HAWORTH. That's really what I am trying to say, Mr. Chairman, and I would point out another thing.

As I said here, we assume that it was not your intention to have us follow this into second- and third-tier subcontracts, but in terms of what I believe your interest is, the dispersal among business organizations, both from the standpoint of the individual organizations and the areas of the country that are affected and so forth, those subcontracts and sub-subcontracts can well be a good deal more important than some of the direct use that the company itself makes.

There's another point that I should have mentioned in the first instance. In many research and development contracts where a company is given a big contract to, let's say, develop a large system of some sort, such as a military system, or one for NASA, the system is a culmination of research and development. They have to do a certain amount of at least applied research if it is a very front-running sort of thing.

A good deal of research must be done to back up the engineering of the system itself. The agency would never know how much of the effort that went into, say, the Polaris missile was development, how much was research, where it all went and so forth. It would take, in my opinion, a very involved investigation to find out how much research went to what companies to develop the Polaris missile.

To do that sort of thing would obviously be a lot of work for the Foundation, which we are quite willing to undertake. It would also be a lot of work for the other agencies concerned and it would involve a great deal, if I may use a slang phrase, of getting in the hair of the companies in trying to sort all of this out.

Mr. DADDARIO. I wouldn't want the committee to come to a quick judgment on it, but it is my feeling that we would not, at the moment at least, expect you to go beyond the primes and the first tier of subcontractors and that perhaps at first there would be a lag during which material is being put together in order to establish a formula through which more complete information could be made available.

Dr. HAWORTH. As I say, we are quite happy, by sampling methods, by trial and error and so on, to try to find out what can actually be done.

Mr. DADDARIO. That's very helpful.

Dr. HAWORTH. But, to have it be a legal requirement right now troubles us.

Mr. DADDARIO. Considering the past testimony and that which you have added today let us see how we can come up with some language in the report which will cover the parts which concern you.

Dr. HAWORTH. It could well be, Mr. Chairman, that interpretation in your report could take care of what I am concerned about.

Mr. DADDARIO. Fine.

Dr. HAWORTH. Incidentally, some of the things I said apply to some of the special cases of nonprofit organizations as well as industry, some of the big ones such as in the aerospace field and so on.

Mr. DADDARIO. Fine. If you will proceed, Doctor.

Dr. HAWORTH. Recognizing the desirability of securing such information but also being fearful that the Foundation might be asked to undertake programs which it could not meaningfully fulfill, I suggest that the phrase "received by each educational institution, nonprofit organization, and private contractor in the United States," be replaced by the phrase "received by each educational institution and appropriate nonprofit organization in the United States."

Needless to say, the Foundation would continue to explore the possibilities of expanding its surveys to more nearly meet the very broad objectives expressed in the present version of the bill.

Section 3(a)(7) would then read as follows:

to initiate and maintain a program for the determination of the total amount of money for scientific research, including money allocated for the construction of the facilities wherein such research is conducted, received by each educational insti-

tution and appropriate nonprofit organization in the United States, including its territories and possessions, by grant, contract, or other arrangement from agencies of the Federal Government, and to report annually thereon to the President and the Congress.

Incidentally, Mr. Chairman, the question of what fraction of the funds that go to construct an R. & D. facility should be charged to research and what to development, this obviously is not an easy thing to decide.

Fourth, I welcome the proposed new section 3(b) which would permit the Foundation to support applied research under certain circumstances. The line which divides basic and applied research at institutions of higher education is far from clear. The Foundation, in fulfilling its responsibility to initiate and support basic scientific research and programs to strengthen scientific research potential, must consider the overall development of science, including education, at academic institutions. While the role of applied research enters into consideration in many disciplines, it arises with particular cogency with respect to engineering education at the graduate level. At the present time, engineering education in this country is commencing to swing back from a predominant emphasis on engineering sciences, divorced from the solution of design problems, to a more balanced approach. Many believe that increased emphasis on applied research by engineering graduate students is necessary to develop engineers with greater competence to adapt new scientific knowledge into engineering practice for the welfare of the country.

However, in its support of research, the Foundation has, in my opinion, reached the limit of what can be defined as "basic research," particularly in engineering. Hence, to the extent that engineering schools are dependent upon support from the Foundation for their research activities, the limiting of such support for research to that which is purely basic interferes with the ability of these schools to expand knowledge and to enrich their curriculums.

Not only would the ability to support avowedly applied projects be beneficial, but also in many cases it would make it possible for the Foundation to extend support to an investigator in such a way as to enable him to follow promising leads developed in the course of a basic research project even though this might take him into applications. In this way totally new and fruitful research frontiers in basic science may become evident.

It would, therefore, be a most constructive development, I believe, for the Foundation to have the authority to be more responsive to the needs of the academic community, not only in engineering but in other disciplines as well.

I believe, however, that the proviso contained in section 3(b) that applied research be "relevant to national problems involving the public interest" must be applied to academic research of the type I have just discussed as a generality and not to individual projects. After all, applied research which will help an engineer to acquire the competence to exploit breakthroughs in fundamental knowledge in making practical applications of importance to the country is research relevant "to national problems involving the public interest," in the first instance.

However, the particular applied research which might be supported to best further such education may not, of itself have a direct bearing,

at least an obvious direct bearing upon a particular national problem. Likewise, the applied research growing out of basic research which may, in turn, lead to new basic findings, may not have a direct link at the time to a recognized national problem, even though in the end it may vitally affect a matter of extreme concern to the country. While, therefore, it could be difficult to make a finding that support of such applied research in a particular instance met the statutory test, academic research as a class does, in my opinion, meet the test.

I would, therefore, like to urge that this subsection be altered to make it clear that academic applied research projects as such are authorized without reference to their relation to a particular national problem. This could be done by amending the first sentence of section 3(b) to read as suggested in the commentary which the National Science Board is submitting, namely as follows:

> In addition to the authority contained in subsection (a), the Foundation is authorized to initiate and support scientific research, including applied research, at academic and other nonprofit institutions. When so directed by the President, the Foundation is further authorized to support, at other appropriate organizations, applied scientific research relevant to national problems involving the public interest.

Now, this may be simply a matter of interpretation on my part, Mr. Chairman, as to whether the clause "research relevant to problems involving the public interest" would modify the authority to support academic applied research or not, but I believe the suggested language would make it clear that it would not, and I would urge that the sections be fixed so it is clear that it does not so modify for the reasons that I have given.

Mr. DADDARIO. How would the recommendation that you have made affect projects of large natures, such as transportation or pollution which the President might recommend be done by the National Science Foundation?

Dr. HAWORTH. I don't believe that my suggestion changes that at all, Mr. Chairman. It is simply that by putting the idea in two sentences the phrase "relevant to national problems involving the public interest" is uncoupled from the academic support. I left it coupled to the "other institutions", industry in other words, just as you had it.

Mr. DADDARIO. Your suggestion here is to broaden your capability rather than to narrow it down?

Dr. HAWORTH. To broaden what I interpret the bill to say. It may be that it is intended to say what I have said in different words, but I was not certain, whereas the suggested language makes it clear that if an engineering group in a university wants to do some applied research, we wouldn't have to make a finding that this was research on a "national problem."

Mr. DADDARIO. That was in the national interest——

Dr. HAWORTH. It is still in the national interest as I have said, but it isn't necessarily a hot national problem.

I go under the assumption that the Foundation endeavors to do, to have sort of everything it does be in the national interest, but in different kinds of ways. It is the question of the problem that is of concern here.

Mr. YEAGER. May I ask one question here, Dr. Haworth?

Dr. HAWORTH. Surely.

Mr. YEAGER. By separating the phrasing this way, you would not construe it to mean that the first part of that sentence would preclude you from supporting research which did involve as you call it, the hot national problem.

Dr. HAWORTH. Certainly not. I just didn't want to limit the research in the academic institutions, which by my interpretation of the present language, it could do.

Mr. YEAGER. I see.

Dr. HAWORTH. I do not believe that, in any sense, I am suggesting a substantively different thing than is intended in the bill. It just to me is clearer, and it may be that I am suggesting going further than you intended, but to me the present wording says that we must make a finding that all projects supported are relevant to national problems. As I have said in the text, research may be relevant to the national interest simply in that it makes better engineers, even though the particular problem may not be something that is a problem we should be in hot pursuit of.

Mr. DADDARIO. Well, we will certainly reflect on it, Dr. Haworth. As you spell it out this morning, it does clarify it. We will look into it carefully and if there is any further question, we will discuss it at a later time.

Dr. HAWORTH. Thank you.

My fifth comment is on proposed section 3(c). As stated in the commentary which the Board is submitting, it seems important that this statement of legislative intent should clearly run to all elements of the Foundation. I am sure you will appreciate that in carrying out his functions, both within the executive branch of the Government and also with respect to the academic community, the Director must of necessity "recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences." As it is impossible for the Director of the Foundation to abstain from expressing opinions on these matters, both the Board and I feel that this section should be changed, in some suitable way to provide for this fact. Perhaps the phrase, "and the Director" could be inserted after the word "Board" in the first line of section 3(c).

This section would then read as follows:

> The Board and the Director shall recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences.

Mr. DADDARIO. Dr. Haworth, don't you consider that you are part of the Board as an ex officio member and isn't your participation covered under the language that now exists which says "The Board shall recommend"?

Dr. HAWORTH. I don't believe so, Mr. Chairman, because as a member of the Board I am one of 25 members of the Board and I do not believe we would expect that each and every one of the 25 members of the Board should individually do this sort of thing.

Mr. DADDARIO. In other words, as the Director you have a little more weight than any single member of the Board.

Dr. HAWORTH. But wearing a different hat. I wear two hats. I wear a hat as one of 25 members of the Board, but I also wear a hat as chief executive officer of the Foundation. It is to the second hat that I refer here. In other words, I should not speak on behalf of the Board without the Board's complete endorsement and full discussion, and so forth.

Mr. DADDARIO. Don't you believe that your recommendation here—and I have come to no final judgment about it—but don't you believe that you are moving in the direction where your vote in fact will be equal to the Board? You are on the Board as it stands, and then when you add "and Director", in a sense by yourself you would be in a position to nullify the action of the Board. Aren't you giving additional emphasis to strength on the Director's part which might put things out of balance?

Dr. HAWORTH. I don't believe so. I simply believe that the Board on the one hand, and the Director on the other hand should do this activity in different spheres. For example, Mr. Chairman, as a sort of member of the Federal Council for Science and Technology, I make many recommendations to the Council which I do as the Director for the Foundation, not as a member of the Board of the Foundation. I vote on the Federal Council and so on and so on.

I firmly believe that the Board should be explicity mentioned here. The wording shouldn't simply say the Foundation. It should make it very clear that this is a proper function of the Board, but I think it should also make it clear that it is a proper function of the Director. The present act says the Foundation. But says in effect that the nonspecified powers of the Foundation are held by the Board. This bill says that the residual functions shall be held by the Director. And, my interpretation of saying Board here is saying this is one of the functions of the Board. And, I believe, it should be. They should be stated separately here. The bill should not simply say the Foundation since, because of the residual powers section, that would imply that the Director would do this rather than the Board, and I believe that would be wrong.

Mr. DADDARIO. You do not believe then that when the Director became a voting member of the Board, changing his prior position of just being a member of the Board without a voting privilege, his hand was sufficiently strengthened within the Board so as to meet your objection, or do you believe that you must move further toward strength.

Dr. HAWORTH. Remember, Mr. Chairman, we are talking here only about recommendations. We are not talking about authority.

Mr. DADDARIO. Yes.

Dr. HAWORTH. Or things of that sort. There are many instances in which things come along on the Monday after the Board met on Friday, and the Director in his capacity as the chief executive officer has to make recommendations to Dr. Hornig or the Bureau of the Budget or appear before a congressional committee or whatever it might be. But, he is then wearing his hat as the Director and not as one of the 25 members of the Board.

Mr. DADDARIO. Well, I think we have touched on that enough.

Dr. HAWORTH. I want it to be clear, Mr. Chairman, I am not suggesting that the Director would be expected to make any recommendations contrary to any of the policies or anything of that sort of the Board.

Mr. DADDARIO. We will take your recommendations in the light that you have given them and we will give them consideration in view of the experience that you have had.

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Dr. HAWORTH. I want it to be very clear here, Mr. Chairman, that I am highly in favor of the Board being specifically mentioned here rather than saying just "the Foundation."

Mr. DADDARIO. I recognize that.

Dr. HAWORTH. But, I think for completeness it also has to say "the Director."

Mr. DADDARIO. Mr. Brown?

Mr. BROWN. May I inquire to a subtle distinction here.

The point which is being raised would not be satisfied I presume, if the language were such as to indicate that the Board both collectively and through its individual members, could make recommendations and encourage the pursuit of national policy. What is being suggested is to establish the Board, and the Director, as two entities that shall make recommendations.

Mr. DADDARIO. I would like Dr. Haworth's opinion on that. My own feeling would be that any individual member of the Board would have to sell his recommendation to the Board rather than to have them fragment themselves by being able to make an individual recommendation.

Dr. HAWORTH. He certainly would have to, if he made any recommendation on behalf of the Board. Of course, it is clear that if there is nothing to the contrary, no statute or regulation or Executive order or whatever that anyone is free to make recommendations. We all do it every day in all sorts of things in all our walks of life, but I just want to be sure that there isn't an implication here that bars the Director from doing so with his Director's hat on. Remember the statute says that the National Science Foundation shall consist of a Board and a Director. It recognizes that there are two facets to the Foundation, each with its own role to play. The Director is an ex officio voting member of the Board to be sure, but that does not cover the case in which he is acting as the Executive Officer of the Foundation.

Mr. BROWN. Do you contemplate, Doctor, the possibility that you will, with your hat on as a Director, would make recommendations and encourage pursuits which would either be contrary to or different from those made by the Board?

Dr. HAWORTH. Certainly not. But, as I said a few moments ago, Mr. Brown, the Board meets every 2 months—for 2 days every 2 months. There are activities all the time in relationship with other agencies, with the Office of Science and Technology, with the Bureau of the Budget, with other representatives of the President, with the Congress and so forth. Now, I would certainly refrain from going beyond the framework of the thinking or the expressed policies concerning anything considered by the Board. But, to me by specifying the Board this section says that even within that framework or where a new matter comes up I should not make recommendations; that is really all I am trying to say.

Mr. DADDARIO. Fine. Proceed, Dr. Haworth.

Dr. HAWORTH. Sixth, in my opinion, sections 4(a) and 5(d) taken together do not apportion the respective responsibilities of the National Science Board and the Director in a completely appropriate manner.

And, here, Mr. Chairman, as you see, I am in part going out of the order of the bill, but these two sections relate so closely that they need to be discussed together.

The 24 eminently qualified scientists, educators, and men of public affairs who serve part time on the National Science Board can bring to bear on the determination of broad Foundation policies a balanced and knowledgeable insight into the needs of science throughout the country. Thus, the Board can and does play an invaluable and unique role in the affairs of the Foundation.

The Director, being on the scene full time, contributes an awareness of the internal affairs of the Government including the operations of the Foundation itself. He is also cognizant of the general views of the Congress insofar as they relate to matters involving scientific research and education. Because of his close involvement in these matters, he has an insight into the practicability of various courses of action and can be responsive on a day-to-day basis to the President or his assistants and to the Congress.

In view of the above, it seems clear to me that the Board should bear the primary responsibility for refining into general objectives the purpose and functions of the Foundation as set forth in the basic act and for formulating broad policies to achieve those objectives. The Director, on the other hand, as chief executive officer of the Foundation, should bear the primary responsibility for specific actions necessary to carry out the general policies and programs of the Foundation.

As generally understood, the formulation of what we refer to as programs bridges these roles of policy determination and operation. Thus, the Board should be much more intimately and constructively involved in the formulation of programs than through the mere exercise of a veto power over specific transactions as provided for in proposed section 5(d). Programs are best constructed by a coherent consideration of a whole range of situations and possibilities rather than by focusing attention on the limited facts and provisions of a particular proposed project. It follows that the general activities to be encompassed in a program developed pursuant to broad objectives established by the Board, and the relative magnitude of the Foundation's resources to be put into such a program, should be determined by the Director and the Board in consultation.

The specific details, and the operating decisions, should be primarily the responsibility of the Director, consulting the Board when such decisions involve relatively important substantive questions. In keeping with the responsibilities of the Board for the formulation of general Foundation policies and objectives, the Board should also, from time to time, review the program activities of the Foundation with a view to assessing their effectiveness in promoting desired objectives.

The fact that policy determination extends to participation in broad program formulation should, in my opinion, be explicitly recognized in the act. If this were done the provision of section 5(d) giving the Board a veto power over individual transactions in new programs would be unnecessary.

Moreover, I do not believe that the requirement of section 5(d) that the Board should pass on commitments over specified sums is a meaningful function of the Board. The issues concerned in making an award may well be more significant in some cases where a few rather than a great number of dollars are concerned. I suggest, therefore, that while the Director should be responsible for bringing before the Board such individual transactions as may contain policy issues or on

which he otherwise needs guidance, he should have complete authority to approve individual awards designed to implement Foundation policy, without regard to the size of the award.

Another consideration in apportioning responsibilities between the Board and the Director is that the Foundation must be in a position to carry out administration policy without delay. The members of the Board are heavily engaged elsewhere and meet only occasionally, while the processes of Government are continuous and on occasion can brook no delay. While, as Director, I would always prefer to consult the Board on matters of importance, there are occasions when a decision must be made by the Director without there being time to convene a meeting of the Board.

In such an instance the Director must be able to act, without securing formal Board approval, in the light of his understanding of established policy, the general thinking of the Board and such informal consultation with Board members as may be feasible.

The various factors discussed above could be accommodated by substituting for the last sentence of section 4(a) the sentence:

> The Board shall be the policymaking body of the Foundation and shall review its programs.

and by replacing section 5(d) with a single sentence providing:

> The formulation of programs by the Director shall be in conformance with the policies of the Foundation and shall be done in consultation with the Board.

Now, Mr. Chairman, I think you can see I have tried to say that I think the Board should be in the activity of formulating, guiding, and so forth, the programs in a more general and meaningful way than is specified in the bill, and that through consultation and review and guidance to the Director it should exercise this very great influence that it should have because of its stature, its knowledge, its experience and so on, and that is a more appropriate way than by controlling programs by vetoing specific grants or contracts.

Mr. DADDARIO. You have enlarged the committee's recommendations. The language reads in the proposed bill, "except as otherwise specifically provided in this act, the function of the Board shall be to establish policies of the Foundation."

You have really added words "and shall review its programs." Now, what does this do to the Board's position? It seems to me that you are actually diminishing from the Board's policymaking function when you recommend that they shall review its programs, "its" referring to the work of the National Science Foundation. Our recommendations intended to wait until the National Science Board came here with its own recommendations. I do think it is important for us to get your idea. The language here reads "The Board shall establish and be responsible for the policies and programs of the Foundation," so there is a great difference here.

Dr. HAWORTH. Well, I believe that my recommendations lie in between the bill and the Board recommendations. I certainly did not intend any difference between my statement with respect to policy and the statement of the bill with respect to policy.

Mr. DADDARIO. We don't mind if you differ with us on occasion, Doctor.

Dr. HAWORTH. No; I want to separate the two things, the policy on the one hand, and the programs on the other.

Mr. DADDARIO. Why do you want to separate them? Should they in fact be separated? Could we not interpret policies to include programs?

Dr. HAWORTH. Partly I would have to say, Mr. Chairman, it is a question of semantics as to what does one mean by a program. We speak of the program of the Foundation. We speak of the Foundation's education program; we speak of the program in support of undergraduate education, and that in turn is broken down into still smaller programs. So the word "program" means a lot of different things.

Now, in the broad sense programs, and especially broad program objectives form a part of policy. But not as to the details of how a particular program works. Let me give a trivial example. And, I admit it is very trivial, and an extreme case. For many years support for institutions purchasing equipment in chemistry let us say, was given from funds taken out of the so-called chemistry research program. A few years ago for reasons of budgetary clarity and accounting convenience and so on, we split off the funds that were used to buy equipment of appreciable cost and put them in a different budget item. It is called the program for chemistry instruments.

Now, I think that is a detail and yet if we literally say that the Board has to approve every program, they would have to approev a detail like that.

On the other hand, to my mind, at the other extreme, the language of the present bill, does not explicitly give any role to the Board in the formulation of programs. I believe that it should explicitly do so—that this role should be recognized in the language.

In other words, the thrust of what I have been saying is to give a bigger role to the Board than I interpret the present language to give with respect to programs. I see no difference with respect to policymaking.

Mr. DADDARIO. It is your idea then that as the Board would review programs, it would in fact be performing a policy function because the Board would be looking over your shoulder as the director, and, therefore, would not be giving you the obligation or the responsibility of reviewing your own activities insofar as programs are concerned, but that the Board would in fact perform that function.

Dr. HAWORTH. Well, one must take the two sections together. Not only in section 4(a) have I put the words "and shall review its programs," but in section 5(d) I suggested the language that "the formulation of programs by the Director shall be in conformance with the policies of the Foundation and shall be done in consultation with the Board." And, that's the main thrust of my proposal to make the role of the Board in program formulation more explicitly recognized than I believe the present language does.

As you can see this same interpretation of the present language was made by the Board by the virtue of the fact that they include the word "programs" separately from "policies" in their own proposal.

Mr. DADDARIO. Well, a person doesn't have as much trouble with the language in 5(d) as I do with the recommendations for 4(a).

Dr. HAWORTH. The reason I did it this way, Mr. Chairman, is as follows: Section 4 is a listing of the functions of the Board. In fact, section 4(a) starts out by saying "it shall be made up of 24 men,"

and so forth and so forth. Then it goes ahead in the bill and says not except as otherwise stated the Board's function shall be to make policy. Section 5, on the other hand, relates to the Director.

In the one case I put a positive statement about the activities of the Board. In the other I put a restriction on the Director. Now, 5(d) the restriction that the present bill puts on the Director is a restriction with respect to his authority to approve, to give grants and contracts in new programs or in cases where the amount of money is more than a particular amount.

Now, I believe that the decision of whether the Board thinks a new program is a good thing should come long before we have made an announcement and received some proposals and decided that a particular one is good. Not to bring the Board in until that point, is in my opinion belated. It should partake in a positive sense in the formulation of the new program in the first place.

Mr. BROWN. Mr. Chairman?

Mr. DADDARIO. Mr. Brown.

Mr. BROWN. May I contribute to the dialog here?

Mr. DADDARIO. Of course. We welcome any comments.

Mr. BROWN. I have some reservations about the proposed formulation of the language in 4(a) for two reasons. One, the phrase "shall review its programs," can be construed both as a limitation on the part of the Board, or a mandatory requirement which might not in every circumstance be desirable.

And, I can imagine programs of natures which might not be the most significant in the world, which are developed in accordance with general policy and which the Board might not have either the time or the inclination at any particular point to wish to review in detail.

The wording, "shall review its programs," might also be construed to say that the Board shall review them but if they don't like them, there is still nothing they can do about them because the wording says they shall merely review.

In my opinion this language is somewhat superfluous because of the fact that the real key to this is how they construe the meaning of the word "policy." Because if I were a board with the power to establish policies, I think one of the first policies I would establish would be that there would be no programs enacted or carried on that we couldn't review if we wanted to, and I think that is a legitimate policy which a board could adopt. I would, therefore, say that the recommendation for revision of 4(a) is probably not necessary, because the power in the present language to establish the policies of the Foundation could be construed as broadly as the Board wishes.

I would agree with the proposals as far as 5(d) is concerned. It is an obvious statement of something that should be adopted by the Board as policy even if it were not contained in the act, and putting it in there probably is a way of getting more specific and spelling out something that is obvious anyway.

I do not necessarily favor putting in a dollar limitations or making an effort to spell out just when something is not important and not to be brought to the Board. I think this is something for the Board to decide itself.

Mr. DADDARIO. Mr. Brown's discussion on this question conforms, very close to mine, Doctor. I wonder if you might comment on whether or not we ought to have dollar limits. I do think the

language that you recommend here might very well suit that requirement.

The fact that you have a recommendation here on reviewing programs, makes me wonder if we aren't getting back to the point where your words "shall review the programs," could put the Board into an operating role that may be interpreted now as being a weakened position.

I wonder if we are not causing more trouble here than less by trying to be more specific to clarify the position?

Dr. HAWORTH. I would say that of all the clauses and phrases in these two recommendations, I hold the least brief for the one that says, "and shall review its programs." I think that is the least important part of the two suggestions. The statement that the Board shall be the policymaking body of the Foundation I think is meant to be very clear. It is meant to say frankly that clearly the policies of the Foundation have to be within the policies of the Government. I believe my formulation makes it clearer that the reference is to policy insofar as the Foundation can make policies.

That was the reason I reversed that particular language.

Mr. BROWN. Doctor, there is a fundamental problem that arises with every board that presumably has policymaking function, but every board has a different concept of what a policy is. There's no definition that I know of in the dictionary or anywhere else that says what policy is.

Mr. DAVIS. Mr. Chairman?

Mr. DADDARIO. Mr. Davis?

Mr. DAVIS. I am reminded of a statement that I read recently which says a camel is a horse put together by a committee. We could come up with a camel here. Isn't this possibly what the draftsman of this phrase has in mind: The Board shall be the policymaking body of the Foundation and as such shall exercise the function of reviewing its program.

Dr. HAWORTH. That's the intent, and incidentally, I'm the phrasemaker.

Mr. DAVIS. Maybe if it were reworded in that language, it would go a long way to meet Mr. Brown's objections.

Dr. HAWORTH. This was the intent.

Mr. DADDARIO. Well, we can come to no quick decision, but I wonder if it just elaborates the situation and does not overcome the questions raised. The Board as a policymaker could in fact establish this as a requirement without it being in the language, which is Mr. Brown's point.

Mr. DAVIS. I agree that's true, too. I think either way would meet the objection.

Mr. DADDARIO. Well, I think we have touched on this enough.

Dr. HAWORTH. The thing I am strongest for is the change in 5(d). Incidentally, we tend—at least I tended at first and I think most people tend—to overlook the new program part of the present language. It doesn't merely set a limitation on grants above a certain size but it also requires approval of the first grant in a new program. To me that implies that that would be the only control the Board would have over the establishment of new programs. I believe it should have more control than that, and so have tried to get that idea into my substitute for 5(d). I think as a matter of fact that

participation in the formulation of the programs in the broad sense—and I'm now not talking about the little details such as I mentioned an example of a while ago—is the most important thing that the Board can do. It is the place where it can contribute the most. The programs are the means of trying to reach the objectives that were intended by the Congress in setting up the National Science Foundation in the first place.

I am speaking now of the Foundation's own activities, rather than the broad advisory and recommendatory functions, and so forth. In terms of internal activities the programs are of the essence. The needs and so forth of the scientific community, and particularly the academic scientific community, constitute the area in which the Board has the most intimate knowledge and understanding and hence in which its potency is the greatest. I believe this should be explicitly recognized and hence tried to call specific attention to it in section 5(d). I believe it should be involved in the sense, of the formulation of the programs, and not in what specific grant is given or not given within a program.

Mr. DADDARIO. Fine. Let's proceed, Dr. Haworth.

Dr. HAWORTH. Seventh, the provisions of the new section 4(b) authorizing the Board to delegate to its Executive Committee or the Director any of its powers and functions under the act would, in my opinion, add flexibility to the distribution of responsibilities I have discussed with respect to sections 4(a) and 5(d) and would strengthen the ability of the Foundation to operate effectively.

An appropriate delegation of authority to the Executive Committee would help promote fast action when necessary since, because of its limited membership, it can be assembled on much shorter notice than can be the entire Board. Moreover, under this section, the Board would be able to delegate to the Director authority for making those policy determinations which it might deem necessary to put him in a position to handle the daily affairs of the Foundation. This would be particularly useful in that operating decisions are often touched with policy implications which the Director might feel unable to decide without having appropriate authority.

I believe, therefore, that section 4(b) constitutes a wise delegation of new authority to the Board.

Eighth, I should like to discuss proposed section 4(g) which would require the National Science Board to render an annual report on the status and health of science and its various disciplines. As mentioned in the commentary, the Board in submitting the proposed language appears, perhaps, to require a report that is most comprehensive. Alternative language is supported in the commentary but I would point out that the explanation of the section as contained in an artlcle by you, Mr. Chairman, in the journal Science of April 1 of this year appears to cover the situation. I should like to quote the following excerpt from the article.

there is no intent here to pin a time-consuming, repetitive task on either the Board or the Foundation staff. We would not expect a complete evaluation and report each year on every science discipline or every phase of technology. We would expect the Board to be selective, to report on areas and developments which appear to it most significant, most timely, where achievement has occurred, or where the greatest gaps and needs exist.

I am sure that with such an understanding the Board would have the freedom of selection necessary to make this annual report in an effective and meaningful manner.

Ninth, proposed new section 6 provides for the appointment of a Deputy Director and four Assistant Directors by the President, by and with the advice and consent of the Senate. I welcome so much of this provision as applies to the Deputy Director. In addition to his normal broad responsibilities, he must be ready to act as Director. Therefore, I believe that it is appropriate and desirable that he be an officer chosen by the President and approved by the Congress through Senate confirmation.

On the contrary, I feel that the Assistant Directors should not be so appointed. While individuals may be recruited directly from the outside for these offices on occasion, these positions should be looked upon by the professional staff as legitimate career aspirations. Moreover, the number of officers required at the level just below the Deputy Director is already in excess of four and will undoubtedly grow as the Foundation's responsibilities increase. Therefore, the setting of any specific number of Assistant Directors is bound in time to lead to a situation where there are "first-class" Assistant Directors appointed by the President and "second-class" Assistant Directors appointed by the Director.

Finally, if these positions are intended as an organizational addition, it is my view that this would constitute undesirable layering which would tend to divorce the professional staff from management. I do, therefore, urge the committee to remove from the bill this provision for the appointment of Assistant Directors by the President by and with the advice and consent of the Senate.

Mr. DADDARIO. Dr. Haworth, how does your organization now deal with other agencies?

We have compiled a list of some 59 statutory positions where there is appointment by the President and confirmation by the Senate in comparable type positions. Now, your people deal with these men who really do have a different status from time to time. How does that work now? What inhibitions result because of this discrepancy and manner of appointment?

Dr. HAWORTH. Well, so far as I am aware, Mr. Chairman, this has had no, at least no appreciable, effect of any sort. The reasoning here, and perhaps I may be misinterpreting, but the reasoning is that the people that serve as Associate Directors of the Foundation are people in line positions. There's an Associate Director for Research, Dr. Robertson. There is an Associate Director for Education, Dr. Riecken, and so forth. And they are in charge of groups of divisions.

The Foundation has many more divisions now than it originally did. It has nine to be exact, and the Associate Directors are professional people who have served for long periods on the Foundation staff. I don't mean that in every instance this would be the case, but they are intimately tied to the activities of these divisions that report to them. More intimately perhaps than to the Director. That is, they are not part of the Director's office so to speak, in contrast to a big agency such as State or Defense or others of that sort where there are, of course, many Assistant Secretaries who are part of the immediate family of the Secretary.

Now, certainly these Associate Directors report to me. I see them at least every day or so. But, their home is where their working people are, and not in my office. Now I interpreted your intent in terms of your original report, in which you provided for four Assistant Directors, and for four divisions of the Foundation and furthermore said that these four Assistant Directors should be the heads of these four divisions. So, I interpreted that your intent here was for them to play the role that what we now call Associate Directors now play, rather than to be a special staff, so to speak, for the Director.

And, that's as I believe it should be.

Mr. DADDARIO. Well, we have discussed that particular point and come to the conclusion that we had built in a certain amount of rigidity which was not necessary or helpful, that we should not impose upon any director labels and, therefore, have withdrawn that proposal. Yet, it does not follow that by limiting to four those having a title of associate or assistant director, however it might be, whatever the situation called for, that you would not be able to provide within the organization under another label, people who could be given additional titles.

Our objectives provide the flexibility, so that you might have people who could act in your stead, carry out responsibilities when you were not available, appear before the committees of the Congress, act with greater capability because they had been given a higher standing, so that they could deal with their counterparts and other agencies and so that there will be attracted to the National Science Foundation people of the necessary standing since you would have the capability of offering them jobs at these levels.

Dr. HAWORTH. Are you suggesting, Mr. Chairman, that you have in mind that there might be up to four assistant directors who were, in this other sense that I spoke of, members of the director's office in the same sense that the deputy director is and that then there would be other people who would direct the affairs of groups of divisions?

Mr. DADDARIO. Yes; this has been our intention even though we may not have spelled it out, apparently we have not.

Dr. HAWORTH. I did not so interpret it because, as I said, of the report. Now I recognize that you do not in the legislation propose a rigid organization of divisions, but I assumed that the function of these four assistant directors was qualitatively the same functions that you intended in the report. That is, that although you are not specifying that we should have this division, that division and the other division, that you nevertheless did still intend that these four assistant directors should be the line operating officials of the divisions or groups of divisions.

Mr. DADDARIO. Well, let's talk about it just a bit since there is some confusion about it. You go so far here in approving the idea of the appointment of a Deputy Director in this manner.

Dr. HAWORTH. Yes.

Mr. DADDARIO. Why do you stop there? Why don't you go further?

Dr. HAWORTH. Well, as I see it, and certainly in terms of the existing organization of the Foundation and as I understood your intent with respect to its organization, the role of the Deputy Director is a quite different kind of role, not simply because of the echelon in

which he is placed, but in the kind of function he performs. In the organization charts I always draw a box and put the Director and the Deputy Director in that same box; I think they are one and the same thing. Somebody has to be in charge, to be ultimately responsible, or as Jim Fisk used to say, to be the man that gets fired if things go wrong. But, except for a couple of cases where for transient reasons, there are offices that report directly to him, the Deputy Director is not a line officer. He is part of the Director. The Director simply has two heads and four arms and so on.

Now, as to the Associate Directors. The Associate Director for Research does not have a broad responsibility across the Foundation, except as every high official of any organization is obviously party to the councils and so forth, but he has responsibility for those divisions that deal with research and in this case also the division that manages the institutional programs. The Associate Director for Education has responsibility for the totality of the education functions of the Foundation. But as I say, just to use geography as a way of putting it, the Associate Directors sit in the part of the building where their people are and not in the part of the building where the Director is.

Now, it would be a quite different thing to say that in addition to the deputy director there might be a couple or so assistant directors who would function at the level of the director's office who are not line officers with respect to these different functions. But, I have not been interpreting your intent in that way.

Mr. BROWN. Mr. Chairman, could I clarify the level of the existing associate directors?

Doctor, could you tell me what their present level is in terms of salary or in terms of the proposal that is made here for the four assistant directors? Are they at that level now or are they at a lower level?

Dr. HAWORTH. They are at the equivalent of grade 18 which is slightly, but not very far in salary below the ——

Mr. BROWN. You seem to have a dichotomy between career positions and Presidential appointments too. This is not a rigid dichotomy.

Dr. HAWORTH. No, that was a minor point. Obviously career people are very often appointed to these kinds of positions. But, on the other hand I think of the positions of the associate directors as they now function in the National Science Foundation as one to which people should aspire as career positions. Perhaps that would have been a better way to say it. So long as they function effectively, I think they should stay there.

Now, I'm not dealing with and frankly I haven't given any thought to this other question of whether there might be more people in the director's office at the Presidential appointment level whose functions would be, as I say, within the director's office as assistant directors in the same way as an assistant secretary who does not have a line responsibility but has a functional responsibility rather than an organizational responsibility; perhaps that's what I'm trying to say.

Mr. DADDARIO. Perhaps we can clarify this by posing some questions for the record. As I recall it, Dr. Haworth, when Mr. Keppel was Assistant Secretary of HEW, he was lifted up to that position from the Commissioner of Education, giving him a higher level to

operate within certain of the agencies, that seemed to me to be one of the objectives. We may have some problems here because of a lack of understanding. I hope we can overcome them by posing some questions and seeing how we might be able to work this out and get ourselves operating in the same direction.

Dr. HAWORTH. I think your example of Mr. Keppel is a very good one to illustrate the different functions that I was trying to express. Mr. Keppel as Assistant Secretary of HEW for Education has responsibility for educational activities all through HEW, not just in the Office of Education. And, that's the sort of responsibility that I mean by a functional responsibility as distinguished from a line responsibility. When Mr. Keppel was Commissioner of Education he had an organization under him for which he was responsible to the Secretary.

Mr. DADDARIO. We have been thinking along those lines without having properly gotten across to you.

Dr. HAWORTH. Well, I think it was the fact that your report inferred that the four Assistant Directors would be the operating heads of the four divisions that you proposed. And although you did not put into the bill the proposal that there be four specified divisions, I thought that you were still proposing that the four Assistant Directors should be the heads of operating units of the Foundation in that same way.

Mr. DADDARIO. Well, we made a bigger mistake in that regard than we thought we did. We withdrew from it and I think we will have to clarify it further. I think we have established sufficient foundation here so that we can come to an understanding. So, I think we should proceed, Dr. Haworth.

Dr. HAWORTH. Finally, as stated in the commentary which the Board is submitting, a rather technical matter is raised by proposed section 8. We feel that the organization of the Foundation is primarily an administrative matter and that, therefore, the initiative for ordering the internal structure of the Foundation, including the creation or dissolution of divisions, should rest with the director. Accordingly, I suggest that section 8 be reworded to read as follows:

> There shall be within the Foundation such divisions as the Director, in consultation with the Board, may from time to time determine.

This view, as you know, is shared by the Board.

Mr. DADDARIO. I think that is a good point, Dr. Haworth.

Dr. HAWORTH. I hope that this discussion of specific points does not becloud my feelings, for I am deeply appreciative of the thoughtful inquiries made by this committee and its constructive proposals as set forth in H.R. 13696. This concludes my statement, Mr. Chairman, and I shall be glad to attempt to answer any further questions that the committee wishes to put to me.

Mr. DADDARIO. I think for the record, Dr. Haworth, you eliminated the last sentence of the letter written to me concerning your coordination of activities in this regard.

Dr. HAWORTH. Yes. I thought that was taken care of.

Mr. DADDARIO. We can include this as part of the statement.

Dr. HAWORTH. Yes. This is just the difference between oral testimony——

Mr. DADDARIO. Mr. Brown, do you have any further questions?

Dr. Haworth, I think we have covered the points of interest as we went along. I want to again thank you and your staff for doing such a penetrating job on this bill. We appreciate your comments. We will take them into consideration, even though we may not follow all of them.

Dr. HAWORTH. Thank you, Mr. Chairman.

(The information follows:)

RESPONSE OF DR. LELAND J. HAWORTH, DIRECTOR, NATIONAL SCIENCE FOUNDATION, TO QUESTIONS FOR THE RECORD SUBMITTED BY THE SUBCOMMITTEE

Question 1. If the Secretary of State or the Secretary of Defense requests NSF to initiate and support specific scientific activities in accordance with section 3(a)(2), would NSF or the requesting agency pay for such activities?

(a) Doesn't the word "support" in section 3(a)(2) indicate that NSF would would pay for the research?

(b) In your comments on the bill you state that section 3(a)(2) should be amended to allow NSF to decide for itself whether it should undertake the requested research. What criteria would NSF employ in determining if it should undertake the requested research?

Answer. There is already sufficient authority under the Economy Act (31 U.S.C. 686) for the Foundation to undertake activities with a transfer of funds from a requesting agency. In such a case the authority of the agency transferring the funds is relied upon. Therefore, if the National Science Foundation were to undertake activities pursuant to section 3(a)(2) at the request of the Secretary of State or Secretary of Defense, it would undoubtedly be the Foundation rather than the requesting agency which would pay for such activities. Thus, the use of the word "support" in section 3(a)(2) does indicate, in my opinion, that NSF would be expected to pay for research or other activities supported pursuant to the section. For this reason, among others, I believe it is essential that the Foundation be able to decide for itself whether to undertake research or other scientific activities which the Secretary of Defense or State might request it to do under this subsection of the bill.

In determining whether to undertake research or other activities in response to a request, the Foundation would consider: its technical competence and administrative ability to support the project in question; the relationship of the project to other projects it was either supporting or expecting to support; and, giving due consideration to the national interest as indicated by the request of the Secretary, the relative priorities for the use of available funds.

Question 2. Under your suggested modification of the proposed section 3(b), would NSF support applied research relevant to national problems involving the public interest such as transportation, environmental pollution, and urban renewal without first being directed to do so by the President?

Answer. The applied research which I foresee the Foundation supporting under proposed section 3(b) (as I have suggested it be modified) would be primarily that which is of interest to the academic community, such as research which could be considered a continuation of basic research, and that which would be useful in the training of graduate students, particularly in engineering and the social sciences. Such research might or might not be directly and demonstrably relevant to national problems involving the public interest. There is no question in my mind, however, but that the support of applied research at academic institutions would definitely contribute more or less directly toward the solution of national problems. However, the Foundation would not wish to initiate or support any large organized program of research looking to the solution of a national problem unless first directed to do so by the President.

Question 3. Would it satisfy your objections to section 4(a) of the bill if the legislative report contained words to the effect that: To aid it in establishing the policies of the Foundation, the Board would be expected to keep abreast of the activities of the Foundation and to periodically review its programs.

Answer. I do not believe this proposed language for the legislative report would take care of the problems I have with respect to section 4(a) as presently set forth in the bill. In the first place, it does not make clear that the Board cannot establish all policies for the Foundation since the Foundation is also subject to congressional and executive branch policy determinations.

Secondly, I do not believe that keeping abreast of the activities of the Foundation and reviewing its programs is so much an aid to the establishment of policies as it is an extension of the policy function toward operations. That is to say, the review of Foundation programs should be undertaken by the Board largely so that the Board may satisfy itself that its policies and the objectives of the programs are being effectively carried out. Of course, insofar as such a review and consideration of the activities of the Foundation might indicate a shortcoming in policy, this would be relevant to the policy function of the Board. However, if language in the report were to be relied upon to meet my reservations, I believe it would need to read somewhat along the following lines:

"The Board in exercising its function as the policymaking body of the Foundation will, of course, be guided by policy determinations of the Congress and the President. It is also expected that the Director will consult with the Board, and that it will participate in evolving programs to carry out Foundation policies."

If language such as this were included in the report, my objections to section 4(a) as presently written would be largely removed.

Question 4. Regarding your comments concerning section 5(d) of the bill, couldn't your objections be met within the framework of section 5(d) whereby the Board may set "such other conditions as the Board in its discretion may determine and publish in the Federal Register?" If not, please explain.

(a) Wouldn't you agree that insofar as it is reasonably prudent, it is desirable to have a clear dividing line between the functions of the Board and the functions of the Director?

Answer. I do not believe that the authority of the Board to delegate, or to establish conditions for the approval of grants and contracts, by publishing such determinations in the Federal Register meets my reservations to section 5(d). I agree that "insofar as it is reasonably prudent, it is desirable to have a clear dividing line between the functions of the Board and the functions of the Director." It is for this reason, however, that I believe the limitations on the day-to-day actions of the Director contained in section 5(d) constitute an inappropriate division of authority between the Board and the Director. Moreover, as I have pointed out, I believe that the Board's participation in the formulation of programs is the important point rather than the Board's authority to veto a particular award. While, theoretically, this could be achieved by the Board publishing regulations in the Federal Register providing that no grants or contracts may be effectuated by the Director unless the Board had approved the relevant program, I believe this would be a forced way of providing for what should be recognized as a joint Board-Director effort in the formulation of programs and, in fact would lodge in the Board authority to establish the details of programs. I believe this could put the Board into the area of operations.

I believe, therefore, that the important aspect of section 5(d) should be to assure Board participation in the formulation of programs and, therefore, feel that the suggestion I made requiring the Director to consult the Board in formulating programs would constitute the best way of making the role of the Board in this respect clear. Preferably this should be in the language of the bill. Failing that it would be helpful if this requirement of consultation were covered in the legislative report along the lines I have indicated in my reply to question 4 above. But, I do not believe it is desirable to link this program formulation function to the approval of specific transactions.

Question 5. In performing your functions as the Director of the Foundation, you no doubt are called upon frequently to appear before the Congress and to consult with representatives of, among others, the scientific community and the various executive agencies. Wouldn't the appointment of Assistant Directors as provided in section 6(b) of the bill provide you with the high-level executive assistance which could be assigned some of these functions in addition to such coordination and control functions which you might assign as a result of the increased responsibilities of the Foundation?

Answer. I do not believe that the appointment by the President of four Assistant Directors, by and with the advice and consent of the Senate, would materially enhance the usefulness to the Director of such high-level executive assistants. We believe that the Foundation has the necessary flexibility to provide such assistance as the Director needs with its present authority.

Question 6. In your proposed revision of section 8 of the bill, you use the term "in consultation with the Board" in lieu of "after receiving recommendations from" as used in the bill. Please explain what you mean by "in consultation with," and how it differs from "after receiving recommendations." Would it be satisfactory if the words "Board" and "Director" as used in section 8 of the bill were switched?

Answer. I do not believe that merely reversing the words "Board" and "Director" in section 8 would altogether meet the situation. The thrust of the sugges-

tion, which both the Board and I have made, is to emphasize that the organization of the Foundation is primarily an administrative matter which is the responsibility of the Director and that he should, therefore, be responsible both for taking the initiative and for following through with required action. If the words "Board" and "Director" were merely switched, it would appear to leave the initiative for formulating recommendations with the Board, which we do not feel is appropriate.

In a very real sense, "in consultation with" differs from "after receiving recommendations." First, "in consultation with" clearly indicates that the Director will take the initiative in bringing the matter to the Board. Secondly, it contemplates a dialog, with perhaps only individual opinions of Board members being expressed, rather than a formal recommendation of the Board as such. Where the Board wishes to make recommendations as a Board, this can, however, at the option of the Board, flow from the consultation. The rewording I have suggested for section 8, therefore, gives greater flexibility to the joint consideration while not in any way restricting the Board should it wish to make formal recommendations.

Mr. DADDARIO. Mr. Pollack?

Mr. Pollack, we welcome you and Dr. Joyce here this morning, and we are anxious to proceed to see if we can finish our morning's objectives before House activity begins, so if we can proceed, please.

STATEMENT OF HERMAN S. POLLACK, ACTING DIRECTOR, OFFICE OF INTERNATIONAL SCIENTIFIC AND TECHNOLOGICAL AFFAIRS, DEPARTMENT OF STATE

Mr. POLLACK. My statement is fairly brief, Mr. Chairman, and I believe I will proceed most expeditiously if I simply read it.

Mr. Chairman and members of the subcommittee, the Department of State is pleased to have an opportunity to testify on H.R. 13696. This bill which would broaden and clarify the functions of the National Science Foundation reflects in part the very considerable interest of this committee in a more active role for the National Science Foundation in international affairs and in the support of international scientific activities. The Department of State welcomes this interest and would welcome a more active role for the National Science Foundation in the international field.

The requirement that activities supported by the National Science Foundation must strengthen science in the United States tends to obscure its authority to support international scientific activities which are designed to improve our foreign relations and attain our foreign policy objectives. As I have stated in previous testimony to this committee, these ends are not incompatible. We understand the consequence of the proposed revision of section 3(2) is to remove the ambiguity concerning the authority of the National Science Foundation to engage in international activities at the request of the Secretary of State. The Department of State believes this clarification of congressional intent is timely and desirable. The authority which this subsection will make available will make it possible to deal more decisively than heretofore with the opportunities afforded by scientific and technological developments for international cooperation and the pursuit of U.S. foreign policies.

It will permit positive action in the so-called gray areas which have thus far proven difficult to come to grips with. Furthermore, it will make possible the inauguration of new bilateral and multilateral scientific relationships which could prove to be of overriding advantage to U.S. national interest, broadly conceived.

Since the committee is considering the functions and activities of the National Science Foundation, I would like to use the occasion to discuss several related matters of interest to the Department of State.

The first of these relates to the fact that science and technology is hurtling the world into a future for which it is philosophically and politically ill prepared. The peaceful atom and its potential international implications, the impact of evolving space technology on weather prediction and control, the movement of man into the oceans illustrate typical developments which appear to be outpacing man's political readiness to deal with them. In its 14th annual report the National Science Foundation stated:

> Understanding of man in relation to other men as individuals, groups, and nations—the domain of the social sciences—has not kept pace with man's knowledge and mastery of the physical universe, and is urgently needed in a world of increasing populations, emerging nations, and growing tensions.

Yet, there is very little scholarly effort being devoted to the philosophical and political preparation of the world for the incredible technological progress that is taking place. In short, there is an urgent and imperative need for focusing multidisciplinary attention on creating the environment which will assure that the scientific and technological process underway and that which lies ahead of us will be used for mankind's benefit rather than become a source of new and possibly intractable international problems.

This, of course, is not a novel point of view and much thought has been given to the responsibility of the scientists for the social, economic, and political consequences of their discoveries.

I do not wish at this time to join in the discussion of how large a share of this responsibility the scientist should bear, but, rather, wish to suggest that it is perhaps not inappropriate for the National Science Foundation which is so clearly charged with the promotion of science to take on major responsibility for the promotion of academic interest and activity on the international consequences of scientific progress. Specifically, we would welcome a source of vigorous leadership backed up by financial resources that would encourage universities and research organizations to develop capacities in the field of the social sciences that could be beneficially devoted to the consideration of what might be called international accommodation to scientific and technological progress.

Such activity on the part of the National Science Foundation would appear to be authorized by the proposed new section 3(b) if the Department of State is correct in its understanding that the applied research as authorized by that section applies to the social as well as the natural sciences.

We find an eloquent statement of the need for an interdisciplinary approach to national and international problems in the Director's statement accompanying the 15th Annual Report of the National Science Foundation when he stated, and again I quote:

> A continuing issue—one that can only be attacked and never disposed of—is that of using the methods and findings of the pure and applied sciences to help deal with pressing social problems of an increasingly complex society. In general, the major problems which loom large before the Nation are almost all related in one way or another to science and technology. But, there is rarely a social problem which is the exclusive concern of a single scientific discipline, in the traditional sense of the term. Many problems can be dealt with in part by chemistry, or in

part by other fields within the physical sciences; some problems clearly require the attention of engineers and social scientists.

The second matter I wish to discuss arises from the Department's search for scientific talent qualified to serve as policy officers in the Department and as scientific attachés abroad.

It is now widely appreciated that an adequate understanding of science and technological considerations is essential if the officers of the Department of State are to deal effectively with international policy questions which have their origin in or are heavily affected by such considerations. This is a conclusion that the Department had earlier come to with respect to a wide range of other considerations, especially in the economic field, that are now recognized as part of the fabric of international affairs.

The need for policy-oriented scientific and technical competence is not met by having a cluster of such talent in my office or scattered at a dozen and a half missions abroad. It must permeate the entire organization, for the interactions are occurring in almost every aspect of the Department's work and in every corner of the globe. In affect, in addition to the need for a staff of full-time scientific attachés abroad the Foreign Service could make good use of 50 or more officers who could bring a measure of professional competence to scientific subjects with international policy implications.

Thus, there is an urgent and growing need, utterly out of balance with the supply, for people who are well trained not only in basic scientific concepts and their applications, but also in their social, political, and economic implications. Until the present time, the few individuals who might claim to possess these attributes have had to work out a personal program of self-training. This is not sufficient. Carefully directed, systematic training programs need to be designed for scientists interested in the sociopolitical environment, and the nonscientists interested in science and technology.

On the latter, the Department has a number of steps underway to prepare its officers for work in this field.

Two months ago Secretary Rusk inaugurated a scientific and technological exchange program in cooperation with NASA, AEC, NSF, and the Department of Commerce. Under this plan, officers are being assigned to tours of duty with each other's agencies, to increase the understanding of the nonscientist for the implications of science and the understanding of the scientist for the implications of international relations within the context of the missions of the various agencies. Last month the third of an ongoing series of seminars on science, technology, and foreign affairs was conducted. On this occasion the participants were 20 handpicked, high-quality, middle-grade officers of the Department.

The Department is also now actively seeking individuals with scientific training as entrants into the career Foreign Service.

This year the Department also instituted a series of "Secretary's science briefings" as another step toward increasing the understanding within the Department of the important relationships between science, technology, and foreign affairs. The initial briefing in February of this year, attended by the Secretary, Under Secretaries, and other principal officers of the Department, was on the subject of desalination.

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Approximately a year ago the Department designated science officers at Foreign Service missions at which a scientific attaché was not located. This concept, which has worked very well in several posts, offers considerable promise for the future provided an adequate supply of qualified Foreign Service officers can be developed.

These efforts to equip the Department's officers with a capacity to deal usefully with the interaction of scientific and technological subject matter and foreign affairs are but a beginning and much more will have to be done. At the same time an increasing effort will have to be made to recruit scientific and engineering personnel with understanding and talent for working in the policy field. I can testify that such persons are exceedingly scarce. Their nonscientific skills are developed more by accident than by design.

Mr. DADDARIO. Mr. Pollack, could you go into that a little bit further. The idea is an exceedingly good one. You will provide people at locations where scientific attachés are not presently assigned. What success have you had? How many people are you talking about? How does it look for the future, recognizing that they are scarce as you have just said?

Mr. POLLACK. I think it probably looks fairly well for the future but I think part of the remainder of the proposal I wish to make here would help to bring the condition I seek about 5 or 10 years earlier than might otherwise arise. We have established now with the exception I think of some 15 posts, the position of science officer. This is to say that in approximately 95 of our missions we either have a scientific attaché or a science officer. Obviously the degree of scientifically related activity will vary from post to post. The man who is so designated in Mexico spends better than 50 percent of his time on science and science-related activities. He happens to have been incidentally, a capable Foreign Service officer who originally received his training as an engineer, so he had some technical background to begin with. We look for such backgrounds whenever we can find it in men assigned to science officer duties.

Our man in Greece is spending a sizable proportion of his time, little bit less than half, on scientifically related activities and this is occurring now with increasing frequencies at posts where the work volume justifies it.

We have just determined that we will put a full-time man, though not as an attaché since the level of the activity doesn't currently call for it, in Yugoslavia, where the position will be a science officer. We don't know yet whether we will be able to find the man we are seeking for the post within the Service. We may have to look outside.

I was once the Director of Personnel for the Department of State. I tell people half in joking, but I think literally I am not too far from the truth, that I now spend more time on personnel than I did when I was responsible for the Department's personnel program. I am a little bit hopeful that the efforts we have made, to spread the fact that we are interested in scientific talent capable of working in the foreign policy field, is beginning to produce results, and people are showing up in our office who have been referred to us by others who are aware of our search. We have had the assistance of many of the agencies in town in this search, including the National Science Foundation.

Very recently I interviewed a man who had graduated as an engineer and then taken to a law school and done so well that he is now serv-

ing as a law clerk to one of the senior justices here in Washington. He has come to a conclusion that what he is seeking out of life is not to be found in a law practice or in the engineering profession, but rather in working with the Government in some capacity that will permit him to use both of those skills. We think we have the answer for that kind of a person. He is exactly the kind of a person that we are interested in.

Dean Price up at Harvard has a standing invitation which I remind him of from time to time, to call to my attention any promising graduates of his graduate seminar because people, scientific or otherwise, that would take that course are properly motivated for the kind of work that the Department is concerned with.

We have one such graduate with us in our office.

Now, our feeling as I go on to say in my statement, is that the recognition by the universities of the need for developing this kind of renaissance talent has only been recently recognized. It is only within the past 5 years or so that our institutions of higher learning have established programs in "science and society" or "science and public policy" which would provide an educational base for preparation of scientists for work on policy questions.

The most celebrated of these is Dean Price's graduate seminar at Harvard. Courses of study in this area are also now available at the Case Institute, MIT, Purdue University, the Fletcher School of Law & Diplomacy, Princeton, Columbia, and possibly several other universities.

Again, the surface has been barely scratched. I suggest that consideration be given to the possibility that the National Science Foundation provide encouragement and leadership which will result in the large-scale development of undergraduate and graduate programs for the training of scientists and engineers for work in policy fields. This objective would be facilitated if it were made clear that such activity is encompassed in the words "education in the sciences," which is embodied in this legislation in several places.

This effort would help to create a new body of knowledge now lacking in this field, which lies neither within the discipline of the natural or the social sciences, but which is being born as a union of the two.

A truly interdisciplinary effort should be encouraged, in which the scientist and his nonscientist colleagues work together to combine the resources of science and technology and those of domestic and foreign policy.

In summary, the Department of State believes that the changes contemplated by the revised language in H.R. 13696 will provide a substantial increase in the ability of the U.S. Government to make effective use of its scientific and technological capabilities in support of international policies and objectives. In this general connection, moving ahead on the two areas of activity discussed above would in the Department's opinion represent constructive steps to be taken at this time.

Mr. DADDARIO. Mr. Pollack, you have made an excellent statement and it includes ideas about which we are all concerned and for which we seek solution.

I wonder if you might give us the benefit of your experience. As you look to the future of people of this type, how could their oppor-

tunity with the State Department grow so that they would not find themselves limited? What would be the career potential?

Mr. POLLACK. I have to deal with this, I think, in two parts. I think as I look forward to the requirement of the State Department for policy-oriented scientific talent—I will use that as a shorthand way of describing the kind of person we are interested in—we will have a continuing need for two categories of personnel. One will be the man who has decided, as apparently has this young engineer-lawyer, that he wishes to pursue neither a career as an engineer nor as a lawyer, either one of which I am sure he could do with great success, but wishes to pursue a career in international affairs which will make use of both of those talents. This officer can look forward within the State Department, within the Foreign Service, to a career of steady progression that would, I think, provide him with fairly heavy opportunity to make use of that combination of talents. Such an officer with the abilities that he appears to have, should be a promising candidate 15 or 20 years hence for high executive responsibilities.

Twenty years from now, I can think of no place in the world where we have an Embassy that would not benefit by having as a chief of mission someone with a solid technical or scientific background.

The other kind of person that we will need on a continuing basis is the highly trained scientist who doesn't want to surrender science as his field and he will have developed capabilities to work effectively in science policy areas through one device or another the way some of the men we are now employing in this capacity have been able to do. He will want to come with the Department of State for 2 years, possibly 3. He will then want to return to his academic environment or research institution. Ten years later he may be ready to take a sabbatical and once again want to serve with us abroad. Several of our earlier scientific attachés have expressed interest in another tour of duty. This man doesn't look to the Department of State for a career advancement. He looks to the Department of State for an opportunity to serve in an important field where he feels he can make an effective contribution. He will move in and out—the Reserve officer concept.

The trend that I see coming ahead of us doesn't lead me at this point and time to worry about an oversupply of talent in this field. It is a reverse concern that haunts me at this stage. I might point out, that by no means is the Department of State the only agency in this Government, and by no means is it only going to be the Government that will be able to make use of policy-oriented scientific talent.

I think industry is going to be seeking this kind of person. I think our universities and many other agencies in town will have occasion to employ this kind of talent as well.

Mr. DADDARIO. Mr. Brown?

Mr. BROWN. I might just add that we can use a few of them in Congress.

Mr. DADDARIO. By appointment?

Mr. BROWN. No; by election, I hope.

Mr. DADDARIO. Mr. Pollack, thank you ever so much. We appreciate your being here, and you have been very helpful to us.

This committee will adjourn until tomorrow morning at 10 o'clock at the same place.

(Whereupon, at 12 o'clock noon, the committee adjourned until 10 a.m., Wednesday, April 20, 1966.)

RESPONSE TO QUESTIONS FOR THE RECORD SUBMITTED TO HERMAN S. POLLACK, ACTING DIRECTOR, OFFICE OF INTERNATIONAL SCIENTIFIC AND TECHNOLOGICAL AFFAIRS, DEPARTMENT OF STATE

Question 1. Dr. Haworth and Dr. Walker have suggested that section 3(a)(2) of the bill be amended to allow the Secretary of State to request that NSF support activities designed to strengthen science education abroad such as by supporting programs in modified course content or curriculum development. Do you see a current or projected need for this authority? If so, please explain.

Answer. The Department of State does see a need for authority residing in NSF whereby it could, when so requested by the Secretary of State, support activities designed to strengthen science education abroad.

AID is ordinarily able to provide support for such programs, when it is in the interests of the United States to do so in countries which are receiving AID support. However, it is likely that there may be instances in the overall U.S. interest to provide such support to such non-AID countries that are still in the process of economic development. At present there is no U.S. capability to provide such support. Alternatively, it may prove to be desirable to cooperate with advanced countries in curriculum development for application in the developing world.

Question 2. We would appreciate an expanded discussion of the effect of the proposed new section 3(a)(2) on the relation between the Agency for International Development and the Foundation? In particular, to what extent would the new language permit the Foundation to independently budget and carry out activities which it presently undertakes almost as a contractor for AID? Also, to what extent would the new proposed language enable the Foundation and the State Department to explore the feasibility and, perhaps, to demonstrate the practicability of internationally financed and operated laboratories for basic research?

Answer. We do not believe that the authority granted under revised section 3(a)(2) will fundamentally change the relationship between the Foundation and AID.

The Department endorses the wording and purpose of the proposed revision of section 3(a)(2), as stated in Dr. Haworth's letter of April 18, 1966, to the committee concerning the authority of the National Science Foundation to engage in international activities at the request of the Secretary of State. The interpretation of this revised section, as agreed upon among the National Science Foundation, the Department of State, and the Bureau of the Budget, was forwarded to you in the letter from Mr. MacArthur to Chairman Miller on May 12, 1966, the pertinent sections of which read as follows:

"We have discussed with the National Science Foundation the wording and purpose of the proposed revision of section 3(a)(2) as stated in Dr. Haworth's letter of April 18, 1966, to the committee concerning the authority of the National Science Foundation to engage in international activities at the request of the Secretary of State. We understand from our discussions with the representatives of the National Science Foundation that the proposed revision of section 3(a)(2) authorizes the National Science Foundation to engage in international scientific activities for reasons other than whether the activities promote and strengthen science or science education in the United States. The Department of State is gratified that the amendment will authorize international scientific activities which may be justified from the standpoint of the U.S. national interest, broadly conceived, that is, the activities further our foreign policy objectives, even if they do not primarily promote science and scientific education in the United States. We also understand from our discussion with representatives of the National Science Foundation that any limitations in section 13(a) of the National Science Foundation Act would not constrain the interpretation of section 3(a)(2), as revised, but instead the National Science Foundation authority under section 13(a) can also be exercised with respect to international scientific activities without regard to whether the activity involved promotes and strengthens science or science education in the United States, if the activity may be justified from the

standpoint of the U.S. national interest, broadly conceived, i.e., the activities further U.S. foreign policy objectives.

"The Department of State considers that the National Science Foundation Act, as so revised, will make it possible to deal more affirmatively than heretofore with opportunities afforded by science and technological developments when affirmative action is desirable from the standpoint of U.S. foreign policy. It will enable us, provided funds are available for the purpose, to seize opportunities in the so-called gray areas which thus far have proven difficult to act upon. Thus it should make possible the inauguration of new bilateral and multilateral scientific relationships which could prove to be of overriding advantage to the United States."

We believe that the language of the revised section 3(a)(2) will permit the Foundation and the Department of State, among other things, to explore the feasibility and perhaps to demonstrate the practicability of internationally financed and operated laboratories for basic research as suggested by the committee.

A BILL TO AMEND THE NATIONAL SCIENCE FOUNDATION ACT OF 1950

WEDNESDAY, APRIL 20, 1966

HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT,
Washington D.C.

The subcommittee met, pursuant to adjournment, in room 2325, Rayburn House Office Building, at 10:05 a.m., Hon. Emilio Q. Daddario presiding.

Mr. DADDARIO. The meeting will come to order.

Dr. Hornig, will you please come forward with your staff if you would like to have them sit with you.

Our hearings this morning begin with a statement from Dr. Donald F. Hornig, Director, Office of Science and Technology. We are happy to have you here, Dr. Hornig.

Dr. HORNIG. I am glad to be here.

STATEMENT OF DR. DONALD F. HORNIG, DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY

Dr. HORNIG. Mr. Chairman and members of the subcommittee, it is a privilege and a pleasure to testify on this bill. The hearings, studies, and reports of this subcommittee have been thorough and in the best tradition of congressional inquiry into important issues of public policy. The questions raised by the subcommittee have prompted extensive thought and discussion in the executive branch and in the scientific community. I shall discuss what seem to me some of the most significant aspects of the bill, particularly the relationships between the Director and the Board and the extension of the authority of the Foundation to support applied research.

The general policies of the Foundation have important effects upon such matters as the paths of development of fields of science, the relative emphasis among fields, the numbers and quality of the Nation's corps of scientists for decades ahead, the effects of science on the cultural and economic development of the country, the independence of universities and their capacity to teach, and the quality of science education at all levels. These are matters of concern to the Nation as a whole, and they are matters to which many highly qualified people have given serious thought. Therefore, the general directions and philosophy of the National Science Foundation are properly framed with the participation of a broadly representative, experienced group of informed citizens who are not full-time officials.

At the same time, the Foundation must be responsive to the policies of the President. The President is responsible for setting

the general goals of his administration, and for insuring that the basic goals and the programs of the major executive agencies—of which the National Science Foundation is one—form a consistent whole. Because the policy functions of the Board must be carried out within the overall policies of the administration I would suggest that the Chairman and the Vice Chairman of the National Science Board should be designated by the President from among the members of the Board.

The policies and operations of the Foundation must also be responsive to the will of Congress as expressed in legislation congressional intent and appropriations.

Mr. DADDARIO. Dr. Hornig, will you go more completely into the reasons, for your suggestion that the Chairman of the National Science board be designated by the President from among the members. The President does appoint all the members. I would presume that with the authority he has, he could assure that a Chairman and a Vice Chairman, if you were to carry it that far, would be men of his choice. Why do you specifically make this suggestion?

Dr. HORNIG. This is not a strong point, but I do feel that it would improve the linkage of the Board to the President. Among the members of the Board all of whom have been selected by the President, the Chairman and Vice Chairman of the Board have special responsibilities in forwarding the views of the Board and making recommendations. It seems to me there are some virtues, therefore, in having them designated by the President. Chiefly, it would improve communication channels, and perhaps elevate slightly the status of the Chairman of the Board.

Mr. MOSHER. Mr. Chairman.

Dr. HORNIG. I don't think there is any question of principle here.

Mr. MOSHER. When you suggest that the President because he chooses all members of the Board could probably influence the selection, what do you mean? Do you mean using his influence in informal discussions with the members? You certainly don't mean that he would appoint some of these people on the precondition——

Mr. DADDARIO. Not at all, but there are many boards in all elements of government where the board chooses its chairman and executive officer. It is usually understood by all of the members that the Chairman should have direct responsibility to the President who has great authority. It is not a matter of preconditioning, but it does involve the way in which policy can be developed through the use of any board where there would be a harmonious rather than a conflicting relationship. It usually works out this way.

Mr. MOSHER. I thought you meant, Mr. Chairman, that the President could somehow suggest or tell the Board who should be Chairman. You weren't suggesting that.

Mr. DADDARIO. I hope I just made it clear that I have not. It seems to me as the situation now stands. We have had 15 years of experience where the Chairman has been appointed from within the membership of the Board, where there has been no such conflict in respect to the chairman's position with the President.

Mr. MOSHER. I think you are right, that there would be a general understanding on the Board that they select someone acceptable to the President.

Mr. DADDARIO. The purpose of my question to Dr. Hornig was to get a more complete analysis of the reasoning behind his suggestion.

He has just given, I think, an excellent reason which involves the prestige that would be attached to the appointment of the Chairman of this Board. Because he was so designated by the President, this would give him, perhaps, a stronger position both within the Board and within the scientific community.

Mr. Conable?

Mr. CONABLE. Mr. Chairman, I would like to ask Dr. Hornig if he thinks the fact that there has not been sufficiently close linkage between the President and the National Science Foundation may have had something to do with the past loss of the National Science Foundation's coordinating function in science to the Office of Science and Technology? Was it necessary to have a closer relationship in carrying out the President's science policy than it was possible for him to have between the National Science Foundation and his Office?

Dr. HORNIG. I wasn't here during the whole of this history but I would like to observe, first, that I think the relationship between the National Science Foundation and the President has been as close and effective as between any of the executive agencies. It has been normal and it has been healthy as far as I can observe.

Now, as to the question of coordinating the activities of all of the agencies of the Government. I think the problem has come up in many places. By and large, it has proved practically impossible, or at least impracticable, for one agency on a parallel level in the Government to effectively dictate the programs and courses of another agency.

This is a question of practical workability, and it has come up not only in this area but in areas far removed from science within the Government.

Mr. DADDARIO. The National Science Board is a unique board in Government, Dr. Hornig. I wonder what your impression would be of the effect of the appointment of the Chairman by the President on the individuality of the Board. Would it affect it in any way? Might it give the type of emphasis which could change its character? For good or bad?

Dr. HORNIG. Well, I wouldn't have made the suggestion unless I thought that on balance it would help. I don't see off hand any ways in which it might decrease the effectiveness or hurt the functioning of the Board.

I then should add in making this suggestion that I think the Board has functioned in an exemplary way with existing arrangements. This is not a suggestion made to remedy any particular problem that has occurred but it might improve the tie to the President if the Chairman were a chairman of his choosing.

Mr. DADDARIO. Fine, I think we have enough in that regard.

Dr. HORNIG. The wording of the bill, section 4(a), is open to the interpretation that the broad policies of the President and of Congress should not be binding upon the Foundation. This objection would be met if the last sentence of section 4(a) were changed to read: "The Board shall be the policymaking body of the Foundation, and shall review its programs." Such a change would have other desirable effects which I shall mention later.

It is necessary to examine carefully the policy role assigned to the Board in the bill in relation to the functions of the Director. In considering the relative roles of the Director and the Board, a dis-

tinction can be drawn between day-to-day decisions that can be called operations and broader matters that can be called policy.

The role of the Board is in the policy area. Its function should be to set general directions, to assess the implications of the Foundation's major actions, to assess the implications of proposed actions, and in these respects to act much like the trustees of a university or a foundation. In short, the Board should outline, within the broad guidance provided by the President, and the Congress, the policies which set the general goals that the Foundation is to pursue under the executive direction of the Director. The precise scope of the policy role is most difficult to define precisely in legal terms. In fact, it is not possible to be precise on this point because there are no criteria that will define exactly what policy matters are as contrasted with operating matters. The wording for the policy function of the Board proposed above—that is, "The Board shall be the policy-making body of the Foundation, and shall review its programs"—provides the necessary flexibility in my view. The wording is intended to give the Director necessary flexibility in taking executive action on matters bordering on policy and to give the Board an explicit role in reviewing the programs of the Foundation.

Day-to-day, detailed decisions can be made effectively only by a full-time executive who has full authority to act. It is important that the basic authority and administrative structure be provided for a coherent, forceful center of administrative responsibility and action. The bill provides for such an administrative center by two related clauses. First, it stipulates, section 4(b), that the Board may delegate to the Director any of its powers and functions. Liberal use of this authority by the Board is essential to the effective operation of the Foundation, and I hope that congressional intent on this point will be made clear. Second, it provides in section 5(d) that except as otherwise specifically provided in the bill, the Director shall exercise all of the authority granted to the Foundation by the act, including that delegated to him by the Board, and that the Director's actions are final and binding. Taken together, these provisions constitute a much improved definition of the role of the Director.

In my view two serious flaws exist in section 5(d) concerning the authority and relationships of the Board and the Director. The first flaw is that authority to review programs is given to the Board only through the awkward device of requiring prior approval of the Board for specific awards involving a new program. The Board should review new programs well before they reach the grant stage in consultation with the Director. The second flaw in section 5(d) is the requirement that the Board approve all awards above a given monetary level. Relatively small grants may raise policy questions and relatively large ones may be clearly within existing policy guides. The authority and responsibility of the Director and the Board, respectively, should not be defined in terms of the size of the awards. The Director should have full operating authority, but with an obligation to follow policy guides and an obligation to consult with the Board. Accordingly, in my view, section 5(d) should be deleted, and wording such as the following substituted: "The formulation of programs by the Director shall be in conformance with the policies of the Foundation and shall be done in consultation with the Board."

Finally, the effectiveness and workability of this arrangement between the Director and the Board under which various kinds and levels of authority and responsibility are shared in a complicated and intimate way depend heavily upon the experience, flexibility, tolerance and insight of those who participate. Reasonable flexibility in the basic statutory language makes it possible for these qualities to be sensitively exercised in carrying out the functions of the Foundation.

I would like to add here that I think this has been the case in the past that the Board and the Director have admirably worked together on these problems.

The explicit authority to support applied research at academic institutions in section 3(b) is, in my judgment, important and sound for two reasons. Research often proceeds on a continuum from fundamental investigation to application, and the Foundation should not be required to cease support because the application of basic findings appears possible.

It shouldn't be necessary to stop work if there is any sign that it will become useful.

The second point is that engineering research in academic institutions often productively combines fundamental and applied work, and clear extension of the authority of the Foundation to support research of this type is desirable. Some problems of great public significance require a combination of basic and applied research not appropriately conducted by other agencies, and the Foundation should, as provided by the bill, be able to initiate and support such research.

Applied research support of the Foundation should be concentrated on the support and stimulation of research at academic institutions because of the importance of sound training in applied science and engineering as well as in basic science. But, the new authority to support applied research in universities should be used very selectively. Particular care should be taken in connection with applied research support available through other agencies. This is another significant point on which a clear expression of congressional intent would be useful.

The bill proposes a number of changes in the compensation and status of the Director, Deputy Director, and Assistant Directors in sections 5(a), 6(a), and 6(b). Two central principles should in my opinion determine the acceptability of these provisions. The first is that they sould be consistent with the general policies of the President on the status and compensation of Federal executives. The second is that they should leave maximum flexibility for staffing, within limits set by the general policies of the President, in the hands of the Director.

The bill in section 4(b) would permit the establishment of a staff for the Board, to be appointed by the Director and assigned at the direction of the Board. The Board should certainly have adequate staff help, particularly because of the responsibilities that would be added by the bill. However, a staff for the Board which is set apart from the staff of the Foundation does not seem to be, to me, a desirable means of insuring that adequate resources are made available to the Board. From my earlier remarks on the interrelations between the operating and policy function, it follows that I would be skeptical of establishing a policy staff associated with the Board which is divorced

from the current decisions that properly condition—and that in part represent—policy decisions. The relationship between the Director and the Board should be such as to insure that the needs of the Board for staff assistance have a high enough priority to insure that the Board can fulfill its responsibilities. Establishment of a separate staff might well limit and complicate rather than extend and simplify the availability of staff help to the Board.

Mr. DADDARIO. Dr. Hornig, you define your analysis of suggested legislation involving a policy staff. It has been the feeling of the committee that it is not a policy staff but rather an administrative staff to help them to perform the duties as they would be enlarged by the bill, so far as supplying reports and this kind of thing is concerned.

Dr. HORNIG. There are many kinds of help that the Board needs. It may need simple clerical and administrative help. If it is preparing the annual report called for in the bill, it may need help by statisticians, and by people well-versed and expert in many of the branches of science or of education.

Mr. DADDARIO. Do you see anything in the bill that limits the availability of other people to the Board beyond those recommended? There seems to me to be no such restriction in the language of the legislation.

Dr. HORNIG. I think you are quite correct, Mr. Chairman. There is nothing in the bill that prohibits it in any way. Nevertheless, it does set up the idea of a separate staff which is, I think, introducing the concept of an unnecessary division. It seems to me that in a well-run organization it should be taken for granted that the senior policymaking body has readily available support of the entire staff of the Foundation as necessary. Setting up a separate staff tends to suggest, rather than to require, that the primary reliance be placed on this special staff of the Board, rather than on having an obligation by the entire staff of the Foundation to give the Board all the support it may require.

Mr. DADDARIO. It seems to me this is more of an assumption than a reality. It is a matter which the committee dealt with in some depth as I recall the testimony. In recognition of the needs involved and of the problems which might have come about, a staff was set up so that there might be development of a competitive instinct. We were extremely careful not to limit the availability of other staff help to the Board and we specifically determined a way so that no competition would come about since the staff was to be appointed by the Director. The Director would have control over the staff at all times and would ensure that their work would be completely administrative. We were concerned as we did this that the problems you raise would not in fact develop.

Dr. HORNIG. Mr. Chairman, I'm sure the committee has given this very careful consideration. I must say that I can see no explicit flaws or difficulties in the language as written. I think I would summarize my point of view by saying simply in my judgment it is an unnecessary provision and that it does tend to suggest that one kind of Board staff is set apart from the rest of the staff. It is a matter of personal judgment. I think this is probably not the wisest provision.

Mr. DADDARIO. Well, I recognize that. The committee certainly takes into consideration your opinion in this regard because of the

respect we have for you, Dr. Hornig, but I do think it is important that we make the record clear as to the intention of this committee so that there will not develop such a harmful competitive relationship.

As we review the language in the bill it says "as an added point, the Board may with the concurrence of a majority of its members permit the appointment of the staff." This is another safety measure in the legislation. All with the intention of creating additional capability and adding prestige to the Board so that the staff might perform its responsibilities on a regular continuous basis. These people will be available and under the control of the Director by the appointment.

Dr. HORNIG. I think these points are well taken, Mr. Chairman.

Mr. DADDARIO. Fine, if we could continue then, Dr. Hornig, please.

Dr. HORNIG. I strongly endorse all of the new provisions of the bill directed to the improvement of the quality of information relating to science and scientists. It is important in my judgment not only to maintain a register of scientific and technical personnel but also, as is newly provided in the bill in section 3(a)(6), to provide a central clearinghouse for data on the current and projected need for a scientific and technical manpower in the United States, and to provide a source of information on manpower for policymaking. Similarly, the new provision, section 3(a)(7) requiring the Foundation to determine the funds received for scientific research by various institutions will result in the development of information relevant to important policy matters. Here, however, it would be prudent to recognize that the part of the program relating to research funds supplied to individual private contractors may be literally impossible to fulfill. There are thousands of contractors, and, in addition, thousands of subcontractors. Either a change of wording or a clear statement of congressional intent modifying the requirement is needed, because it is going to be very, very difficult to trace down to the ultimate subcontractor in many cases.

Mr. DADDARIO. We had a discussion yesterday, Dr. Hornig, with Dr. Haworth, about this. I think the point is well taken, but we are dealing with public funds. There is an accountability which involves itself even in those places where private contractors are given the latitude to expend certain amounts of money on overhead research as Dr. Haworth designates it. I recognize that it does go down to various tiers of subcontractors on all levels. Perhaps we could follow your suggestion of modifying the requirements by developing this report through let's say the first tier of subcontractors and primes and then see where we go from there.

Dr. HORNIG. I think this is reasonable, Mr. Chairman. This is not a theoretical problem. For some questions this has been a real problem, for instance in the Department of Defense. It is not really a question of the accountability for public funds. The problem mostly concerns the effects of expenditures of public funds.

Mr. DADDARIO. I don't stress accountability as being our greatest concern, although it is a concern of all of the Government as you know, but rather that because it is accountability that a label could be attached to the work involved and that eventually as we pursue it, we would be able to use this as one of the means through which we could come to a better determination of what is being accomplished.

Dr. HORNIG. I quite agree with you, Mr. Chairman. I think we must certainly learn to succeed. My point was only that, practically, in the immediate future and until the techniques of data gathering are developed I doubt that it will be possible to always identify the ultimate recipient.

I think your suggestion of the prime contractor and first tier of subcontractors would be quite practical.

Mr. VIVIAN. Mr. Chairman, may I interrupt.

Mr. DADDARIO. Yes, Mr. Vivian?

Mr. VIVIAN. I would like to point out that I had something to do with the existence of those words in the bill and have had to deal with this matter on occasion.

First, every evidence I see is that sub-contract and prime-contract funds are distributed similarly geographically despite comments to the contrary. It is important to have that information brought out. It was brought out in the testimony during the 1964 hearings but on a very limited basis.

Secondly, I have a comment on the matter of attempting to determine the amount of funds spent for materials research. It may eventually happen that more money will be spent on materials research than will be spent by direct contracts. The distribution of this money both in terms of technology and location is very difficult to trace. It is almost invisible to the Congress because of the manner in which budgets are handled and I believe this is undesirable.

Therefore, if more clerical work needs to be done in order to trace this money, it seems in order that it be done.

Dr. HORNIG. I quite agree that it is important that we get this information in hand. We have been making very considerable efforts ourselves to put just such data together as fast as we can.

Mr. DADDARIO. I see no argument with Dr. Hornig's position here. It is just a practical problem which confronts us as to the way to get the job properly done from a good beginning.

Dr. HORNIG. I think that is quite correct.

Finally, the annual report required of the Foundation in section 3(e) and the new annual report required of the Board in section 4(g) will be important public documents. In connection with the Board report, there should be a clear understanding that it would be impractical and unwise to prepare a report each year on all aspects of our scientific resources and on all progress in basic science. The Board should be able to select important topics for emphasis in each annual report so that when together the entire series will constitute a comprehensive report.

Mr. DADDARIO. Dr. Hornig, yesterday we had a statement from Dr. Haworth on this point. We covered this in some degree and his understanding is somewhat similar to yours. The Board will have the freedom to select those fields of science necessary to make the annual report effective and meaningful. I think we are all quite clear that over the course of time the report will cover all aspects of science resources. However, it will not have to cover everything every year.

Dr. HORNIG. I'm sure that's what the committee had in mind, but it is well to get this point out.

Mr. DADDARIO. I am pleased you have, because I think it is extremely important to understand what we do mean and where we are heading.

Now, Dr. Hornig, I have a point here I would like to ask you about. On the bottom of page 2 you refer to the wordings of the bill, section 4(a) as open to the interpretation that the broad policies of the President and of Congress should not be binding on the Foundation. You make a suggestion that this problem would be met if the last sentence of section 4(a) were changed. Your suggestion is that the words "and shall review its programs" be added, and the word policies be changed to policymaking. Then you said it would have the desirable effects which I shall mention below.

I take it that everything you have talked about from that point on refers back to this. However, I would like to have you go into it in a more specific manner. Why do you change the word "policies" to "policymaking," and why do you believe it important to add "shall review its programs," recognizing that there are various interpretations of what policy means? I wonder if your suggestion does not add to the problem rather than detract from it. It seems to me when we talk about established policies of the Foundation that the Board and the Director would work out their understanding of this and that they would establish rules and regulations. It doesn't seem to me that there could be any argument about a review of programs which would fall out of their definition of "policies," I don't think anyone could expect the Board not to review its programs just as he would not expect the Director, who is in charge of the programs, would have the responsibility of reviewing his own activities.

Dr. HORNIG. There are two completely separate points involved, Mr. Chairman. The first half of the sentence I didn't have in mind at all. The Director-Board relationship, but rather the point I made in the paragraph above as phrased in section 4(a) where it says the function is to establish the policies of the Foundation. It didn't seem to me that that phraseology quite recognized clearly enough that the policymaking function of the Board is restrained in any case by the fact that the policies must be part of the overall policies of the President and the Congress. And hence, the emphasis, the change is not so much from policy to policymaking as from changing "to establish the policies" to "shall be the policymaking function of the Foundation." It seems to me desirable to recognize that policies made were in a broader policymaking frame of the Government as a whole.

It is a very slight switch in emphasis that I was trying to suggest here.

Now, as to the second half of the sentence, I think that you are quite correct that this adds no legal force to it and that particularly if my suggestion on the top of page 5, that is, formulation of programs by the Director, et cetera, were taken, that this might be unnecessary.

The reason I suggested it, however, is that it does seem to me that one of the most important general roles of the Board is just general oversight over everything the Foundation does and that this phrase would perhaps make this a little bit more explicit and evident.

But, I think I would quite agree that functionally this does not add or detract from what the Board is empowered to do.

Mr. DADDARIO. On page 4 where you call attention to the two serious flaws as you see them. We also had some discussion of the second flaw which you relate to section 5(d) yesterday. We determined from Dr. Haworth's testimony and now that you lay added emphasis to it that we should look more closely into this question of the approval of awards above a given monetary level because the amounts may not be as significant as the programs. This does deserve additional attention, and we appreciate your calling it to our attention.

I would, however, appreciate it, Dr. Hornig, if you could go into it a little bit so that we could have additional information in the record and have something further to refer back to.

Mr. MOSHER. Mr. Chairman, May I interrupt at that point?

Mr. DADDARIO. Yes.

Mr. MOSHER. I was somewhat bothered by the wording suggested on top of page 5, "the formulation of programs by the Director shall be in conformance with the policies of the Foundation and shall be done in consultation with the Board." Isn't there any chance of that rather indefinite wording would be borrowing trouble? Couldn't there arise in practicality arguments as to when there should be consultation with the Board and when there shouldn't on specific grants?

Dr. HORNIG. Mr. Mosher, I think that the question you raise is very real. I think it is implied under both languages. The problem as I mentioned is that there is no clear line between what is policymaking and what is administration. A little bit of policy gets made even when some grants are made and the circumstances are determined that some new programs may be construed by the Director, under the original language of the bill, as making new policy, but the Board might construe it otherwise.

These problems have not in fact come up in the past but they are, I suppose, implicitly present in the fact that there is no sharp legal distinction that can be made between policymaking and execution. So, it deemed desirable to me to emphasize the process of close and continuous consultation.

Mr. MOSHER. At this point, you were talking about how specific awards would be interpreted, weren't you? If you say shall be done in consultation with the Board, is there any implication there? Aren't you going back to the question of whether the Board should approve every award or do I misunderstand?

Dr. HORNIG. I think I meant to go a little further than that. It came up in the connotation of new awards, but it had the provision for the review of new programs by the Board.

Mr. MOSHER. I think if we use the language which you suggest the legislative intent would have to be spelled out so that later there wouldn't arise trouble over what is involved. The language seems very vague.

Dr. HORNIG. I think it would be desirable to spell out the legislative intent, but I would like to suggest that I think the situation is necessarily always vague and that the problem is to draw this with enough flexibility with the intent specified so that the Board and the Director can work harmoniously together, as they always have, I might add.

Mr. CONABLE. Well, if we can establish the legislative intent clearly by discussion, why don't we put it in the bill?

Mr. DADDARIO. Is that a statement or a question?

Would you like Dr. Hornig to answer that?

Mr. CONABLE. I realize sometimes in drafting a bill you can't be as specific as you would like, but you are all saying it should be spelled out, but are we spelling it out sufficiently here to present the legislative intent clearly?

Mr. MOSHER. I was looking more for an interpretation of this what seems to be very vague phrase, "shall be done in consultation with the Board."

Mr. CONABLE. It still seems somewhat vague to me.

Dr. HORNIG. I don't know how to put it into the bill or I would have made a suggestion that was more precise than this. But since there is this essential ambiguity as to when you are making policy and when not, because there are all levels of policymaking, it seemed to me—rather than consulting or requiring the Director to consult on some specific cases—that it was desirable to require him to consult with the Board on all programs that are formulated. In this way the question of whether or not there is a policy question could then be resolved by discussion between the Board and the Director. I think under these circumstances the Board is clearly the senior body on matters of policy.

If they find a policy issue, I think there is one.

Mr. MOSHER. This says the formulation of programs shall be done in consultation with the Board. In effect that's what the sentence says.

Dr. HORNIG. That is in effect.

Mr. MOSHER. There would always be a problem in my mind as to in what detail and how specifically the consultation may be? Whether every little program had to be discussed.

Mr. CONABLE. In effect, you are requiring the Board to delegate powers to the Director again, although one of our purposes was to give the Director fairly broad powers not requiring specific Board action.

Dr. HORNIG. I think this is why I suggested the word, "consultation" rather than "approval" for example. But, I think this is an essentially ambiguous situation which occurs in all of the languages that have been suggested.

Mr. VIVIAN. Mr. Chairman?

Mr. DADDARIO. Mr. Vivian?

Mr. VIVIAN. Having myself dealt with somewhat similar situations in corporate organizations, I would suggest that what we need is to define the minimum obligations of the Board. Those things which it must do and the maximum freedom which it must have or maximum freedom which it may have without interfering with the functions of the President's office. Those are not clearly spelled out in this document as yet.

Dr. HORNIG. It is very difficult to do.

Mr. VIVIAN. You would permit the Board to look at all functions of the Foundation by including the phrase, "and shall review its programs." I don't believe the present document clearly defines the minimum obligations of the Board.

Dr. HORNIG. I think the minimum obligations is to set the major policy framework within which the Foundation acts.

Mr. VIVIAN. I would point out that is a rather difficult thing to point out and decide in itself. For example, the Board never met or discussed very little at its meeting for years, but the Foundation still operated.

Dr. HORNIG. That is absolutely correct.

Mr. VIVIAN. It is difficult to see what changes are placed on the Board in either past or present material. The only clear conclusion that I can reach is that the Board is given a free hand to recommend if it so desires.

Dr. HORNIG. Well, there is certainly more implicit power than that in the requirement that the Director's programs be carried out in conformance with the policy set by the Board.

Mr. VIVIAN. Yes, but I can also point out your remarks in your own testimony regarding the responsibility of the National Science Foundation to be responsive to the policies of the President. Isn't this true? It could conceivably come into conflict.

Dr. HORNIG. I think this is conceivable. This is, of course, true of any executive agency.

Mr. VIVIAN. All I am pointing out is that we haven't really cleared up the question as to the relationship between the Board and the Director's responsibilities and that I think would be the minimum obligation.

Dr. HORNIG. I can only say that I have thought and thought about this problem and have never been able to find in my own mind a precise way of drawing a line between these two functions.

Mr. VIVIAN. Could I ask what other major agencies of the Government have a governing Board with line responsibility?

Dr. HORNIG. I don't know of any other than the regulatory things like the Federal Reserve Board.

Mr. VIVIAN. The regulatory agencies are not obligated to respond to the President's instructions.

Dr. HORNIG. That is right, but they don't have a line operating function of the same sort either.

Mr. VIVIAN. Is this the only agency that has this double direction?

Dr. HORNIG. I think this is a unique agency as far as I know, in its administrative structure. The Atomic Energy Commission has a pluralistic head, but it is the administrative as well as the policy-making head of the Atomic Energy Commission. It is both. This particular structure, of course, was set up as I mentioned in the first page of my testimony in recognition of the very broad and delicate interplay of the activities of an agency like the Science Foundation which is responsible for the general health of science and science education, interplay with a large body of America, the scientific community, the educational community, and also the industrial and economic community.

Mr. BROWN. Mr. Chairman?

Mr. DADDARIO. Mr. Brown?

Mr. BROWN. Both the present witness and the witness yesterday recommended the inclusion of this phrase with regard to the review of its programs. As I pointed out yesterday, I fail to see the effect of inserting this language. It either is a directive that they will review each of the programs or, it has other undesirable effects.

I also have some trouble with the present language in the section 4(a) which says that except as otherwise specifically provided in this

act the function of the Board shall be to establish the policies of the Foundation. What this seems to say or could be interpreted to say is that the Board only has one function, which is limited in other places in the act. I don't think the bill is exactly precise in what we want the Board to do. We certainly want to have it feel free to review programs which it feels are important for the determination of the implementation of policy. Therefore, it would seem to me that we need somewhat more flexible language in order to accomplish this.

Now, here is a suggestion which includes some of the points that Dr. Hornig has made. I would like to suggest wording something like this: The Board shall establish and oversee the implementation of the policies of the Foundation subject to the provisions of applicable law and Presidential direction. That is not necessarily final polished language, but it includes both the establishment of policy and overseeing the implementation of policy which I think is absolutely necessary and in fact implied corollary in being able to establish policy. As I said yesterday, if I had a statement such as this before me that the role of a board was just to establish policy, the first policy I would establish would be some appropriate review program which would take care of the matter. But, if that is a point of question, write it in. It is also clear that everything we assign to the Foundation is subject to the appropriate laws enacted by the Congress.

I don't think the Foundation wants to put itself above the law. This is superfluous to insert really but if it comforts anyone, put that language into the law.

Mr. DADDARIO. Well, of course, we are holding the hearings for the purpose of coming to some determination about this. There are some ambiguities which the record will show. We can research them out and come to a determination about the exact language. Dr. Hornig is appearing here as the other witnesses are so that this, among other objectives might be achieved.

Mr. BROWN. May I offer this as my contribution to the ambiguity, sir?

Mr. DADDARIO. Yes, I appreciate that, Mr. Brown.

Are there any further questions on this point?

Mr. Wydler?

Mr. WYDLER. No, I have general questions, Mr. Chairman. They don't relate to any specific point.

Mr. DADDARIO. Will you hold them for a moment then.

Dr. Hornig, on page 4 I would like you to elaborate a little more on the first of your flaws. Consider your suggestions as against the language of the bill, which is presently operable but which in my opinion is very restrictive even though it has offered no problems. The Board has delegated to the Director much authority but the Board does have veto power over all problems which the Foundation undertakes. Your language as I see it, would eliminate this as a Board capability. What problems might result in the event you did have a Director who had not established a proper and harmonious relationship with the Board? He could completely ignore them, as I see the effect of your language.

Dr. HORNIG. I think that you raise a very real problem, Mr. Chairman. I think that if the Board and the Director are determined to go in opposite directions, it is very difficult to draft any language

which will insure that they will work harmoniously. If I were a deliberately obstreperous Director I think I could do many things without setting up a new program if I construe program to mean a formally designated program as it has been. So I think that inherent in my comments is the assumption that high governmental officials will be reasonable and competent men.

Mr. DADDARIO. Well, the hypothetical case I draw then is not a good one. Let's say they work very nicely together but then they come up with one important issue where they are in conflict as reasonable men might.

Dr. HORNIG. My construction of the bill and of my comments as well that the Board is an arbiter of a policy. It is quite true we don't provide, either in my suggestions or the bill, explicit penalties for violating the provisions of the bill. But I think the Director is enjoined as administrative officer to operate by the law within the policies established by the Board. And, it would appear to me that if they were to consult in the formulation stage which is an earlier stage of new programs that this gives the Board the continuous possibility rather than the veto over formulated programs, and there is a possibility of injecting its policymaking responsibilities during the formulation stage. This is what I have in mind.

Mr. DADDARIO. We take your reasoning for the elimination of the monetary level because a small program may sometimes be more important clearly to the country than one which entails the expenditures of large sums of money, if we apply the logic of your suggestion on section 5(d), if a conflict were to arise in the establishment of a new program, and if we eliminate the ability of the Board to become involved in an establishment of new programs would this be a helpful suggestion. I'm frankly disturbed and think the committee will have to look at this a bit more. I don't know whether I could agree with you.

Dr. HORNIG. Mr. Chairman, I would only like to observe that that suggestion should be taken together with the suggestion that there be the explicit statement that the formulation of programs by the Director shall be in conformance with policies established by the Board. What I was attempting to do was to help get a clear view of the Board as the policymaking body of the Foundation which does include a very considerable extent this oversight function in order to exercise that responsibility and, on the other hand, that the Director have clear administrative authority to act on the day to day matters.

Mr. CONABLE. Mr. Chairman?

Mr. DADDARIO. Yes, Mr. Conable?

Mr. CONABLE. Dr. Hornig, for my own information there is certainly no criticism implied at all—I would like to know when you appear before a subcommittee like this, do the various witnesses appearing before the subcommittee get together and discuss the matters that are to be brought up? I ask this because Mr. Carey is recommending the exact same wording you are in respect to section 5(d) and it seems more than a coincidence that the wording is expressly the same.

Dr. HORNIG. I think that on matters which are as subtle as this and as difficult as this, it would be wrong if we didn't debate this out somewhat.

Mr. CONABLE. All right. I'm pleased to understand that. I am not critical. I am trying to find out if you arrived at this conclusion completely independently.

Dr. HORNIG. No, I think it is correct to say that it has been debated and discussed very extensively.

Mr. CONABLE. Of course I think I should say that I am glad there is consultation among the affected parties about the impact of important legislation.

Mr. DADDARIO. The wording may mean different things to them, however.

Mr. CONABLE. You mean each has his own secret legislative intent?

Mr. DADDARIO. We are happy to have Mr. Wydler who, although not a member of this subcommittee, has taken great interest in our activities, we are happy to have you participate, Mr. Wydler. I understand you have some questions.

Mr. WYDLER. Thank you, Mr. Chairman.

They are of a general nature. I want to compliment you and the subcommittee for the work you have done in regard to the National Science Foundation. It is most important. Although I am not a member of the subcommittee, I have a few ideas about the functioning of the National Science Foundation which I brought out in the full committee. You told me at that time that this would be the proper time and place to raise them. So that's why I came in today.

I was looking, Mr. Chairman, over the legislative booklet that has been prepared on the proposed change and I don't see anything regarding the continuous nature of the authorization authority in the proposed bill. Is it in here or is it just that I can't find it?

Mr. DADDARIO. There has never been any authorization authority in the Science and Astronautics Committee or any other committee. And, we seek none at this time.

Mr. WYDLER. Well, I believe there must be somewhere, a continuing authorization authority of this committee to obtain funds through appropriation committees. I'm sure it must have existed in the past.

As a matter of fact, I find on page 20 of the booklet entitled "National Science Foundation Act of 1950" where they do have a continuing authorization in section 904.

Mr. DADDARIO. Well, Mr. Wydler, I would suggest to you that this is a congressional problem and would be a matter for us to determine within the structure of the House rather than with the executive branch because they have no control over it and may or may not welcome it.

Mr. WYDLER. I would like to point out to the chairman, of course, that's true about all the laws that we enact. I presume we are asking these gentlemen to give us their opinions about various parts of this proposed legislation which we are going to decide either to enact or not to enact.

Mr. DADDARIO. I have no objection to you asking anything you want to about authorization and their opinion about it, even though it may have some bearing on what the membership of the House might do. However, I wish you to know that we have not raised this question even though I and other members of the committee may have some strong feelings about it.

Mr. WYDLER. The point I am making, Mr. Chairman, is this. Doctor, quite frankly I am disturbed by the method that the Congress

has adopted in the past of merely giving an open-end continuing authorization to the committee. I think that's the reason why the whole operational procedure of the National Science Foundation has not been reviewed by this committee since creation. I think that's a bad situation, personally; and I believe that we should put this under some type of an authorization that doesn't have to be annual, but possibly every 3 to 5 years. In that way we would be sure that this matter would come back to this committee in some periodic fashion for review and would have a chance to rethink it out because not only has the Foundation grown enormously over the years but it is undoubtedly going to continue to do just that. Although I am perfectly delighted by the fact that this hearing is taking place today, I think that practically speaking it should have taken place before. I would like to have you direct your attention to this point.

Dr. HORNIG. Well, I'm afraid on this matter of continuing annual or semiannual appropriations, I haven't given it enough thought to venture an offhand view on it. I would rather not. It seems to me this poses a real question.

Mr. WYDLER. To answer my way, would it be fair to say that you don't see any objection to it?

Dr. HORNIG. Not off hand, with the reservation that I haven't thought seriously about the question.

Mr. DADDARIO. I'm sure in the event that the Congress decided that this committee should have authorization control over the Foundation or over certain of its programs as we have given some thought to, Dr. Hornig would be happy to come up and testify.

Dr. HORNIG. That's correct.

Mr. DADDARIO. I do think that the point you raise is an excellent one, Mr. Wydler, but it should be a matter to be determined by the committee and if it did come to a decision to carry its request to, through the leadership to the House itself.

Mr. WYDLER. I thank the chairman.

Dr. Hornig, do I understand that all grants or awards made by the National Science Foundation require some part of a payment to be made by the receiving institution?

Dr. HORNIG. That is right. There is now in last year's appropriation legislation a requirement that there be some cost showing.

Mr. WYDLER. Dr. Haworth seems to be disagreeing in the back.

Dr. HAWORTH. This applies to research grants, but only to research grants. It doesn't legally apply to contracts or to grants for other purposes than research.

Mr. DADDARIO. Dr. Haworth, why don't you come forward? We didn't expect that you might be called on, but with Mr. Wydler here asking some questions, I think you ought to participate if you would be kind enough to.

Mr. WYDLER. Then do I understand that the answer, as far as the research grants are concerned, is that some part of the funds that are supplied by the institution are involved?

Dr. HAWORTH. That is right.

Mr. WYDLER. Is there any proposal at this time to change that procedure?

Dr. HAWORTH. No; that requirement has always been true in some measure, but as a legal requirement it is the result of a provision in the Independent Office Appropriation Act of 1966, and, therefore, is subject, of course, to what happens to the next appropriation act.

Mr. WYDLER. What is the amount of the contribution? Is that fixed?

Dr. HAWORTH. No, it is dependent on circumstances; and in actuality in the past, for example, the academic institutions have contributed a great deal in varying amounts, depending on circumstances, in some extent depending on the institution; until this year virtually all of them were forced to contribute because of the ceiling—20 percent on the overhead allowance. But, for example, in most instances of academic institutions, the institution contributes a fraction at least of the time of the faculty, the scientists, to direct and take part in the program. They have many other contributions that are harder to put your hands on.

Mr. WYDLER. In other words, the contributions are in other than cash?

Dr. HAWORTH. They simply don't get reimbursed for all the costs.

Mr. MOSHER. Is there some accounting done? Is there some determination of the equivalent in cash?

Dr. HAWORTH. This is now being done as a result of the appropriation act language of the current year. And, whereas in the past we did not require any accounting of those things that they did not claim reimbursement for, we now do up to the extent that the university or college or any other body says that it is making contributions.

In other words, we say that the contribution has been more than a nominal amount and in the case of educational institutions we are requiring that it be in the amount at least equal to half of the cost of the faculty participation during the academic year. That's a lower limit on it. And we take into account the circumstances along such lines as this.

If you have a project in theoretical physics, for example, or mathematics where it is mostly the professor and some graduate students where the added cost to the university is relatively not great, then we expect a greater contribution than say if it is for the operation of a great big accelerator or for something of that sort where the out-of-pocket cost is covered very carefully.

Mr. WYDLER. I thank you for the explanation, Doctor, and thank you, Mr. Chairman.

Mr. DADDARIO. Mr. Mosher?

Mr. MOSHER. The very fact that you are using formula from Budget Circular A–21——

Dr. HORNIG. Circular 74.

Mr. MOSHER. The very fact that you are using this requires better accounting of some of the overhead costs, doesn't it?

Dr. HORNIG. What it requires is an accounting of the overhead cost and on the matter, though, of the cost sharing of time, it requires accounting of that time for which credit has been claimed. This has been a sensitive point with the universities and they undoubtedly will not claim credit for all of the things that they might properly charge to us because they are very sensitive on particularly the matter of accounting time.

Mr. DADDARIO. Dr. Haworth, it might be helpful if you could send up a memorandum on this and we can save some time.

Dr. HAWORTH. I will be glad to send you what we call our important announcement that we send to all the universities and colleges;

well, all the grantee institutions. It spells out our particular way of answering the cost-sharing requirements.

(The information is as follows:)

NATIONAL SCIENCE FOUNDATION,
OFFICE OF THE DIRECTOR,
Washington, D.C., January 24, 1966.

IMPORTANT NOTICE TO PRESIDENTS OF UNIVERSITIES AND COLLEGES, PRESIDENTS OF PROFESSIONAL SOCIETIES AND ACADEMIES OF SCIENCE, HEADS OF INSTITUTES, AND OTHER NONPROFIT ORGANIZATIONS

SUBJECT: COST SHARING ON RESEARCH GRANTS

This notice provides information on cost principles applicable to research grants and instructions regarding cost-sharing procedures to be followed on research grants made by the Foundation after March 1, 1966. The information in this notice supersedes the NSF important notice of September 22, 1965, on "Cost Sharing on Research Projects," and supplements information contained in the NSF brochure, "Grants for Scientific Research" (NSF 63–27, as amended, December 1963).

It is recognized that institutions contribute to the support of basic research in many ways, including the provision of faculty or other staff time and accumulated knowledge, and the furnishing of the institution's physical plant and organization. For the last several years the acts of Congress providing appropriations for the Foundation limited overhead for research grants to a fixed percentage of the direct costs. This has had the effect, in most cases, of assuring another type of institutional contribution to research projects receiving Foundation support. However, the Independent Offices Appropriations Act for fiscal year 1966 (which applies to the National Science Foundation and became effective August 16, 1965) eliminates this limitation and stipulates that the agencies may not reimburse any recipient of a grant for the full costs of a research project. This legislative change affects grants made by various Government agencies. Consequently, the Bureau of the Budget has issued Circular No. A–74, dated December 13, 1965 (copy attached), which provides Government-wide guidelines governing cost sharing on all research projects supported by Federal grants.

In determining the amount of NSF support for research grants awarded by the Foundation on or after March 1, 1966, full indirect costs, calculated in accordance with applicable cost principles, will be reimbursable. However, institutions will be required to share in the cost of each of their research projects supported by an NSF grant.

The provisions of this cost-sharing requirement will not apply to those grants awarded in support of research which are made solely for the purpose of providing funds for (*a*) conferences and symposia; (*b*) publication of manuscripts; (*c*) travel; (*d*) rehabilitation, construction, or purchase of equipment or facilities; or (*e*) logistic support activities.

The following principles will serve as guidelines in establishing degrees of cost sharing:

(1) A high level of cost-sharing by grantees is appropriate for those grants (*a*) which provide for relatively significant reimbursement of academic-year faculty salaries at educational institutions; or (*b*) where the grantee institution prefers substantial cost-sharing as a matter of institutional policy.

(2) A low level of cost-sharing may be appropriate for those grants which (*a*) include a relatively significant amount for the purchase, rehabilitation, construction or operation of major equipment or facilities for research; (*b*) provide principally for services to be made available on a regional or national basis; or (*c*) provide special stimulus for an area of research in the national interest.

Cost-sharing on projects supported by NSF research grants may be accomplished by the recipient institution by a contribution to any of the cost elements in the project, direct or indirect.

Universities and colleges

Research is one of the normal functions of institutions of higher education and is an essential component of graduate education. Therefore the National Science Foundation has always regarded NSF-supported research at colleges and universities as a joint enterprise of the institutions and the Foundation. Since the faculty is an intrinsic part of the educational institution and research a natural function of the faculty, it appears that the provision of faculty time is a particularly

appropriate contribution of an educational institution towards the support of basic research.

In general, universities and colleges must share in the costs of each project as follows:

(1) For those research project grants in which NSF reimburses all or part of the academic year salary of faculty members [1], the cost-sharing requirement will be deemed to be satisfied if the grantee institution contributes to the cost of the project from non-Federal sources an amount that at least matches the NSF support of faculty salaries for the academic year (including applicable indirect costs), provided that such contribution constitutes more than a token participation.

(2) In institutions or major components thereof where faculty appointments are on a calendar year basis, the cost-sharing requirements will be deemed to be satisfied if the grantee institution contributes to the cost of the project an amount that at least matches half the NSF support of faculty salaries (including applicable indirect costs), provided that such contribution constitutes more than a token participation.

(3) Claims for reimbursement for faculty members of a major component of an institution must be treated in a consistent manner insofar as academic year and calendar year appointments are concerned.

(4) Those research projects in which the proposed institutional contribution, through faculty salary matching or otherwise, does not constitute more than a token amount will be subject to negotiation with respect to cost sharing.

Indirect costs will be calculated in accordance with the provisions of Bureau of the Budget Circular A–21, as revised March 3, 1965.

Other nonprofit research organizations

The appropriate level of cost sharing for nonprofit institutions other than universities and colleges will be determined on a case-by-case basis. Those research projects in which the Foundation considers that the proposed institutional contribution does not constitute a reasonable amount under the particular circumstances will be subject to negotiation with respect to cost sharing.

Indirect costs will be calculated in accordance with the provisions of Federal Procurement Regulations, FPR 1–15.2 except where NSF determines that the nonprofit institution is organized and functioning in a manner similar to colleges and universities, in which case Circular A–21 will be applied.

Submission of proposals

As of March 1, 1966, budgets for all research proposals submitted to the Foundation should include the following:

(1) The amount requested of NSF for direct cost of each of the cost elements of the research proposed. Where applicable, faculty salaries should be separately allocated between academic year and summer salaries, unless salaries are claimed on a calendar year basis.

(2) The amount requested for indirect cost. Indirect cost will be requested only on applicable direct costs to be supported by NSF.

(3) The total requested from NSF.

(4) The amount proposed as the institution's cost-sharing contribution from non-Federal sources, itemized by the same categories of cost as above.

Where the institution's proposed contribution is not more than a token amount, the level of cost-sharing should be adequately justified.

Indirect costs

As stated above, the determination of indirect cost rates to be allowed each grantee on NSF grants will, in all instances, be made in accordance with principles prescribed by Circular A–21, or other applicable cost principles. Rates will be determined by one of the following methods:

(1) Department of Defense or other Federal agency audit rates established in accordance with Circular No. A–21 (or other applicable cost principles) may be used as the basis for the NSF rate determination.

(2) If recent approved rates are not available, rates will be determined on the basis of an indirect cost proposal submitted by the institution, supported by the following:

(*a*) A statement indicating the method used in separating the component activities such as research, instruction, and other institutional activities.

[1] As used in this important notice (a) the term "academic year" means the usual two semester school year, of approximately 42 weeks, or its equivalent, such as three quarters if the institution is on a four-quarter basis; and (b) the term "faculty member" includes "instructors" or equivalent members of the instructional staff, and individuals whose title includes the word "professor" in any form.

(*b*) A statement indicating the basis for distributing indirect costs to such component activities.

(*c*) A computation of the indirect cost rate based on the principles outlined in Circular A–21 (or other applicable cost principles). (Where research activities are performed at an off-campus location, a separate indirect cost proposal applicable thereto should be submitted.)

(*d*) A copy of the institution's audited financial statements and other supporting information for the period covered.

(3) If the total direct cost of all Government-sponsored research and development work at a college or university does not exceed $500,000 a year, the abbreviated procedure as prescribed by Circular A–21, will be acceptable in determining the indirect cost rate.

Indirect cost rates established as indicated above will be considered "predetermined fixed rates," thus enabling institutions to earn overhead on an NSF grant at a definite rate. The rates will be effective for awards made on or after the date of the rate determination, and until new predetermined rates are established. They will not be made retroactive, and they will not be subject to adjustment during the period of a grant, or any amendment thereto.

In submitting research proposals, the approved rate for the institution will be used in computing estimated indirect cost amounts. Budgets submitted with research proposals may reflect items as direct cost only if such items are classified and consistently recorded as direct cost in the proposer's accounting system. The proposed budget must also: (*a*) identify the Federal agency establishing the rate; (*b*) show the date when the rate was determined; and (*c*) indicate the period covered by the audit on which the rate is based.

If approved rates are not available and if a current indirect cost proposal has not been submitted to NSF, an indirect cost proposal should be submitted simultaneously with the initial research proposal submitted under these guidelines. As a general rule, indirect cost rates will be based on salaries and wages, except that the rates for educational institutions having less than $500,000 research and development work annually sponsored by the Federal Government or otherwise qualify under section H of Bureau of the Budget Circular No. A–21, may be based on total direct cost. A new indirect cost proposal is required annually and should be submitted to the Foundation within 4 months after the end of the fiscal year.

All indirect cost proposals should be submitted directly to the NSF Comptroller, Attention: Indirect Cost (Rate) Determination Office.

Where audited or approved rates are not available and where sufficient data have not been submitted to enable the Foundation to make an indirect cost rate determination, awards will be withheld until the indirect cost rate is determined.

Records and reports

Since it will be necessary to demonstrate that cost-sharing is fulfilled, institutions must maintain accounting records which will establish their contribution. If the expenditures for the research are less than originally contemplated, the relationship between the institutions contribution and the total cost should remain essentially the same as proposed in the approved application or in a subsequent approved revision.

LELAND J. HAWORTH, *Director.*

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington D.C., December 13, 1965.

Circular No. A–74.

To the heads of executive departments and establishments.

Subject: Participation in the costs of research supported by Federal grants.

1. *Purpose.*—This circular provides guidelines for Federal agencies concerning participation by colleges and universities and other institutions in the cost of research supported through Federal grants.

These guidelines take into account provisions in the appropriation acts for the fiscal year 1966 for the Department of Defense (Public Law 89–213), the Department of Labor and Health, Education, and Welfare (Public Law 89–156), and the independent offices (Public Law 89–128), that prohibit Federal agencies from paying any recipient of a grant for the conduct of a research project an amount equal to as much as the entire cost of such a project. These guidelines also take into account the removal of statutory limitations on the payment of the indirect costs of research financed by Federal grants.

This circular does not effect existing policies and practices of Federal agencies concerning cost participation in research financed through contracts.

2. *Effective date.*—The guidelines set forth in this circular should be applied as soon as practicable to all research grants awarded subsequent to the issuance of this circular and not later than March 1, 1966.

3. *Background of cost participation.*—The conduct of research is a significant function and important responsibility of institutions of higher education. In addition to contributing to the advancement of knowledge, academic research is an essential element in the advanced training of scientists and engineers. At the same time, the Federal Government relies heavily upon research conducted in non-Federal institutions, and particularly in colleges and universities, to assist in the accomplishment of the missions of Federal agencies. Thus, Federal research grants generally serve the objectives both of the institutions and of the Federal Government. Cost participation reflects this mutuality of interest.

In the past, cost participation by the grantee institution has been accomplished through: (*a*) cost participation as a consequence of legal limitations on the proportion of indirect costs payable by the Federal agencies under research grants; (*b*) cost participation through continued payment by grantee institutions of part or all the salaries of faculty members or professional personnel participating in sponsored research, and (*c*) payment by grantee institutions of a portion of other costs such as equipment.

4. *Guidelines for Federal Agencies.*—(*a*) Agencies should generally continue their present policies and practices concerning the extent of cost participation by grantee institutions:

(1) Except for increased indirect cost allowances which may be paid as a result of the removal of statutory limitations on payment of such allowances;

(2) Except that in cases where Federal agencies would otherwise pay all research costs, the applicant institution must share in such research costs on more than a token basis.

(*b*) The costs which may be charged to a research grant include direct costs and their associated indirect costs, as determined in accordance with Bureau of the Budget Circular No. A–21 (Revised), dated March 3, 1965.

(*c*) The extent of cost participation by grantees may vary in accordance with a number of factors relating to both the granting agency and the grantee institution, e.g.:

(1) A higher degree of cost participation should ordinarily exist when the cost of the research consists primarily of the efforts of senior faculty during the academic year, or when the grantee institution's long range interests are best served by substantial cost participation;

(2) Cost participation should generally be lower when a major portion of the research cost consists of equipment, when the grant provides for a large component of services to be made available on a regional or national basis, or when in the view of a Federal agency an area of research requires special stimulus in the national interest.

5. *Administration.*—(*a*) Federal agencies will require that proposals for each research grant include:

(1) The amount requested for direct expenses, by category of direct expense;

(2) The amount requested for indirect expenses related to the requested direct expenses;

(3) The total grant request;

(4) The additional amount which the grantee institution proposes as its contribution from non-Federal sources to the planned research.

(*b*) Federal agencies will require each grantee institution to maintain records to demonstrate a total actual contribution by the grantee institution of an amount which is not less, in proportion to the actual charges against the grant, than the total amount proposed in the application, or any subsequent revision thereof, approved by the agency. The amount of the grantee institution's contribution will be subject to audit.

6. *Agency reports on cost participation.*—Each agency which awards research grants will report to the Bureau of the Budget by November 1 of each year on cost participation by grantee institutions in the immediately preceding fiscal year. This report should provide information on the overall amount obligated for grants in the preceding fiscal year and the overall additional amount which grantee institutions proposed to contribute to the research supported by these grants. (The report to be submitted by November 1, 1966, should cover grants awarded from the date of implementation of this circular through June 30, 1966.)

CHARLES L. SCHULTZE, *Director.*

Mr. DADDARIO. All right. Then Dr. Hornig might append to it anything extra that he thinks may be helpful in this regard. This should answer your questions more precisely.

Mr. MOSHER. Just one brief question.

Going back to Mr. Wydler's question and I may be revealing serious ignorance here, but aren't there a lot of the agencies that are not subject to annual authorization action by the Congress? Certainly the National Science Foundation is one example of many agencies which do not come before the Congress or congressional committee every year for authorization.

Mr. DADDAIRO. There are many agencies which have no such authorization hearings. There are some agencies where there are authorization hearings over certain types of projects. There's no precise formula. It can be complete or partial or not at all.

Mr. MOSHER. But, nevertheless, I think Mr. Wydler raised a good question.

Mr. DADDARIO. Mr. Wydler has raised an excellent question. It is one that comes up time and again, but it is an internal problem.

Dr. HAWORTH. Mr. Chairman, might I correct one thing that Mr. Wydler said? I believe that the general authorization for the Foundation's appropriation is contained in section 17 of the act, that the one to which you referred relates only to the section on science information service. And, I think you will find that. And, that's continued in the new bill, section 16.

Mr. WYDLER. Sixteen?

Dr. HAWORTH. Yes. You will find it under 13, but it is under 16 and 17.

Mr. WYDLER. But, it doesn't restate the proposition.

Dr. HAWORTH. No; just carries the old language and it was a specific authorization for particular program.

Mr. WYDLER. Thank you.

Mr. DADDARIO. Dr. Hornig, thank you and thank you for your impromptu participation here, Dr. Haworth.

RESPONSE OF DR. DONALD F. HORNIG, DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY, TO QUESTIONS FOR THE RECORD SUBMITTED BY THE SUBCOMMITTEE

Question 1. In the last paragraph of page 2 of your statement you say that the wording of section 4(a) of the bill "is open to the interpretation that the broad policies of the President and of Congress should not be binding upon the Foundation." If this is in fact a defect in the bill, please explain how your substitute amendment would remedy the defect.

Answer. Section 4(a) provides that "the function of the Board shall be to establish the policies of the Foundation." The proposed modification was intended to make explicitly clear what is generally accepted; that the Board exercises its policy-making role within the framework of broad policies set by the President and the Congress.

However, in the light of the intent expressed both by numerous witnesses, the Chairman and members of the Committee, I am satisfied that the wording of section 4(a) of H.R. 13696 would not result in the establishment of policies at variance with the general policies of the President.

Question 2. Would it satisfy your objections to section 4(a) of the bill if the legislative report contained words to the effect that: "To aid it in establishing the policies of the Foundation, the Board would be expected to keep abreast of the activities of the Foundation and to periodically review its programs."

Answer. My objections to section 4(a) are met by the expression of Congressional intent noted under the preceding point, but I think the above sentence proposed for the legislative report would be useful.

Question 3. Regarding your comments concerning section 5(d) of the bill, couldn't your objections be met within the framework of section 5(d) whereby the Board may set "such other conditions as the Board in its discretion may determine and publish in the Federal Register"? If not, please explain.

Answer. The "such other conditions" clause does not meet my objections to section 5(d) because it does not remove the specific requirements which I consider unwise. Establishment of a dollar ceiling on the awards which the Director may make without Board approval is, in my opinion, unwise. The policy implications of awards are not necessarily proportional to the size of the awards. Some small awards may raise important policy issues. Many large awards will raise no policy issues. In addition, I do not believe that the Board should exercise its policy function relating to new programs through authority to veto specific awards. The process of resolving policy questions raised by new programs should be, and is, completed long before the first awards under new programs are made.

It does not seem to me that experience has demonstrated a need for this clause, and it seems inconsistent with the general intent of the bill to strengthen the executive role of the Director.

Question 3. (a) Wouldn't you agree that in so far as it is reasonably prudent, it is desirable to have a clear dividing line between the functions of the Board and the functions of the Director?

Answer. While it is desirable to have a clear dividing line between the functions of the Board and the Director, I do not believe that it is possible to establish it in the mechanical or procedural sense set forth in the bill. In attempting to protect the policy-making function of the Board, it is also necessary to protect the initiative and leadership of the Director necessary for the day-to-day management of a large Federal agency. In the last analysis the effectiveness and workability of the arrangement between the Director and the Board depend on the experience, flexibility, tolerance and insight of those who participate.

Question 4. In your comments concerning section 3(b) of the bill, you appear to indicate that NSF should support applied research only when such research is not "appropriately conducted by other agencies." Who would make this determination?

Answer. I think that NSF should not be barred from undertaking in academic institutions applied research in broad fields of interest to other agencies. There may be research and advanced training in such fields which would be appropriate to NSF but which is not being carried out by other agencies with primary responsibility. The propriety and need for such support by NSF would have to be assessed in the light of the full circumstances surrounding each case.

Normally, the decision to undertake such research would be made by NSF based upon the nature of the research itself and upon the outcome of discussions with other agencies.

Question 4. (a) It is your understanding of section 3(b) of the bill that NSF could support on its own initiative applied research relevant to national problems involving the public interest such as transportation, environmental pollution, and urban renewal?

Answer. I think that the wording is ambiguous. It is my view that NSF should have authority to support applied research at academic and non-profit institutions. I also think that NSF should be permitted to support applied research in institutions other than academic and non-profit, but only (1) on national problems involving the public interest and (2) when directed by the President.

Question 5. To what extent is funding for "little science" in danger from the funding of "big science" basic research? How does this possible danger compare with the often voiced fears that applied research would drive out basic research?

Answer. I think that the funding for "little science" basic research is for several reasons to an increasing degree competitive with "big science" basic research. The rising cost of "big science" basic research in many fields tends to force a choice between support for these large projects and "small science", particularly when both "little science" and "big science" basic research is funded from the budget of a single agency. The competition between "little science" and "big science" is in my opinion as sharp in the basic as in the applied area. So far as NSF is concerned, maintenance of the balance between "little science" and "big science" basic research is a current problem, and addition of authority to support applied research without commensurate expansion of its budget would complicate the problem.

Our next witness is Mr. William Carey, who is Executive Assistant Director of the Bureau of the Budget. Will you please come forward.

Mr. CAREY. Thank you.

Mr. DADDARIO. It is a pleasure to have you here, Mr. Carey. I'm sorry that we are cutting down your time, but I do think we can complete both the testimony and the questioning if we proceed.

STATEMENT OF WILLIAM D. CAREY, EXECUTIVE ASSISTANT DIRECTOR OF THE BUREAU OF THE BUDGET

Mr. CAREY. Mr. Chairman, I might precede my statement by mentioning that we have just completed in the Bureau of the Budget after about 2 years of work, a report on the administration of Government supported research at universities. I have with me three copies of the report. I underestimated the needs here today, but if I may I will leave with you at least these three copies and we shall be glad to provide you more copies immediately.

Mr. DADDARIO. It would be helpful if you would leave those and send up let's say another dozen because there are people on the committee who have expressed interest in this same subject and we can distribute them to those who are interested and concerned.

Mr. CAREY. Very well.

Mr. Chairman and members of the subcommittee. I appreciate the opportunity to bring you the views of the Bureau of the Budget on H.R. 13696, which deals with the organization and functions of the National Science Foundation. Let me say at the outset that the subcommittee, in our opinion, has approached these questions with conspicuous fairness and diligence, and its report of last January entitled "The National Science Foundation—Its Present and Future" was notable for the depth of perception which went into its analysis.

The Foundation has come a long way from its turbulent beginnings and modest early initiatives. The assumptions which underlay its creation did not fully materialize, while at the same time unexpected needs influenced its growth and formation. Today its standing in Government and in the Nation is high, a fact which speaks well for those who have been most responsible for its direction and its policies.

In these 15 years, total Federal support for scientific research at academic institutions has grown from $150 million to nearly $1.5 billion annually, and the Foundation's share of this support is significant. But, the relative importance to academic institutions of Foundation activities cannot be measured entirely by a dollar standard because the Foundation has a very great responsibility for maintaining and strengthening academic science. But, as public investment in science and technology has grown on a scale far beyond the expectations of those who wrote the National Science Foundation Act, it is well that we reassess the place of the Foundation in this new and presumably durable environment. It should, we think, have the scope and flexibility to contribute meaningfully to the needs of our society in the coming decades. I take it this is the subcommittee's concern, too.

H.R. 13696 proposes a number of changes in the present statutory authority under which the Foundation operates. I should like to comment on what we regard as the principal changes proposed in the bill, and then speak briefly to a few additional provisions.

First, there arises the important question of whether the Foundation is to be authorized to go beyond basic research in its support of science. The bill would authorize the Foundation to initiate and support

applied research, and of course this is a potentially far-reaching departure from past history. We think it needs to be thought through very carefully. It is a close question.

Applied research is already widely supported by Federal agencies for mission-related reasons, whereas the Foundation has a well-understood mandate for the support of general-purpose basic research. Rightly or wrongly, basic research still suffers when the chips are down and a choice must be made as between supporting long-term and often costly basic research compared with shorter run utilitarian applied research.

What we have been reasonably certain of, up to now, was that through the Foundation we could maintain a workable balance as between both of these, and what concerns us in the context of the present bill is that we would end up with more, rather than less, ambiguity as to the Foundation's mission. We suspect that applied research, over time, could operate to drive out basic research or draw resources away from it.

We find it hard to brush away these apprehensions, but we recognize that research does not lend itself to clean classifications as to what is "basic" and what is "applied." We take some reassurance from the fact that the bill "directs" the Foundation to support basic research while it "authorizes" it to support applied research.

It may be a lawyer's fine point, but it is there nevertheless. We also have to agree that there is something unreal about carrying basic research up to the point where support must be summarily suspended because the research has entered a zone of uncertainty where nobody has the responsibility for going on, and we have come to think that the principle of "hot pursuit" has validity here in the sense that the Foundation should not be barred from taking basic research a reasonable step further, at least through supporting work at the transition stages in academic and similar institutions.

On balance, though not without reservations, the Bureau of the Budget feels that the weight of the argument runs in favor of allowing the Foundation to support applied research in academic institutions. We think there are four kinds of situations that this authority might reach.

First, there are the borderline situations—such as engineering and the social sciences—where it is difficult to label the research either basic or applied, and where the intent of the investigator may be the controlling element.

Second, there are the "hot pursuit" situations where applied research is an immediate and logical extension of basic research being performed and where rigid rules would otherwise result in the untimely termination of the work.

Third, in some disciplines—again, engineering and the social sciences occur to us—it may be that some applied research may be the most effective way to train graduate students.

Fourth, circumstances may arise—as was the case for a time in weather modification—where the Federal Government may wish to move ahead with applied research at a time when our fundamental knowledge in the field is too limited to warrant a large-scale effort by a mission-oriented agency, and here it would seem appropriate for the Foundation, if so directed, to get started in the public interest a program involving both basic and applied research until sufficient

progress is made to justify assigning responsibility for a major applied research effort to another agency.

In summary, then, we offer no objection to adding this authority to the present statute as a means of clarifying an admittedly ambiguous and restrictive situation. At the same time, we would expect the Foundation to construe and administer this added authority in a selective way and not at the expense of its primary function of supporting basic research.

Mr. DADDARIO. Mr. Carey, the committee appreciates your concern in this regard and yet the phraseology seems to indicate that we have not as a committee properly explained the work that we have done in this regard. It seems to me that the record is quite explicit. We see this as a step which should proceed with extreme care. Dr. Hornig, in supporting this authority does say, for example:

> Some problems of great public significance require a combination of basic and applied research, not appropriately conducted by other agencies and the Foundation should, provided by the bill, be able to support and initiate such research.

We have had a great deal of testimony on this and we have been extremely careful about it; I think that the record is quite explicit and that you seem to be ringing an alarm which might indicate that we have not covered this possibly in our report.

Mr. CAREY. Well, I have read the report and I also read your article in Science, and I think the intent is very clear there. I have dwelt on this, Mr. Chairman, in order to add emphasis so far as the history of this legislation is concerned.

We come out to the same answer and I think for the same reasons and while the points that I have made perhaps appear to overdo it, we do not make them with any sense that the thinking of the subcommittee and the Bureau of the Budget is really different. So, I hope you will simply take this not as argumentation or criticism of the subcommittee, but rather to nail it down from the standpoint of what it is we are concurring in and why.

Mr. DADDARIO. Well, we appreciate the fact that this is made for the record, I bring up the committee's position only because it is not mentioned in your remarks and so that it might be clear that we have been equally concerned about this and in my opinion have taken the necessary steps to document this concern.

For example, we made reference to the work being done in weather modification and suggested that this program had reached such a level of feasibility that its operational programs ought not to become the responsibility of the Foundation because it would detract funds from the basic area.

We are pleased as a committee that, since this report has been made, steps are being taken by the Executive to implement this suggestion. This committee, recognizing the excessive costs of such applied programs, is concerned that it might detract from the basic and unique responsibilities of the Foundation. We recognize as testimony comes before us that there is basic research that might fall between the cracks because it could not be done in any other agencies and that in the best interest of the country something must be done about this. I stress this point because I know the academic community has been concerned about it, but I feel that their concern comes because they have not gone back to the point where we have documented our reasons for making this recommendation.

We do believe that this has been one point at least about which we have been extremely careful.

Mr. CAREY. I see no difference in the position of the committee in the history it has made, and our position. I think as I say, we are only adding emphasis to this history from the Executive Branch side, Mr. Chairman.

Mr. DADDARIO. Fine, Mr. Carey.

Mr. CAREY. Shall I go on, sir?

Mr. DADDARIO. Yes, please.

Mr. CAREY. The second major question dealt with in the bill concerns the relationship between the National Science Board and its Director. Looking back over 15 years, it seems clear that the Board and the Directors have worked together very well and that the activities of the Foundation have not been impaired by these organizational arrangements. Nevertheless, if the act is to be reopened at this time there is much to be said for clarifying and strengthening the responsibilities of the Board and the Director.

And, if I may interpolate, we would try to do this while bearing in mind that the original law after all did create a complex structure and the more we try to spell it out, the more complicated we are probably going to make it, Mr. Chairman.

But, it seems to us that the role of the Board should be to provide a broad framework of policies within which the Foundation is to carry out—through its Director—the duties placed upon it by the Congress and the President. Policies need to be flexible and adapted to changing needs and priorities. The Foundation exists in a complex setting where its affairs are touched and influenced by many forces, including the legislative process, the Presidency, the interaction which goes on all the time with the executive departments and agencies, and inputs from the scientific community. Policy formulation is a process in which the Director must take part and obviously does take part. Attempts to draw too fine lines as to where policy-making starts and ends are likely to be unproductive. It should be made clear, however, that executive responsibilities belong with the Director and not in a part-time policy board. I do not think there is any issue here, but the point ought to be made.

In our view, the National Science Board ought to concern itself with forming the broad policies of the Foundation, evaluating the timeliness and current relevance of existing policies, and reviewing the programs which are being carried on to give effect to these policies. This is an area where it is extremely helpful to have the perspective and criticism and fresh ideas of a high-level body, and incidentally we note with much interest the subcommittee's expectation that the Board will share its perspectives and value-judgments with the President and the Congress through an annual report.

To strengthen and clarify this concept of the functions of the Board, the Bureau recommends as OST has done, that the second sentence of section 4(a) be changed to read, "the Board shall be the policy-making body of the Foundation and shall review its programs."

At the same time, we believe that the executive responsibility of the Director should not be restricted by requiring him to obtain the prior approval of the Board for grants or contracts in excess of stated money levels or where the arrangement involves a new program. We see no reason for these restraints on the chief executive officer of the

Foundation. Where new programs are involved, his consultation with the Board should—and in our judgment would—occur long before the stage of making a grant or contract. The dollar maximums now contained in the bill have the effect of continuing to limit the responsibilities of the Director without conveying any offsetting gains to good management, and we believe they should be deleted and the Director made fully responsible for the executive business of the Foundation. To accomplish this, the Bureau of the Budget recommends that the proposed section 5(d) be deleted from the bill and a new section substituted to read, "The formulation of programs by the Director shall be in conformance with the policies of the Foundation and shall be done in consultation with the Board."

The effect of these several changes would be to clarify and reemphasize the function of the National Science Board in the area of policy, and to clearly focus executive functions in the Director, who would formulate specific programs to carry out the Foundation's policies and be clearly responsible for their effective and efficient execution. While the formulation of programs involves functions of policy, and therefore should be done in consultation with the Board, we believe that this is the correct role for the Director who is a full-time officer in close contact with the Congress and the executive agencies with whose programs those of the Foundation must be coordinated. Finally, by removing the dollar limitations on the day-to-day actions of the Director, we would recognize that the size of a particular grant or contract does not provide a good index of the policy significance of the grant, and that the Director should be depended upon to exercise good judgment in bringing to the Board's attention those policy issues which may arise out of a particular award, regardless of the dollar amounts involved.

Mr. DADDARIO. Mr. Carey, you were in the room when we were discussing this point with Dr. Hornig. I wonder whether or not in view of the discussion which took place there and the questions asked of Dr. Hornig, there may be some changes in your suggestions.

Mr. CAREY. Mr. Chairman, I have heard that discussion and it is indeed a murky field to get into. It strikes me, sir, that it would be very difficult in legislation to be so specific about the interaction of the Board with the Director and it would probably not be productive. I think that the most we can do, sir, is to speak of spheres of responsibility and do it with a reasonable amount of specificity which I feel would be accomplished by the wording that OST and we have suggested, so it is understood to reasonable people. The Board has its hands full if it deals properly with the very difficult questions of science policy and future goals. This is an area, in my view at least, where we have been very weak. We have had great strength, I think, in administration, in program operations throughout the Government. But the rationalizing of it all, the attempt to shape a framework in connection with which we do all of this research and development and technology—there I think, and I think you think, too little has been accomplished, and if the Board is indeed to be enhanced as you intend, the more we can push it in the direction of this sphere of policymaking while the executive business of the Foundation is strongly focused in the Director, I think that the more we will gain out of this very constructive examination by this subcommittee. If nothing else came out of it, I think it would be very worthwhile and I

think that your various changes here including the idea of a report from the Board does give a color, a strong color to this generic distinction between policymaking and execution which is very helpful.

Whereas I find it very unsatisfactory, myself, Mr. Chairman, to try to draw too fine a line with words and punctuation that would nail down where the Board leaves off and the Director starts.

I think that there has to be an interaction among reasonable men in the setting of the Foundation. I think that if the choices of the National Science Board members are well made, and if the choice of a Director is well made, then even though they may not agree on everything, even though it may not be the lowest common denominator kind of policymaking which I think none of us would want and none of us would respect, this is really going to be the ultimate answer as to how this Foundation works. It runs to the people. It also runs, I think, to their understanding of these respective spheres in general terms, not necessarily in lawyer's terms. I'm afraid all this may not be very helpful.

Mr. DADDARIO. I think it is helpful. We are all trying to accomplish the same end and are here for the purpose of determining if there is any imprecise definition in the language, which can be eliminated. Also, we want our intentions understood for the record. I wonder if the language that you propose does not move us further away from that end.

Mr. CAREY. That's entirely possible, Mr. Chairman, but that's not our intention.

Mr. DADDARIO. I understand that, and do think that the matter of reviewing programs might add to the problem rather than detract from it. I would like you to consider one other point as you go further into this. At the moment, the Board does have authority which it has chosen in a permissive way to grant to the Director. Things are working out nicely in that direction. And yet, the Board does have the authority to withdraw this authority. The language that is recommended by you appears to move the Board further away from being a participating group. I recognize that we do want to strengthen the Director. At the same time, we want to be sure that this relationship continues but we must take into consideration that the Board does have certain authorities with which we must deal with care.

Mr. CAREY. It is hard to make an argument against that, Mr. Chairman. I think if I were to try to restate the way we look at this, we would think that the wording that we have suggested here, the substitute wording, would put the Director in the position of taking policy from the Board, however it might be expressed by the Board, and translating it into programs which would be visible, which would have eventual outputs that would reflect the intent of the Foundation.

The translation of a policy into programs might not be instantaneous. It might not be a 1-year process. It might not be entirely in the first budget after the Board has expressed its policy. It might in effect be evolutionary and take 3 to 5 years to really move on a policy of the Board.

Now, in this stage of shaping programs which would be responsive to the policies of the Board, I find it inconceivable that in real life the Director would not be in communication and consultation and dialog

with the Board and with members of the Board who have a very keen interest, let's say, in a particular sector of policy. So, I think the Director ought to take the policy and do what he is paid for, what he is appointed for, which is to do something practical with it in turning it into programs.

Then he ought to be clearly responsible for running those programs. When he conceives of a program, he should indeed take it up with the Board, not from the standpoint of saying, "Will you authorize me to proceed with this program," but more from the standpoint of saying "It's my business and my responsibility to shape a responsive and useful program. I want to know and the President wants to know if you feel this is consistent with policy as you have expressed it."

There may be these occasions when there is disagreement. I can't say there wouldn't be. On the other hand, I don't feel particularly alarmed about this because as I say, I think a certain amount of tension is probably a healthy thing as long as it is not completely disruptive of orderly functioning. But, the Board, again as I see this, would not have a veto over a program that the Director would develop other than letting him know plainly that the program in their opinion won't work or that it is untimely or that it is inadequate. But, if the Board were to feel very strongly that the Director has come up with a program which is contrary to or inconsistent with the policies of the Board, then I think the fur would fly and I think that the Board, if it couldn't convince the Director, would go to the man who appointed him, to the President of the United States and make their position very clear and the matter would be taken from there and worked out.

But, I don't think that in effect the Director could shape programs without being very sure that there was policy authorization from the Board.

Now, that's about as far as I can attempt to interpret a future situation under the kind of language that I have given you here. But, it seems to me again, Mr. Chairman, that we ought not to expect quarreling and bickering between the Board and its Director. There hasn't been that sort of thing in the past and I don't think the reason for the tranquillity of the past has run to the fact that the Board could pull in the reins and take authority back. I don't think that has been the fact. I think it is more in the character of the people who have worked both on the Board and in the directorship. And, I strongly assume that that condition will exist in the future.

Mr. DADDARIO. I would agree with your argument and it is an extremely good one. I just wonder about these aspects of it. I agree that it has not been because the Board has had the authority to withdraw the grant of power to the Director which has developed this good relationship. And, yet you move in your argument toward that one place where an issue may develop. Supposing that the Board did not have authority, all they could do would be to put their prestige on the line with the President as against the Director. This kind of situation could raise great problems within the academic and scientific community, considering the way in which the Board was initiated in the first place.

Since these men of quality have been able to develop a working relationship, might it be better to approach this situation from

another angle by developing in the Board policy responsibility, allowing it to retain its policy function, granted that there is some argument about what this may mean, and giving it the prestige which goes with rather than detracts from their desire to participate?

Then in the event that a situation does develop, they could argue it out amongst themselves rather than to make it an issue of this other kind.

Mr. CAREY. I think, Mr. Chairman, that there are some elements here that maybe we are overlooking. I have not reached the point in my statement where I make the suggestion that you might wish to think about having the President name the Chairman and the Vice Chairman of the National Science Board, to designate them. He appoints the members, but he does not now designate the Chairman and the Vice Chairman.

It seems to me, Mr. Chairman, that if we were to have the President make the designations you would take a long step in improving the visibility and the muscle, if you will, of the Board in the area of policy because under these circumstances I think the voice of the Chairman and the Vice Chairman would be louder and be heard more often than in the quiet precincts of a Board room.

I think one of the problems here is that the Board has not had much visibility for a lot of reasons. I think that you are giving the Board that role or that visibility through the annual report. I think that you might also give it to them through enhancing the stature of the Chairman and the Vice Chairman, and all of these things, in the art of government, I suggest, Mr. Chairman, do have their value and can affect outcomes.

Mr. DADDARIO. I agree, and I wonder how we have moved in this direction over the course of time. If we take the history of the Science Board in the first instance, the idea came about that the National Science Foundation should be created and that the Board wished to name a Director. Have we now come to the point that the Board would be willing to and that the community which looks toward the Board would be willing if the President now named its Chairman, and its Vice Chairman? Has it moved that far? Would you in fact be adding to its prestige or detracting?

Mr. CAREY. Well, it is arguable; I don't know what the members of the Board themselves would think of this suggestion that I have made or what the academic community might think of it. They might think very badly. I think that, here again, it runs to a question of motives and intent and I offer it to enhance the stature of the Board whereas I can freely see that someone might well say that it was a bright idea to try to diminish the stature of the Board and to make the Chairman less responsive to the other members of the Board and more responsive to the Executive. These arguments we can't do anything about in my opinion, Mr. Chairman, because they will always be made and I can only say that I am proposing this in good faith and I think it would be a worthwhile thing.

Mr. DADDARIO. There is no question but that there is substance to either side of it. It is a matter of judgment as to which would create the better situation. It does appear that if we have narrowed down the areas within which there could develop conflict and you made an excellent contribution in that regard.

Mr. CAREY. Thank you, sir. Shall I run on here?

Mr. DADDARIO. Yes, I believe we ought to continue.

Mr. CAREY. There are a few remaining points in the proposed bill which require brief comment.

The bill would authorize a separate professional staff for the Board. We agree that the Board needs and must have appropriate staff assistance, but we believe that the bill should not provide explicitly for a staff solely to serve the Board. In our view, statutory encouragement for a separate professional staff could lead to divisive consequences and disrupt rather than improve the conduct of the Foundation's business. So, we recommend that this provision be deleted.

Mr. DADDARIO. Again, Mr. Carey, in this regard you heard the comments made during the dialog which took place when Dr. Hornig was testifying.

Mr. CAREY. I heard part of that conversation, sir, not all of it.

Mr. DADDARIO. Well, if I could review it quickly and ask you to comment. We have taken great care that the staff be specifically labeled as an administrative staff, that it be appointed by the Director, that it not, by any means, be all the staff that would be made available to the Board, that we are trying to give it additional responsibilities, and that in this way we would better provide for continuity of action on its part.

I wonder if there would be such a possibility of a divisive consequence.

Mr. CAREY. Mr. Chairman, I don't like to switch from being an optimist to being a pessimist. I feel that the idea of having staff who are responsive to the Board, to its needs for example, in the preparation of this report—if it is going to be worthwhile doing, it ought to be done very well indeed—there ought to be arrangements for keeping the members of the Board well informed on the operations and activities of the Foundation. I think what troubles us about this idea is the cosmetic consequences of the fact that here within the Foundation there is now to be a group of people who have the advantage, the protection of law about them, that they are in the Foundation but of the Board, that their salaries and other privileges are provided for by explicit legislative action. I can't help but feel, Mr. Chairman, that if there is another way to accomplish the staffing of the Board, than to do it this way, it would be healthier to find that other way. That's really why I haven't offered alternative language; I have suggested that the thing be deleted and I guess what I had in mind is that you might make enough legislative history through these hearings to get the point across to the Director of the Foundation that the Board perhaps needs more resources than it has now and this is a point on which we certainly would make no adverse argument at all.

Mr. DADDARIO. I wonder if we aren't chasing shadows here, we have set up safeguards and we cannot overcome the fact the Board does exist. If the Board and the Director have a proper relationship and if the Director does provide staffing in the way we have suggested, it seems to me that it all fits into place. The Board has a membership of some of the best men in the country. We are giving it a responsibility which entails the development of a report. I have read with great interest your own article on the need of having such an annual report. It seems to me that these people have the capability to perform that function. The fact that it would give the Board people to do this job would appear to be helpful rather than conflicting.

Mr. CAREY. I certainly think they ought to be given the people to do the job, Mr. Chairman. I think what I am unable to bring myself around——

Mr. DADDARIO. You are concerned about the way.

Mr. CAREY. Yes; I just don't like to see competing bureaucracy set up within an organization.

Mr. DADDARIO. I am glad you brought that up because I do think that the way it has been established does not in fact assign any people to them. The people are still a part of the Foundation. They are assigned this staff responsibility and they can be fed through it as part of their career in the Foundation.

I can see nothing in the bill that indicates that they are not part of the whole career bloodstream of the Foundation itself. Certainly, this would not be our intention and the record I think shows that time and time again. It has been bolstered here this morning.

Mr. CAREY. I think, Mr. Chairman, there is also a little problem here about using the figure five, for if you are going to do this as a subcommittee and if this is going to turn up in the final legislation, I think that you ought to think a little bit perhaps about whether you want to nail it down to five, because if this legislation is going to stand still now for a few years at least then this might not be wise.

If you are going to do it, I would be inclined to take the five out.

Mr. DADDARIO. I think that's a good suggestion. The fact that the staff is part of the overall Foundation personnel, gives it sufficient room for that kind of flexibility. Fine.

Mr. CAREY. Shall I go on, sir?

Mr. DADDARIO. If you would, please.

Mr. CAREY. The bill would also raise the Director to level II of the Federal Executive Salary Schedule (see appendix D, p. 147) and fix his term at 6 years unless sooner removed by the President. The Deputy Director would be placed in level III, and four assistant directors would be provided and placed in level V. The Bureau of the Budget believes that the Director is now correctly placed in level III of the salary schedule, and that the changes contemplated by the present bill do not alter his responsibilities sufficiently to justify a higher level.

While we have no objection to a Presidential appointment and Senate confirmation for the Deputy Director, we do not feel that his salary level should be altered at this time. Finally, we are not persuaded that there is justification for four assistant directors holding Presidential appointments, and we recommend that the bill not specify such positions, since the existing legislation furnishes ample flexibility to establish positions and levels of pay below the level of the Deputy Director.

I might interject here, Mr. Chairman, just this other comment on the pay question, which is always a delicate one. The executive salary schedule was written into law less than 2 years ago as you know, sir. The positions which were slotted into the first and second levels, particularly, were examined by the President personally. They were examined very closely by the legislative committees which had jurisdiction over that bill. I would say that the higher level executives downtown were not uniformly happy with the result of the bill. A great deal of compromising had to be done and close judgments on the margin had to be made. What the administration hopes we can

avoid is piecemeal amendment of the executive salary schedule. Because it is like starting a run in a lady's stocking, Mr. Chairman; it's all gone pretty soon, and it may be—although I can't give you a definite promise here—it may be that before too long the executive salary schedule is going to have to be looked at again. I don't think it will be this year, sir, and at that time perhaps we will have recovered from the first round and have good enought health to take on another, and then there will be changes, many changes. For example, we have to admit that when you set up a Department of Housing and Urban Affairs or go to a Department of Transportation, if that should happen, and when you write new legislation of a substantive nature creating a program in Congress, I am sure you do indeed have to deal with jobs that didn't exist 2 years ago when the executive salary schedule was prepared. So, while there have been no penetrations, if I may use the word, of the salary schedule as it was enacted then, there have been additions through other actions of the Congress for new departments or new functions.

Mr. DADDARIO. I appreciate that, Mr. Carey. I hope that the Bureau of the Budget will not fall back on this piecemeal approach when it considers that this committee, which has legislative responsibility over the National Science Foundation and reviews the entire legislation, cannot possibly be accused of taking a piecemeal position insofar as salary is concerned when it must necessarily be included in our thinking as we review the entire legislation.

Mr. CAREY. I respect your position.

Mr. DADDARIO. I would hope that the Bureau of the Budget would recognize that this is part and parcel of the objectives of the committee.

Mr. CAREY. I understand your position, Mr. Chairman.

Mr. DADDARIO. We have recognized the great growth of the agency, and the need to recognize that the Science Foundation is, in fact, a unique organization. It does spread itself throughout many agencies of the Government in a way that does not occur in agencies headed by people of higher levels. The Director's prestige is extremely important as he deals with the entire scientific community.

The quality of the man, the position that he is given, and the scheme of things is extremely important. For example, a small college professor who sits in a highly endowed chair has tremendous prestige throughout the entire academic community. If a small school can have several of these chairs, they can attract to them people of great quality and lift up the whole level of effort. The work that we are trying to do here, will be looked at by the entire community.

Mr. CAREY. The only other thing I would want to say on that, Mr. Chairman, is that with the Director ranked in level III with Under Secretaries of Cabinet departments, he is put in a rather high position in the order of things.

Mr. DADDARIO. I will take that last statement, it is a rather high position.

Mr. CAREY. Shall I go on, sir?

Mr. DADDARIO. Yes.

Mr. CAREY. The bill continues the present arrangement under which the Director is appointed for a 6-year term unless sooner removed by the President. With the exception of certain commissions whose members are appointed for fixed, overlapping terms, the Director is the only Federal executive appointed for a specified number of years. The committee may wish to consider substituting the prevailing arrangement—that is, appointment to serve at the pleasure of the President—rather than for a specified term.

This, I bring you, Mr. Chairman, not with intense feelings at all, but to note the exceptional arrangement for the term of the Director in case you may wish to change it.

Mr. DADDARIO. Mr. Carey, I appreciate your bringing this up. We have thought about it and I can't argue with your recommendation even though we have not included it in the report because this is a matter of judgment and balance. The argument doesn't swing very much in either direction.

Mr. CAREY. I think this is right, sir.

As I said a little earlier, Mr. Chairman, we suggest for the subcommittee's consideration a further amendment providing that the Chairman and Vice Chairman of the National Science Board be designated hereafter by the President. In view of the importance of the Board's policy role, we think it entirely appropriate to improve the stature of the Chairman by having him chosen by the President.

Finally, Mr. Chairman, we are glad to see the specific reference to the social sciences in the proposed bill. This is an area where we believe there is great potential for attacking many of the problems of a changing society, and we welcome greater visibility for social science research within the framework of the Foundation's policies and programs.

That concludes my statement, Mr. Chairman.

Mr. DADDARIO. Do you have any questions, Mr. Brown?

Mr. BROWN. No.

Mr. DADDARIO. Mr. Carey, I appreciate the fact that you have been here and the effort you put into this report, and I am certain the committee will give it every consideration.

Mr. CAREY. Thank you, sir.

Mr. DADDARIO. The work you have done at the Bureau of the Budget is important. Also, we have been struck by the outside activities you have taken part in and the articles you have written over the course of time concerning the place of science and research in Government. Because of that, this comes to us with greater weight than it otherwise would. We appreciate both your efforts in that behalf and your help to us this morning.

Mr. CAREY. You are very kind. Thank you, Mr. Chairman.

Mr. DADDARIO. This committee will adjourn until tomorrow morning at 10 o'clock, same place.

(Whereupon, at 12:20 p.m. the committee adjourned until 10 a.m., Thursday, April 21, 1966.)

RESPONSE TO QUESTIONS FOR THE RECORD SUBMITTED TO WILLIAM D. CAREY, EXECUTIVE ASSISTANT DIRECTOR, BUREAU OF THE BUDGET, BY THE SUBCOMMITTEE

Question 1. You express concern in your prepared statement that the Foundation might, in time, become too involved with applied research to the detriment of basic research. Would it be advisable, in your opinion, to require the Foundation to include in its annual report to the President and the Congress (as required by sec. 3(e) of the bill) information about the type of applied research it has supported and the amount of funds it has expended on such research in order that it would serve to highlight any imbalance which might develop between basic and applied research?

Answer. I think it would be helpful to provide that the Foundation's annual report should disclose the Foundation's activity in applied research. However, I would not think it desirable to require the Foundation to report in such detail that it would necessitate keeping separate books and accounts differentiating support of basic from support of applied research. As the subcommittee knows, which way a project falls is likely in many instances to be a matter of subjective judgment. It would be better, I think, to make the statutory requirement a fairly simple one. This could consist of instructing the Foundation to report on how it has made use of its authority to support applied research. This should suffice, since in addition the budgeting and appropriations process provides a regular procedure for looking into the balance between basic and applied research support.

Question 2. Would it satisfy your objections to section 4(a) of the bill if the legislative report contained words to the effect that, to aid it in establishing the policies of the Foundation, the Board would be expected to keep abreast of the activities of the Foundation and to periodically review its programs?

Answer. The intent of the suggested language is very good. I must say, however, that the rewording of the final sentence of section 4(a) as proposed in our testimony still seems to us to define the function of the Board more accurately than the present wording. Granting that it has the ring of semantics, the fact is that the Board cannot really establish the Foundation's policies in the exclusive sense conveyed by the wording of the bill, because the agency's policies are obviously and necessarily affected by the Congress and the President as well as by the Board. The point is, I think, that to the extent that policy is made within the agency—and so long as the Board is other than an advisory body—this is the Board's responsibility. In keeping with the intent of the committee to clarify the current authority of the Board, the language we have proposed concerning the Board's review of programs seems to us to preserve the Board as a policy body while giving the Director the responsibility for shaping and executing programs. I hope the subcommittee will consider carefully whether this should not go into the bill instead of into the accompanying report.

Question 3. Regarding your comments concerning section 5(d) of the bill, couldn't your objections be met within the framework of section 5(d) whereby the Board may set "such other conditions as the Board in its discretion may determine and publish in the Federal Register"? If not, please explain.

(a) Wouldn't you agree that insofar as it is reasonably prudent, it is desirable to have a clear dividing line between the functions of the Board and the functions of the Director?

Answer. We think it would be most unfortunate to forgo the opportunity now present to make the Director fully responsible for making contracts or grants. I shall not repeat my testimony on this point, except to say again that we can see no reason for circumscribing the Director's authority in the precise area of executive action where there ought to be as little ambiguity as possible. It is hard, for example, to reconcile the provision of the bill which would put the Director in level II of the salary schedule with this provision which makes him subject to the Board on matters involving the making of grants and contracts. The one provision raises his stature while the other diminishes it. Making a grant is an executive function and not a policy making one, and we strongly urge the subcommittee to use this opportunity to meet the issue by removing the restraints on the Director.

Question 4. To what extent is funding for "little science" in danger from the funding of "big science" basic research? How does this possible danger compare with the often-voiced fears that applied research would drive out basic research?

Answer. It is quite possible that heavy investment in some sectors of basic research could be made at the expense of other sectors. We have no evidence at this point to indicate that "big science" in basic research is holding back other fields. Opportunities vary from one sector of basic research to another, and the element of uncertainty is conspicuous where we are dealing with basic science. Until we have better perspectives on science as a whole, decisions are likely to be imperfect though conscientious. This is why some of us have urged new devices to provide an overview of science (an annual report being one such device), together with a stronger effort to formulate criteria of scientific choice which could help in guiding public investment decisions. Meanwhile, the most that can be said is that the Foundation, the Office of Science and Technology, and the Congress need to be watchful of the balance between "big" basic science and general support of research.

A BILL TO AMEND THE NATIONAL SCIENCE FOUNDATION ACT OF 1950

THURSDAY, APRIL 21, 1966

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT,
Washington, D.C.

The subcommittee met, pursuant to adjournment, in room 2325, Rayburn House Office Building, at 10:05 a.m., Hon. Emilio Q. Daddario presiding.

Mr. DADDARIO. The meeting will come to order.

Dr. Walker, we are pleased to have you here as our first witness this morning. Dr. Eric A. Walker is president of the Pennsylvania State University and also Chairman of the National Science Board.

We are happy to have you this morning, and we are anxious to hear your statement.

STATEMENT OF DR. ERIC A. WALKER, CHAIRMAN, NATIONAL SCIENCE BOARD

Dr. WALKER. Mr. Daddario and members of the committee, the members of the National Science Board have spent a great deal of time discussing the bill before us today. They have arrived at the consensus which I have sent to the committee. It is a formal document entitled "Commentary, Concerning H.R. 13696" which I would like to have made a part of the record.

Mr. DADDARIO. Without objection it will be made a part of the record, Dr. Walker.

(The commentary is submitted for the record on p. 86.)

Dr. WALKER. Rather than spend your time and mine reading this commentary, I would like to highlight a few points in it which I think you have been discussing the last few days.

Let me refer to the bill proper.

Scientific research activities in international affairs is covered on page 2, line 6–12. The Board would like to suggest two changes. We would like to insert the phrase "and with the approval of the National Science Board" on line 7 between "Defense" and "to," and we would like to delete the word "research" on line 8. The reasons for this are that the Board would like to reserve to itself the power to review proposals which come from the Secretary of State or the Secretary of Defense to assure itself that operations which are proposed are the proper concern of the National Science Foundation.

In other words, first we do not want to be doing something that is not within the sphere of the Foundation. Secondly, we would like to delete the word "research" because we can visualize requests which

are made to strengthen science education, and we would not want these to be ruled out by the inclusion of the word "research."

Now, may I spend a little time commenting on the inclusion of "applied research," in the scope of the National Science Foundation.

There are good arguments for, and there are arguments against granting the Foundation permissive authority to support applied research at certain institutions. The National Science Board has arrived at a position which is acceptable to most members of the Board. We suggest that the wording on page 4, lines 1 through 12 might be changed to read as follows:

"(b) In addition to the authority contained in subsection (a), the Foundation is authorized to initiate and support scientific research, including applied research, at academic and other nonprofit institutions. When so directed by the President, the Foundation is further authorized to support, at other appropriate organizations, applied research relevant to national problems involving the public interest."

The arguments for this wording are many and complex, but in essence they are that we feel basic research is really important but too often it is an orphan. We must guard against applied research driving out basic research. We must also guard against applied research being used as a test to see if we ought to perform basic research. Moreover, applied research is often mission oriented, the mission of other agencies of the Government, and we do not want to conflict with their operations.

Furthermore, applied research is often done profitably by industry. However, there are some areas in which applied research is not attractive to industry, but the public interest demands that something be done. This is an area in which we think the National Science Foundation could make a contribution.

Thus, the Board feels that a change in the wording is justified.

Mr. DADDARIO. Dr. Walker, we are pleased to have your point of view showing the concern of the Board on this matter. I think it is of utmost importance that the record show not only your feelings but your support of the Committee's fundamental position that the applied science activity in which the Science Foundation may become involved does not grow to the point where it could obscure and overcome the important work in basic research.

I think that this is an extremely important addition to the record and we are pleased to have it.

Mr. MOSHER. Mr. Chairman?

Mr. DADDARIO. Mr. Mosher?

Mr. MOSHER. I would be interested to have you comment a little further. I think you said we should guard against applied research being used as a test to determine whether basic research should be attempted.

Dr. WALKER. Yes, sir, that deserves a little more explanation.

From all outward appearances, there is no use for basic research.

Mr. MOSHER. For what?

Dr. WALKER. This is why we call it *basic* research.

Mr. MOSHER. You say from all outward appearance?

Dr. WALKER. Yes, from the point of view of what use you can make of it.

Mr. MOSHER. Unless you have a philosophy that any new information is basic.

Dr. WALKER. We have that philosophy and we would not want people to say: "We do not see any application for what you are doing, because you are not doing any applied research on what you are proposing to do more basic research on." We do not want to couple the two together.

Mr. MOSHER. In other words, you want to guard against making a requirement for basic research that there be some definite applied research goal in mind.

Dr. WALKER. That is correct, sir. That is it exactly.

Mr. MOSHER. I would like that philosophy.

Mr. CONABLE. You can make a good argument for the two being not in any way related.

Dr. WALKER. That is right, and this is what we would like to do.

Mr. CONABLE. If it has some applied research aspect to it, isn't it applied research?

Dr. WALKER. Yes, and the same research can be different to different people, depending on their points of view.

Mr. MOSHER. And yet I heard a competent person the other day arguing and presumably stating as a fact that so far as armed services research is concerned there has been almost always a recognized need before the basic research has been attempted in the past.

Now, I suppose that is a special situation in armed services.

Dr. WALKER. Yes, but I think it is a correct one, sir. I have heard Admiral Bolster and Dr. Waterman say when they were in the Office of Naval Research, that they tried to find projects which the Navy needed to know something about, and, therefore, it was *applied* research as far as the Navy was concerned, but as far as the investigator was concerned it was just *basic* research. So the same piece of research can look different to different people.

Mr. CONABLE. We have many problems with this kind of definition. In the larger sense there isn't such a thing as basic research because almost everything gets used somehow eventually.

Mr. MOSHER. Isn't it true that there are many examples of inventions of applied research where the basic research has been done afterward? After you have something working then you do the basic research to find out why it works that way.

Dr. WALKER. As an engineer, sir, I think that is the way it usually happens. You get something done, then you want to know why it works.

Mr. DADDARIO. Dr. Walker, it may be helpful here to continue with this discussion even though we have the fear we should not express the bill in such a way as to eliminate the National Science Foundation from some activity in the applied field. We think we have set up the necessary safeguards. You mentioned ONR. ONR which is certainly a mission-oriented agency supplied some of the most important basic research the country has had. In fact, it established a formula in the basic field which has been imitated by others. Dr. Waterman, first Director of the National Science Foundation, moved directly from ONR to the National Science Foundation.

So, you can do both basic and applied research. They are not in conflict with one another. In addition you can have goals and still develop basic research. In fact, because you have goals it gives you the reason for so doing the research.

Dr. WALKER. That is right.

Mr. DADDARIO. So, you ought not to be so fearful about the fact that this word "applied" begins to creep into this legislation.

Dr. WALKER. Sir, I am *not* fearful, certainly not as long as it is done in colleges, universities, and nonprofit organizations. This does not bother me a bit. But there are so many big areas in which we need a great deal of research that is going to cost us a great deal of money that this could inflate the request of the National Science Foundation to the point where I think we would horrify the Congress as well as ourselves.

Let me give you one example. There is lot of talk now about solid waste disposal. How do you get rid of junk cars?

Mr. DADDARIO. We have heard about this argument.

Dr. WALKER. There is very little being done on this problem because there is no profit in it. You cannot pay a man to haul a car away any more. Somebody has to do some real applied research on developing machines and systems to get rid of discarded things. This is not going to cost $25,000 or $50,000. It is going to cost a million dollars even to build a machine to try it. So someone may come in with a request for a hundred million dollars to do applied research on just getting rid of junk cars. This could be a large item in the NSF budget.

Mr. MOSHER. Didn't we pass last year $10 million for this. I forget what agency is spending this money.

Dr. WALKER. I think it is the Department of Commerce.

Mr. MOSHER. In other words, when a job like that comes along and Congress decides to appropriate the money it should designate not the National Science Foundation, but the Commerce Department.

Dr. WALKER. Personally, I would much rather have Commerce do it.

Mr. CONABLE. I just want to say one of the most felicitous phrases you had in discussing this, used by Dr. Haworth and Dr. Hornig, was the doctrine of "hot pursuit." It was stated that it would be unfortunate if the National Science Foundation had to come to a screeching halt on some particular aspect of basic research with which it was concerned simply because somebody discovered a practical use for the basic research that was being investigated.

I think what you are saying is that the emphasis should be from the basic research toward the applied rather than the other way around starting with the applied and letting that dominate the decision on what basic research is to be investigated.

Dr. WALKER. That is correct.

Mr. CONABLE. Isn't that another way of saying what you are saying, Doctor, here?

Dr. WALKER. Yes.

Mr. CONABLE. You are afraid if you start from the applied research point of view very quickly this can come to dominate the scientific judgment of those who otherwise would be in it purely for the advancement of science?

Dr. WALKER. That is correct, sir.

Mr. DADDARIO. Why don't we use the example of weather modification which is before us, and which has been discussed in the record. Isn't this an example of National Science Foundation being involved in some applied activity where the basic research necessary to bring an important national goal close to accomplishment is carried out, feasibility is demonstrated and at that stage the program is transferred

from the National Science Foundation to an operating agency? Is this an example of how it ought to work? Does this example show that this kind of research can be handled and that we ought not to be fearful that once a mission is assigned to the National Science Foundation the program will remain in NSF's overhead and prevent the Foundation from doing its necessary basic work?

Dr. WALKER. This is a very good example of the way it ought to operate.

Mr. DADDARIO. It is being emphasized more on fear than is indicated by either the activity of this committee, its recommendations or the actual happenings of Government insofar as this example of weather modification is concerned. It seems to me to be one which we have fitted nicely.

Dr. WALKER. This is probably because we are getting old and remember before World War II whereas the younger generation remember after the war. Before the war, money for basic research was very, very hard to get. Perhaps this fact looms too large in our memory.

Mr. DADDARIO. I am pleased. I think progress is being made. Members of Congress know what the definition of "basic research" is.

Mr. CONABLE. Or appear to.

Dr. WALKER. Could I move on to another item, sir, which connects two different points?

Mr. DADDARIO. Please.

Dr. WALKER. In the bill on page 4, lines 13–15, the committee outlines the Board's role in establishing national policies. Let me say that we concur, and we hope that we will be able to carry out the committee's wishes in this regard. Later on, on page 7, lines 9–18, it is stated that the Board shall render an annual report to the President for submission each year to the Congress on the status and health of science and its various disciplines. In the formal Board commentary which I have submitted, we state that this charge is also very welcome, with certain reservations, and suggest a slightly different wording. The first of these suggested changes in wording implies that we prefer not to be burdened with a statutory requirement to render a report covering *all* disciplines *every* year. We did not think you intended this, but we wanted to make certain.

First, it would be an impossible task to report on everything every year; secondly, some disciplines do not change measurably from year to year, making a report unnecessary.

Therefore, we would hope that the Board would be allowed to have some latitude to select areas on which it would report, preferably those that are important and in which progress is being made rapidly.

Mr. MOSHER. There would have to be a presumption that the Board would survey the whole field in deciding what to report on.

Dr. WALKER. Yes.

Mr. MOSHER. There would have to be an appraisal of the whole view.

Dr. WALKER. That is correct. This leads me on to the next point I was going to make.

Beginning on line 21, page 7, it was suggested that the Board permit the appointment of a staff consisting of not more than five professional members. Our only concern here is whether you ought to specify the number "five." During the past year I know a Board Chairman

we could have used three or four staff members to work with our committees. But, as you just pointed out, when it comes to writing an annual report the Board will have to borrow a lot of assistance from the Foundation staff. In fact, they will have to do most of the work for us. We will have to ask the Director to assign people to specific areas to survey these fields so that we can write this report. We believe the number assigned to the Board proper will change in time, it will change in character as the problems differ, and we therefore would hope that you would delete the number. We think that is a little too binding.

Mr. DADDARIO. Well, Dr. Walker, there's nothing fixed about the number. And yet it was our idea, that we should recommend that the Board might have available to it on a continuous basis a staff where further activity could be developed. I do want to emphasize that this was not intended to be the greatest number of people you could have at any time during the year or that the Director would limit you to the five or six or seven or whatever the number might be.

If we go back to your concern just one moment about the report. I think that Dr. Haworth covered it very well in his statement where on page 8 he referred to something I had said, and then concluded with his own statement about the latitude the Board ought to have in that regard.

Mr. MOSHER. Mr. Chairman, you are saying that even though the number "five" is mentioned, the understanding would be that temporary part-time ad hoc people could be hired.

Mr. DADDARIO. Not hired but would be assigned by the Director the same way as these five are to be or would be assigned.

Mr. CONABLE. Perhaps this could be taken care of by inserting the word "permanent" there to imply that there was nothing to restrict the appointment of temporary people in addition.

Mr. DADDARIO. Well, we would have to look at the language as we go along from the legislative point of view.

My offhand opinion is that we are not stuck on the number "five," but neither should we get into the record that a number is applied, that this would be all the personnel available to the Board at any time. I know that Dr. Haworth understands that is not to be the case.

Dr. WALKER. There is one last point that I would like to make, and this involves, of course, the function of the Board and its role in the National Science Foundation.

On page 5, the proposed bill states on lines 11–13:

> Except as otherwise specifically provided in this Act, the function of the Board shall be to establish the policies of the Foundation.

This is the item on which the National Science Board itself has spent a great deal of time over the past year, trying to decide what its job is and where its responsibilities begin and end. The Board after this consideration voted to recommend to you that the above sentence be deleted and, in its place, there be substituted the following:

"The Board shall establish and be responsible for the policies and programs of the Foundation."

The National Science Board feels that if this language is included in the bill it says that the Board is responsible first for the policies of the Foundation and secondly to see that the programs carry out these policies. I submit this statement to you with the authority of the Board as a suggested substitution.

Mr. DADDARIO. Mr. Walker, you probably know when Dr. Haworth was referring to this point he also recommended language. His language would change the existing terminology of the bill to read as follows:

"The Board shall be the policymaking body of the Foundation and shall review its programs."

When you compare this statement with yours, which do you prefer and for what reasons?

Dr. WALKER. Let me say the statement I read was the one voted on by the National Science Board; therefore, I do not feel that I am in a position to change it. The key word here is "responsible," responsible for the policies and programs. It does not say review the programs. I am not sure I know what review means. It means look at them, but then do you do anything about it?

The wording of the Board implies that, if you are responsible for the programs, you look at them, if you do not think they are in accordance with the policies that the Board has established, you see that they are changed so that they are in accordance with those policies.

These are the differences in the two statements, as I see them.

Mr. DADDARIO. Maybe we can approach it this way: If you take the language which we now have, it says "the function of the Board shall be to establish the policies of the Foundation." Recognizing that there is difficulty in assigning a definite definition to the word "policies," would it not be the case that when the Board sat down and reviewed its responsibilities under the new legislation, that it would begin to establish rules of procedure which would take into consideration what its responsibility might be in regard to reviewing programs; and that this would be the way to work it out rather than to add words here at this time I wonder if you are not achieving an opposite effect than the one you would like to achieve?

Dr. WALKER. I hardly know how to answer that, sir, except to say that my emotions lead me to feel that we would not. I know there is a lot of question about what you mean by "policy". This is decided by every university president who deals with a board of trustees. The board establishes policy and tells him what to do. He then puts these policies into effect. The policies are the goals, the settled practices, the settled ways of doing things. This is the strategy of the battle. The procedures, what you do from day to day, are the tactics. Now, a field commander can determine tactics; however if a tactic gets so large it upsets the strategy, he should be careful to go back to GHQ and find out if it is all right.

I do not think there is really any problem here in defining the policies; but you cannot make policy and not check to see if it is carried out. It may be that you formed a policy, it was carried out, a decision was later made that the policy was wrong and that it needed to be changed. It seems to me you have to have this followup to see what programs you have, what the effect of the program is, and if the effect is not what you want, then you have to go back and change the policy. I quess what I am saying is that you do not set policy and then walk away from it.

Mr. DADDARIO. You have more confidence that you could define the word "responsible" for the policies than the word "review." You have already said you don't really know what "review" means.

I wonder if you wouldn't have the same problems about the word "responsible."

Dr. WALKER. Let me say, sir, I think that as Board members we feel considerable responsibility to scientists, educational and nonprofit organizations, and the general public. Now, suppose the universities come to us and say: "As a result of some of the things you are doing, you are hurting the universities." Well, we think it is our business to see what programs are in being and what policies we established that made the staff implement these programs that are hurting the universities. We should not just say it is not our policy to do so and walk away from it. We ought to be responsible for the *end effect.* The Board should not be allowed to say, "Oh, we set policies and that is it."

Mr. DADDARIO. You don't feel that when you are assigned a responsibility of establishing the policies of the Foundation that you would have responsibilities to oversee the effectiveness of the programs which were being conducted by the Foundation. In other words, you could say to anyone who was critical that you had no responsibility there because you were limited to a policymaking function of the Foundation? Do you think it is that restrictive?

Dr. WALKER. No; but I still think the Board ought to have the right, the authority, and the responsibility for seeing that the *end effect* works out the way it is supposed to work out.

Mr. Daddario, you know that when the National Science Foundation was originally set up, it was intended that the Board would be responsible for the "health of science in the United States." Well, to me those were the key words—responsible for the health of science—not responsible for setting policies, but responsible for the end result. I believe this is the thinking behind the Board's reasoning by which they suggested this particular wording.

Mr. CONABLE. Mr. Chairman?

Mr. DADDARIO. Mr. Conable?

Mr. CONABLE. I think this is a good point. Using the parallel of our situation in Vietnam, how many Congressmen are now saying: "Well, we don't have any responsibility for what's going on there, that's the President's responsibility." Nobody would deny that we are a policy-setting group. I think that the responsibility should be assigned, as well as the obligation to establish policy. It is obvious that when you get into an unpopular situation frequently you try to avoid responsibility at the same time that you may have a key part to play in the setting of policy.

Mr. BELL. I would be inclined to agree with the gentleman from New York on this point. It is well taken.

Mr. DADDARIO. We are happy to have all this for the record. I do think we have spent enough time on this question. We can proceed.

Dr. WALKER. Mr. Daddario, I would like to conclude by saying that the Board has also looked carefully at the other recommendations of your committee and has stated its position in the commentary. I am not commenting on many of these at this time because, for the most part, we agree with you. The Board thinks you have done a very fine job in restudying the responsibilities of the Board. We think a great deal of good is going to come out of your committee's review and this bill. The two or three points I selected to speak on here were ones that we feel particularly strong about, and I wanted to discuss them further with you.

Mr. DADDARIO. Dr. Walker, there's no question about that. Your statement is an all-inclusive one. It shows a great amount of work has gone into analysis of the bill, it does show the Board's concern about various points and parts of it, both concern by agreement and disagreement. The disagreement we take as being objective.

There is one question I would like to direct to you because it is a matter which concerns the Board and came up yesterday.

We had a recommendation by Dr. Hornig that the Chairman of the Board be appointed by the President and——

Mr. CONABLE. From the members of the Board.

Mr. DADDARIO. I'm sorry, Mr. Conable?

Mr. CONABLE. From the members of the Board.

Mr. DADDARIO. From the members of the Board; yes. And, one from Mr. Carey that this include not only the Chairman but the Vice Chairman. I wonder if you might make some comment on that recommendation.

Dr. WALKER. Instead of the Chairman of the Board being elected by the members of the Board?

Mr. DADDARIO. That he be designated from the membership by the President.

The other recommendation is that this kind of appointment include the Vice Chairman of the Board.

Dr. WALKER. Well, without having given much thought to it, I would not like the idea. The reason is fairly simple. I think the members of the Board are there representing science, the scientific and educational communities, the Congress, and the people, without special designation as representing any one person or group. It seems to me that the minute the Chairman would be designated by the President, he would find himself in exactly the same position as the Director. I do not know whether the Director has used these words in testimony here, but I have heard him say that he wears two hats. There is nothing more difficult than wearing two hats. It means that one represents two different publics, two different points of view. As long as those points of view coincide, there is no problem. But, when those points of view begin to diverge, one gets schizophrenic and does not know which point of view to advocate.

As the elected Chairman of the Board, I represent the Board. I can speak with complete freedom saying I represent the Board. However, if I were also designated as Chairman of the Board by the President, I would feel that I had another hat and that I had to represent the administration and this might place the Chairman in a most difficult position.

These are my personal offhand reasons why I think this is not a very good idea.

I have not heard the reasons for it, so I cannot really make a balance. But, my quick judgment is that it is not a very good idea.

Mr. DADDARIO. Well, thank you.

Mr. Yeager, do you have any questions?

Mr. YEAGER. May I ask two questions in connection with a point you brought up, Dr. Walker.

One of them involves the section which dealt with the Secretary of State and Secretary of Defense making a request of the Science Foundation to perform work for them or support work for them. Both you and the Foundation would like to put a limitation on that

and make it at the discretion of somebody. Your language was "with the approval of the Board."

Dr. WALKER. That is right.

Mr. YEAGER. The language of the Science Foundation was suggested to be "at the discretion of the Foundation." Do you see a distinction here, or does this mean the same thing to you? In other words, do you read "at the discretion of the Foundation" to include the Board and its policymaking function?

Dr. WALKER. I would think so. I am not sure everybody else would, but I would think that, if it says "Foundation" and the Board is responsible for the policies of the Foundation, then it is clear. I would hope it would also be to other people.

Mr. YEAGER. So, the language would mean the same thing, either phrase?

Dr. WALKER. It would to me.

Mr. YEAGER. The other question that I have concerns the language which you suggest in connection with section 4(a) that "The Board shall establish and be responsible for the policies and programs of the Foundation." This was tied into section 5(d) in the recommendations of the Science Foundation which suggested additional language for 5(d). You have in your testimony indicated that 5(d) might be entirely eliminated—at the bottom of page 13, the Board's statement says that "If the Board remains authorized to give definition to the terms and conditions of awards under all of the programs of the Foundation," which I presume would be the case if your language were adopted in 4(a), "this provision seems quite unnecessary and accordingly the Board recommends that section 5(d) be eliminated."

Mr. DADDARIO. That is at bottom of 13 of your commentary, Dr. Walker. Last paragraph.

Mr. YEAGER. If this were done, I want to be clear. You would construe this to mean that the Board would retain the present power which it has to veto or to regulate or to, as you say, be "responsible" for individual programs, grants, contracts, and this type of thing?

Dr. WALKER. That is correct. What we are saying is that a dollar limit is not a very good way of drawing the line. In a new program you would want a low dollar limit. In an ongoing program where the policies and procedures are well established, the Board delegates very high dollar limits to the Director. We have a complete understanding on this. If there is an area of doubt, the Director brings the matter to our attention. In fact, he brings to us a number of proposals that are just under the dollar limit so that we can see the kind of thing that he is approving. This is a system that has worked very well, and we believe it would be unnecessary if the Board had the power to call back the authority any time it wanted to.

(The following commentary was subsequently submitted by Dr. Walker in clarification of the foregoing discussion.)

ROLE OF THE NATIONAL SCIENCE BOARD ON APPROVAL OF PROGRAMS VERSUS GRANTS AND CONTRACTS

It is important to distinguish between the proposed role of the National Science Board as regards programs on the one hand and individual grants and contracts on the other. By our proposal, the Board would establish the purposes of a new program of awards and indicate the frame of reference and general policy guidelines which would be appropriate to its management. Moreover, no new programs could be established within the Foundation without Board approval.

After establishment of the program by the Board, the Director and his staff, with advice from an appropriate panel of experts, would evaluate requests under the program and make the awards without need for prior, specific consultation with the Board. Nor would the Board be empowered to exercise a retroactive veto after the Director has authorized an award. But the Board would, from time to time, examine the program by considering the number and magnitude of the awards which had been made, the quality and distribution of the investigators and their institutions, the nature of the work being done, etc. This would permit a judgment as to whether the actual program, in being, conforms to the goals the Board had in mind when it established the program. Should this prove not to be the case, the Board could then terminate the program or have the operating guidelines redrafted, as it seems most appropriate. However, the Board itself would participate neither in the consideration of individual applications nor in the approval process. That authority would be lodged exclusively in the Director. The only exceptions to this procedure would be those instances in which the Director would bring a specific proposal to the Board because its approval required a clarification of policy, and those instances in which the entire program consists of one or a few major actions, such as Project Mohole, the construction of a unique expensive telescope, or the creation of a new national laboratory.

Mr. DADDARIO. Mr. Conable?

Mr. CONABLE. I would like to propound a somewhat academic question to you, sir. If I can phrase it properly.

We have been going through a great process with respect to the National Science Foundation. And we come up with some changes, many of the changes we have come up with are changes which could have been implemented within the organization itself. I wonder if you could assess for me as a legislator how much value you ascribe to the actual legislation that we are coming out here, what can be done, and what is the most significant part of it?

Do you think that probably the most beneficial part of these hearings has been the process of self-examination which inevitably the Foundation has had to go through in the process of preparing for them and of justification? I'm interested in knowing how you would assess the relative value of the process itself and the end product.

Dr. WALKER. Well, you don't know what a Pandora's Box you opened there! The National Science Foundation, as you know, is a unique sort of organization within the Federal Government. It was intended to be that way. It is one place where a board, a lay board, has the authority to set the policies and govern the programs. It has worked exceptionally well. I think America can be proud of it; the Congress can be proud of it. They set it up this way, and it has worked very well. It has done much for science.

The scientists, the engineers, the Board are very jealous of this position. We do not want to be reduced to an advisory board. I have served on advisory boards. For example, as a member of the Naval Research Advisory Committee, we give advice; the Navy takes it or leaves it. About all we can do if they leave it and things don't work out well, is to say, "I told you so."

But, here is a place where a board of scientists, engineers, educators, public servants, establish the policies, guide the programs, and things have come out very, very well.

I think the most valuable thing resulting from these hearings and this bill is a restatment that this is a system that has worked in a very fine way and we are going to preserve this system. The Board is going to be a board with powers and not an advisory board.

Mr. CONABLE. Implicit in this question is the query, of course, of how often we should go through this process. Now, you have gone through a remarkable period of change and growth over a period of 15 years and Congress has not concerned itself during this period.

We have apparently been justified in letting things go because, as you state, the basic function has been fine. But, we touched on this a little yesterday. What should Congress' role be?

Dr. WALKER. Again, sir, I will give you my personal opinion. You should have done this 5 years ago, and you ought to be sure to do it 10 years from now. I think 10 years is about the proper span. I think a period of 15 years, during the rapid growth of the Foundation and changes in the world, was too long.

Mr. CONABLE. Well, since the committee has the responsibility of oversight it is a matter of concern to us, to try to judge what our responsibility is. I'm sure the process is a salubrious one for the Foundation. I am happy to have your comments on that in the record.

Mr. DADDARIO. I would just like to amend Mr. Conable's remarks so as it will not be indicated that we all agree, and I am sure that Mr. Conable does not mean that the Congress has had nothing to do with the National Science Foundation over these 15 years.

Mr. CONABLE. Well, all right.

Mr. DADDARIO. Dr. Walker, I do think it might be helpful if you would refer yourself to your commentary at the top of page 12 where you endorse one of our proposals. I think that deserves some emphasis because it deals directly with the status of the Director and because this was touched on yesterday to a considerable degree. I would like to have your opinion and reasons for supporting the proposal wherein the Director of the Foundation be raised in the Federal executive schedule level.

Dr. WALKER. The Board did not debate this very much, sir. We did not think it was necessary to do so. We think that the Director of the Foundation is an important person in the Federal Government, and the Board would like to see him elevated as high as possible.

Mr. DADDARIO. And that's in keeping with the statement you just said in answer to Mr. Conable's last question, that you are jealous of the progress of the Foundation and have deep concern about its importance in the scheme of things.

Dr. WALKER. That is correct, sir.

Mr. DADDARIO. Dr. Walker, I appreciate everything you have said here and the help that you have been to us during the course of the general hearings and prior to the hearings on the bill and we certainly will be in touch with you again and thank you for your time, effort, and help.

Dr. WALKER. Thank you, sir.

(The information follows:)

RESPONSE BY DR. ERIC A. WALKER TO QUESTIONS SUBMITTED BY THE SUBCOMMITTEE

Question 1. Regarding your suggested amendment to add "and with the approval of the National Science Board" to section 3(a)(2) of the bill [NSF Act], what criteria would the Board employ in determining if the Foundation should undertake the requested research? (a) Do you view this determination as a policy matter?

Answer. I believe the Board would utilize the same criteria in judging support of activities referred to the Foundation by the Departments of State or Defense

as it follows in evaluating requests which are received directly from the scientific and educational communities. Among these are scientific merit, relation to contemporary scientific research or science education, duplication of effort, scientific ability, and resources of the investigators. Of course, the proposed activity would have to be considered in its proper context in the national or international sphere.

The Board's proposed language here was meant to serve as an added safeguard to the Foundation so that it would not one day find itself utilizing an undue proportion of its funds for such activities, worthy though they might be, to the detriment of its basic mission. I believe this is the "policy matter" involved.

Question 2. You express concern in your prepared statement that the Foundation might, in time, become too involved with applied research to the detriment of basic research. Would it be advisable, in your opinion, to require the Foundation to include in its annual report to the President and the Congress (as required by sec. 3(e) of the bill [NSF Act]) information about the type of applied research it has supported and the amount of funds it has expended on such research in order that it would serve to highlight any imbalance which might develop between basic and applied research?

Answer. The annual report of the National Science Foundation now contains data on the distribution of the funds appropriated to it by the Congress, and it should be understood that it will hereafter also include information on the support of applied research. Therefore, it does not seem necessary to be quite so explicit in outlining the nature of this annual report.

However, I should like to point out, as the Board noted in its "commentary," that there will be many research projects which cannot be designated as being entirely either "basic" or "applied." Hence, the information presented will be to some extent an approximation.

Question 3. In your comments regarding section 4(g) of the bill (National Science Foundation Act) you use the phrase "such matters as." This implies that the Board may wish to bring to the attention of the Congress and the President matters other than, and in addition to, those which are specified in section 4(g). If this is true, would you favor adding the words "and such other matters as the Board deems necessary to include in the report" after "society"?

Answer. I believe the Board would favor the additional mandate to report on "such other matters as the Board deems necessary to include in the report."

Question 4. Would it satisfy your objections to section 4(a) of the bill (National Science Foundation Act) if the legislative report contained words to the effect that: To aid it in establishing the policies of the Foundation, the Board would be expected to keep abreast of the activities of the Foundation and to periodically review its programs?

Answer. The National Science Board at its 105th meeting on March 17–18, 1966, formally adopted the proposed language set forth in its "commentary." The Board feels strongly about its suggested revision of this key sentence. Without consulting the Board, I could not agree on its behalf to the original text of the bill with the inclusion of explanatory language in the legislative report. The difficulty with the language which you propose for the legislative report lies in the word "review." "Review" does not suggest any recourse or action, if the Board finds that programs and practices do not conform to its adopted policies.

However, if the subcommittee does not feel disposed to accept the Board's proposed language, it is my personal opinion that the statement you have suggested for the legislative report goes a long way toward meeting the need to clarify the Board's role and responsibilities, but we would much prefer the wording we suggested.

Question 5. Regarding your comments concerning section 5(d) of the bill (National Science Foundation Act), couldn't your objections be met within the framework of section 5(d) whereby the Board may set "such other conditions as the Board in its discretion may determine and publish in the Federal Register"? If not, please explain. (a) Wouldn't you agree that insofar as it is reasonably prudent, it is desirable to have a clear dividing line between the functions of the Board and the functions of the Director?

Answer. It is entirely possible for the Board to operate within the framework of conditions published in the Federal Register. As a matter of fact, such a procedure would insure the Board a safeguard should later circumstances warrant a necessity for changing its approval procedures.

I believe it is the Board's position that it is highly desirable to take advantage of every opportunity to distinguish and clarify the respective functions of the Director and the Board.

Question 6. In our proposed revision of section 8 of the bill (National Science Foundation Act), you use the term "in consulation with the Board" in lieu of "after

receiving recommendations from" as used in the bill. Please explain what you mean by "in consultation with," and how it differs from "after receiving recommendations." Would it be satisfactory if the words "Board" and "Director" as used in section 8 of the bill (National Science Foundation Act) were switched?

Answer. It is the Board's desire that the Director, as its chief executive officer, be given as much liberty as possible in organizing the Foundation to perform its tasks. It would be my understanding that "in consultation with the Board" would give the Director more freedom than "after receiving recommendations." Under our proposed language, the Director would be obliged to *discuss* the matter with the Board but would not be held to taking its *advice*, as might be the case if the text read "after receiving recommendations."

Question 7. To what extent is the funding for "little science" in danger from the funding of "big science" basic research? How does this possible danger compare with the often-voiced fears that applied research would drive out basic research?

Answer. The problem of the equitable distribution of resources between *little versus big science* is a good analogy to that of *basic versus applied research.*

I think there is a great deal of validity to the oft-heard complaint that "little science" is suffering because of the tremendous pressures and expenditures from "big science." This is difficult to document with dollars and cents, but one finds many instances where worthy individual investigators or small projects do not compete favorably with large, attractive, popular activities.

There is scarcely a Board meeting held at which this topic is not discussed, with a conclusion that little science needs more support. Therefore, in considering the granting of permissive authority to the Foundation to support applied research, we are attempting to set up every possible safeguard to avoid its encroaching on the support of basic research, which the Board feels strongly is now and always should be the *primary mission* of the National Science Foundation.

(The formal statement of the National Science Board as submitted by Dr. Walker follows.)

COMMENTARY SUBMITTED BY THE NATIONAL SCIENCE BOARD CONCERNING H.R. 13696, A BILL TO AMEND THE NATIONAL SCIENCE FOUNDATION ACT OF 1950

The comments offered below are presented in the order in which the proposed amendments would alter the National Science Foundation Act of 1950. This order does not reflect the order of importance of these changes but, rather, is intended to facilitate comparative examination of the commentary and the proposed legislation. References are to sections and paragraphs of the act as it would be amended.

ON THE FUNCTIONS OF THE NATIONAL SCIENCE FOUNDATION

Section 3(a) (1) and (3) (p. 2, lines 1 and 15)

The National Science Board strongly approves addition of the *social sciences* to the previous listing of the broad fields of science which the National Science Foundation is authorized to support.

With the knowledge and consent of the President and of the Congress, the National Science Foundation has, for several years, provided limited support for research and education in the social sciences, particularly those aspects of social science which are subject to quantification and objective verification. These activities were considered proper as support of "other sciences" in section 3(a)(2) of the original act.

We recognize that expanded efforts in this area must be undertaken with clear awareness of the many difficulties inherent in such studies. But man has been much more successful at understanding his own biology and the universe in which he finds himself than he has been in understanding himself as a social being. Since that understanding may well be imperative to man's very survival as well as to his success in utilizing the fruits of science and technology so as to improve the human condition, the Board welcomes this affirmation by the Congress.

Section 3(a)(2) (p. 2, line 8)

It is suggested that the word "research" be deleted from the phrase "* * * and support specific scientific research activities * * *." Such deletion would then permit the Foundation to initiate and/or support activities calculated to strengthen

science education abroad, such as appropriately modified course content or curriculum development programs, at the request of the Secretary of State, while still authorizing support of scientific research as presently intended. The possible desirability of such future activities may readily be projected and it would be well to provide such authorization at this time.

Section 3(a)(2) (p. 2, line 12)

In accordance with the suggestion above, the word "activities" should then be substituted for the word "research."

Section 3(a)(2) (p. 2, line 7)

It is suggested that the phrase "and with the approval of the National Science Board" be inserted so that this sentence would read "* * * the Secretary of Defense, and with the approval of the National Science Board, to initiate and support. * * *"

This clause would assure that the Board would have opportunity to review the proposed program with respect to its intrinsic merit, its relation to the activities of the Departments of State or Defense, and its propriety as a program of this Foundation. Under the circumstances here envisioned, Board review and approval would appear to be particularly important.

Section 3(a)(5) (p. 2, lines 20 and 21)

The Board welcomes the directive "to evaluate the status and needs of the various sciences" and concurs with the position of the subcommittee that the Foundation could tailor its support programs in more meaningful and purposeful fashion if there were at hand reliable, critical appraisals of the status and needs of those disciplines and scientific areas for the health and vigor of which the Foundation is given responsibility by the act.

It is hoped that the committee will also recognize that such evaluations are useful only if they are reasonably up to date and reliable. The effort required for such continuing appraisals is a task of considerable magnitude and will require augmentation of the Foundation staff and the cooperation of the scientific community.

Section 3(a)(6) (p. 3, lines 7 to 8)

Since the National Science Foundation is becoming the focal Federal agency concerned with scientific and engineering manpower information, legislative affirmation of this role of the Foundation is indeed welcome.

The proposed amendment directs the Foundation "to maintain a current register of scientific and technical personnel * * *." The Board is concerned that the word "current" may be interpreted to mean "annual." This register has been compiled on a 2-year cycle. In view of the purposes for which the register is intended and can be used, a 2-year data cycle appears to be quite adequate. Acquisition of the necessary data and their compilation and interpretation is a large task which requires the cooperation and services of many learned and professional societies as well as a substantial effort by the NSF staff. In our view, it would be more useful to continue to seek means to improve the present activity than to attempt conversion to a 1-year data cycle. The Board hopes that either the bill or an accompanying committee report will clarify this matter.

Section 3(a)(7) (p. 3, lines 20 to 21)

Increasingly, members of the governmental and academic communities have found need for data concerning the manner of distribution of Federal funds in support of science. Accordingly, the Board is pleased to have legislative direction that the Foundation acquire, analyze, and publish such data. We are concerned, however, lest the Foundation be asked to undertake studies which are not feasible or meaningful; nor do we wish the Foundation to find itself, perforce, publishing analyses of dubious certainty or reliability. For these reasons we suggest that the phrase "* * * received by each educational institution, nonprofit organization, and private contractor in the United States * * *" be modified to read "* * * received by each educational institution and nonprofit organization in the United States * * *."

At this time, there appears to be no reasonable means of ascertaining the fraction of a development or procurement contract, between a mission-oriented agency and a prime contractor, which is to be utilized for basic or applied research. And this problem is even more complex when considering second- or third-tier subcontractors. (Retrospective data, available perhaps 1 or 2 years after the fact, are indeed obtainable.)

Accordingly, a modification of the proposed amendment is suggested, as described above. At the same time the committee can be assured that the Foundation will fully explore the possibility of obtaining the data concerning the federally supported research of private contractors which would permit providing the information described by the subcommittee.

Section 3(b) (p. 4, line 3)

A. Shall the Foundation support applied research?

Perhaps the most dramatic change in the nature and role of the National Science Foundation arises in the phrase "* * * the Foundation is authorized to initiate and support scientific research, including applied research, * * *"

This proposed amendment has been intensively considered by the full Board and its committees. On balance, the Board favors the proposal that the Foundation's authority be enlarged to encompass the support of applied research. In view of the great significance of this proposed action, it is important that the committee be appraised of the arguments, pro and con, which led to our conclusion.

In the course of these discussions the following arguments were made in opposition to the proposal:

1. Over any long time-frame, basic research is among the most significant of human activities. Since it seems perennially necessary to reconvince nonscientists that "Nothing is more practical than basic research," surely there should be one agency in Government devoted exclusively to the support of basic science which is among the most exciting adventures of our time and the applications of which have remolded the world in which we live.

2. If the Foundation were to embark upon a visible program of applied research, with the passage of time the generally favorable disposition of nonscientists, including many in the Congress, toward applied research would probably result in a relative diminution in the basic science portion of the budget in favor of support of applied programs.

3. Further, the Foundation may, one day, find itself obliged to defend the various components of its basic research program in terms of their relationship to the applied programs, thereby driving out the opportunity to support truly imaginative frontier research whose application, at that moment, can be foreseen by no one.

4. The short-term gains which may derive from expanded Federal or National Science Foundation support of applied research would be the cause of serious long-term losses if the program of basic research were curtailed thereby. Hence, let us restrict the National Science Foundation to support of basic research and offer the latter the maximum possible support, secure in the understanding that other Federal agencies will support the applied research relevant to their missions.

These apprehensions are shared by essentially all members of the Board. But almost all of the Board, nevertheless, agree that a legislative mandate to support applied research is desirable on the following grounds:

1. Limitation of the programs of the Foundation to "basic research" is an unclear mandate since the line which divides basic and applied research is frequently unclear, is certainly arbitrary, and often reflects the attitude of the investigator, his organization, or the agency which supplies supporting funds, rather than the intrinsic attributes of the research. In any case, the Foundation is already supporting some research which might readily be declared to be "applied," in programs which have already been certified by the Board.

2. By restricting its programs to "basic" research, the National Science Foundation may be causing some scientists, and particularly some engineers, to direct their research activities and, hence, their educational impact also, away from their legitimate applied interests.

3. There is a genuine need for support, at academic institutions, of applied work which will help to bridge the gap between fundamental findings and socially useful systems or concepts.

4. There are many large and serious problems affecting society, which do not lie clearly within the mission of any other Federal agency, for which the Nation acutely needs new technological solutions.

B. Where and under what conditions shall the Foundation support applied research?

The Board believes that it is wise to delimit the mandate to the Foundation, concerning applied research, in such ways as (1) to remove it from competition with the clearly understood missions of other Federal agencies, (2) to keep the Foundation from moving from "applied research" to "development," and (3) to

insure that the applied research to be supported seeks generic solutions to broad problems rather than specific solutions to specific and unique problems.

Accordingly, and in this light, we welcome the limitations inherent in the phrases, "* * * at academic and other nonprofit institutions, and, when directed by the President, at other appropriate organizations, relevant to national problems involving the public interest." The Board, the Director, and the staff will have relatively little difficulty in applying the guidelines stated above to applications and proposals from academic and nonprofit institutions. Hence, to clarify this entire paragraph and give force to the statement concerning Presidential directives, it is strongly suggested that this subsection be altered to read as follows:

"(b) In addition to the authority contained in subsection (a), the Foundation is authorized to initiate and support scientific research, including applied research, at academic and other nonprofit institutions. When so directed by the President, the Foundation is further authorized to support, at other appropriate organizations, applied research relevant to national problems involving the public interest."

Section 3(c) (p. 4, lines 13 to 15)

The Board is mindful of the intent of the subcommittee that the Board participate in the development of national science policies in a more significant and meaningful manner than has been the case heretofore. We are also mindful of the rationale which led to the enactment of Reorganization Plan No. 2 of 1962, and the resultant limitations placed upon this role of the Board.

Accordingly, we welcome the explicit charge to the Board stated in this paragraph. It is our belief that the Board function described therein is the logical extension of the "balance wheel" concept of the role of the Foundation, an agency which is expected to assure the vitality and strength of the national scientific enterprise. Since this function can be effectively discharged only if those responsible for giving direction to the affairs of the Foundation are adequately informed with respect to the nature and magnitude of all aspects of that national enterprise, the Board considers it logical and proper that the body, within the Federal Government, which, perforce, must be thus knowledgeable, also make general recommendations with respect to perceived national weaknesses and deficits and the requirements for their strengthening.

In addition, we believe this section should make it clear, as does section 3(a)(1) of the original act, that all elements of the Foundation should partake of this function. In fact, it is a necessity for the Director to "recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences" in the councils of Government.

ON THE NATIONAL SCIENCE BOARD

Section 4(a) (p. 5, lines 11–13)

The proposed version of this paragraph would alter the status of the Board by deleting from the original act the phrase "* * * and shall, except as otherwise provided in this Act, exercise the authority granted to the Foundation by this Act." While stating instead that "Except as otherwise specifically provided in this Act, the function of the Board shall be to establish the policies of the Foundation."

In order to assure the efficacy of the National Science Board as a policymaking body, it is recommended that the statutory responsibility of the National Science Board for the programs as well as the policies of the Foundation be continued and be made explicit in the act.

To be sure, relatively little of the Board's effort is currently directed to the review and approval of grants or contracts. Were it to undertake the yet more extensive policymaking role provided by section 3(c), undoubtedly the Board would employ its present legal prerogative and delegate yet more, it not all, of its grantmaking authority to the Director.

Accordingly, the Board concurs with the decision (sec. 5(b), p. 9) to give *de jure* recognition to the fact that it is the Director who does, in fact, exercise the grant and contractmaking authority of the Foundation. In so doing, the Director and the staff normally obtain advice from appropriately constituted technical panels and committees rather than from the Board.

But legal retention by the Board of ultimate responsibility for the affairs of the Foundation offers a series of important virtues. For example, it affords a mechanism whereby the Board could offer protection to the Director, should external circumstances so warrant. Moreoever, while the Board wishes to

emphasize its complete confidence in the present Director to exercise the full authority described in new section 5(b), it is not unthinkable that initial confidence in the wisdom and judgment of some future Director of the Foundation will have been misplaced and, under such circumstances, the Board could serve the Nation best if it had statutory responsibility for the manner in which the Foundation's authority is exercised. Further, a Board charged with the responsibility for programs of grants and contracts, whether or not it has statutory authority to make such awards, must continue to review the monthly lists of grants awarded and proposals declined so that, in fulfilling its obligation as the policymaking body of the Foundation, it is also sufficiently knowledgeable with respect to implementation of its policies. Finally, external policy recommendations from a *de jure*—even if not operationally *de facto*—powerful National Science Board would carry greater weight than recommendations from a body which had lost responsibility for the implementation of those recommendations within the very agency with which it is most concerned.

It is suggested also that the meaning of the sentence on page 5, line 11, "Except as otherwise specifically provided in this Act, the function of the Board shall be to establish the policies of the Foundation." is somewhat confusing and unclear as well as in some conflict with section 5(b).

The report of the subcommittee strongly suggests that the general position presented above is shared by the subcommittee. Accordingly, to make these relationships entirely explicit, it is most earnestly urged that the sentence on lines 11, 12, and 13 of page 5 be deleted and, in its place, there be substituted:

"The Board shall establish and be responsible for the policies and programs of the Foundation."

This sentence is intended to convey the following:

1. The Board is to establish the purpose and general nature of the various individual programs of awards conducted by the Foundation.
2. The Board is to exercise a continuing general surveillance of the awards made under such programs.
3. The Board can modify or terminate such programs when, in its judgment, they no longer appear to serve the national interest adequately.
4. The Director will bring to the Board those applications for grant or contract funds which raise matters of policy or their interpretation.

Under these circumstances, whereas it will be apparent that the Director will exercise the authority of the Foundation and with his staff will render the multitudinous judgments required in the award of research grants, construction grants, training grants, and fellowships, and in the management of the national centers and programs, ultimate responsibility for the nature and national purpose of these programs and the manner in which their operation reflects their goals continues to reside in the Board. Thereby can we retain the remarkable, unique character of the National Science Foundation, the character which has won for it the respect and confidence of the scientific and academic communities as well as of the Congress, the administration, and Federal agencies generally.

Section 4(b) (p. 5, lines 14–17)

The Board believes that the authority contained in this subsection authorizing the Board to delegate to its executive committee or the Director or both such of its powers and functions as it deems appropriate will add desirable flexibility to the operation of the Foundation.

Section 4(g) (p. 7, lines 9–18)

The Board, having agreed that the Board and the Director should engage more extensively in activities which lead to the formulation of national policies for science, believes that the proposal that the Board should submit an annual report to the President, for submission to the Congress, on the status and health of science would provide a platform for the policy recommendations of the Board and assure adequate "visibility" to the recommendations. We are concerned, however, that the proposed language is, at once, perhaps both too broad and too explicit. It seems neither necessary nor feasible to attempt an annual assessment of the *whole* of science and its various disciplines and it would certainly be unwise to restrict such evaluations to the accomplishments of the immediately preceding year. Accordingly, the following modification is suggested:

"The Board shall render an annual report to the President, for submission on or before the 31st day of January of each year to the Congress, on the status and health of science and its various disciplines. Such report shall include an assessment of such matters as national scientific resources and trained manpower, progress in *selected* areas of basic scientific research and an indication of those

aspects of such progress which might be applied to the needs of American society. The report shall include such recommendations as the Board may deem timely and appropriate, together with minority views and recommendations, if any, of members of the Board."

Section 4(h) (p. 7, lines 19–24; p. 8, lines 1–11)

The Board recognizes the sympathetic, good wishes of the subcommittee in offering to the Board a professional staff and establishing for the latter pay ceilings which should be attractive. Presumably, authority to secure such a staff for its own purposes has already been available to the Board under the terms of the act. Until now, no need for such a continuing staff, specifically assigned to the Board, has been apparent, while in those instances in which it required special assistance, the Board has considered that the entire staff of the Foundation is the staff of the Board. Incidentally, the Board has had a superb secretariat which has ably met its past needs.

The prospect of undertaking an annual report of the Board, however, warrants consideration of the manner whereby a staff can serve the Board in this regard. This annual activity will require the services of statisticians, scientific professionals, writers and artists, as well as secretaries and clerks. If the earlier suggestion that the annual report focus sharply on selected areas of science or science education be adopted, then the necessary qualifications of the staff will also change annually, while the number of the staff, in any one year, may considerably exceed the five specified in the proposed amendment.

For these reasons it is suggested that the committee consider whether the amended act should recognize the increased total workload engendered by the amplified policy-related activities of the Board and the annual Board report, thereby necessitating a significant increase in especially well qualified staff, without specifying either the number thereof or the specific organizational arrangements so that these may evolve as the Board and the Director learn to function in their new and altered capacities.

ON THE DIRECTOR OF THE FOUNDATION

Section 5(a) (p. 9, lines 3 to 5)

The Board enthusiastically endoreses the proposal that the Director of the Foundation be raised to level II of the Federal executive salary schedule, the top level for the chief official of an independent office. The Director bears a huge responsibility and, hence, warrants such status while, concomitantly, such action gives recognition to the significance of the Foundation in our national life.

Section 5(b) (p. 9, lines 8 to 15)

The Board concurs with the provisions of this subsection. Although it is a clear transfer to the Director of authority previously held by the Board, this transfer recognizes the de facto situation. Were the language proposed above for section 4(a) accepted by the committee, and section 5(d) deleted as suggested below, then an appropriate and acceptable balance of authority and responsibility would be established thereby. The full-time Director would exercise full authority for the award of grants and contracts while the part-time Board (of which the Director is a member) which is in constant communication with the scientific, academic, and industrial communities, would determine the purpose and nature of the programs which are implemented by the award of grants and contracts by the Director and the success and efficacy of these programs would remain under continuing review by the Board.

Section 5(d) (p. 9, lines 23 and 24; p. 10, lines 1 to 7)

This subsection, in effect, offers to preserve some measure of the authority of the Board as originally described in section 5(b) of the present act. In our view, were the language proposed above for the new section 4(a) adopted, the provisions proposed for the new section 5(d) become unnecessary. Indeed, there are serious objections to these provisions which are considered, seriatim, below:

1. An awkward problem is posed by the phrase, "* * * if such contract, grant, or other arrangement involves a new program * * *." One can foresee needlessly difficult episodes if the act were to encourage the Director to plan, announce and commence to implement new programs on his own initiative, without prior Board consultation, and then "test" them by offering the Board power to disapprove of the initial awards under such programs. This problem would be obviated if, instead, it is clear that the Board, as the policymaking body of the Foundation, is specifically authorized to establish all new programs, prescribe their guidelines

and frames of reference, terminate unsatisfactory, inadequate, or unnecessary old programs and adjudicate any instance in which it is unclear whether a given action is in accord with the Board's intent in establishing the relevant program.

2. The proposed requirement for Board approval of all commitments in excess of a specified amount is, indeed, a description of current practice. This practice evolved over the history of the Foundation as, with an expanding number of transactions, the part-time Board could address itself to an ever-diminishing fraction of the total. But the practice lacks a compelling logic. Awards involving large sums are studied closely, not only by the Director and his staff but by panels of well-qualified experts. In a general way, the larger the sum, the closer and more intense the scrutiny, and the more cautious the approach. The technical judgment, however, is rendered by the panel of experts, in any case. If the terms and conditions of the program from which such an award is to be made have been clearly set forth by the Board, then problems of policy are no more likely to arise in the award of large sums than in the award of lesser sums. And it is to such problems that the Board should address itself with respect to the on-going operations of the Foundation. Large, ad hoc single commitments to a new enterprise (e.g., Mohole) may themselves be considered to be "new programs" and, hence, require Board approval. The committee may wish to give explicit consideration to this specific type of award.

3. Essentially similar considerations apply to the proposal that prior Board approval may be required "* * * subject to such other conditions as the Board in its discretion may determine and publish in the Federal Register."

If the Board remains authorized to give definition to the terms and conditions of awards under all of the programs of the Foundation, this provision seems quite unnecessary and accordingly the Board recommends that section 5(d) be eliminated.

ON THE DEPUTY DIRECTOR AND ASSISTANT DIRECTORS

Section 6(a) (p. 10, lines 19 to 25; p. 11, lines 1 to 7)

The Board welcomes this subsection in all respects. The role of the Deputy Director in the life and operations of the Foundation is such that he well merits the status which is engendered by Presidential appointment and Senate confirmation.

Section 6(b) (p. 11, lines 8 to 18)

The Board respectfully requests that this subsection be deleted.

We recognize that, by this proposal, the subcommittee offers increased prestige and visibility to the Foundation. But it is hoped that the committee will remove this provision on the following grounds:

1. The positions here designated as "Assistant Directors" appear to be viewed as analogous to the Assistant Secretaries of the large Federal departments. But this analogy is not apt. Whereas Assistant Secretaries are arms of the Secretary and function in a staff capacity, those who presently hold the title of "Associate Director" of the Foundation have line-operating responsibility and authority.

2. The Board hopes that it can remain apparent that positions at this level are a reasonable and legitimate aspiration for the career professional staff. The present system of career appointments encourages cohesiveness and rapport among the top management of the Foundation and supports the morale of the entire professional staff. It would not serve the interests of the Foundation and its mission to convert this level of position into relatively temporary and possibly politically oriented appointments.

3. Were those at this level of the Foundation staff to be so appointed, the requisite number would certainly exceed four and may be expected to change with time as circumstances dictate changes in the organizational structure of the Foundation. Since it would not do to have first- and second-class Assistant Directors, the inevitable consequence of this situation, it seems logical to avoid the problem in its entirety.

ON THE DIVISIONAL STRUCTURE OF THE FOUNDATION

Section 8 (p. 13, lines 7 to 9)

The Board believes that the Director, as the chief executive officer of the Foundation, should exercise the initiative for ordering the administrative structure of the Foundation. As the divisions are integral parts of such administrative arrangements, we feel that primary responsibility for this matter should be

lodged in the Director. We, therefore, recommend that the proposed new section 8 of the National Science Foundation Act of 1950 be changed to read:

"There shall be within the Foundation such divisions as the Director may, in consultation with the Board, from time to time, determine."

ON WEATHER MODIFICATION

Section 14 of the present act (p. 14, lines 7 and 8)

The Board notes that the operational responsibility of the Foundation for weather modification is to be repealed. If the proposed new section 3(b) is enacted, this appears to be a wise and sound course. Indeed, it may, to some degree, serve as a model for the role of the National Science Foundation in applied research as proposed in the new section 3(b). Whenever applied research supported by the Foundation has been sufficiently successful as to permit undertaking a substantial development or operations program, the latter should become the responsibility of some Federal agency with an appropriate mission.

The Board notes also, however, that the Foundation may and should continue to support research in atmospheric science and in weather modification.

Mr. DADDARIO. Dr. Seitz. Our next witness is Dr. Frederick Seitz, who is the President of the National Academy. You will be our closing witness. We are pleased to have you here before us again, Dr. Seitz.

Dr. SEITZ. Thank you very much, Mr. Daddario. It is a pleasure to be with this committee again.

STATEMENT OF DR. FREDERICK SEITZ, PRESIDENT, NATIONAL ACADEMY OF SCIENCES

Dr. SEITZ. Since I am sixth in the sequence of those testifying on the proposed revision of the Science Foundation bill, many of the matters which I can emphasize have already been stated quite eloquently by others. I would, however, like to underscore some points which have been made, and would also like to emphasize that the scientific community has a very special attitude toward the National Science Foundation as a Federal agency supporting scientific research. I would like to begin with the second point first, since it will provide the setting for more detailed comments concerning the bill.

It has been said so often that we live at present in a society that is vitally dependent on science-based technology, that there is serious danger that we will, through boredom, accept the statement without appreciating its full implications. There is also the danger that we will confuse the needs of science with the requirements of what I might call classical technology; that is, the form of technology which was predominant before the age of modern science, and which served human society enormously well for most of its history. In actual fact, our Nation had little science-based technology of its own origin until this century. Prior to that our country was quite successful in developing its natural resources and raising our standard of living, without much direct recourse to science.

Man is a toolmaker. We can find the tools he has made over the last several hundred thousand years in countless places where he lived. These tools become more and more sophisticated as we go from the past toward the present and as the intelligence and skill of our antecedents grew through the process of natural evolution. Starting about 50,000 years ago, the types of tools he made began to show vast diversity and ingenuity, leading us to suppose that *Homo sapiens* finally reached something in the nature of an intelligence plateau,

and was intrinsically the equivalent of modern man as far as inborn genetical features go. Our species has had many brilliant successes in these past 50,000 years which were achieved through our ability to devise ingenious tools and systems of tools. For example, about 5,000 years ago our predecessors learned to develop agriculture in the great river valleys of the world—Egypt, Mesopotamia, India, and China—taking advantage of the abundant supply of river water for irrigation and of the annual deposits of silt from the rivers for renewing the fertility of the land. This step permitted man to revolutionize his society by creating cities somewhat like our modern cities, with large populations and containing a number of classes of citizens, each highly specialized in the needs of society. Engineering as a profession came into being at that time along with the development of numerous professions. In fact, most modern fields of engineering can be recognized in such early urban societies, with only the electrical and the nuclear engineer being entirely absent.

Through all technological advances of this type the pattern of development was quite similar. A practical problem appeared; techniques were devised to solve it on a relatively ad hoc basis. Practically no general principles were used. Instead experience, art, observation, and commonsense were the basic tools of reason. There were no significant systematic bodies of theory of natural phenomena available to guide the engineer or the artisan, unless we include odd rules-of-thumb that were handed down by tradition. It is true that some segments of society, particularly the priests and philosophers, did develop bodies of knowledge related in part to modern science, particularly in mathematics and astronomy. Such knowledge, however, did not constitute a significant part of the world of engineering or technology.

Mr. CONABLE. Doctor, you don't mean to imply that science doesn't use trial and error, do you?

Dr. SEITZ. Oh, yes, science uses trial and error, but traditional technology uses nothing else. It is ad hoc, so to speak, with a gradual growth of knowledge and experience; the sort of thing a carpenter does or a mason.

Procedures whereby practical problems were solved on the basis of techniques imbedded in practical experience carried man through the construction of the Egyptian pyramids, the Roman aqueducts, the development of the horse-drawn iron plow in temperate Europe over a thousand years ago, the invention of the sailing ships which made the voyages of Columbus and Magellan possible, the invention of the firearms which gave the Europeans such an advantage over the peoples in newly discovered lands, and on into the early development of the steam engine. In fact, this technique is still completely indispensable for handling many of the problems of everyday life. It is used by all of us every day, and will indeed be useful as long as our species exists.

Some 500 years ago, our European forebears envisaged a new approach to technology which they thought could accelerate the process of development—the method of science-based technology. Among the English-speaking peoples, the name of Francis Bacon is commonly associated with the formulation of this new point of view, but it was also voiced on the Continent by several other brilliant men. The idea was in the air in the Europe of that time and many individuals recognized it.

According to the new view, one could accelerate and expand technology by observing in detail all effects associated with nature *regardless of any immediate applications*, and by constructing from such observations a framework of understanding of nature as a whole. In effect one would use experimental observations in a systematic way to discover the general laws which govern nature and thereby be in a position to use such laws for whatever applications might arise. What is even more important, one might expect the newly discovered facts to suggest completely novel applications.

The acceptance of the new point of view required that one be willing to devote attention, ingenuity, and money to experimental work and speculation not necessarily related to immediate applied problems. One would, however, anticipate that the ultimate practical payoff would be so enormous as to justify the effort completely.

We have no really good idea of what the practical artisans and engineers of the time thought of this proposition. Probably most of them ignored it, although a few very great ones joined in proclaiming the values of the new point of view. Fortunately, enough brilliant and ingenious scholars, wealthy aristocrats, and governmental leaders were intrigued by the new idea to support it, hoping to satisfy their curiosity about what the laws of nature might be and to profit from the practical gains.

The conjectures of the philosophers concerning the power of science eventually proved to be completely right; however, the really great dividends were not realized for about 200 years. Those of us who live in technically advanced countries enjoy the standard of living we have because the pursuit of science over the past few centuries did indeed provide us with knowledge to open up enormous new opportunities for practical innovation.

I might mention a few of the gifts of science. There are, for example, the almost endless products of modern chemistry, made possible by the discovery of the elements and their compounds. This includes special metals and pigments, synthetic fabrics, and modern antibiotics. There is also the whole world of electricity and magnetism which is used for the production and transmission of power, and for communications. Similarly, our knowledge of the origins of infectious and other diseases and many of the means for curing them are direct outcomes of scientific research. The same is true of the many devices associated with the fields of electronics, nuclear energy, and modern computers. The age of flight would still be limited to the kite and balloon, without science. This list could of course be extended enormously. The main point I wish to make is that, while the classical methods of technology based exclusively on trial and error lifted our species out of an animal-like existence, we would be living in a far cruder and more unhealthy world than we do if the Europeans had not developed the scientific method, supported it to maturity, and had the practical wisdom to put it to use.

We in the United States were primarily users of European science until well into the present century, even though we did have a few very great scientists before World War I. We have had, of course, many excellent engineers and technologists since Colonial times, and have managed to repay Europe adequately for the basic knowledge we borrowed by sending back countless inventions. It became evident to many of our leaders in World War II, however, that we owed

ourselves the obligation of being strong in basic science. The reasons were spelled out clearly and eloquently by the great scientists who led our national effort in pure and applied science during World War II. In response, the Federal Government permitted Federal agencies, old and new, to support scientific research on a national scale following the war. These expenditures in turn, when coupled to our growing scientific population, made it possible for us to take a place among the leading nations in science. In the meantime, we also exploited science for many useful ends. Our successes since the war have proved that our various institutions for conducting research—most prominently the academic, governmental, and industrial institutions—can, with appropriate support, be exceedingly effective in generating good science and putting it to work.

It should be emphasized that most of the agencies which have supported scientific research since the war are mission oriented. This includes the Office of Naval Research and the other agencies of the Department of Defense, the National Institutes of Health, the Atomic Energy Commission, the National Aeronautics and Space Administration, as well as the agencies of the Departments of Commerce and Interior. For the most part, they have done exceedingly well in interpreting their missions broadly because of the presence of wise and far-seeing members of the administration, and have provided sustenance to fundamental scientific research as well as to work more immediately tied in with their missions. The fact remains, however, that such agencies do have the responsibility for advancing their applied objectives. As a result they have inevitably given primary attention to their applied missions during periods of level or receding budgets. I need not elaborate on this point here. Practically all of the agencies have found it necessary to abandon good scientific research at various times because of the competing demands of the more applied programs connected with their missions.

From the viewpoint of the scientists, the National Science Foundation is unique among the Federal agencies in the sense that its main mission has been to support good scientific research within the spirit of the scientific method I described earlier. It has had, first and foremost, the obligation to keep science strong by aiding the process of exploring nature without immediate regard to applied goals. No other Federal agency has had the same objective, which is in the long run of priceless importance for the welfare of science and hence of science-based technology.

It is true that the National Science Foundation was very poorly funded for most of the first 10 years of its existence. The lean initial years were, I assume, associated with the fact that our Nation still did not quite appreciate the great need to support to some significant degree research carried out primarily for the welfare of science itself, with the explicit understanding that practical dividends would inevitably emerge from the new knowledge. There was an inclination to leave almost all the support of science in the hands of the mission-oriented agencies with the hope that this would somehow maximize the practical results.

The launching of sputnik by the Soviet Union caused our Nation to review its attitudes toward science once again. There was a general realization that we had been much too narrowly practical in our outlook and had allowed the Soviet Union to steal a lead in the very

dramatic field associated with scientific satellites in which we could easily have been the innovators. Following this event, we not only created NASA but began to give the National Science Foundation far more adequate funds for the support of general science.

It seems to me that the lessons to be learned from sputnik are very profound. Whenever we permit short-range practical objectives to deflect us from pursuing the types of basic knowledge which lie well within our means, we run the grave risk of suffering some significant loss, whether in prestige or in a practical innovation.

One of the greatest fears expressed by the scientific community is that the National Science Foundation will eventually be transformed into an agency that is so involved in applied missions, such as the promotion of secondary school education or weather modification, that the support of basic scientific research will be limited to a starvation level. Should this occur, and I believe the danger is far from remote, we could easily pay a heavy price by sacrificing positions of leadership in important fields of science. In fact, the community of chemists and of physicists not involved in high-energy physics have already indicated in reports published by the National Academy of Sciences that they are losing ground. More specifically, they have evidence to show that the support of the type of independent research which is carried out by the academic scientist who works in his own laboratory with a small group is now beginning to fall behind the need. I do not believe that our Nation can afford this type of retrogression at the present time. Experience has already made it amply clear that research of the type carried out by such independent investigators is vitally important for future technology, as well as for training students.

I think I speak for a very major segment of the scientific community in saying that whatever other duties the National Science Foundation may be assigned, it should be obligated to give first priority to the support of frontier scientific research which will maintain our national strength in understanding the world of nature—quite apart from the immediate relevance of this knowledge to applied missions. We have the experience of the past to assure us that this procedure will pay significant dividends in the future.

Next I should like to turn to several points in the proposed legislation which may have a major impact upon the direction of science in the United States and upon the role which the National Science Foundation may play in the evolution of science and technology in the coming years.

The suggested language in H.R. 13696 with respect to support of applied research by NSF marks a significant change in attitude with respect to the functions of the Foundation. I view this proposed change with mixed feelings. I can understand the desire to eliminate ambiguity with respect to support of research in academic institutions, whether that research be in pure mathematics or medicine, in atomic physics or engineering. There are many reasons why the academic and industrial communities should come closer together, should interact more freely, should cooperate more effectively with one another to their mutual advantage. There are also good reasons why at least one agency of Government should have the ability to support research in areas important to the national interest but which may lie outside the areas of responsibility of mission-oriented agencies.

However, as I stated at some length above, I am concerned that the support of applied research at academic institutions may be the thin edge of the wedge which could ultimately result in pressures to support mission-oriented work at the expense of basic research. This could have a damaging effect upon science, upon our academic institutions and, in the long run, upon our economic well-being.

The matter of supporting research at nonprofit organizations also represents a point of departure from previous practice which might lead to degradation of the role of the National Science Foundation over the years. I would feel easier if a safeguard were introduced to make certain that the nonprofit organizations considered are engaged in work of quality comparable to that at the best academic institutions.

Nonetheless, I endorse the permissiveness inherent in the proposed changes which will make it possible for the National Science Foundation to support good research in academic institutions, whether that research be basic or applied. Particularly in the engineering disciplines this should make it clear that the important thing is that the research proposed be soundly conceived and carried out imaginatively; it is less important that the investigator be motivated more by a search for truth than by an interest in the solution to challenging, difficult, and important problems which may have practical implications.

Two points which must be considered together are the roles, respectively, of the Director and of the National Science Board of the National Science Foundation. It is important to bear in mind that administrative and management responsibility must reside in the Director of the Foundation. He is the full-time head of the agency, appointed by the President, by and with the consent of the Senate. You may remember that a bill passed by Congress which did not take this point fully into account was vetoed by President Truman. I am therefore pleased to see that this situation is completely understood and fully recognized in the proposed legislative changes. It is essential that the Director have management responsibility for the programs of the Foundation and thus be accountable for such programs to the President and to the Congress. One man can be held responsible for the programs of a Government agency, but 24 cannot.

The role of the National Science Board as an integral part of the National Science Foundation has many similarities to that of the board of directors of a private foundation or an industrial corporation. It must determine whether the programs of the Foundation conform to the intent of Congress as stated in its legislative actions and whether these programs contribute as they should to the benefit of the scientific community and to the public welfare. This resembles the way in which a board of directors examines the responsibilities of the management as outlined in the charter under which the organization operates and makes certain that the welfare of the shareholders is given proper attention in the normal conduct of business. The National Science Board should be able to advise the Director and staff of the Foundation with respect to the policies which guide its programs. The increased policy role of the National Science Board as outlined in these proposed legislative changes is a definite step forward in defining more clearly what the primary function of the Board should be.

Finally, I should like to endorse the specific inclusion of the social sciences among the sciences to be supported by the National Science

Foundation. It is obviously more difficult to be quantitative in some of the social sciences than in the more exact physical sciences, but the research problems are no less real or demanding, and no less subject to judicious, intelligent, imaginative research, important for our progress. The committee is to be commended for having proposed that the social sciences be included explicitly with the natural sciences and engineering.

Thank you.

Mr. DADDARIO. Thank you, Dr. Seitz.

Mr. Bell?

Mr. BELL. Thank you, Mr. Chairman.

Dr. Seitz, I believe in your statement, page 10 or thereabouts, you make the inference that the National Science Foundation is basically the one organization that is set up to do basic research perhaps more than some of the other organizations. However, I do believe that there are many other organizations that are doing a substantial amount of our basic research. Air Force, for example, has such organizations as Rand Corp. that are doing deep basic research on many other areas as does the NASA organization. I just wanted to clarify that point. You agree with that, do you not?

Dr. SEITZ. Yes, they are doing basic research. If one examines the internal policies of the agencies with applied missions, however, one will find that over the years there's always a debate concerning the frontier, that is, where the boundary stops. Where should one carry out basic research and where not? The policy tends to waver back and forth.

Mr. BELL. Although no such organization as Aerospace and so forth, have a general overall goal that they are going for, they do get these think factories going into areas which is about as close to basic research as you can get?

Dr. SEITZ. Yes; a certain fraction of the investment is in excellent basic research. Especially during periods of tight budgets, however, there is some debate within such organizations as to where the percentage should be decreased, it follows that there may be an instability in the basic research support in such agencies.

Mr. BELL. Now, inasmuch as we might say that there are with varying differences many organizations that are deeply involved in basic research and as you also pointed out, the National Science Foundation is geared in this direction, also. Isn't there some kind of a danger of this basic research getting away from us? In other words, the right hand doesn't know what the left hand is doing. We might be working on a program in basic research that some other arm of the Government has already worked on for 3 years. Would you think that there should be some motivation or move in the direction of having central depository for this type of work?

Dr. SEITZ. I think the process of overviewing the national research program to make sure that needless duplication is avoided is quite good. It comes about in many ways. The Academy has played a role in this area over the years by acting as one of the central advisers to the Federal Government in the various fields of science. In addition, the individuals in the agencies communicate very well. Still further there are bodies like the Federal Council for Science and Technology which bring together the representatives of the different agencies.

Mr. BELL. I know that an attempt is being made. However, I'm curious as to whether or not it is adequate at this stage of the game with the tremendous amount of research that we are all doing in all branches.

I know the armed services, Commerce Department, NASA, and your organization have central areas, and will get away from us if we don't do something about it.

Dr. SEITZ. It is a point that requires continual vigilance, however, I can state with some confidence that the amount of needless duplication of research is negligibly small in our present environment because of the number of checks and balances we do have.

Mr. BELL. Thank you.

Mr. DADDARIO. Mr. Vivian?

Mr. VIVIAN. I'm particularly interested in the contrast to some of your remarks with those of preceding speakers on preceding days. You have indicated on page 14, Dr. Seitz, the comment: National Science Board should be able to advise the Director and staff of the Foundation with respect to the policies which guide its programs. The word "advise" is used there rather carefully, I expect. I don't think that was any accident, and above that is the statement that "one man can be held responsible for the programs of the Government agency but 24 cannot." I don't know who is responsible for the Federal Reserve Board and I am a little hard put to decide how many do decide their actions but I don't think it is necessarily true that groups are not held responsible. However, I believe you are aware of the testimony just given, which you listened to, rather clearly recommended that the responsibility for the programs of the National Science Foundation be given to or retained by the Board and not the Director, which would appear to be in direct conflict with both quotations on, page 14 of your testimony. Do you construe your remarks and previous remarks as being in conflict?

Dr. SEITZ. They may be as far as wording goes, although I think the intent is similar. I would picture the situation as follows: The Director of the Science Foundation is the individual having the prime responsibility for carrying through the program. He will receive guidance from both the executive and legislative branches when the budget is constructed. He will have also a Board that will review programs and policies and, presumably, emerge with opinions that are obtained by consensus. He would of course, want to be keenly aware of what those opinions are.

Mr. VIVIAN. The organization always is talking of the problems that come forth. As you know, we can make almost any organization work with the right people, and make almost no organization work with people who will not cooperate, but beyond that the Congress occasionally writes I think very explicit legislation and says exactly how thing should be done, and other times it writes legislation which I would say was most intentionally ambiguous, the purpose being to start an operation and hope someone else will know how to make it work correctly, and I think that might be said with regard to the legislation of the National Science Foundation for example, but the President appoints a Director, if I am correct, for a specified period of time which makes both the President and the Board somewhat remote from the Director. I believe that is a correct statement.

The President cannot nominally remove the Director without good cause, nor can the Board affect the Director. This means that the

Board does not have major power such as given to the boards of directors of most corporations to establish the chief operating officer or the president.

I have heard no one request that the Board have the authority to appoint the Director and that the Director be subject to the interest of the Board.

Dr. SEITZ. As I recall such a plan was proposed in the original Science Foundation bill; President Truman vetoed the bill for that reason. He felt that the Director should be appointed by him.

Mr. CONABLE. Will the gentleman yield at that point?

Mr. DADDARIO. Mr. Conable?

Mr. VIVIAN. Yes.

Mr. CONABLE. I wonder, Dr. Seitz, if you would also comment on the divergent testimony we have had about whether the President should appoint the Chairman of the Board? We have had some disagreement about that right here.

Dr. SEITZ. I think the strength of the Board is increased by electing its own chairman and my personal opinion is that this is the proper way.

Mr. CONABLE. You don't feel that this is part of the President's responsibility for setting science policy to have that direct connection between the Chairman of the Board and the Presidency itself?

Dr. SEITZ. My own picture of affairs, is that the Director is a very important person in the line of responsibility. He is appointed by the President with the consent of the Senate; I think that is adequate.

Mr. CONABLE. So, you would agree with our previous witness on that point.

Dr. SEITZ. Yes.

Mr. VIVIAN. Dr. Seitz, it seems to me part of this problem revolves around the fact that there are three publics being served: There is a general public which Congress directly serves through its appropriation; there is the administrative public, which is served through the functions of the Bureau of the Budget, particularly, and through the Director's immediate tie to the other agencies under the President; and then there is the scientific, the academic and the industrial public which the Board probably is the principal agent for. I don't think the Board is as much as agent for the other two as it is for the latter. At the present time as far as I can determine the role of the Board is rather remorseful because it does not appoint the Director and when the Bureau of the Budget says, "Thou cannot", then the Board is in no position to say we will. I have the impression that the system works today principally because the persons involved, human beings involved have great respect for each other. Has the present structure of authority ever been tested? Have there been any major conflicts between the Director and members of the Board?

Dr. SEITZ. I know of none. However, I have never served on the Board so I don't know what has happened from inside experience. I believe that if the Director acted in a way that was quite contrary to the wishes of the Board in regard to policy, he would find himself getting into serious difficulties.

Mr. VIVIAN. It is not obvious to me what instructions the Board can give the Director at the present moment.

Dr. SEITZ. Well, there will be many matters of policy. The details of the budget for one. I don't mean decisions involving the last

decimal point, but on the broad areas of science which should be supported. For example, the Board should play a role in deciding how far the Foundation should go in requesting funds for high energy physics or things like the Mohole. I assume those would be major policy matters to which the Board would address its attention.

Mr. VIVIAN. Let me ask the question. Supposing the Board decided the Mohole project should be cut back 20 percent and the Director and Bureau of the Budget decides it should not be cut back 20 percent. Who wins?

Dr. SEITZ. I will put it this way: I think that this would be a signal for a review of the issue whatever it may be. [Laughter.]

You recall that there was a time in the history of the Atomic Energy Commission—I don't want to get too far off the beam, but I think this is relevant to what we are talking about—when it wasn't clear whether the Commission or the General Advisory Committee ran the organization. The crucial issue that decided the matter arose when the Chairman of the Commission felt he had to ask President Truman to decide whether the Commission had authority or not to go ahead with research in the field of hydrogen weapons. It was decided at that time that the authority resides with the Commission.

Mr. VIVIAN. To come back to the previous comment, suppose the dispute on say reducing Mohole 20 percent does come to a head. How is it decided; who decides, and what authority does the Board have?

Dr. SEITZ. I think I will have to speak in the manner of a lawyer; that would be a very interesting case. [Laughter.]

The relationship would probably be decided by the outcome of such an incident in which controversy might arise because the fact there is an issue would be reflected both to the upper levels of the executive branch and to the Congress.

Mr. VIVIAN. Let me say that my impression is that the phraseology in the present act is in fact quite ambiguous and that the power distribution also relatively ambiguous. It may be advisable for the Congress to leave it this way, but I wonder if some of the phraseology which has been suggested by both sides of this argument, perhaps might be too explicit for the benefit of the Foundation. Do you have any comments on that subject?

Dr. SEITZ. No. I think that the statements in this latest version of the bill are not too explicit. I believe that they are about right. My own feeling—and I must be careful here, because I am not speaking for the members on the Board who endorse the view which Dr. Walker presented or for members of the Academy as a whole—is that one will get a man of higher quality as Director if it is quite clear that while he has inputs from the Board on matters of policy, he, in the last analysis, is the person who is Director of the Foundation.

Mr. VIVIAN. That corresponds with your statement on page 14 of your testimony. The Board should be able to advise the Director rather than instruct the Director.

Dr. SEITZ. Advise him on matters of policy; yes.

Mr. VIVIAN. And, that also corresponds to the remark I made earlier with regard to having 1, not 24 persons in control.

Now, you as the President of the National Academy of Science in a sense represent the scientific community. Whether you desire it or not, you do. The Board through Dr. Walker also represents the

scientific community. What does the scientific community prefer? Would you like to estimate the strength of your voting publics within the scientific community?

Dr. SEITZ. I would find that very difficult to resolve. I think that in discussing such features of this presentation I'm necessarily speaking personally.

Mr. VIVIAN. I have no further questions. I think the question lies about where I started as a matter of fact.

Mr. DADDARIO. Just following that one step further, however, Dr. Seitz, on page 14 you say "the increased policy role of the National Science Board as outlined in these proposed legislative changes is a definite step forward in defining more clearly what the primary function of the Board should be." Even though there are some questions as to where to go from there and these points have been raised by Mr. Vivian, I would think that there would be general agreement on this principle which I have just read. Wouldn't you say that would be so?

Dr. SEITZ. Yes. I think I'm safe in saying that.

Mr. DADDARIO. How the Board reviews programs? Whether there is a difference in terminology which is sufficiently important to cause arguments. These will be matters of procedure which the Board within its policymaking function could define during development of procedures.

Dr. SEITZ. That is right.

Mr. DADDARIO. Mr. Conable?

Mr. CONABLE. Mr. Chairman, I would like to address myself to the concern you expressed, Dr. Seitz, on page 12. At the bottom you said you—

> feel easier if safeguards were introduced to make certain nonprofit organizations considered are engaged in work of quality comparable to that at the best academic institutions.

Is there anything in the law that says the best academic institutions are the ones that are going to receive the grants?

Dr. SEITZ. No; I was trying to emphasize that there is a wide spectrum of nonprofit organizations.

Mr. CONABLE. This is true of academic institutions also; is it not?

Dr. SEITZ. Yes.

Mr. CONABLE. Do you feel an additional safeguard is necessary with respect to nonprofit organizations that is not necessary with respect to academic institutions? Or, only because this represents a new departure?

Dr. SEITZ. Because it represents a departure.

Most nonprofit organizations are not set up to achieve educational objectives or to pursue basic research; most are set up as mission-oriented organizations.

Mr. CONABLE. Don't you think we can trust the Director on things of this sort? You think we need to put this specific safeguard in the law?

Dr. SEITZ. At some place in the bill it is stated that either the Federal Council or the President shall determine whether applied research is appropriate. I don't know whether I can find the item, but I have a feeling that the inclusion of nonprofits would be safer if there were some such restriction to make certain whenever a nonprofit is brought in, there is no doubt that it is in the interest of science and the Nation to do so.

Mr. CONABLE. There's going to have to be a qualitative analysis made anyway.

Dr. SEITZ. That's right.

Mr. CONABLE. That's all.

Mr. DADDARIO. On this matter of applied research and your concern about it, Dr. Seitz, you have spent some time developing this thesis and yet you say that the Foundation should support good research whether that research be basic or applied.

Just so the record may better indicate your feeling about this and because you do come back to this point, I wonder if you could emphasize your argument in relation to the concern you show here and why you then do say they should support the basic as well as applied?

Dr. SEITZ. I think the issue arises because our universities frequently have engineering departments. Such departments are closely integrated with the life of the academic institutions; in fact it is very important that they be so. Some of the most valuable problems which the engineers work on and, in many ways the most valuable contributions engineers in universities make, center about things which have an applied connotation; for example, an engineering department may be interested in a hypothetical analysis of the future method of railroad transportation.

I think it would be appropriate to have the Science Foundation support academic groups in engineering departments that have goals of an applied nature, provided such work is carried out in accordance with high professional standards and in the spirit of inquiry.

Mr. DADDARIO. Well, then you are concerned about something affecting this adversely.

Dr. SEITZ. Yes, I am concerned but I recognize there is a problem and I think the Science Foundation should address itself to it.

Mr. DADDARIO. There's a need, which must be filled, and the National Science Foundation is the proper party to take care of this need even though there is a danger. By recognizing it, making a move in this direction and establishing necessary safeguards, we fill a gap and will probably not reach a point where it will be a disintegrating influence on the Foundation?

Dr. SEITZ. That's right.

Mr. DADDARIO. I had occasion to go back to the basic national goals which the Academy put together for the Congress. In summary, I think there are a couple of sentences which ought to be read because they are important to this argument and I would like your comment.

Under section 5 of the summary entitled of "Basic Research and National Goals": We must improve the connection between basic and applied science, it says: "We must examine more carefully the efficiency with which our Nation has been able to convert successes in basic research to practical advantage." This was somewhat discussed and then it continues: "But now many of the panelists believe the universities do play a notable role in maintaining our strength in applied research." For, as Brooks suggests, there is a steady flow of people trained in university-type research who go into applied science, "which has been one of the characteristic features of American science that has contributed to its vitality." This indeed is one of the important ways in which the results of basic science are converted into applied payoffs. And neither Teller nor Kantrowitz nor

Bode wishes to disturb our position of leadership in basic research, established largely because the Government has supported basic research at the universities so steadily. Rather the former two suggest a new educational pattern for applied science in which the citadels of basic research, the universities, and of applied research, the industrial and Government laboratories, form joint entities devoted to graduate education in the applied sciences.

All of this interweaves itself with your comments this morning that the basic research does complement the applied research. They are both related in the way which people move from the basic to the applied fields. By learning more about how this transition takes place, we are performing a needed function.

Dr. SEITZ. That is right. I agree. I think the engineers in universities should be given support through the Foundation in ways which are meaningful to the advancement of engineering.

Mr. CONABLE. Well, there is a basic science to engineering too, isn't there?

Dr. SEITZ. I'll get into a row with Eric Walker here, if I talk too much about engineering since he is the expert.

Mr. DADDARIO. You think in the graduate schools, expecially in the engineering areas, there is a need for additional support. Your concern is that support doesn't spread to the point where great sums of money are spent in the National Science Foundation on applied problems which could divert funds from its unique responsibility in basic research.

Dr. SEITZ. That's right. Regarding the question you raised, I would say this: I think that in present-day society the prime responsibility of the engineer is to facilitate the handover of the basic ideas generated by science to application. The engineer introduces some things of his own along the way; things of which he is very proud. The engineer has prime responsibility for what I have called the process of handover.

Mr. CONABLE. But, some of his techniques can involve basic science. They may not have direct application.

Dr. SEITZ. That is right.

Mr. CONABLE. To a specific problem.

Mr. Chairman, before we adjourn—I assume we are about to.

Mr. DADDARIO. I have a couple more questions.

Mr. CONABLE. Excuse me.

Mr. DADDARIO. Dr. Seitz, you refer on page 10 to "support of basic scientific research being limited to a starvation level." What are you actually referring to here? I am concerned that the record show clearly the amounts of money spent by the Government for increased Federal support in academic research. In the budget for fiscal 1967 Federal support is somewhere between 10 and 12 percent as I can estimate. This is a pretty good rate of growth. Is your concern about the overall percentage or about some of the disciplines where proper support is not going?

Dr. SEITZ. I would say the biggest source of concern of the scientific community at large is in the distribution or division of funds between big science and what I have called independent science and what many others call little science. Most of the physical and organic chemists in universities and many of the physicists who are not in high-energy physics, feel that funds are becoming increasingly limited.

As a matter of fact, about 2 weeks ago I read a letter from the head of a physics department in an excellent university with a long history of productivity. The department does not engage appreciably in high-energy physics, but is involved in other areas. He reached the conclusion that the department head had to cut down on the number of graduate students it could take because the funds, derived from Government sources have reached a ceiling. Although the Federal budgets for science are climbing, there are important areas, of research, which are not receiving proportional benefits. As a matter of fact, the provost at the institution I mentioned made the informal comment that if his institution had not by good fortune been selected recently as one of the recipients of a National Science Foundation development grant it would be in very great straits because it was not receiving funds for research commensurate with the increase in students.

Mr. DADDARIO. We are presently contemplating the construction of a 200-Bev. accelerator which will cost somewhere in the neighborhood of $350 million with an annual operating cost of $80 million as I understand the estimate to be. Do gigantic programs of this kind, necessary as they might be, which increase the overall percentage, detract from certain areas of science which are vital insofar as national growth is concerned.

Dr. SEITZ. Yes, this is the worry. I might say that I think that machine is excellently conceived and represents a great national need. Smaller science deserves similar attention.

Mr. DADDARIO. Yes, I did not bring this up because I disagree with the program, but rather to indicate more precisely your own concern that as we expend these funds, we do have a tendency to decrease spending in less glamorous places. I expect that this is really your point.

Dr. SEITZ. That's the point I was driving at.

Mr. VIVIAN. Mr. Chairman?

Mr. DADDARIO. Mr. Vivian?

Mr. VIVIAN. I'm happy to wait until you are completed, otherwise I would like to ask questions.

Mr. DADDARIO. You may proceed.

Mr. VIVIAN. With regard to the support of chemistry and of certain facets of physics which was very ably discussed in the National Academy of Sciences reports received earlier this year, certainly I rank chemistry as one of the top fields of science. What do the Board and the National Science Foundation do in a situation such as this? What action is being taken to respond to such inquiries or suggestions as made by the various groups of chemists?

Dr. SEITZ. I suspect that in drawing up its budget for the future the National Science Foundation, which is quite conscious of this issue, attempts to include more money for the relatively small grants that are needed to keep such fields healthy. Under the pressures which exist, however, it doesn't always achieve its goals.

Mr. VIVIAN. Will it for example reduce support in any other area?

Dr. SEITZ. I think you would have to speak to Dr. Haworth about that.

Mr. VIVIAN. Such as Mohole for example.

Mr. Chairman, am I free to ask Dr. Haworth a question at this point?

Mr. DADDARIO. Dr. Haworth has been kind enough to be here and he is always willing to step forward.

Mr. VIVIAN. Dr. Haworth, I am curious to know what the likely response will be of the Foundation through its Board and its Director to the suggestion made for the increased support of chemical science which I regard as a very valid subject.

Dr. HAWORTH. Let me take the example of chemistry. A few months after I came with the Foundation we began to be aware of this, that chemistry did seem to be suffering. And, I think the reason primarily is that chemistry doesn't have a mission-oriented home across chemistry in the same sense that some of the others, biology has a mission-oriented home in NIH, and materials has in AEC, and NASA, and DOD, and so on. And, chemistry as a subject doesn't in the same sense; so as the budgets tended to level off in the support from the mission-oriented agencies, it was somewhat at the expense of chemistry. Well, in the intervening time, if you take—that was 1963 we were just embarking when I came on the 1964 budget year, fiscal year. Since that time and taking into account the budget that lies before the Congress now, we have a little more than doubled the funds that we allocate to chemistry assuming that our appropriation bill will be passed as requested, whereas for basic research as a whole it has gone up about 50 percent.

So, we do respond.

Mr. VIVIAN. You have already responded and do you participate further?

Dr. HAWORTH. Yes, but I don't mean our response is adequate, but we are very aware of this sort of thing.

Mr. VIVIAN. What freedom of action do you have, for example, adjusting the amount of money for Mohole project to, for example, enhance the effort in chemistry?

Dr. HAWORTH. I think the thing that really determines that project is the level at which you have to support it in order to make it an efficient operation.

It is at a stage where to hold the shipyard back or things of that sort would simply make it cost more money in the long run. But, it is not restraints that determine how much we put into it, but what is the most effective way to keep it going properly not in any sense of on a crash program basis, but as a straightforward progress toward——

Mr. VIVIAN. Has there been any dispute between the Board and Director on the amount of money for the Mohole project?

Dr. HAWORTH. No.

Mr. VIVIAN. Let me compliment you on your peaceful relationship with the agency.

Mr. DADDARIO. Mr. Yeager, you have a final question?

Mr. YEAGER. Dr. Seitz, one of the major, perhaps cardinal, motives of the committee in its report and in the drafting of this legislation has been to strengthen the Science Foundation upgrading it within the scientific structure of the executive branch.

Would you concur that anything the committee could reasonably do to affect this would be a useful process at this time?

Dr. SEITZ. Yes, I would like to put the matter quite strongly. Science is now built so deeply into our society that raising the stature of the Science Foundation among the agencies is basically equivalent

to raising the stature of our own country. I think it is as simple as that. I advocate the steps recommended here.

Mr. YEAGER. One of the things that the bill would do is to raise the grade level of the Director of the Science Foundation. Yesterday the impression was left, I think, that this level II which we have discussed was more or less limited to Deputies or Under Secretaries. The law shows, however, that out of the 19 people so designated, 5 are in this category, 10 are directors or chairmen of independent agencies. So, what the committee proposes would certainly be not a precedent-setting matter. I was wondering if you would comment on whether you felt this would be appropriate? (See appendix D. p. 147.)

Dr. SEITZ. Is this in connection with the Associate——

Mr. YEAGER. The Director and the Deputy Director, in raising their salary levels.

Dr. SEITZ. Yes, I strongly recommend this. In an earlier version of the bill, which I saw, the positions of the Assistant Directors were specified rather narrowly. I strongly endorse this latest version which indicates that there will be some flexibility in the areas of responsibility of the Assistant Directors.

Mr. YEAGER. Thank you, Mr. Chairman.

Mr. DADDARIO. Mr. Conable?

Mr. CONABLE. Mr. Chairman, I assume we are about to adjourn now since Dr. Seitz is the last witness. I wonder what the plans are for the subcommittee to consider some of the very good points that have been made for revision of this bill? Will we have an executive session and proceed to put it into a clean bill?

Mr. DADDARIO. Mr. Conable, it's my feeling at the moment that additional witnesses will not be necessary and therefore the public hearings will come to a close as soon as this meeting ends.

We will analyze the testimony, see how the testimony does affect the legislation as it now stands, see what recommendations are needed and will then if necessary call witnesses, which I would doubt, or proceed in executive session of the committee, working with our staff, to make changes as they may be indicated by the testimony.

Mr. CONABLE. If we do make substantial changes, will we put in a clean bill?

Mr. DADDARIO. Yes, we will. It would be our hope to do that.

Mr. VIVIAN. Mr. Chairman?

Mr. DADDARIO. Mr. Vivian?

Mr. VIVIAN. I have a brief remark to make. One of the purposes of our action is to raise the stature of the National Science Foundation, I concur with this, but I feel there is a very basic conflict. If we raise the stature of the Foundation in the scientific eyes, we may do so only publicly by increasing the stature of the Board relative to the status of the administration's presence in the agency through the Director but to raise NSF's stature in the overall functions of Government related to science, the only way we are going to do this is to raise the stature of the Director and the President's role in the Foundation at the expense of the Board. I think this basic conflict has to be recognized.

I don't think it is possible to play a major role in all of the agencies of Government unless its director responds principally to the President. As I say, this is in direct conflict to opinions expressed.

Mr. DADDARIO. I can see no conflict between our objectives and that suggestion, Mr. Vivian. What we are doing here is getting the benefit of NSF's 15 years' experience. We have a good understanding of what has developed and the recommendations, which have been made, are in keeping with the progress of the Foundation as it has grown. It seems to me that we have reached the point by recognizing what the activities of the Board have been, giving substance to its position by our recommendations and also have seen to it that the Director have the ability to perform better leadership position in the Foundation and by making a bigger impression as the Director on the agencies with which he deals from time to time.

I think this will all work itself out and we can analyze it in committee and see to it that as we do come up with a report on the bill that we emphasize the elements of concern which have been shown, not only within the committee, but within the scientific community.

Any further questions?

This committee will adjourn to a time and place to be determined by the Chair.

(Whereupon, at 12 o'clock noon, the subcommittee adjourned.)

RESPONSE TO QUESTIONS FOR THE RECORD SUBMITTED TO DR. FREDERICK SEITZ, PRESIDENT, NATIONAL ACADEMY OF SCIENCES BY THE SUBCOMMITTEE

Question 1. You express concern in your prepared statement that the Foundation might, in time, become too involved with applied research to the detriment of basic research. Would it be advisable, in your opinion, to require the Foundation to include in its annual report to the President and the Congress (as required by sec. 3(e) of the bill) information about the type of applied research it has supported and the amount of funds it has expended on such research in order that it would serve to highlight any imbalance which might develop between basic and applied research?

Answer. If the National Science Foundation became involved in a large amount of mission-oriented applied research, the attention and funds given to such work could quite easily have the effect of starving the basic work for which the Foundation has a unique responsibility among the Federal agencies. I believe it would be highly desirable to have the National Science Foundation include a special section on this topic in its annual report, pointing out the type of work in applied research it supports and the magnitude of the Foundation's budget devoted to it.

Exception might be made for work in applied research in the departments of engineering of the universities in cases in which the magnitude of the individual programs is about the same as individual programs for independent investigators in the science departments. Where such work is clearly tied to the educational process, and is in the range of, say, $50,000 to $150,000 per investigator, it need not be handled in a way distinctly different from the work of independent scientists.

Question 2. To what extent is funding for "little science" in danger from the funding of "big science" basic research? How does this possible danger compare with the often-voiced fears that applied research would drive out basic research?

Answer. Big and little science are both essential for the healthy evolution of scientific knowledge. Many fields of investigation exclusively involve small programs, but many others eventually grow to a state in which it becomes necessary to have large and expensive equipment in order to advance. This is true for example in space science, earth science, and high-energy particle physics. It is highly important that there be some reasonable balance between the two types of work. Big science tends to strike the public fancy because of the dramatic quality of the large equipment and the fact that one usually has such equipment located at one or more specific centers that can be identified geographically. As long as the funds available for scientific research are less than is needed to support all good programs that are proposed, as will undoubtedly be the case indefinitely in the future, it is essential that small science be protected to some degree from the demands of big science.

62-309—66——8

STATEMENT OF THE AMERICAN SOCIETY FOR ENGINEERING EDUCATION

The American Society for Engineering Education has considered the report of the Subcommittee on Science, Research, and Development entitled "The National Science Foundation—Its Present and Future," and commends the subcommittee, chaired by Representative Emilio Q. Daddario, for the thoroughness of its review and its perception of the accomplishments and problems of the National Science Foundation. Since the inception of the National Science Foundation, the American Society for Engineering Education has recognized the special role of the Foundation in supporting engineering education at all levels through improvement of facilities and curriculums, and through the encouragement and funding of graduate students and engineering research. The Foundation has an almost unlimited potential for the advancement of the science of engineering.

The favorable comments concerning the accomplishments of the Foundation, as presented in the testimony to the subcommittee, are noted, and in them the ASEE concurs. The society notes with special interest the attention given in the report to the need for strengthening and enlarging the role of the National Science Foundation that it may assume a more positive, dynamic stance. Full exploration of the ways in which the efforts of the National Science Foundation may be vitalized should be undertaken.

The influence of the National Science Foundation upon the development of engineering education is critical. Engineering education has undergone drastic changes in the past decade and further changes in the immediate future are inevitable in order to prepare the engineering graduate to assume responsibilities beyond those inherent in a narrow technical specialty. Not only are interactions among the various areas of engineering increasing, but broad interdisciplinary activities among engineering and the biological and social sciences are developing rapidly. The National Science Foundation is in a key position to stimulate and foster such activities. In order to assist in the active implementation of broad developments of this character, increased engineering representation on the National Science Board is mandatory, as is adequate funding of engineering research to permit the full exploration of interdisciplinary potentials.

An unprecedented momentum in research has been developed in the engineering and science colleges of the country, and ways and means must be provided to make it possible for the National Science Foundation to assume a positive and powerful "balance wheel" role in the coordination of the development of the sciences, including engineering, without putting the Foundation in the position of exercising undue and restrictive control over all such developments as a line organization.

The American Society for Engineering Education, representing engineering education both through its institutional membership and its individual members, will be glad to cooperate with the Committee on Science and Astronautics and with the Subcommittee on Science, Research, and Development in providing pertinent data relative to the interactions between the National Science Foundation and engineering education.

GEORGE D. LOBINGIER,
President, American Society for Engineering Education.

APRIL 18, 1966.

STATEMENT OF THE ENGINEERS JOINT COUNCIL

The Engineers Joint Council has been considering a series of complex national issues involving technology, including these relating to pollution, transportation, urban development, and international assistance. In the light of these considered studies, we have read with particular interest both the recent report on the National Science Foundation, Its Present and Future prepared by the Subcommittee on Science, Research, and Development, which you chair and also the proposed bill, H.R. 13696, which is based on the subcommittee report.

Engineering has benefited enormously from support given by the National Science Foundation to basic science because presently it is principally from the findings of basic science that engineering derives new principles which, in turn, has made possible the development of new technology. However, there are problems with respect to the role of the National Science Foundation in the direct support of the development of engineering technology which have not been resolved adequately. Those responsible for allocating resources in the National Science Foundation have been constrained by present legislation which does not provide for the support of applied science activities through which engineering technology is developed. Many mission-oriented agencies of the Government are able to support applied research, but the National Science Foundation has a charter relating solely to science and science education.

The proposed legislation in H.R. 13696 authorizes National Science Foundation support of applied research and should lead to some National Science Foundation funding of programs for engineering. We believe this authorization for applied research in H.R. 13696 is essential in order that the National Science Foundation can continue to play its important and dynamic role in the creation of a national base for science and technology.

Many of the great national issues of the day, such as urban development, transportation, and pollution, fall within the purview of one or more of the mission-oriented agencies, but in many instances these agencies do not have a tradition of research. In the field of urban development, there has been essentially no research. In the field of transportation, with the exception of vehicular support by the Department of Defense and certain research connected with the national highway and airway systems, there has been a very limited amount of support provided by the Federal Government in comparison with its enormous responsibilities. The same is true with respect to virtually all aspects of the pollution problem.

As the testimony before your subcommittee made clear, there are currently no profit incentives which attract risk capital to the support of large research and development programs in these fields. Accordingly, industry is not stimulated to apply engineering talents to the new work that needs to be done on these complex public problems. It would seem that a new form of partnership needs to be evolved between engineering and public bodies.

We believe that with authorization to fund applied research, the National Science Foundation can serve as the Government's agency to anticipate national needs and to build research and development programs to cope with these needs. These programs eventually could be transferred to mission agencies of the Government as their recognition of the appropriateness of research and application in these fields becomes reflected in suitable appropriations. Such an approach would have many aspects in common with the establishment several years ago of the Advanced Research Projects Agency in the Department of Defense. We understand that this agency nurtures new technology and concepts until the military departments can take over their exploitation.

While the engineering community is deeply concerned with the need for solving the more urgent national problems that require a huge technical effort in addition to the social, political, and financial considerations involved, we find it difficult to locate coherent and unified approaches to the long-range aspects of these problems within the Federal Government. Under H.R. 13696, the National Science Foundation could assume this responsibility. While we recognize that there are certain risks in the assumption by the National Science Foundation of

such an applied research mission in addition to its major mission in support of the Nation's scientific competence, we believe that the National Science Foundation should assume the responsibility of facing these national problems as permitted under H.R. 13696.

CLARENCE H. LINDER, *President,*
ENGINEERS JOINT COUNCIL,
New York, N.Y.,

APRIL 25, 1966.

STATEMENT OF THE SECRETARY, SCIENCE AND TECHNOLOGY COMMITTEE, CHAMBER OF COMMERCE OF THE UNITED STATES, WASHINGTON, D.C.

The Chamber of Commerce of the United States supports the objectives of legislation to reorganize the National Science Foundation, as a means of providing for more effective management of national research programs. We recognize that Federal financing of scientific and technological research has contributed significantly to the Nation's defense effort and to its economic growth and industrial development.

There has been concern, however, with the manner in which Federal financing programs have expanded, not only in dollar amounts, but also in relation to privately financed research and development. Federal funds have become a major portion of total spending for research, rising much faster than industrial research spending. Although a temporary plateau may have been reached on the Federal side, further increases are likely. A better sense of direction for Federal programs would reduce unwarranted emphasis on certain areas of research and make way for new areas.

There has also been concern with the various channels through which Federal research funds are allocated, largely without planned coordination among the agencies involved. Thus, those agencies with authority to spend large sums—NASA, AEC, NSF, and DOD particularly—have followed different guidelines. Congressional intent has not been invaryingly clear, and the review procedures, likewise, have varied from agency to agency.

National chamber studies relating to the responsibility for scientific research and development indicate that a suitable level of Federal support must be provided, and that such support should be decided on the basis of selected program objectives. The reorganization of the National Science Foundation, along lines proposed in H.R. 13696, would help the Federal Government to more effectively determine both the level and the direction of the Federal research effort.

The NSF needs greater authority for assessing research needs, for defining Federal policy with respect to meeting those needs, and for coordinating such Federal programs as Congress may authorize and fund.

New authority for the National Science Board, as proposed in H.R. 13696, would more adequately centralize the research advisory functions without tending to centralize either financial control or policymaking.

Broad and authoritative representation on this Board is vital to a balanced research effort. In this regard, we recommend that section 4(c) be amended to specify representation on the National Science Board of persons eminent in the field of research management, that is, businessmen with outstanding ability in devising and directing industrial research programs. We recommend inserting the words "research management" following the word "education" in line 21, page 5, of H.R. 13696.

On several occasions, in recommendations to congressional committees, the national chamber has indicated that the funding of scientific research by Government should be based on criteria which will provide for more efficiency in government, better value for each research dollar, and fuller recognition of the capabilities of private and university research. We are hopeful that reorganization of the National Science Foundation, such as proposed in H.R. 13696, will help to redirect Federal research programs toward these objectives.

DONALD W. VAN TUYL,
Secretary, Science and Technology Committee,
Chamber of Commerce of the United States.

MAY 9, 1966.

APPENDIX A

NATIONAL SCIENCE FOUNDATION ACT OF 1950 (PUBLIC LAW 507—81ST CONGRESS) AS AMENDED THROUGH AUGUST 15, 1963, AND AS MODIFIED BY REORGANIZATION PLAN NO. 2 OF 1962, AND BY REORGANIZATION PLAN NO. 5 OF 1965

SECTION 1

[PUBLIC LAW 507—81ST CONGRESS]*

[64 STAT. 149]

[S. 247]

AN ACT To promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "National Science Foundation Act of 1950".

ESTABLISHMENT OF NATIONAL SCIENCE FOUNDATION (42 U.S.C. § 1861)

SEC. 2. There is hereby established in the executive branch of the Government an independent agency to be known as the National Science Foundation (hereinafter referred to as the "Foundation"). The Foundation shall consist of a National Science Board (hereinafter referred to as the "Board") and a Director.

FUNCTIONS OF THE FOUNDATION (42 U.S.C. § 1862)

SEC. 3. (a) The Foundation is authorized and directed—

(1) to develop and encourage the pursuit of a national policy for the promotion of basic research and education in the sciences; [1]

(2) to initiate and support basic scientific research and programs to strengthen scientific research potential in the mathematical, physical, medical, biological, engineering, and other sciences, by making contracts or other arrangements (including grants, loans, and other forms of assistance) to support such scientific activities and to appraise the impact of research upon industrial development and upon the general welfare; [2]

(3) at the request of the Secretary of Defense, to initiate and support specific scientific research activities in connection with matters relating to the national defense by making contracts or other arrangements (including grants, loans, and other forms of assistance) for the conduct of such scientific research;

(4) to award, as provided in section 10, scholarships and graduate fellowships in the mathematical, physical, medical, biological, engineering, and other sciences;

(5) to foster the interchange of scientific information among scientists in the United States and foreign countries;

*As amended by: Act of April 5, 1952 (P.L. 82-298; 66 Stat. 43) Act of Aug. 8, 1953 (P.L. 83-223; 67 Stat. 488), Act of July 11, 1958 (P.L. 85-510; 72 Stat. 353), Act of Sept. 8, 1959 (P.L. 86-232; 73 Stat. 467), Act of June 11, 1960 (P.L. 86-507; 74 Stat. 200), Act of June 29, 1960 (P.L. 86-550; 74 Stat. 256), Act of Oct. 16, 1962 (P.L. 87-835; 76 Stat. 1069), and as modified by Reorganization Plan No. 2 of 1962, effective June 8, 1962 (76 Stat. 1253) (Text of Plan printed at end of Act).

[1] Reorganization Plan No. 2 of 1962 (76 Stat. 1253), Part I, Sec. 3(a)(1) transferred from the Foundation to the Director of the Office of Science and Technology so much of the functions of this paragraph as will enable him to advise and assist the President in achieving coordinated Federal policies for the promotion of basic research and education in the sciences.

[2] The Act of Sept. 8, 1959 (P.L. 86-232; 73 Stat. 467) amended this paragraph (2) by adding the phrase: "and programs to strengthen scientific research potential," and by substituting the phrase: "to support such scientific activities" for the phrase: "for the conduct of such basic scientific research."

(6) to evaluate scientific research programs undertaken by agencies of the Federal Government,[3] and to correlate the Foundation's scientific research programs with those undertaken by individuals and by public and private research groups;

(7) to establish such special commissions as the Board may from time to time deem necessary for the purposes of this Act;

(8) to maintain a register of scientific and technical personnel and in other ways provide a central clearing house for information covering all scientific and technical personnel in the United States, including its Territories and possessions;

(9) [4] to initiate and support a program of study, research, and evaluation in the field of weather modification, giving particular attention to areas that have experienced floods, drought, hail, lightning, fog, tornadoes, hurricanes, or other weather phenomena, and to report annually to the President and the Congress thereon.

(b) In exercising the authority and discharging the functions referred to in subsection (a) of this section, it shall be one of the objectives of the Foundation to strengthen basic research and education in the sciences, including independent research by individuals, throughout the United States, including its Territories and possessions, and to avoid undue concentration of such research and education.

(c) The Foundation shall render an annual report to the President for submission on or before the 15th day of January of each year to the Congress, summarizing the activities of the Foundation and making such recommendations as it may deem appropriate. Such report shall include (1) minority views and recommendations, if any, of members of the Board, and (2) information as to the acquisition and disposition by the Foundation of any patents and patent rights.

NATIONAL SCIENCE BOARD (42 U.S.C. § 1863)

SEC. 4. (a) The Board shall consist of twenty-four members to be appointed by the President, by and with the advice and consent of the Senate, and of the Director ex officio, and shall, except as otherwise provided in this Act, exercise the authority granted to the Foundation by this Act. The persons nominated for appointment as members (1) shall be eminent in the fields of the basic sciences, medical science, engineering, agriculture, education, or public affairs; (2) shall be selected solely on the basis of established records of distinguished service; and (3) shall be so selected as to provide representation of the views of scientific leaders in all areas of the Nation. The President is requested, in the making of nominations of persons for appointment as members, to give due consideration to any recommendations for nomination which may be submitted to him by the National Academy of Sciences, the Association of Land Grant Colleges and Universities, the National Association of State Universities, the Association of American Colleges, or by other scientific or educational organizations.

(b) The term of office of each voting member of the Board shall be six years, except that (1) any member appointed to fill a vacancy occurring prior to the expiration of the term for which his predecessor was appointed shall be appointed for the remainder of such term; and (2) the terms of office of the members first taking office after the date of enactment of this Act shall expire, as designated by the President at the time of appointment, eight at the end of two years, eight at the end of four years, and eight at the end of six years, after the date of enactment of this Act. Any person who has been a member of the Board for twelve consecutive years shall thereafter be ineligible for appointment during the two-year period following the expiration of such twelfth year.

(c) The President shall call the first meeting of the Board, at which the first order of business shall be the election of a chairman and a vice chairman.[5]

(d) The Board shall meet annually on the third Monday in May, unless, prior to May 10 in any year, the Chairman has set the annual meeting for a day in May, other than the third Monday, and at such other times as the Chairman may determine, but he shall also call a meeting whenever one-third of the members so request in writing. A majority of the voting members of the Board shall constitute a quorum. Each member shall be given notice, by registered mail

[3] Reorganization Plan No. 2 of 1962, Part I, Sec. 3(a)(2) transferred from the Foundation to the Director of the Office of Science and Technology the function of evaluating scientific research programs undertaken by agencies of the Federal Government.

[4] The Act of July 11, 1958 (P.L. 85-510; 72 Stat. 353) added paragraph (9).

[5] Subsection (c) is now covered by Subsection (e) of this section.

or by certified mail [6] mailed to his last known address of record not less than fifteen days prior to any meeting, of the call of such meeting.[7]

(e) An election of the Chairman and Vice Chairman of the Board shall take place at the first meeting of the National Science Board following enactment of this legislation. Thereafter such election shall take place at the second annual meeting occurring after each such election.[8] The Vice Chairman shall perform the duties of the Chairman in his absence. In case a vacancy occurs in the chairmanship or vice chairmanship, the Board shall elect a member to fill such vacancy.

DIRECTOR OF THE FOUNDATION [9] (42 U.S.C. § 1864)

SEC 5. (a) There shall be a Director of the Foundation who shall be appointed by the President, by and with the advice and consent of the Senate. The Board may make recommendations to the President with respect to the appointment of the Director, and the Director shall not be appointed until the Board has had an opportunity to make such recommendations. He shall serve as a nonvoting ex officio member [10] of the Board. In addition thereto he shall be the chief excutive officer of the Foundation. The Director shall serve for a term of six years unless sooner removed by the President.

(b) In addition to the powers and duties specifically vested in him by this Act, the Director shall, in accordance with the policies established by the Board, exercise the powers granted by sections 10 and 11 of this Act, together with such other powers and duties as may be delegated to him by the Board; but no final action shall be taken by the Director in the exercise of any power granted by section 10 or 11(c) unless in each instance the Board has reviewed and approved the action proposed to be taken, or such action is taken pursuant to the terms of a delegation of authority from the Board or the Executive Committee to the Director.[11]

POWER TO CREATE COMMITTEES [12] (42 U.S.C. § 1865)

SEC. 6 (a) The Board is authorized to appoint from among its members an Executive Committee,[13] and to assign to the Executive Committee such of the powers and functions granted to the Board by this Act as it deems appropriate; except that the Board may not assign to the Executive Committee the function of establishing policies.[14]

(b) If an Executive Committee is established by the Board—

(1) Such Committee shall consist of the Director, as a nonvoting ex officio member,[15] and not less than five nor more than nine [16] other members elected by the Board from among their number.

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[6] The Act of June 11, 1960 (P.L. 86-507; 74 Stat. 200) inserted: "or by certified mail" following "registered mail."

[7] The Act of September 8, 1959 (P.L. 86-232; 73 Stat. 467) amended this paragraph (d) by changing the day of the annual meeting from the first Monday in December to the third Monday in May.

[8] The Act of September 8, 1959 (P.L. 86-232; 73 Stat. 467) amended this paragraph (e) by changing the day of expiration of the terms of the Chairman and Vice Chairman from the first Monday in December to the day of the annual meeting as provided in paragraph (d) supra.

[9] Reorganization Plan No. 2 of 1962, Part II, Sec. 23(a)(2) abolished the Office of Director of the Foundation. Section 22 established a new Office of Director with a six year term (unless sooner removed by the President) and compensation at the rate of $21,000 per annum. The Plan also provided that the Director shall be appointed by the President by and with the advice and consent of the Senate; that the Director shall not engage in any other business, vocation, or employment, nor shall he, except with the approval of the Board, hold any office in or act in any capacity for, any organization or institution with which the Foundation makes any contract or other arrangement under this Act.

[10] Reorganization Plan No. 2 of 1962, Part II, Sec. 23(b)(2) abolished this function of the Director as a nonvoting member of the Board; Part II, Sec. 22(c) provided that the Director shall be an ex-officio, voting member of the Board.

[11] The Act of September 8, 1959 (P.L. 86-232; 73 Stat. 467) amended this paragraph (b) by adding the words following the last comma of the paragraph.

[12] Reorganization Plan No. 2 of 1962, Part II, Sec. 23 (a)(1) abolished the Executive Committee authorized by this Section 6. Section 21 of the Reorganization Plan established a new Executive Committee and transferred to it the functions of the Executive Committee authorized by Section 6. Section 21 provides that the Executive Committee shall consist of five members, including the Director, ex officio, who shall be Chairman. Each of the four other members is elected by the Board for a term of two years, and is ineligible for service as a member during the two-year period following six consecutive years of service on the Committee.

[13] Reorganization Plan No. 2 of 1962, Part II, Sec. 23(b)(1) abolished this function of the National Science Board to appoint an Executive Committee. (See Footnote 12.).

[14] The Act of September 8, 1959 (P.L. 86-232; 73 Stat. 467) amended this paragraph (a) by striking out language which followed the word "policies": ". . . or the function of review and approval (except review and approval of minor modifications of contracts or other arrangements previously approved by the Board), to be exercised by the Board in accordance with Section 5(b)."

[15] Reorganization Plan No. 2 of 1962, Part II, Sec. 23(b)(2) abolished the function of the Director as a nonvoting member of the Executive Committee; Part II, Sec. 21(a) provided that the Director shall be a voting member and Chairman of the Executive Committee.

[16] The Act of September 8, 1959 (P.L. 86-232; 73 Stat. 467) amended this paragraph (1) by substituting: "not less than five nor more than nine" for "nine." Reorganization Plan No. 2 of 1962 provided that there shall be an Executive Committee of five members. (See Footnote 12.).

(2) The term of office of each voting member of such Committee shall be two years, except that (A) any member elected to fill a vacancy occurring prior to the expiration of the term for which his predecessor was elected shall be elected for the remainder of such term; and (B) the term of office of four of the members first elected after the date of enactment of this Act shall be one year.

(3) Any person who has been a member of such Committee for six consecutive years shall thereafter be ineligible for election during the two-year period following the expiration of such sixth year.

(4) The membership of such Committee shall, so far as practicable, be representative of diverse interests and shall be so chosen as to provide representation, so far as practicable, for all areas of the Nation.

(5) Such Committee shall render an annual report to the Board, and such other reports as it may deem necessary, summarizing its activities and making such recommendations as it may deem appropriate. Minority views and recommendations, if any, of members of the Executive Committee shall be included in such reports.

(c) The Board is authorized to appoint from among its members or otherwise such committees as it deems necessary, and to assign to committees so appointed such survey and advisory functions as the Board deems appropriate for the purposes of this Act.

DIVISIONS WITHIN THE FOUNDATION (42 U.S.C. § 1866)

SEC. 7. (a) Until otherwise provided by the Board there shall be within the Foundation the following divisions:

(1) A Division of Medical Research;

(2) A Division of Mathematical, Physical, and Engineering Sciences;

(3) A Division of Biological Sciences; and

(4) A Division of Scientific Personnel and Education, which shall be concerned with the programs of the Foundation relating to the granting of scholarships and graduate fellowships, in the mathematical, physical, medical, biological, engineering, and other sciences.

(b) There shall also be within the Foundation such other divisions as the Board may, from time to time, deem necessary.

DIVISIONAL COMMITTEES (42 U.S.C. § 1867)

SEC. 8. (a) There shall be a committee for each division of the Foundation.

(b) Each divisional committee shall be appointed by the Board and shall consist of not less than five persons who may be members or nonmembers of the Board.

(c) The terms of members of each divisional committee shall be two years. Each divisional committee shall annually elect its own chairman from among its own members and shall prescribe its own rules of procedure subject to such restrictions as may be prescribed by the Board.

(d) Each divisional committee shall make recommendations to, and advise and consult with, the Board and the Director with respect to matters relating to the program of its division.[17]

SPECIAL COMMISSIONS (42 U.S.C § 1868)

SEC. 9. (a) Each special commission established pursuant to section 3(a)(7) shall consist of eleven members appointed by the Board, six of whom shall be eminent scientists and five of whom shall be persons other than scientists. Each special commission shall choose its own chairman and vice chairman.

(b) It shall be the duty of each such special commission to make a comprehensive survey of research, both public and private, being carried on in its field, and to formulate and recommend to the Foundation at the earliest practicable date an over-all research program in its field.

SCHOLARSHIPS AND GRADUATE FELLOWSHIPS (42 U.S.C. § 1869)

SEC. 10. The Foundation is authorized to award, within the limits of funds made available specifically for such purpose pursuant to section 17, scholarships and graduate fellowships for scientific study or scientific work in the mathematical,

[17] Reorganization Plan No. 2 of 1962, Part II, Sec. 23(b)(3) abolished so much of the functions conferred upon divisional committees by this paragraph as consisted of making recommendations to, and advising and consulting with, the Board.

physical, medical, biological, engineering, and other sciences at appropriate [18] nonprofit American or nonprofit foreign institutions selected by the recipient of such aid, for stated periods of time. Persons shall be selected for such scholarships and fellowships from among citizens or nationals [19] of the United States, and such selections shall be made solely on the basis of ability; but in any case in which two or more applicants for scholarships or fellowships, as the case may be, are deemed by the Foundation to be possessed of substantially equal ability, and there are not sufficient scholarships or fellowships, as the case may be, available to grant one to each of such applicants, the available scholarship or scholarships or fellowship or fellowships shall be awarded to the applicants in such manner as will tend to result in a wide distribution of scholarships and fellowships among the States, Territories, possessions, and the District of Columbia. Nothing contained in this Act shall prohibit the Foundation from refusing or revoking a scholarship or fellowship award, in whole or in part, in the case of any applicant or recipient, if the Board is of the opinion that such award is not in the best interests of the United States.[20]

GENERAL AUTHORITY OF FOUNDATION (42 U.S.C. § 1870)

SEC. 11. The Foundation shall have the authority, within the limits of available appropriations, to do all things necessary to carry out the provisions of this Act, including, but without being limited thereto, the authority—

(a) to prescribe such rules and regulations as it deems necessary governing the manner of its operations and its organization and personnel;

(b) to make such expenditures as may be necessary for administering the provisions of this Act;

(c) to enter into contracts or other arrangement, or modifications thereof for the carrying on, by organizations or individuals in the United States and foreign countries, including other government agencies of the United States and of foreign countries, of such basic scientific research activities as the Foundation deems necessary to carry out the purposes of this Act, and, at the request of the Secretary of Defense, specific scientific research activities in connection with matters relating to the national defense, and, when deemed appropriate by the Foundation, such contracts or other arrangements or modifications thereof, may be entered into without legal consideration, without performance or other bonds and without regard to section 3709 of the Revised Statutes;

(d) to make advance, progress, and other payments which relate to scientific research without regard to the provisions of section 3648 of the Revised Statutes (31 U.S.C., sec. 529);

(e) to acquire by purchase, lease, loan, gift, or condemnation,[21] and to hold and dispose of by grant, sale, lease, or loan, real and personal property of all kinds necessary for, or resulting from, the exercise of authority granted by this Act;

(f) to receive and use funds donated by others, if such funds are donated without restriction other than that they be used in furtherance of one or more of the general purposes of the Foundation;

(g) to publish or arrange for the publication of scientific and technical information so as to further the full dissemination of information of scientific value consistent with the national interest, without regard to the provisions of section 87 of the Act of January 12, 1895 (28 Stat. 622), and section 11 of the Act of March 1, 1919 (40 Stat. 1270; 44 U.S.C., sec. 111);

(h) to accept and utilize the services of voluntary and uncompensated personnel and to provide transportation and subsistence as authorized by section 5 of the Act of August 2, 1946 (5 U.S.C. 73b–2) for persons serving without compensation; and

(i) to prescribe, with the approval of the Comptroller-General of the United States, the extent to which vouchers for funds expended under contracts for scientific research shall be subject to itemization or substantiation prior to payment, without regard to the limitations of other laws relating to the expenditure of public funds and accounting therefor.

[18] The Act of September 8, 1959 (P.L. 86–232; 73 Stat. 467), substituted "appropriate" for "accredited" and deleted "of higher education" following "foreign institutions."

[19] The Act of June 29, 1960 (P.L. 86–550; 74 Stat. 256) added "or nationals" after "citizens."

[20] The Act of October 16, 1962 (P.L. 87–835; 76 Stat. 1069) added this last sentence of Sec. 10.

[21] The Act of September 8, 1959 (P.L. 86–232; 73 Stat. 467) amended this paragraph (e) by adding: "or condemnation" after "gift," and "grant" after "dispose of by."

PATENT RIGHTS (42 U.S.C. § 1871)

SEC. 12. (a) Each contract or other arrangement executed pursuant to this Act which relates to scientific research shall contain provisions governing the disposition of inventions produced thereunder in a manner calculated to protect the public interest and the equities of the individual or organization with which the contract or other arrangement is executed: *Provided, however,* That nothing in this Act shall be construed to authorize the Foundation to enter into any contractual or other arrangement inconsistent with any provision of law affecting the issuance or use of patents.

(b) No officer or employee of the Foundation shall acquire, retain, or transfer any rights, under the patent laws of the United States or otherwise, in any invention which he may make or produce in connection with performing his assigned activities and which is directly related to the subject matter thereof: *Provided, however,* That this subsection shall not be construed to prevent any officer or employee of the Foundation from executing any application for patent on any such invention for the purpose of assigning the same to the Government or its nominee in accordance with such rules and regulations as the Director may establish.

INTERNATIONAL COOPERATION AND COORDINATION WITH FOREIGN POLICY (42 U.S.C. § 1872)

SEC. 13. (a) The Foundation is hereby authorized to cooperate in any international scientific activities consistent with the purposes of this Act and to expend for such international scientific activities such sums within the limit of appropriated funds as the Foundation may deem desirable. The Director, with the approval of the Board, may defray the expenses of representatives of Government agencies and other organizations and of individual scientists to accredited international scientific congresses and meetings whenever he deems it necessary in the promotion of the objectives of this Act. In this connection, with the approval of the Secretary of State, the Foundation may undertake programs, granting fellowships to, or making other similar arrangements with, foreign nationals for scientific study or scientific work in the United States without regard to section 10 or the affidavit of allegiance to the United States required by section 16(d)(2) of this Act.[22]

(b) (1) The authority to enter into contracts or other arrangements with organizations or individuals in foreign countries and with agencies of foreign countries, as provided in section 11(c), and the authority to cooperate in international scientific activities [23] as provided in subsection (a) of this section, shall be exercised only with the approval of the Secretary of State, to the end that such authority shall be exercised in such manner as is consistent with the foreign policy objectives of the United States.

(2) If, in the exercise of the authority referred to in paragraph (1) of this subsection, negotiation with foreign countries or agencies thereof becomes necessary, such negotiation shall be carried on by the Secretary of State in consultation with the Director.

WEATHER MODIFICATION (42 U.S.C. § 1872a)

SEC. 14.[24] (a) In carrying out the provisions of paragraph (9) of section 3(a), the Foundation shall consult with meteorologists and scientists in private life and with agencies of Government interested in, or affected by, experimental research in the field of weather control.

(b) Research programs to carry out the purposes of such paragraph (9), whether conducted by the Foundation or by other Government agencies or departments, may be accomplished through contracts with, or grants to, private or public institutions or agencies, including but not limited to cooperative programs with any State through such instrumentalities as may be designated by the governor of such State.

(c) For the purposes of such paragraph (9), the Foundation is authorized to accept as a gift, money, material, or services: *Provided,* That notwithstanding section 11(f), use of any such gift, if the donor so specifies, may be restricted or limited to certain projects or areas.

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[22] The Act of September 8, 1959 (P.L. 86-232; 73 Stat. 467) amended this paragraph by changing "international scientific research activities" to "international scientific activities" in two places in the first sentence and by adding the last sentence.

[23] The Act of September 8, 1959 (P.L. 86-232; 73 Stat. 467) changed "international scientific research activities" to "international scientific activities."

[24] The Act of July 11, 1958 (P.L. 85-510; 73 Stat. 353) added this Sec. 14 and renumbered former Sections 14, 15 and 16 as 15, 16 and 17.

(d) For the purposes of such paragraph (9), other agencies of the Government are authorized to loan to the Foundation without reimbursement, and the Foundation is authorized to accept and make use of, such property and personnel as may be deemed useful, with the approval of the Director of the Bureau of the Budget.

(e) The Director of the Foundation, or any employee of the Foundation designated by him, may for the purpose of carrying out the provisions of such paragraph (9) hold such hearings and sit and act at such times and places and take such testimony as he shall deem advisable. The Director or any employee of the Foundation designated by him may administer oaths or affirmations to witnesses appearing before the Director or such employee.

(f) (1) The Director of the Foundation may obtain by regulation, subpena, or otherwise such information in the form of testimony, books, records, or other writings, may require the keeping of and furnishing such reports and records, and may make such inspections of the books, records and other writings and premises or property of any person or persons as may be deemed necessary or appropriate by him to carry out the provisions of such paragraph (9) but this authority shall not be exercised if adequate and authoritative data are available from any Federal agency. In case of contumacy, by, or refusal to obey a subpena served upon, any person referred to in this subsection, the district court of the United States for any district in which such person is found or resides or transacts business, upon application by the Director, shall have jurisdiction to issue an order requiring such person to appear and give testimony or to appear and produce documents, or both; and any failure to obey such order of the court may be punished by such court as a contempt thereof.

(2) The production of a person's books, records, or other documentary evidence shall not be required at any place other than the place where such person usually keeps them, if prior to the return date specified in the regulations, subpena, or other document issued with respect thereto, such person furnishes the Foundation with a true copy of such books, records, or other documentary evidence (certified by such person under oath to be a true and correct copy) or enters into a stipulation with the Director as to the information contained in such books, records, or other documentary evidence. Witnesses shall be paid the same fees and mileage that are paid witnesses in the courts of the United States.

(3) Any person who willfully performs any act prohibited or willfully fails to perform any act required by the above provisions of this subsection, or any regulation issued thereunder, shall upon conviction be fined not more than $500.

(4) Information contained in any statement, report, record, or other document furnished pursuant to this subsection shall be available for public inspection, except (A) information authorized or required by statute to be withheld and (B) information classified in accordance with laws to protect the national security. The foregoing sentence shall not be interpreted to authorize or require the publication, divulging, or disclosure of any information described in section 1905 of title 18 of the United States Code, except that the Director may disclose information described in such section 1905, furnished pursuant to this subsection, whenever he determines that the withholding thereof would be contrary to the purposes of this section and section 3(a) (9) of this Act.

MISCELLANEOUS PROVISIONS (42 U.S.C. § 1873)

SEC. 15.[24] (a) The Director shall, in accordance with such policies as the Board shall from time to time prescribe, appoint and fix the compensation of such personnel as may be necessary to carry out the provisions of this Act. Such appointments shall be made and such compensation shall be fixed in accordance with the provisions of the civil-service laws and regulations and the Classification Act of 1949: *Provided*, That the Director may, in accordance with such policies as the Board shall from time to time prescribe, employ such technical and professional personnel and fix their compensation, without regard to such laws, as he may deem necessary for the discharge of the responsibilities of the Foundation under this Act. The Deputy Director hereinafter provided for, and the members of the divisional committees and special commissions, shall be appointed without regard to the civil-service laws or regulations. Neither the Director nor the Deputy Director shall engage in any other business, vocation, or employment than that of serving as such Director or Deputy Director, as the case may be; nor shall the Director or Deputy Director, except with the approval of the Board, hold any office in, or act in any capacity for, any organization, agency, or institution with which the Foundation makes any contract or other arrangement under this Act.

(See footnote 24, p. 120.

(b) The Director may appoint, with the approval of the Board, a Deputy Director who shall perform such functions as the Director, with the approval of the Board, may prescribe and shall be Acting Director during the absence or disability of the Director or in the event of a vacancy in the Office of the Director.

(c) The Foundation shall not, itself, operate any laboratories or pilot plants.

(d) The members of the Board, and the members of each divisional committee, or special commission, shall receive compensation at the rate of $50 [25] for each day engaged in the business of the Foundation pursuant to authorization of the Foundation and shall be allowed travel expenses as authorized by section 5 of the Act of August 2, 1946 (5 U.S.C. 73b-2).

(e) Persons holding other offices in the executive branch of the Federal Government may serve as members of the divisional committees and special commissions, but they shall not receive remuneration for their services as such members during any period for which they receive compensation for their services in such other offices.

(f) Service of an individual as a member of the Board, of a divisional committee, or of a special commission shall not be considered as service bringing him within the provisions of section 281, 283, for 284 of title 18 of the United States Code or section 190 of the Revised Statutes (5 U.S.C. sec. 99), unless the act of such individual, which by such section is made unlawful when performed by an individual referred to in such section, is with respect to any particular matter which directly involves the Foundation or in which the Foundation is directly interested.

(g) In making contracts or other arrangements for scientific research, the Foundation shall utilize appropriations available therefor in such manner as will in its discretion best realize the objectives of (1) having the work performed by organizations, agencies, and institutions, or individuals in the United States or foreign countries, including Government agencies of the United States and of foreign countries, qualified by training and experience to achieve the results desired, (2) strengthening the research staff of organizations, particularly nonprofit organizations, in the States, Territories, possessions, and the District of Columbia, (3) aiding institutions, agencies, or organizations which, if aided, will advance basic research, and (4) encourage independent basic research by individuals.

(h) Funds available to any department or agency of the Government for scientific or technical research, or the provision of facilities therefor, shall be available for transfer, with the approval of the head of the department or agency involved, in whole or in part, to the Foundation for such use as is consistent with the purposes for which such funds were provided, and funds so transferred shall be expendable by the Foundation for the purposes for which the transfer was made, and, until such time as an appropriation is made available directly to the Foundation, for general administrative expenses of the Foundation without regard to limitations otherwise applicable to such funds.

(i) The National Roster of Scientific and Specialized Personnel shall be transferred from the United States Employment Service to the Foundation, together with such records and property as have been utilized or are available for use in the administration of such roster as may be determined by the President. The transfer provided for in this subsection shall take effect at such time or times as the President shall direct.

SECURITY PROVISIONS (42 U.S.C. § 1874)

SEC. 16.[24] (a) The Foundation shall not support any research or development activity in the field of nuclear energy, nor shall it exercise any authority pursuant to section 11(e) in respect to that field, without first having obtained the concurrence of the Atomic Energy Commission that such activity will not adversely affect the common defense and security. To the extent that such activity involves restricted data as defined in the Atomic Energy Act of 1946 the provisions of that Act regarding the control of the dissemination of restricted data and the security clearance of those individuals to be given access to restricted data shall be applicable. Nothing in this Act shall supersede or modify any provision of the Atomic Energy Act of 1946.

(b)(1) In the case of scientific or technical research activities under this Act in connection with matters relating to the national defense, with respect to which

(See footnote 24, p. 120.)

[25] The Act of September 8, 1959 (P.L. 86-232; 73 Stat. 467) amended this paragraph (d) by substituting "$50" for "$25."

funds have been transferred to the Foundation from the Department of Defense in accordance with the provisions of section 15(h) of this Act, the Secretary of Defense shall establish such security requirements and safeguards, including restrictions with respect to access to information and property, as he deems necessary.

(2) In the case of scientific research activities under this Act in connection with matters relating to the national defense other than research activities referred to in paragraph (1) of this subsection, the Foundation shall establish such security requirements and safeguards, including restrictions with respect to access to information and property, as it deems necessary.

(3) Any agency of the Government exercising investigatory functions is hereby authorized to make such investigations and reports as may be requested by the Foundation in connection with the enforcement of security requirements and safeguards, including restrictions with respect to access to information and property, established under paragraph (1) or (2) of this subsection.

(c) No employee of the Foundation shall be permitted to have access to information or property with respect to which access restrictions have been established under section (b)(1) or (2) until the Civil Service Commission [26] shall have made an investigation into the character, associations, and loyalty of such individual and shall have reported the findings of said investigation to the Foundation, and the Foundation shall have determined that permitting such individual to have access to such information or property will not endanger the common defense and security.

(d)(1) No part of any funds appropriated or otherwise made available for expenditure by the Foundation under authority of this Act shall be used to make payments under any scholarship or fellowship awarded to any individual under section 10, unless such individual—

(A) has taken and subscribed to an oath or affirmation in the following form: "I do solemnly swear (or affirm) that I bear true faith and allegiance to the United States of America and will support and defend the Constitution and laws of the United States against all its enemies, foreign and domestic"; and

(B) has provided the Foundation (in the case of applications made on or after October 1, 1962) with a full statement regarding any crimes of which he has ever been convicted (other than crimes committed before attaining sixteen years of age and minor traffic violations for which a fine of $25 or less was imposed) and regarding any criminal charges punishable by confinement of thirty days or more which may be pending against him at the time of his application for such scholarship or fellowship.

The provisions of section 1001 of title 18, United States Code, shall be applicable with respect to the oath or affirmation and statement herein required.

(2)(A) When any Communist organization, as defined in paragraph (5) of section 3 of the Subversive Activities Control Act of 1950, is registered or there is in effect a final order of the Subversive Activities Control Board requiring such organization to register, it shall be unlawful for any member of such organization with knowledge or notice that such organization is so registered or that such order has become final (i) to make application for any scholarship or fellowship which is to be awarded from funds part or all of which are appropriated or otherwise made available for expenditure under the authority of section 10 of this Act or (ii) to use or attempt to use any such award.

(B) Whoever violates subparagraph (A) of this paragraph shall be fined not more than $10,000, or imprisoned not more than five years, or both.[27]

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[26] The Act of April 5, 1952 (P.L. 82-298; 66 Stat. 43) amended this paragraph (c) by substituting the words "Civil Service Commission" for "Federal Bureau of Investigation."

[27] The Act of October 16, 1962 (P.L. 87-835; 76 Stat. 1069) amended paragraph (d) by striking out the requirement that the individual shall have executed an affidavit that "he does not believe in, and is not a member of and does not support any organization that believes in or teaches, the overthrow of the United States Government by force or violence or by any illegal or unconstitutional methods," and by adding the provisions of sections (1)(B) and (2) (A) and (B).

Paragraph (d) formerly read as follows:

"(d) No part of any funds appropriated or otherwise made available for expenditure by the Foundation under authority of this Act shall be used to make payments under any scholarship or fellowship to any individual unless such individual (1) has executed and filed with the Foundation an affidavit that he does not believe in, and is not a member of and does not support any organization that believes in or teaches, the overthrow of the United States Government by force or violence or by any illegal or unconstitutional methods, and (2) has taken and subscribed to an oath or affirmation in the following form: "I do solemnly swear (or affirm) that I will bear true faith and allegiance to the United States of America and will support and defend the Constitution and laws of the United States against all its enemies, foreign and domestic." The provisions of section 1001 of title 18, United States Code, shall be applicable with respect to such affidavits."

APPROPRIATIONS (42 U.S.C. § 1875)

SEC. 17.[24] (a) To enable the Foundation to carry out its powers and duties, there is hereby authorized to be appropriated to the Foundation, out of any money in the Treasury not otherwise appropriated, such sums as may be necessary to carry out the provisions of this Act.[28]

(b) Appropriations made pursuant to the authority provided in subsection (a) of this section shall remain available for obligation, for expenditure, or for obligation and expenditure, for such period or periods as may be specified in the Acts making such appropriations.

Approved May 10, 1950.

SECTION II

REORGANIZATION PLAN NO. 2 OF 1962 (76 STAT. § 1253)

Prepared by the President and transmitted to the Senate and the House of Representatives in Congress assembled, March 29, 1962, pursuant to the provisions of the Reorganization Act of 1949, 63 Stat. 203, as amended.

CERTAIN SCIENCE AGENCIES AND FUNCTIONS

PART I. OFFICE OF SCIENCE AND TECHNOLOGY

SEC. 1. *Office of Science and Technology.* There is hereby established in the Executive Office of the President the Office of Science and Technology, hereafter in this Part referred to as the Office.

SEC. 2. *Director and deputy.* (a) There shall be at the head of the Office the Director of the Office of Science and Technology, hereafter in this Part referred to as the Director. The Director shall be appointed by the President by and with the advice and consent of the Senate and shall receive compensation at the rate of $22,500 per annum.

(b) There shall be in the Office a Deputy Director of the Office of Science and Technology, who shall be appointed by the President by and with the advice and consent of the Senate and receive compensation at the rate of $20,500 per annum. The Deputy Director shall perform such functions as the Director may from time to time prescribed and shall act as Director during the absence or disability of the Director or in the event of vacancy in the office of Director.

(c) No person shall while holding office as Director or Deputy Director engage in any other business, vocation, or employment.

SEC. 3. *Transfer and performance of functions.* (a) There are hereby transferred from the National Science Foundation to the Director:

(1) So much of the functions conferred upon the Foundation by the provisions of section 3(a)(1) of the National Science Foundation Act of 1950 (42 U.S.C. 1862(a)(1)) as will enable the Director to advise and assist the President in achieving coordinated Federal policies for the promotion of basic research and education in the sciences.

(2) The functions conferred upon the Foundation by that part of section 3(a)(6) of the National Science Foundation Act of 1950 (42 U.S.C. 1862(a)(6)) which reads as follows: "to evaluate scientific research programs undertaken by agencies of the Federal Government."

(b) In carrying out the functions transferred by the provisions of section 3(a) of this reorganization plan, the Director shall assist the President as he may request with respect to the coordination of Federal scientific and technological functions and agencies.

(c) The Director may from time to time make such provisions as he deems appropriate authorizing the performance of any of his functions by any other officer, or by any employee or agency, of the Office.

SEC. 4. *Personnel.* The Director may appoint employees necessary for the work of the Office under the classified civil service and fix their compensation in accordance with the classification laws.

PART II. NATIONAL SCIENCE FOUNDATION

SEC. 21. *Executive Committee.* (a) There is hereby established the Executive Committee of the National Science Board, hereafter in this Part referred to as the Executive Committee, which shall be composed of five voting members. Four

(See footnote 24, p. 120.)

[28] The Act of August 8, 1953 (P.L. 83-223; 67 Stat. 488) amended this paragraph (a) by substituting the wording: "such sums as may be necessary to carry out the provisions of this Act" for the previous language: "not to exceed $500,000 for the fiscal year ending June 30, 1951, and not to exceed $15,000,000 for each fiscal year thereafter."

of the members shall be elected as hereinafter provided. The Director provided for in section 22 of this reorganization plan, ex officio, shall be the fifth member and the chairman of the Executive Committee.

(b) At its annual meeting held in 1964 and at each of its succeeding annual meetings the National Science Board, hereafter in this Part referred to as the Board, shall elect two of its members as members of the Executive Committee, and the Executive Committee members so elected shall hold office for two years from the date of their election. Any person who has been a member of the Executive Committee (established by this reorganization plan) for six consecutive years shall thereafter be ineligible for service as a member thereof during the two-year period following the expiration of such sixth year. For the purposes of this subsection, the period between any two consecutive annual meetings of the Board shall be deemed to be one year.

(c) At its first meeting held after the effective date of this section the Board shall elect four of its members as members of the Executive Committee. As designated by the Board, two of the Executive Committee members so elected shall hold office as such members until the date of the annual meeting of the Board held in 1964 and the other two members so elected shall hold such office until the annual meeting of the Board held in 1965.

(d) Any person elected as a member of the Executive Committee to fill a vacancy occurring prior to the expiration of the term for which his predecessor was elected shall be elected for the remainder of such term.

(e) The functions conferred upon the Executive Committee now existing under the provisions of the National Science Foundation Act of 1950, by the provisions of section 6 of the National Science Foundation Act of 1950 (42 U.S.C. 1865) or otherwise, are hereby transferred to the Executive Committee established by the provisions of this Part; and the authority of the National Science Board to assign its powers and functions to the now-existing Executive Committee, and statutory limitations upon such assignment, shall hereafter be applicable to the Executive Committee established by the provisions of this Part.

SEC. 22. *Director.* (a) There is hereby established in the National Science Foundation a new office with the title of Director of the National Science Foundation. The Director of the National Science Foundation, hereafter in this Part referred to as the Director, shall be appointed by the President by and with the advice and consent of the Senate. Before any person is appointed as Director the President shall afford the Board an opportunity to make recommendations to him with respect to such appointment. The Director shall receive compensation at the rate of $21,000 per annum and shall serve for a term of six years unless sooner removed by the President. The Director shall not engage in any business, vocation or employment other than that of serving as such Director, nor shall he, except with the approval of the Board, hold any office in, or act in any capacity for, any organization, agency or institution with which the Foundation makes any contract or other arrangement under the National Science Foundation Act of 1950.

(b) Except to the extent inconsistent with the provisions of section 23(b) (2) of this reorganization plan, all functions of the office of Director of the National Science Foundation abolished by the provisions of section 23(a) (2) hereof are hereby transferred to the office of Director established by the provisions of subsection (a) of this section.

(c) The Director, ex officio, shall be an additional member of the Board and, except in respect of compensation and tenure, shall be coordinate with other members of the Board. He shall be a voting member of the Board and shall be eligible for election by the Board as chairman or vice chairman of the Board.

SEC. 23. *Abolitions.* (a) The following agencies, now existing under the National Science Foundation Act of 1950, are hereby abolished:

(1) The Executive Committee of the National Science Board (section 6 of Act; 42 U.S.C. 1865).

(2) The office of Director of the National Science Foundation (sections 2 and 5 of Act; 42 U.S.C. 1861; 1864).

(b) There are also hereby abolished:

(1) The functions conferred upon the National Science Board by that part of section 6(a) of the National Science Foundation Act of 1950 (42 U.S.C. 1865(a)) which reads "The Board is authorized to appoint from among its members an Executive Committee".

(2) The functions of the Director of the National Science Foundation provided for in sections 4(a) and 5(a) of the National Science Foundation Act of 1950 (42 U.S.C. 1863(a); 1864(a)) with respect to serving as a nonvoting member of

the Board and his functions with respect to serving as a nonvoting member of the Executive Committee provided for in section 6(b) of that Act (42 U.S.C. 1865(b)).

(3) So much of the functions conferred upon divisional committees by the provisions of section 8(d) of the National Science Foundation Act of 1950 (42 U.S.C. 1867(d)) as consists of making recommendations to, and advising and consulting with, the Board.

(c) The provisions of sections 23(a) (1) 23(b) (1) hereof shall become effective on the date of the first meeting of the Board held after the effective date of the other provisions of this reorganization plan.

PART III. TRANSITIONAL PROVISIONS

SEC. 31. *Incidental transfers.* (a) So much of the personnel, property, records, and unexpended balances of appropriations, allocations, and other funds employed, held, used, available, or to be made available, in connection with the functions transferred by the provisions of section 3 of this reorganization plan as the Director of the Bureau of the Budget shall determine shall be transferred to the Office of Science and Technology at such time or times as the said Director shall direct.

(b) Such further measures and dispositions as the Director of the Bureau of the Budget shall deem to be necessary in order to effectuate the transfers provided for in subsection (a) of this section shall be carried out in such manner as he shall direct and by such agencies as he shall designate.

SEC. 32. *Interim officers.* (a) The President may authorize any person who immediately prior to the effective date of Part 1 of this reorganization plan holds a position in the Executive Office of the President to act as Director of the Office of Science and Technology until the office of Director is for the first time filled pursuant to the provisions of this reorganization plan or by recess appointment, as the case may be.

(b) The President may authorize any person who immediately prior to the effective date of section 22 of this reorganization plan holds any office existing under the provisions of the National Science Foundation Act of 1950 to act as Director of the National Science Foundation until the office of Director is for the first time filled pursuant to the provisions of this reorganization plan or by recess appointment, as the case may be.

(c) The President may authorize any person who serves in an acting capacity under the foregoing provisions of this section to receive the compensation attached to the office in respect of which he so serves. Such compensation, if authorized, shall be in lieu of, but not in addition to, other compensation from the United States to which such person may be entitled.

SECTION III

(PUBLIC LAW 864—85TH CONGRESS)

TITLE IX—SCIENCE INFORMATION SERVICE

FUNCTIONS OF THE SERVICE (42 U.S.C. § 1876)

SEC. 901. The National Science Foundation shall establish a Science Information Service. The Foundation, through such Service, shall (1) provide, or arrange for the provision of, indexing, abstracting, translating, and other services leading to a more effective dissemination of scientific information, and (2) undertake programs to develop new or improved methods, including mechanzied systems, for making scientific information available.

SCIENCE INFORMATION COUNCIL (42 U.S.C. § 1877)

SEC. 902. (a) The National Science Foundation shall establish, in the Foundation, a Science Information Council (hereafter in this title referred to as the "Council") consisting of the Librarian of Congress, the director of the National Library of Medicine, the director of the Department of Agriculture library, and the head of the Science Information Service, each of whom shall be ex officio members, and fifteen members appointed by the Director of the National Science Foundation. The Council shall annually elect one of the appointed members to serve as chairman until the next election. Six of the appointed members shall be leaders in the fields of fundamental science, six shall be leaders in the fields of librarianship and scientific documentation, and three shall be outstanding representatives of the lay public who have demonstrated interest in the problems of

communication. Each appointed member of such Council shall hold office for a term of four years, except that (1) any member appointed to fill a vacancy occurring prior to the expiration of the term for which his predecessor was appointed shall be appointed only for the remainder of such term, and (2) that of the members first appointed, four shall hold office for a term of three years, four shall hold office for a term of two years, and three shall hold office for a term of one year, as designated by the Director of the National Science Foundation at the time of appointment. No appointed member of the Council shall be eligible for reappointment until a year has elapsed since the end of his preceding term.

(b) It shall be the duty of the Council to advise, to consult with, and to make recommendations to, the head of the Science Information Service. The Council shall meet at least twice each year, and at such other times as the majority thereof deems appropriate.

(c) Persons appointed to the Council shall, while serving on business of the Council, receive compensation at rates fixed by the National Science Foundation, but not to exceed $50 per day, and shall also be entitled to receive an allowance for actual and necessary travel and subsistence expenses while so serving away from their places of residence.

AUTHORITY FOR CERTAIN GRANTS AND CONTRACTS (42 U.S.C. § 1878)

SEC. 903. In carrying out its functions under this title, the National Science Foundation shall have the same power and authority it has under the National Science Foundation Act of 1950 to carry out its functions under that Act.

APPROPRIATIONS AUTHORIZED (42 U.S.C. § 1879)

SEC. 904. There are hereby authorized to be appropriated for the fiscal year ending June 30, 1959, and for each succeeding fiscal year, such sums as may be necessary to carry out the provisions of this title.

SECTION IV

REORGANIZATION PLAN NO. 5 OF 1965

Prepared by the President and transmitted to the Senate and the House of Representatives in Congress assembled, May 27, 1965, pursuant to the provisions of the Reorganization Act of 1949, 63 Stat. 203, as amended

NATIONAL SCIENCE FOUNDATION

SECTION 1. *Abolition of committees.* There are hereby abolished all functions of the (divisional) committees provided for in section 8 of the National Science Foundation Act of 1950 (64 Stat. 152; 42 U.S.C. 1867), all functions with respect to the appointment of committees under that section, and all committees now existing under that section. The Director of the National Science Foundation shall make such provisions as he shall deem necessary respecting the winding up of any outstanding affairs of the committees abolished by this section.

SEC. 2. *Authority to delegate.* The Director of the National Science Foundation may from time to time make such provisions as he shall deem appropriate authorizing the performance by any other officer, or by any agency or employee, of the National Science Foundation of any of his functions (including functions delegated to him by the National Science Board).

TEXT OF H.R. 14838, 89TH CONG., 2D SESS.

A BILL To amend the National Science Foundation Act of 1950 to make changes and improvements in the organization and operation of the Foundation, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 3 of the National Science Foundation Act of 1950 is amended to read as follows:

"FUNCTIONS OF THE FOUNDATION

"SEC. 3. (a) The Foundation is authorized and directed—

"(1) to initiate and support basic scientific research and programs to strengthen scientific research potential in the mathematical, physical, medical, biological, engineering, social, and other sciences, by making contracts or other arrangements (including grants, loans, and other forms of assistance) to support such scientific activities and to appraise the impact of research upon industrial development and upon the general welfare;

"(2) to award, as provided in section 10, scholarships and graduate fellowships in the mathematical, physical, medical, biological, engineering, social, and other sciences;

"(3) to foster the interchange of scientific information among scientists in the United States and foreign countries;

"(4) to evaluate the status and needs of the various sciences as evidenced by programs, projects, and studies undertaken by agencies of the Federal Government, by individuals, and by public and private research groups, employing by grant or contract such consulting services as it may deem necessary for the purpose of such evaluations; and to take into consideration the results of such evaluations in correlating the research and educational programs undertaken or supported by the Foundation with programs, projects, and studies undertaken by agencies of the Federal Government, by individuals, and by public and private research groups;

"(5) to maintain a current register of scientific and technical personnel, and in other ways to provide a central clearinghouse for the collection, interpretation, and analysis of data on the availability of, and the current and projected need for, scientific and technical resources in the United States, including its territories and possessions, and to provide a source of information for policy formulation by other agencies of the Federal Government; and

"(6) to initiate and maintain a program for the determination of the total amount of money for scientific research, including money allocated for the construction of the facilities wherein such research is conducted, received by each educational institution, nonprofit organization and private contractor in the United States, including its territories and possessions, by grant, contract, or other arrangement from agencies of the Federal Government, and to report annually thereon to the President and the Congress.

"(b) When requested by the Secretary of State or the Secretary of Defense, the Foundation is authorized to initiate and support specific scientific activities in connection with matters relating to international cooperation or national security by making contracts or other arrangements (including grants, loans, and other forms of assistance) for the conduct of such scientific activities.

"(c) In addition to the authority contained in subsections (a) and (b), the Foundation is authorized to initiate and support scientific research, including applied research, at academic and other nonprofit institutions. When so directed by the President, the Foundation is further authorized to support, through other appropriate organizations, applied scientific research relevant to national problems involving the public interest. In exercising the authority contained in this subsection, the Foundation may employ by grant or contract such consulting services as it deems necessary, and shall coordinate and correlate its activities

with respect to any such problem with other agencies of the Federal Government undertaking similar programs in that field.

"(d) The Board shall recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences.

"(e) In exercising the authority and discharging the functions referred to in the foregoing subsections, it shall be one of the objectives of the Foundation to strengthen research and education in the sciences, including independent research by individuals, throughout the United States, including its territories and possessions, and to avoid undue concentration of such research and education.

"(f) The Foundation shall render an annual report to the President for submission on or before the 15th day of January of each year to the Congress, summarizing the activities of the Foundation and making such recommendations as it may deem appropriate. Such report shall include information as to the acquisition and disposition by the Foundation of any patents and patent rights."

SEC. 2. Section 4 of the National Science Foundation Act of 1950 is amended to read as follows:

"NATIONAL SCIENCE BOARD

"SEC. 4. (a) The Board shall consist of twenty-four members to be appointed by the President, by and with the advice and consent of the Senate, and of the Director ex officio. In addition to any powers and functions otherwise granted to it by this Act, the Board shall establish and be reponsible for the policies of the Foundation.

"(b) The Board shall have an Executive Committee as provided in section 7, and may delegate to it or to the Director or both such of the powers and functions granted to the Board by this Act as it deems appropriate.

"(c) The persons nominated for appointment as members of the Board (1) shall be eminent in the fields of the basic, medical or social sciences, engineering, agriculture, education, or public affairs; (2) shall be selected solely on the basis of established records of distinguished service; and (3) shall be so selected as to provide representation of the views of scientific leaders in all areas of the Nation. The President is requested, in the making of nominations of persons for appointment as members, to give due consideration to any recommendations for nomination which may be submitted to him by the National Academy of Sciences, the National Association of State Universities and Land Grant Colleges, the Association of American Universities, the Association of American Colleges, or by other scientific or educational organizations.

"(d) The term of office of each member of the Board shall be six years; except that any member appointed to fill a vacancy occurring prior to the expiration of the term for which his predecessor was appointed shall be appointed for the remainder of such term. Any person, other than the Director, who has been a member of the Board for twelve consecutive years shall thereafter be ineligible for appointment during the two-year period following the expiration of such twelfth year.

"(e) The Board shall meet annually on the third Monday in May unless, prior to May 10 in any year, the Chairman has set the annual meeting for a day in May other than the third Monday, and at such other times as the Chairman may determine, but he shall also call a meeting whenever one-third of the members so request in writing. A majority of the members of the Board shall constitute a quorum. Each member shall be given notice, by registered mail or certified mail mailed to his last known address of record not less than fifteen days prior to any meeting, of the call of such meeting.

"(f) The election of the Chairman and Vice Chairman of the Board shall take place every second annual meeting. The Vice Chairman shall perform the duties of the Chairman in his absence. In case a vacancy occurs in the chairmanship or vice chairmanship, the Board shall elect a member to fill such vacancy.

"(g) The Board shall render an annual report to the President, for submission on or before the 31st day of January of each year to the Congress, on the status and health of science and its various disciplines. Such report shall include an assessment of such matters as national scientific resources and trained manpower, progress in selected areas of basic scientific research, and an indication of those aspects of such progress which might be applied to the needs of American society. The report may include such recommendations as the Board may deem timely and appropriate.

"(h) The Board may, with the concurrence of a majority of its members, permit the appointment of a staff consisting of not more than five professional staff members and such clerical staff members as may be necessary. Such staff shall be appointed by the Director and assigned at the direction of the Board. The professional members of such staff may be appointed without regard to the

civil service laws or the Classification Act of 1949 and compensated at a rate not exceeding the appropriate rate provided for individuals in grade 15 of the General Schedule of the Classification Act of 1949, as may be necessary to provide for the performance of such duties as may be prescribed by the Board in connection with the exercise of its powers and functions under this Act. Each appointment under this subsection shall be subject to the same security requirements as those required for personnel of the Foundation appointed under section 14(a).

"(i) The Board is authorized to establish such special commissions as it may from time to time deem necessary for the purposes of this Act.

"(j) The Board is also authorized to appoint from among its members such committees as it deems necessary, and to assign to committees so appointed such survey and advisory functions as the Board deems appropriate to assist it in exercising its powers and functions under this Act."

SEC. 3. Section 5 of the National Science Foundation Act of 1950 is amended to read as follows:

"DIRECTOR OF THE FOUNDATION

"SEC. 5. (a) The Director of the Foundation (referred to in this Act as the 'Director') shall be appointed by the President, by and with the advice and consent of the Senate. Before any person is appointed as Director, the President shall afford the Board an opportunity to make recommendations to him with respect to such appointment. The Director shall receive compensation at the rate provided for level II of the Federal Executive Salary Schedule and shall serve for a term of six years unless sooner removed by the President.

"(b) Except as otherwise specifically provided in this Act (1) the Director shall exercise all of the authority granted to the Foundation by this Act (including any powers and functions which may be delegated to him by the Board), and (2) all actions taken by the Director pursuant to the provisions of this Act (or pursuant to the terms of a delegation from the Board) shall be final and binding upon the Foundation.

"(c) The Director may from time to time make such provisions as he deems appropriate authorizing the performance by any other officer, agency, or employee of the Foundation of any of his functions under this Act, including functions delegated to him by the Board; except that the Director may not redelegate policymaking functions delegated to him by the Board.

"(d) The Director shall not make any contract, grant, or other arrangement pursuant to section 11(c) without the prior approval of the Board if such contract, grant, or other arrangement involves a new type of program, or involves a total commitment of over $2,000,000, or over $500,000 in any one year, or a commitment of such other amount or amounts and subject to such other conditions as the Board in its discretion may determine and publish in the Federal Register.

"(e) The Director, in his capacity as ex officio member of the Board, shall, except with respect to compensation and tenure, be coordinate with the other members of the Board. He shall be a voting member of the Board and shall be eligible for election by the Board as Chairman or Vice Chairman of the Board."

SEC. 4. The National Science Foundation Act of 1950 is further amended by striking out section 8, by redesignating sections 6 and 7 as sections 7 and 8, respectively, and by inserting after section 5 the following new section:

"DEPUTY DIRECTOR AND ASSISTANT DIRECTORS

"SEC. 6. (a) There shall be a Deputy Director of the Foundation (referred to in this Act as the 'Deputy Director'), who shall be appointed by the President, by and with the advice and consent of the Senate. Before any person is appointed as Deputy Director, the President shall afford the Board and the Director an opportunity to make recommendations to him with respect to such appointment. The Deputy Director shall receive compensation at the rate provided for level III of the Federal Executive Salary Schedule and shall perform such duties and exercise such powers as the Director may prescribe. The Deputy Director shall act for, and exercise the powers of, the Director during the absence or disability of the Director or in the event of a vacancy in the office of Director.

"(b) There shall be four Assistant Directors of the Foundation (each referred to in this Act as an 'Assistant Director'), who shall be appointed by the President, by and with the advice and consent of the Senate. Before any person is appointed as an Assistant Director, the President shall afford the Board and the Director an opportunity to make recommendations to him with respect to such appointment. Each Assistant Director shall receive compensation at the rate provided for level V of the Federal Executive Salary Schedule and shall perform such duties and exercise such powers as the Director may prescribe."

SEC. 5. The section of the National Science Foundation Act of 1950 redesignated as section 7 by section 4 of this Act is amended to read as follows:

"EXECUTIVE COMMITTEE

"SEC. 7. (a) There shall be an Executive Committee of the Board, (referred to in this Act as the 'Executive Committee'), which shall be composed of five members and shall exercise such powers and functions as may be delegated to it by the Board. Four of the members shall be elected as provided in subsection (b), and the Director ex officio shall be the fifth member and the chairman of the Executive Committee.

"(b) At each of its annual meetings the Board shall elect two of its members as members of the Executive Committee, and the Executive Committee members so elected shall hold office for two years from the date of their election. Any person, other than the Director, who has been a member of the Executive Committee for six consecutive years shall thereafter be ineligible for service as a member thereof during the two-year period following the expiration of such sixth year. For the purposes of this subsection, the period between any two consecutive annual meetings of the Board shall be deemed to be one year.

"(c) Any person elected as a member of the Executive Committee to fill a vacancy occurring prior to the expiration of the term for which his predecessor was elected shall be elected for the remainder of such term.

"(d) The Executive Committee shall render an annual report to the Board, and such other reports as it may deem necessary, summarizing its activities and making such recommendations as it may deem appropriate. Minority views and recommendations, if any, of members of the Executive Committee shall be included in such reports."

SEC. 6. The section of the National Science Foundation Act of 1950 redesignated as section 8 by section 4 of this Act is amended to read as follows:

"DIVISIONS WITHIN THE FOUNDATION

"SEC. 8. There shall be within the Foundation such Divisions as the Director, in consultation with the Board, may from time to time determine."

SEC. 7. Section 9(a) of the National Science Foundation Act of 1950 is amended by striking out "section 3(a) (7)" and inserting in lieu thereof "section 4(i)".

SEC. 8. Section 10 of the National Science Foundation Act of 1950 is amended—

(1) by striking out "section 17" and inserting in lieu thereof "section 16"; and

(2) by inserting "social," after "engineering,":

SEC. 9. (a) Section 11(c) of the National Science Foundation Act of 1950 is amended—

(1) by striking out "basic";

(2) by striking out "research" each place it appears;

(3) by inserting "Secretary of State or" before "Secretary of Defense"; and

(4) by striking out "the national defense" and inserting in lieu thereof "international cooperation or national security".

(b) Section 11(d) of such Act is amended by striking out "research" and inserting in lieu thereof "activities".

SEC. 10. Section 13(a) of the National Science Foundation Act of 1950 is amended—

(1) by striking out ", with the approval of the Board,"; and

(2) by striking out "section 16(d) (2)" and inserting in lieu thereof "section 15(d) (2)".

SEC. 11. Section 14 of the National Science Foundation Act of 1950 is repealed.

SEC. 12. (a) Section 15 of the National Science Foundation Act of 1950 is redesignated as section 14, and is amended to read as follows:

"MISCELLANEOUS PROVISIONS

"SEC. 14. (a) The Director shall, in accordance with such policies as the Board shall from time to time prescribe, appoint and fix the compensation of such personnel as may be necessary to carry out the provisions of this Act. Except as provided in section 4(h), such appointments shall be made and such compensation shall be fixed in accordance with the provisions of the civil service laws and regulations and the Classification Act of 1949: *Provided*, That the Director may, in accordance with such policies as the Board shall from time to time prescribe, employ such technical and professional personnel and fix their compensation, without regard to such laws, as he may deem necessary for the dis-

charge of the responsibilities of the Foundation under this Act. The members of the special commissions shall be appointed without regard to the civil service laws or regulations.

"(b) Neither the Director, the Deputy Director, nor any Assistant Director shall engage in any other business, vocation, or employment while serving in such position; nor shall the Director, the Deputy Director, or any Assistant Director, except with the approval of the Board, hold any office in, or act in any capacity for, any organization, agency, or institution with which the Foundation makes any grant, contract, or other arrangement under this Act.

"(c) The Foundation shall not, itself, operate any laboratories or pilot plants.

"(d) The members of the Board and the members of each special commission shall receive compensation at the rate of $100 for each day engaged in the business of the Foundation pursuant to authorization of the Foundation and shall be allowed travel expenses as authorized by section 5 of the Act of August 2, 1946 (5 U.S.C. 73b–2).

"(e) Persons holding other offices in the executive branch of the Federal Government may serve as members of the special commissions, but they shall not receive remuneration for their services as such members during any period for which they receive compensation for their services in such other offices.

"(f) In making contracts or other arrangements for scientific research, the Foundation shall utilize appropriations available therefor in such manner as will in its discretion best realize the objectives of (1) having the work performed by organizations, agencies, and institutions, or individuals in the United States or foreign countries, including Government agencies of the United States and of foreign countries, qualified by training and experience to achieve the results desired, (2) strengthening the research staff of organizations, particularly nonprofit organizations, in the States, territories, possessions, and the District of Columbia, (3) aiding institutions, agencies, or organizations which, if aided, will advance scientific research, and (4) encouraging independent scientific research by individuals.

"(g) Funds available to any department or agency of the Government for scientific or technical research, or the provision of facilities therefor, shall be available for transfer, with the approval of the head of the department or agency involved, in whole or in part, to the Foundation for such use as is consistent with the purposes for which such funds were provided, and funds so transferred shall be expendable by the Foundation for the purposes for which the transfer was made."

SEC. 13. Sections 16 and 17 of the National Science Foundation Act of 1950 are redesignated as sections 15 and 16, respectively. Subsection (a) of the section redesignated as section 15 is amended by striking out "1946" each place it appears and inserting in lieu thereof "1954". Subsection (b) of the section redesignated as section 15 is amended by striking out "section 15(h)" in paragraph (1) and inserting in lieu thereof "section 14(g)".

SEC. 14. (a)(1) Section 303(b) of the Federal Executive Salary Act of 1964 is amended by adding at the end thereof the following new paragraph:

"(20) Director of the National Science Foundation."

(2) Section 303(c) of such Act is amended by striking out paragraph (41), and by adding at the end thereof the following new paragraph:

"(47) Deputy Director, National Science Foundation."

(3) Section 303(e) of such Act is amended by striking out paragraph (66), and by adding at the end thereof the following new paragraph:

"(101) Assistant Directors, National Science Foundation (4)."

(4) The amendments made by this subsection (and the amendments made by sections 3 and 4 of this Act insofar as they relate to rate of compensation) shall take effect on the first day of the first calendar month which begins on or after the date of the enactment of this Act.

(b) Section 902(c) of the National Defense Education Act of 1958 is amended by striking out "$50" and inserting in lieu thereof "$100".

SEC. 15. Except as otherwise specifically provided therein, the amendments made by this Act are intended to continue in effect under the National Science Foundation Act of 1950 the existing offices, procedures, and organization of the National Science Foundation as provided by such Act, part II of Reorganization Plan Numbered 2 of 1962, and Reorganization Plan Numbered 5 of 1965. From and after the date of the enactment of this Act, part II of Reorganization Plan Numbered 2 of 1962, and Reorganization Plan Numbered 5 of 1965, shall be of no force or effect; but nothing in this Act shall alter or affect any transfers of functions made by part I of such Reorganization Plan Numbered 2 of 1962.

APPENDIX B

The Evolution of the National Science Board

A strong Board type organization with a Director as executive officer was the predominant choice of persons who went on record on this subject during the period preceding the passage of the National Science Foundation Act of 1950. Nevertheless, there was also a considerable degree of support for the opposite form of organization; namely, a Director in charge of the Foundation's policies and operations, assisted by a Board serving in an advisory capacity. The fact that there were strong supporters for each position resulted in a considerable amount of discussion of the strengths and weaknesses or advantages and disadvantages of both.

The initial proposal for a National Research Foundation is commonly attributed to the recommendations of Dr. Vannevar Bush, Director of the Office of Scientific Research and Development, in a report to the President, presented in July 1945, on the general subject of postwar science organization. The report, Science: the Endless Frontier, was comprised of Dr. Bush's final report, and included as appendixes were the reports of four committees which had been appointed to examine different aspects of the general problem. The Committee on Science and the Public Welfare, under the chairmanship of Dr. Isaiah Bowman, considered the question, "What can the Government do now and in the future to aid research activities by public and private organizations?"

The Bowman Committee report, submitted in April 1945, recommended the creation of a National Research Foundation controlled by a 15-member part-time Board, composed of "eminent men who are cognizant of the needs of science, and experienced in administration." The Board was to have power to appoint an executive director who would be a full-time officer. Powers and responsibilities of the proposed Foundation were enumerated in some detail, but there appears to have been no discussion as to why the Committee chose to recommend that control be placed in the hands of a Board rather than in a single officer.

The recommendation for a National Research Foundation which Dr. Bush included in his final report retained the control in a multiple body, which he referred to as National Research Foundation members, with the chief executive officer to be a Director appointed by the Members. From the enumeration of functions, powers, and duties of the members of the Foundation, there is no doubt that he intended that control was to be vested in them.

In a concluding section entitled "Action by Congress," Dr. Bush discussed briefly the reasoning for the form of organization which he had recommended:

"The National Research Foundation herein proposed meets the urgent need of the days ahead. The form of the organization is the result of considerable deliberation. The form is important. The very successful pattern of organization of the National Advisory Committee for Aeronautics, which has promoted basic research on problems of flight during the past 30 years, has been carefully considered in proposing the method of appointment of members of the Foundation and in defining their responsibilities. * * *"

On July 19, 1945, companion bills, S. 1285 and H.R. 3852, which followed the recommendations of the Bush report, were introduced by Senator Warren Magnuson and Representative Wilbur Mills. Four days later, S. 1297 was introduced by Senators Kilgore, Johnson, and Pepper. It differed from the Magnuson and Mills bills in many respects. In contrast to S. 1285, which vested power in a nine-member Board, with authority to appoint a Director, S. 1297 vested power in a Director appointed by the President, with a 16-member Board, half Government officials, half public members, to act in an advisory capacity.

S. 1297 followed the findings and recommendations in a report of the Subcommittee on War Mobilization to the Senate Military Affairs Committee which was based on an investigation initiated in the closing months of the 77th Congress into the Government's wartime research and development effort and the problems of reconversion.

In a message to Congress of September 6, 1945, President Truman urged that Congress adopt legislation for the establishment of a single Federal research agency, but he said nothing concerning the form such an agency should take other than that it discharge certain functions which he listed.

During October and early November 1945, joint hearings were held on both the Magnuson and the Kilgore bills by the Subcommittee on War Mobilization of the Senate Committee on Military Affairs. Since introduction, Senator Kilgore's bill had been revised to incorporate the major provisions recommended in the President's message, in Dr. Bush's report, and in previously published reports of the subcommittee. Approximately 100 witnesses gave testimony with advocates for both sides. An analytical summary of testimony was prepared by the Subcommittee in December 1945, which included a section on the administrative organization of the proposed Foundation, and presented in condensed form and by categories, the views of the witnesses on this subject.

S. 1720, a new version of S. 1297, was introduced in December 1945; in February 1946, S. 1850, a compromise version of S. 1720 was introduced. S. 1850, providing for an Administrator and an Advisory Board, passed the Senate on July 3, 1946. No further action was taken on the bill.

In October 1946, President Truman appointed John R. Steelman Chairman of a President's Scientific Research Board to make a study of Federal research programs, of non-Federal research and development and training facilities, and of the interrelation of Federal and non-Federal research and development.

The legislative history of S. 526, the bill which finally passed both Houses of Congress on July 22, 1947, and which was pocket vetoed by President Truman, is very complicated. Introduced by Senator Alexander Smith, in February 1947, the bill originally provided for a 24-member Board, which would elect a 9-member executive committee to exercise the powers and duties of the Foundation, including appointment of the Director and prescribing his powers and duties. During consideration of the bill on the floor of the Senate, Senator Kilgore attempted to amend the bill so that the Foundation would be headed by an Administrator with a nine-member Advisory Board. Senator Kilgore's amendment was rejected by a vote of 52 to 23, with 20 members not voting. Then Senator Magnuson proposed an amendment to the bill which would provide for the Director to be appointed by the President instead of the Executive Committee. The amendment was proposed in an attempt to meet administration and presidential objections, and was passed by a vote of 42 to 41 with 12 members not voting. The bill passed the Senate on May 20, 1947.

A similar bill, H.R. 4102, was introduced in the House on July 7, 1947, and was considered and passed by the House on July 16; immediately thereafter a motion was made to strike out everything after the enacting clause and insert the text of S. 526. The motion was agreed to by the House and the bill was sent to conference.

In conference, the administrative organization of S. 526 was accepted. Both Houses approved the report on July 22 and the bill was sent to the President and subsequently vetoed.

On August 27, 1947, Mr. Steelman presented his report to the President, entitled "Science and Public Policy" in which he expressed agreement with President Truman's view that "the role to be played by a representative group of scientists in the administration of the National Science Foundation is 'more appropriately one of an advisory nature rather than of full responsibility.' " Mr. Steelman recommended that the National Science Foundation "should be headed by a Director appointed by the President and assisted by a part-time Advisory Board of distinguished scientists and educators similarly appointed."

Legislative action continued in 1948 with the introduction of S. 2385 by Senator Smith and H.R. 6007, by Mr. Wolverton, originally identical bills. S. 2385 passed the Senate May 5. Both bills were considered in committee and in brief hearings on June 1, and H.R. 6007, with changes, was reported on June 4. No further action was taken in 1948. The administrative provisions of S. 2385 differed from S. 526, which the President had vetoed, by providing that the Director would be appointed by the President instead of the Foundation, and would be responsible to both, and by elimination of the provision for an Executive Committee elected by the Foundation to supervise its programs, although the Foundation could appoint one to advise the Director.

A dozen bills to create a National Science Foundation were introduced in 1949. Except for H.R. 359, which provided for an Administrator and an Advisory Board, all the other bills were roughly identical in providing for a National Science Board of 24 members to be appointed by the President with the advice and consent of the Senate, and for a Director as chief executive officer, also appointed by the

President with Senate consultation and approval. The House Interstate and Foreign Commerce Committee held hearings (National Science Foundation) on March 31, April 1, 4, 5, and 26, 1949. The following excerpts pertaining to Foundation administrative organization were taken from the 23 statements and approximately 40 briefs, letters, reports, etc., submitted for the record from Government agencies, scientific and educational organizations, and interested individuals.

STATEMENTS IN FAVOR OF A STRONG NATIONAL SCIENCE BOARD

J. C. Hunsaker, Chairman, National Advisory Committee for Aeronautics:

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"Sound American business principles recognize the effectiveness of a board of directors guiding the policies and operations of an organization through officers who are subject to the board. An organization, similar to this is proposed in all of the bills except H.R. 359, which would place the whole authority in an Administrator with a Board which would be merely advisory to him. It is believed that highly qualified men who can best guide the destinies of a National Science Foundation would be reluctant to serve under an Administrator who would be free to act without regard to their considered judgment. For this reason, the NACA suggests that the form of organization proposed in H.R. 359 is less desirable than that proposed in the other bills."

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Karl T. Compton, Chairman, Research and Development Board, National Military Establishment:

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"The bills before your committee fall into two principal groups (those identical with H.R. 6007 and those identical with S. 2385, both of previous session) * * *. Both are entirely satisfactory to us, and they meet the specifications for a suitable form of National Science Foundation which were accepted by all but a few of those interested in this legislation. Moreover, I believe that both groups of bills provide a generally acceptable resolution of all of the controversies which have arisen in the past.

"Specifically, they provide for an independent agency in which the wisdom and experience of a rather broad cross section of the leaders of science, industry, and public affairs will be brought to bear on the highly complicated technical problems which the Foundation will be called upon to solve. At the same time, they provide for efficient administration by a well-paid Director who will be subject to proper controls within the executive branch of the Government. * * *

"H.R. 359 stands apart from the two groups of bills above discussed. In general, it contains the provisions which gave rise to the major issues the resolution of which has been accomplished by both of the groups of bills now before your committee * * *."

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TESTIMONY OF DR. KARL T. COMPTON

"Mr. O'HARA. * * * Let me ask you first, should the Foundation run the show or should the Director run the show?

"Secondly, to what extent would be the effect of the Foundation or the Director, whichever directs, upon the scientists of the country having in mind the necessity of their wholehearted cooperation in doing these many things which are contemplated in such a bill?

"Dr. COMPTON. * * * I believe the Foundation should run the show as far as basic policies and scientific objectives are concerned, the Director being an executive officer to carry out those policies but having one additional function which I think is important, having the veto power over any action which is contrary to Government administrative policy. In that sense he would safeguard the executive branch of the Government.

"There are many scientists, I think I can almost say a majority of scientists and maybe a very large majority, who are very much worried about this science foundation bill, for fear that it may be straitjacket science, or that it may be misused. Perhaps I shouldn't say this, but they are afraid it would get into politics. It has been pretty free of that. I think they have enough faith in the way in which things have been handled during the war that that will not happen and their faith will be supported by the fact of having this large board of men who presumably will be distinguished scientists and men of public affairs.

Any Director of the Foundation I think would find himself in a very difficult position if he acted in such manner as to bring about a condemnation by that Board of 24 men. So I think the scientists feel that this large Board appointed by the President after consideration of recommendations of such scientific agencies and other public groups as wish to make recommendations for personnel, they would have a good assurance against the things that they fear, and if those things that they fear continue to be protected against, then I think they are all for this bill. * * *"

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Charles F. Brannan, Secretary, Department of Agriculture:

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"[Expressed support for principles of H.R. 12 and other similar bills] * * * The form of organization proposed in H.R. 359 differs quite materially from that proposed in the other bills referred to. Under this bill, the National Science Foundation would be an independent agency of the Federal Government consisting of an administrative organization headed by an Administrator and operating in much the same manner as other Government departments and agencies. The Administrator would consult and advise with a National Science Board of nine members plus the chairmen of several divisional scientific committees.

"In view of the fact that the duties of the Foundation largely relate to the determination of grants and contracts for research and the awarding of scholarships and fellowships, it is suggested that the form of organization provided in the five bills previously referred to would be better adapted to the type of Foundation provided for in this legislation. A Foundation of 24 members (as proposed in the other bills) can appropriately be given the responsibility of taking into consideration the wide variety of factors required in the allotment of grants and the awarding of fellowships, and advising the Director according."

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Frank Pace, Jr., Director, Bureau of the Budget:

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"Generally speaking, H.R. 12 appears to provide a workable basis for the establishment and operation of a National Science Foundation. However, I am somewhat disturbed by certain structural rigidities imposed upon the Foundation by the provisions of the bill. I refer to (1) the mandatory provision of an executive committee in section 5, * * *. I believe that the purposes of the Foundation would be better served by substituting in each of these instances permissive language which would serve to guide the members of the Foundation in approaching the problem of organization, while recognizing the essential need for flexibility in a major undertaking of this nature where organization must be readily adjusted to the changing frontiers of scientific research * * *."

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George E. Folk, adviser to the Committee on Patents and Research, National Association of Manufacturers:

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"The NAM favors the provision of paragraph (b) of section 6 of group 1 bills which paragraph reads as follows:

" '(b) The Director shall, in accordance with such directives as the Executive Committee shall from time to time prescribe, exercise the powers set forth in this Act within the policies developed by the Foundation: *Provided*, That the authority granted to the Foundation by paragraph (c) of section 11 shall be exercised by the Director with the approval of the Executive Committee.'

"In canceling out the above paragraph (b), the specification of the powers of the Director has been left out of group 2 bills. This is, in the opinion of the NAM, a serious omission. As a result of this omission, there is no adequate check on the Director. It appears as if, in effect, this omission tends to make the Director a one-man Foundation with the members of the Foundation serving only in an advisory capacity. The NAM believes that the concentration of authority in one man is unsound."

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Charles E. MacQuigg, dean, College of Engineering, and director, Engineering Experiment Station, Ohio State University:

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"* * * Throughout the history of this type of legislation over the past decade or more, the chief final matters of controversy have come down to (*a*) the organi-

zation of the Foundation and (*b*) the patent question. It has been thought generally by persons speaking for the sciences involved, that the major administrative responsibilities, such as nomination of the Director, would best be in the hands of the Board on the score that such a scheme would most nearly eliminate the possibility of partisan criticism."

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Dr. Dael Wolfle, secretary of Intersociety Committee for the National Science Foundation:

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"With regard to the administrative structure, we have a slight preference for S. 247 over H.R. 12 or the similar House bills. The Senate bill does not require a specific committee organization as is required in most of the House bills. It is extremely unlikely that the Foundation would try to operate without an executive committee. The appointment of such a committee is therefore almost as likely under S. 247 as it is under the House bills. But other committees may also be necessary. Time may change the Foundation's requirements. Since fairly general agreement has now been reached upon a Foundation consisting of 24 experts, we believe that they should be given as great freedom as possible to arrange the details of their own internal organization and to change those details from time to time as changing conditions may warrant.

"With regard to the Director of the Foundation, we support the manner of appointment described in section 6(a) of H.R. 12. We strongly recommend the retention of section 6(b) of H.R. 12, which specifies the duties of the Director. This statement of his duties and authority seems much preferable to the silence of S. 247 on the question of the authority of the Director."

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Vannevar Bush, Carnegie Institution of Washington, Washington, D.C.:

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"I am gratified to see that six of the bills before your committee show general agreement as to the essential nature of the National Science Foundation. The record of past hearings show that these bills meet with the general approval of the vast bulk of scientists, educators, and industrial and Government officials. Among the bills before you, again excluding from consideration H.R. 359, there are divergences but these appear to me to be of minor importance. * * *"

S. 247, as amended, was approved by the President on May 10, 1950, becoming Public Law 507, the National Science Foundation Act of 1950. In a statement at the signing of the bill, President Truman expressed approval of the bill and gratification to Congress for resolving the differences and clearing the way to passage.

Dael Wolfle discussed the administrative structure in his August 1957 review article on the first 6 years of the Foundation ("National Science Foundation: The First 6 Years." Science, vol. 126, Aug. 23, 1957, pp. 335–342). He stated that the issue of the Board-Director relationship was "more vigorously debated than any other aspect of the Foundation idea. Yet once the bill became law, the argument quickly died." He cited the impossibility of knowing how well an alternative arrangement would have worked, and quoted Board Chairman Chester Bernard's opinion as stated in the Foundation's fifth annual report: "During the 5 years of its work, this peculiar organization, depending upon cooperation between the Board and the Director, has worked exceedingly well."

In 1958 the organization of the Board came under consideration both through a self-examination and during hearings on amending legislation which the Foundation sponsored. Dr. Waterman discussed the internal review in the introductory statement to the reissuance of Dr. Bush's report, "Science: the Endless Frontier," in 1960:

"In 1958 the Board, through an ad hoc committee appointed for this purpose, reviewed the working relationship of the Director and the Board in the light of experience and noted that this relationship has been harmonious and constructive largely as a result of the excellent cooperation on the part of both. The Board noted further that each year of successful operation, built on a clear understanding on the part of each Board member of his proper function, and upon wise statesmanship on the part of the Director and his associates gives assurance of continued success. The Board further observed that as each year passes a body of precedents

for sound administrative procedures is being built up that may ultimately become an unwritten constitution which will prevail."

The Board's findings are understood to be contained in a Board report, "Report of the Ad Hoc Committee on the Relationship Between the Board and the Director," of December 1, 1958—the Middlebush report.

Nevertheless, despite Dr. Waterman's favorable summary of the Board's findings, the need for certain changes was revealed in legislation introduced in 1958 at the Foundation's request, which in addition to shifting the anniversary of Board members' terms, sought to allow the Board to delegate to the Director certain of its powers and duties. Another proposed section provided for changes in the size and authority of the executive committee. Hearings were held on the bill, H.R. 11257, and on other bills affecting Foundation activity on May 13–16, and July 24, 1958, by the House Interstate and Foreign Commerce Committee. Only Dr. Waterman and Dr. Bronk, Board chairman, gave testimony on this bill. In consideration of the bill on the floor on August 20, 1958, the House approved a motion to substitute the provisions of a similar bill, S. 3268, which the Senate had passed earlier. No further action was taken during the 85th Congress.

Similar legislation, H.R. 8284, was introduced in 1959 and the House Committee on Science and Astronautics held 3 days of hearings in July 1959.

Foundation analysis of the changes requested was contained in a statement submitted during the hearings which is excerpted below:

"* * * The changes proposed for section 5(b), section 6(a), and section 6(b) of the National Science Foundation Act of 1950 are related. At the present time, the Board must approve the award of each fellowship and each grant or contract for basic research. This rigid requirement has at times posed serious problems for efficient operation. For example, when grants were being made for supplies for the scientific expedition to Antarctica in connection with the International Geophysical Year, time was of the essence. The lack of a Board meeting at which a contract or grant could be approved at the proper moment was an obstacle to assuring the timely dispatch, and therefore arrival, of equipment for the scientists. Under the proposed changes, it is contemplated that the Board might delegate specific authority to its executive committee or to the Director to approve grants or contracts in certain situations. In addition, delegations of authority to the Director could be made by the executive committee as well as by the full Board. The change in the required size of the executive committee is suggested for the purpose of giving the Board authority to constitute a smaller executive committee, if that would appear desirable, which could more easily be assembled for emergency action. The Board would still retain complete power in any given case to exercise or delegate its authority to approve grants or contracts. * * *"

The authority the Foundation sought was granted through enactment of the bill, which became Public Law 89–232, approved September 10, 1959.

The most recent changes in the evolution of the Board occurred under Reorganization Plan No. 2 of 1962. Most of this story is so well known that it seems unnecessary to review this change in detail. Some interesting background information not previously made public was given by Board Chairman Dr. Walker in his written response to questions following his appearance before your subcommittee at the 1965 hearings. Excerpts from his remarks may serve to conclude this somewhat abbreviated review of the Board's evolution:

* * * * * * *

"The Board spent a great deal of time in 1961 and 1962 discussing how well this [Board-Director] relationship had worked. Dr. Baker, as chairman of an ad hoc Committee on the Organization of Government for Science and Technology, produced a report on the matter which said in essence that continued successful operation was possible.

"On March 15, 1962, the Board was informed that a reorganization plan was being written for submission to the Congress 'which will among other things create an Office of Science and Technology in the Executive Office of the President. This act was expected to do several things. It would transfer the evaluation function (of the Board) to the new Office and the authority to develop and encourage a national policy for basic research and education in the sciences. Other changes would make the Director a voting member of the Board, and have the divisional committees report to the Director rather than jointly to the Director and the Board.' There were other proposals which were intended to reduce the size of the Board and to change the term of the Director. All of these proposals were discussed. Some of which met with approval and others with strong disapproval.

"This matter was discussed in executive session on March 15, 1962, and it was agreed that it would be unfortunate to reduce the size of the Board, change the term of office, or to reduce the Board to an advisory board only.

"At one point in the review the Chairman, Dr. Bronk, summed things up by saying:

" 'I consider the relationship between the Director and the Board to have been most satisfactory—there have been no unresolved matters between them. By being responsible for the formulation of policy and decisions on the Foundations programs and budgets, the Board members have felt that they have rendered a considerable service to science in this country. *These same members would probably not have given so freely of their time and effort if they had been serving only in an advisory capacity.*' [Italic supplied.]

"As a matter of fact, Dr. Bronk felt the organization of the Foundation might well serve as a pattern for other Government agencies.

"To complete the history, it should only be noted that the most recent Reorganization Act (1965) abolished the statutory requirement for the divisional committees. Since they did not report to the Board, the Board did not vote on the desirability of this change".

DOROTHY M. BATES,
Analyst in American Government and Public Administration, Legislative Reference Service, Library of Congress.

APRIL 14, 1966.

APPENDIX C

The following information was provided at the committee's request by the National Aeronautics and Space Administration. It indicates the type of reporting on contract information which a major Federal research and development agency has been able to inaugurate.

NASA Subcontract Reporting Program

The NASA system for reporting of subcontract awards requires that its prime contractors report all first-tier subcontracts in excess of $10,000 on each prime contract in excess of $500,000. Each of the first-tier subcontractors awarded a NASA subcontract in excess of $50,000 reports second-tier subcontracts in excess of $10,000. All of NASA prime contractors having a prime contract of $500,000 or more have participated in this reporting program since January 1964.

Mechanically the reporting is accomplished by the use of a simple reporting card, NASA form 667, which is sent directly to the NASA Procurement Office, Washington, D.C. A copy of the card report form is as follows.

62-309—66——10

SECTION I.	1. PRIME CONTRACT NO.			*Form Approved Budget Bureau No. 104-R012*	*For NASA Use Only*
	2. PRIME CONTRACTOR				A.
	3. ADDRESS				B.
II. FIRST-TIER SUBCONTRACT	4. SUBCONTRACTOR				C.
	5. ADDRESS				D.
	6. SMALL BUSINESS ☐ YES ☐ NO	7. SUBCONTRACT NO.	8. SUBCONTRACT AMT. $	9. ☐ NEW CONTRACT 10. ☐ MODIFICATION	
	11. PRINCIPAL PLACE OF PERFORMANCE *(If known)*				E.
	12. DESCRIPTION OF WORK				F.
III. SECOND-TIER SUBCONTRACT	13. SUBCONTRACTOR				G.
	14. ADDRESS				H.
	15. SMALL BUSINESS ☐ YES ☐ NO	16. SUBCONTRACT NO.	17. SUBCONTRACT AMT. $	18. ☐ NEW CONTRACT 19. ☐ MODIFICATION	
	20. PRINCIPAL PLACE OF PERFORMANCE *(If known)*				I.
	21. DESCRIPTION OF WORK				J.
	22. COMPANY SUBMITTING REPORT		23. SIGNATURE	24. DATE	

NASA FORM 667 AUG 62 GPO : 1962 O - 655168

REPORT ON NASA SUBCONTRACTS

INSTRUCTIONS

GENERAL

A. This report form is for use by NASA prime contractors and first-tier subcontractors participating in the NASA subcontracting reporting program. Parts I and II of the form are for use by the prime contractors; Parts I, II and III are for use by the first-tier subcontractors.

B. NASA prime contractors will complete and submit Parts I and II of the form for each subcontract *(as defined in paragraph D below)* placed by them which is estimated will exceed $10,000 and for each action *(modification)* in excess of $10,000 on such subcontract. Modifications to be reported include actions which result in the decommitment of funds as well as commitments.

C. First-tier subcontractors having any subcontracts which are estimated will exceed $10,000 will complete and submit the form in entirety for each subcontract *(as defined in paragraph D below)* placed by them which is estimated will exceed $10,000 and for each action *(modification)* in excess of $10,000 on such subcontract. Modifications to be reported include actions which result in the decommitment of funds as well as commitments.

D. The term *"subcontract"* as used herein means procurement in excess of $10,000 by the prime contractor or first-tier subcontractor of articles, materials, or services entering into the performance of a specific NASA prime contract. It does not include purchases, regardless of amount, of stock items, materials, or services which cannot be identified with a specific NASA prime contract.

E. NASA prime contractors will provide the number of the NASA prime contract to their first-tier subcontractors for entry on the reports.

F. The report is to be submitted as soon as possible after placement of the subcontract to the National Aeronautics and Space Administration, Procurement and Supply Division, Code BRP, Washington 25, D. C.

G. Prime contractors will obtain a supply of the forms from their NASA Contracting Officer. Subcontractors will obtain the forms from the prime contractor.

SPECIFIC

Item 1. Enter the NASA prime contract number.

Item 2. Enter name, and division if applicable, of the prime contractor.

Item 3. Enter address *(City and State only)* of the prime contractor.

Item 4. Enter name, and division if applicable, of the subcontractor.

Item 5. Enter address *(City and State only)* of the subcontractor.

Item 6. Enter a check in the applicable box.

Item 7. Enter subcontract or purchase order number specified by the contractor initiating the action.

Item 8. Enter in terms of commitments, to the nearest dollar, the amount of the subcontract, or amount of modification to the subcontract. Modifications resulting in decommitments are to be enclosed in parentheses.

Item 9. Enter a check if this report is the first report submitted on the subcontract.

Item 10. Enter a check if this report is for a modification of a previously reported subcontract.

Item 11. Enter the location *(City and State only)* of the principal plant or place of business, where the items will be produced or supplied from stock or where the work will be performed, if known. For construction subcontracts enter the site of construction.

Item 12. Enter a brief description of the item to be furnished or the work to be performed under the subcontract. *(For example: Environmental control system for Apollo Spacecraft, Fuel Pumps, etc.)*

Items 13 thru 21. See Items 4 thru 12.

Item 22. Enter the name of the company submitting the report. This should be the name of the prime contractor for reports on first-tier subcontracts; it should be the name of the first-tier subcontractor for reports on second-tier subcontracts.

Item 23. To be signed by the company individual submitting the report.

The data obtained through the subcontract reporting program are compiled using automatic data processing facilities and are issued quarterly in various types of reports.

One type of report lists the individual subcontracts showing for each subcontract, the name of the prime contractor, the prime contract number, the place of performance of the prime contract, the NASA project from which the NASA prime contract is funded, the name of the subcontractor, whether the subcontract is first or second tier, the place of performance of the subcontract, whether the place of performance is a labor surplus area or not, whether the subcontractor is a small or large business firm, a description of the subcontract effort, and the amount of the subcontract. Starting in fiscal year 1966, the report shows whether or not R. & D. effort is involved in the subcontract effort. These subcontract listings are issued in five sections each of which is devised to meet the needs of a specific group of users. The sections are organized as follows:

1. By Place of Performance—State and City.
2. By Prime Contract.
3. By Prime Contractor.
4. By NASA Project.
5. By Subcontractor.

In addition to the subcontract listings, statistical reports are developed which show the flow of first and second tier subcontractor dollars from State to State and from company to company. The reports also show for each prime contract, prime contractor, and project, the State and city distribution of the subcontracts, and the amount given to small business and labor surplus areas.

NASA Prime Contract Reporting Program

NASA has a field installation to headquarters prime contract reporting program which provides detailed data on all actions on each research and development contract and on each contract with and grant to educational and other nonprofit institutions on which the cumulative obligations amount to $10,000 and over; and on all actions on each other contract on which the cumulative obligations amount to $25,000 and over. The data reported are shown on the inserted NASA form 507. In addition to the statistics shown on the form, financial data are also reported showing the obligations, accrued costs and expenditures on each contract. These prime contract data are made available in various types of reports.

INDIVIDUAL PROCUREMENT ACTION REPORT

I.
CONTRACTOR NAME: CODE:
(23-37) _____ (38-44) _____
CONTRACTOR DIVISION:
(45-55) _____
CONTRACTOR ADDRESS (CITY AND STATE): CODE:
_____ (56-61) _____
PLACE OF PERFORMANCE (CITY AND STATE): CODE:
(62-73) _____ (74-79) _____
INSTALLATION USE
REPORT SERIAL NUMBER _____

DATE: (2) (3-4) (5)
__ MO. __ DAY __ YR.

CONTRACT/P.O. NUMBER:
(6-16) _____ - _____
MODIFICATION NUMBER:
(17-19) ___

PROCUREMENT PLACEMENT CODE ____

IV. PROCURING INSTALLATION _____ CODE (20-21): __

CONTRACT DATE: MO. DAY YR.
(22) (23-24) (25)

MODIFICATION DATE: MO. DAY YR.
(26) (27-28) (29)

CONTRACT COMPLETION DATE:
MO. (30) __ YR. (31) __

PLACE OF PERFORMANCE LABOR SURPLUS AREA (32) YES ☐ NO ☐

PREFERENCE (33) YES ☐ NO ☐

KIND OF ACTION (34-35)
01 ☐ INITIAL LETTER CONTRACT
02 ☐ DEF. CONTR. SUPER. LTR. CONTR.
03 ☐ DEFINITIVE CONTRACT
04 ☐ ORDER UNDER CONTRACT
05 ☐ PURCHASE REQUEST
06 ☐ GRANT
MODIFICATIONS:
DEFINITIVE LETTER
07 ☐ ADDITIONAL WORK 17 ☐
08 ☐ FUNDING ACTION 18 ☐
09 ☐ CHANGE ORDER 19 ☐
10 ☐ TERMINATION OR CANCELLATION

REASON FOR NOT SELECTING SMALL BUSINESS (36)
SMALL BUSINESS NOT SOLICITED:
1 ☐ NO KNOWN SMALL BUS. SOURCE
2 ☐ UNSOLICITED PROPOSAL
3 ☐ OTHER
SMALL BUSINESS SOLICITED:
4 ☐ BID NOT RECEIVED
5 ☐ BID NOT LOW
6 ☐ BID NOT RESPONSIVE
7 ☐ QUANTITATIVE AND DELY. REQTS.
8 ☐ OTHER

TYPE OF CONTRACT (37-38)
01 ☐ FIXED PRICE, FIRM
02 ☐ FIXED PRICE, REDETERMINATION
03 ☐ FIXED PRICE, ESCALATION
04 ☐ FIXED PRICE, INCENTIVE
05 ☐ COST, NO FEE
06 ☐ COST SHARING
07 ☐ COST PLUS FIXED FEE
08 ☐ COST PLUS INCENTIVES
09 ☐ TIME AND MATERIALS
10 ☐ LABOR-HOUR

EXTENT OF COMPETITION (39)
1 ☐ ADVERTISED
2 ☐ NEGOTIATED COMPETITIVE—SOURCE EVALUATION BOARD
3 ☐ NEGOTIATED COMPETITIVE—NO SOURCE EVALUATION BOARD
4 ☐ FOLLOW-ON AFTER COMP. NEG.
5 ☐ NEG. NONCOMPETITIVE

NUMBER OF PROPOSALS:
SOLICITED-TOTAL (40-41) __
SOLICITED-SMALL BUS. (42-43) __
RECEIVED-TOTAL (44-45) __
RECEIVED-SMALL BUS. (46-47) __

PROPERTY RIGHTS IN INVENTION CLAUSE INCL. (48) YES ☐ NO ☐

QUALITY REQUIREMENTS CATEGORY (50) _

SUBJECT TO RELIABILITY PROG. REQMTS. (51) YES ☐ NO ☐

PROPOSED PROCUREMENT SYNOPSIZED (49) YES ☐ NO: EXCEPTION _

SUBJECT TO EQUAL EMPLOYMENT OPPORTUNITY REPTG. (52) YES ☐ NO ☐

CONTRACT ADMINISTERED BY
_____ CODE (53-54) __

GOVT. PROPERTY ISSUED (55) YES ☐ NO ☐
ADMINISTERED BY _____
_____ CODE (56-57) __

CONTRACT AUDITED BY
CODE (58-61) ____

ESTIMATED COST (THOUSANDS OF DOLLARS) TOTAL EXCL. OF FEE (68-74) _____ FEE (75-79) _____

II. (22-63) DESCRIPTION OF CONTRACT, MODIFICATION OR OTHER ACTION CARD NO.

_____ 1
_____ 2
_____ 3
_____ 4
_____ 5
_____ 6
_____ 7

OBLIGATIONS: PRIOR	THIS ACTION	CUMULATIVE INCL. THIS ACTION
$	$	$

OBLIGATIONS BY AGENCY-WIDE CODING STRUCTURE:

FOR RESEARCH, DEVELOPMENT AND OPERATION

UNIQUE PROJECT NUMBER . 1, 2, 3	SYSTEM OR SRT CODE 4, 5	PROGRAM YEAR 14	METHOD OF FINANCING 15, 16	FUND SOURCE 17	THIS ACTION $

FOR CONSTRUCTION OF FACILITIES

FACILITY PROJECT NUMBER 1, 2, 3, 4	XXXXXX	PROGRAM YEAR 14	METHOD OF FINANCING 15, 16	FUND SOURCE 17	THIS ACTION $
(A)	(B)	(C)	(D)	(E)	(F)

One type lists the individual prime contracts in various sorts and degrees of detail. The reports which are made avaliable to the public at the NASA's Public Affairs Office are described as follows:

NASA Procurement Reports Available to the Public

Semiannual and annual procurement reports

A compilation of statistics on various aspects of NASA's procurement program. Distributed to the Congress, other Government agencies, and, upon individual request for each issuance, to the public.

E–18 NASA's prime contracts—By State and city

A geographical listing of all active contracts of generally $10,000 and over in simple format (no coding) showing for each contract the contractor name, contract date, brief description, NASA project involved and current fiscal year and cumulative obligations. Issued quarterly. Contains data on approximately 11,000 contracts. Available for inspection at the NASA Public Affairs Office.

E–18A NASA's prime contractors—By State and city

A summary of the E–18 showing the States and cities in which NASA work is being performed, the names of the contractors, the number of their active contracts and aggregate current fiscal year and cumulative obligations on the contracts. Does not list individual contracts. Issued monthly. Available for inspection at the NASA Public Affairs Office.

E–19 NASA's prime contracts—Alphabetically by contractor

Same content as E–18 but arranged alphabetically by contractor. Shows individual contracts and place of performance and provides total dollar data for each contractor and division thereof. Available for inspection at the NASA Public Affairs office.

E–19A NASA's prime contractors—Alphabetically by contractor

A summary of the E–19 showing the individual contractors but not individual contracts. Shows total number of active contracts at each place of performance and current fiscal year and cumulative obligations on the contracts. Issued monthly. Available for inspection at the NASA Public Affairs Office.

E–21 NASA's prime contracts—By installation

A listing of all active contracts of generally $10,000 and over sorted by installation and alphabetically by contractor under each installation. Includes detailed statistical data and obligations and accrued costs on each contract. Issued quarterly. Available for inspection at the NASA Procurement Office.

E–22 monthly procurement actions

A listing of procurement actions of generally $10,000 and over accomplished during the given month, sorted by installation and alphabetically by contractor under each installation. Describes each new procurement and each modification to an existing contract. Includes detailed statistical data and the amount of obligations resulting from each action. Issued monthly. Available for inspection at the NASA Public Affairs Office.

The prime contract listings are also sorted by NASA program and project for program management purposes.

Another type of report provides statistical compilations and analyses of the data contained in the NASA Form 507. The NASA annual procurement report shows the type of data made available to the public. Additional analyses which provide data on the procurement performance of the individual field installations are compiled for procurement management purposes.

APPENDIX D

SECTION 303(b), PUBLIC LAW 88-426. THE FEDERAL EXECUTIVE SALARY ACT OF 1964

(b) Level II of the Federal Executive Salary Schedule shall apply to the following offices and positions, for which the annual rate of basic compensation shall be $30,000:

(1) Deputy Secretary of Defense.
(2) Under Secretary of State.
(3) Administrator, Agency for International Development.
(4) Administrator of the National Aeronautics and Space Administration.
(5) Administrator of Veterans' Affairs.
(6) Administrator of the Housing and Home Finance Agency.
(7) Administrator of the Federal Aviation Agency.
(8) Chairman, Atomic Energy Commission.
(9) Chairman, Council of Economic Advisers.
(10) Chairman, Board of Governors of the Federal Reserve System.
(11) Director of the Bureau of the Budget.
(12) Director of the Office of Science and Technology.
(13) Director of the United States Arms Control and Disarmament Agency.
(14) Director of the United States Information Agency.
(15) Director of the Federal Bureau of Investigation, Department of Justice, so long as the position is held by the present incumbent: *Provided*, That thereafter the position shall be placed in level III.
(16) Director of Central Intelligence.
(17) Secretary of the Air Force.
(18) Secretary of the Army.
(19) Secretary of the Navy.

APPENDIX E

COMMUNICATIONS

UNIVERSITY OF VIRGINIA,
SCHOOL OF ENGINEERING AND APPLIED SCIENCE,
Charlottesville, April 4, 1966.

Hon. EMILIO Q. DADDARIO,
House of Representatives,
Washington, DC.

DEAR MR. DADDARIO: I have read the report of your subcommittee on the National Science Foundation and should like to offer one or two comments. The committee has done a very thorough job of analyzing the National Science Foundation and pointing out its strengths and weaknesses and has presented many worthwhile recommendations for its further improvement.

I am disappointed, however, to find little to indicate that the attitude of the Foundation toward engineering will be changed. As I understand the original charter of the Foundation, it was restricted to basic research, and this has been rather strictly interpreted, so that much very valuable engineering research has been ruled ineligible for sponsorship by the National Science Foundation. Without engineering, science would be quite sterile, as the findings of the pure scientists must be applied by the engineers and the applied scientists. Thus I believe the more applied research of the engineers is as important as the very basic research of the pure scientists.

The strict interpretation of basic research has tended to encourage a trend which developed in engineering schools in recent years of putting greater emphasis on basic or purely scientific type of research than on more applied engineering aspects of many problems facing us in our technological development. While certain of this research should be done in engineering schools, this trend toward the scientific aspects has been at the expense of research and graduate student training in applied science and engineering. This situation should be brought into better balance.

I hope that, in considering modifications to the laws under which the National Science Foundation operates, it can be made clear that engineering is an important part of our total science technology spectrum, and that support of applied research in this field is a proper function of the National Science Foundation.

Sincerely yours,

LAWRENCE R. QUARLES, *Dean.*

THE UNIVERSITY OF NEW MEXICO,
SCHOOL OF MEDICINE,
Albuquerque, April 4, 1966.

Representative EMILIO Q. DADDARIO,
House of Representatives, Washington, D.C.

DEAR SIR: I have just read your article in Science concerning the proposed legislation affecting the National Science Foundation. In addition, I have studied a copy of your bill. Although I am in great sympathy with many of the things which you and your committee are trying to do, there is one area about which I have some reservations. As a scientist and as a member of one of NSF's advisory panels, I feel I must voice this reservation. Moreover, to make it clear that I am not involved in grinding a personal ax, I should like to point out that none of the grants which I have received have come from the National Science Foundation.

My main concern is with the treatment of the basic science mission of NSF. I thoroughly agree that NSF should have a role in pointing out attacks on applied problems and should have a voice in the solution of these problems. Where I disagree is that funding of projects concerned with their solution should come from the National Science Foundation. I believe it would be more appropriate if NSF

were to gather information and to provide this information for other governmental agencies directly concerned with the solution of the problem being studied. For example, information on problems of water resources could well be gathered by NSF and relayed to the Department of the Interior or other governmental agencies.

The role of NSF in support of basic science has been unique and a credit to this country. It has pointed out that basic science is important. Furthermore, it has been of value to the scientific community to know that unusual or unorthodox projects will get a fair evaluation by NSF, uncomplicated by competition for funds for applied projects. If the mandate of NSF were changed such as to allow it to directly support applied projects, one could predict that it is only a matter of time before its mission would be primarily in applied fields. Let me state that I do not believe this is your intent or the intent of your committee, but the danger must be recognized that future legislatures will not always have the wisdom in this matter as shown by this Congress.

It is for these reasons that I am concerned.

Sincerely yours,

SIDNEY SOLOMON, Ph. D.,
Professor and Chairman.

CORNELL UNIVERSITY,
Ithaca, N.Y., April 7, 1966.

Hon. EMILIO Q. DADDARIO,
House of Representatives, Washington, D.C.

DEAR CONGRESSMAN DADDARIO: I have just been reading your article in the April 1 Science discussing your new bill to revise NSF. This, plus your talk to the chemists a few weeks back, leads me to make a few comments. I particularly want to speak to the objectives of your bill, to the role of PSAC in the total Federal operation, and to some implications of the second point.

The purposes which you list for new legislation seem to me entirely in order and excellent. I particularly think that the Office of the Director does need strengthening and salute the proposals which you make for this. I also believe that the Foundation will be strengthened by some reorganization. Finally, I think that an operation which explicitly charges the NSF with a greater evaluation responsibility and a greater "balance wheel" role in the overall support of science is thoroughly desirable.

As you know from previous discussion, I have some reservations about the role of the NSF in directing applied research. On the other hand I do find your analysis of your intent in the Science article enlightening and reassuring. I shall follow with interest the progress of your bill.

Let me turn to the question of the role of PSAC in the overall Federal operation.

I agree with you that more explicit data gathering and analysis as well as reporting by NSF would in fact be a real help both to PSAC and perhaps more importantly, to OST. Whether the consequence of this would be to permit PSAC "to concentrate on specific important practical missions" is a somewhat different point, however. When I look back over some of the more important studies which PSAC has made in recent years, in almost every case there was at least one Federal agency explicitly charged to do some of the analyses which PSAC groups made. The general character of a successful PSAC study has, however, been to take the more objective, occasionally somewhat longer view which a group somewhat outside of the Government can do and which is particularly hard for an operating agency to do.

Let me give you only one example: When, with PSAC's strong support, the Defense Department reorganized its research operations and established a strong Office of Defense Research and Engineering, PSAC, itself, assumed that one consequence would be that it could get out of the defense science business. This has not turned out to be true. PSAC has, in fact, gone back in almost to the same degree that it was in before Herb York or Harold Brown took over. The reason, I am persuaded, is because the total system does need the somewhat distant, objective and often more critical kind of analysis which the PSAC groups can give, at least partly because they are not so committed to the day-to-day operations. I think that the need for this kind of thing will continue and will not be diminished by more analyses by NSF. I do agree that the NSF work will make PSAC more effective, not less so.

The important thing which characterizes PSAC is that it is a group of able scientists chosen with careful consideration of their ability to do the kinds of things which PSAC attempts. A second characteristic is the PSAC is a very

hard working group. The people on it are part time, true, but almost as part of the invitation to join PSAC it is pointed out that service to the extent of several days a month is indicated. Personally I know that my average service to PSAC is larger than 4 days a month, often going to 5 and 6. The combination of hard work plus vigorous utilization of people from beyond PSAC for panels has led to the relatively large volume of work which they have put out. As just one example, my PSAC Panel on Space Technology met as a full panel 14 times in less than a year and, in addition, met on several occasions as subpanels.

All of this, I think, bears strongly on the question of the effectiveness of the Board of NSF. It is probably essential for such a Board to end up with a somewhat involved set of criteria for choosing members. This certainly has strengths as far as giving national representation. It also offers weaknesses in that one is considerably less sure of getting people who are really prepared and willing to work. For this reason, I am somewhat doubtful whether the Board will, in fact, be made into a substantially more significant body. This is, of course, an excellent reason to support one of your principal recommendations, that the Office of the Director be both strengthened and given greater authority.

All in all, the Science article was a lucid discussion of an important topic. I enjoyed it.

Sincerely yours,

F. A. LONG,
Vice President for Research and Advanced Studies.

WAYNE STATE UNIVERSITY,
COLLEGE OF LIBERAL ARTS,
Detroit, Mich., April 12, 1966.

Congressman EMILIO Q. DADDARIO,
House Office Building,
Washington, D.C.

DEAR MR. DADDARIO: I have just finished reading, with great satisfaction, your article in Science (Apr. 1, 1966) on the rationale of H.R. 13696. While there may be a few scientists who will not endorse the proposed changes in the structure and functions of the National Science Foundation, I believe that the scientific community as a whole will support them enthusiastically.

Many of us have felt for some time that the Foundation was too passive in its orientation toward the trends of research in many fields. I do not think that we would want the Foundation to set up extensive laboratories and do what NIH calls in-house research; but it does seem possible that NSF could locate gaps in major fields of research and actively solicit proposals from persons known to be competent in the area. This is obviously open to the criticism of "Government direction of research" but it need not extend to Government control of methodology or of personnel. I suspect, indeed, that a few wisely selected staff people could trigger latent research ideas of many young scientists who would truly not be doing what they had been told, but would be doing what they devised for themselves with a little judicious stimulation.

I felt that you used a phrase which may be misinterpreted in proposing to "make NSF more sensitive to the changing winds of our national scientific climate," because it seems to me that your proposal really implies that NSF should start these winds blowing. The task of NSF would, so to speak, be to locate a low-pressure center and give it a push to start it spinning. It would be most unfortunate if scientists got the idea that you meant that research should be planned in accordance with some kind of opinion poll, even of Government science advisers. On the other hand, of course, it would be highly appropriate that NSF consult with the National Academy of Sciences, the National Research Council, and the boards of the various scientific societies to gather ideas for exploitation.

You mention two points very dear to my heart. One is that more effort go into social sciences, and the other calls for an international orientation. May I be specific with respect to a kind of problem in which basic research is badly needed, and could serve practical as well as scientific purposes? At a recent meeting of the National Research Council we discussed the problem of great gaps in our knowledge of how people may be persuaded to change their food habits. It is reported, for example, that our wheat spoils in some areas of India because the local population is accustomed only to rice. But our knowledge of what factors block such change, and of the variables which might be manipulated by the Indian Government to solve this problem, is deplorably limited.

There are important areas of human behavior in which both practical and ethical considerations prevent sound research in the United States. We would obviously be hard put to find any justification for such research on food habits here (some work was done in World War II but was never pursued afterward), and we would be open to criticism for indefensibly interfering in people's private lives if we did experiment on methods of persuasion. Yet in India we have both ethical and practical justification for such research, as indeed we do in Peru and in other underdeveloped areas.

Finally, much will depend on the Director of the Foundation. The person in this role must accept the idea of actively mingling with people of OST and PSAC, as of course with the National Academy and the National Research Council. He must really believe in the policy of energetically striving to influence the course of events, rather than sitting quietly and wait for a bright idea to flit within reach of his desk. He must be reasonably conversant with the behavioral sciences as well as the natural sciences, although obviously no one is going to be competent in all areas of our monstrously proliferating scientific knowledge.

I hope you are successful with H.R. 13696.

Very truly yours,

ROSS STAGNER,
Chairman, Department of Psychology.

FEDERATION OF AMERICAN SOCIETIES
FOR EXPERIMENTAL BIOLOGY,
Bethesda, Md., April 16, 1966.

Mr. GEORGE MILLER,
Chairman, Committee on Science and Astronautics,
House of Representatives, Washington, D.C.

DEAR MR. MILLER: This federation consists of the six scientific societies. These have a membership of over 8,000 distinguished scientists who are the Nation's leading and most active investigators and teachers in their special fields. The federation board, made up of representatives from the six societies, has reviewed with very great interest and appreciation the many activities, in relation to the National Science Foundation, of the Committee on Science and Astronautics of which you are chairman, and the Subcommittee on Science, Research, and Development of which Mr. Emilio Q. Daddario is chairman.

The federation board has instructed me to transmit to you its sincere thanks for the long study which has been given to the National Science Foundation and the National Science Board and for the hearings and reports which have been generated by these activities. The federation board takes them as further evidence of the praiseworthy appreciation by you and your committee of the importance of science today and of the crucial role of the National Science Foundation in the present and future of American biological science. H.R. 13696, introduced by Representative Daddario, displays an earnest and informed concern with the future operations of the National Science Foundation and with the future of research in the biological sciences.

Two aspects of the proposed legislation have been of special concern to us.

The first point relates to the role of the Foundation in support of pure and applied research, the latter being a proposed new mandate. Whereas it may be difficult occasionally to distinguish between pure and applied research, the new mandate should define clearly the responsibility of the Foundation to sustain the support of the paramount need for fundamental advancement that derives from pure research, as its support of applied research becomes of increasing consequence.

Second, the federation board wishes to emphasize to you and to your committee its opinion that extensive and responsible participation of scientists in planning and in the framing of decisions which concern research aims and policies has proved its value. The federation board feels also that the role of the National Science Board must include the planning, policymaking, and operation of the Foundation and should utilize fully and freely the special knowledge and viewpoints of the academic and scientific communities. Accordingly we strongly urge that the National Science Board continue to remain the body responsible for the policies and general operation of the Foundation.

With best wishes for the continued productive and successful activities of the Committee on Science and Astronautics, I remain

Sincerely yours,

KARL H. BEYER, Jr., *President.*

U.S. SENATE,
COMMITTEE ON COMMERCE,
April 19, 1966.

Hon. EMILIO Q. DADDARIO,
Chairman, Subcommittee on Science, Research, and Development,
House Committee on Science and Astronautics,
House of Representatives, Washington, D.C.

DEAR CONGRESSMAN DADDARIO: Thank you for your letter of March 30, 1966, concerning H.R. 13696. While I appreciate your invitation to appear at the hearings on April 19–21, my schedule will not permit it.

I commend your objectives. I have given considerable attention to the National Science Foundation over the years, and I encourage your efforts to strengthen and streamline it. The thorough manner in which you have approached the matter augurs well for your success.

H.R. 13696 is a complex proposal. As you well know, there are often varying paths to the same goal. The committee has recently studied in depth, the subject of weather modification. Under the present law, the Foundation has the major responsibility for the subject. Based on this experience, as well as others, I would certainly agree with many of your suggestions.

There are several portions of the bill, however, that I would like to study further. I will have a detailed specific statement on H.R. 13696 for you before the record closes on May 9.

Thank you for your consideration.

Sincerely yours,

WARREN G. MAGNUSON,
Chairman.

U.S. SENATE,
COMMITTEE ON COMMERCE,
April 29, 1966.

Hon. EMILIO Q. DADDARIO,
Chairman, Subcommittee on Science, Research, and, Development,
House Committee on Science and Astronautics,
House of Representatives, Washington, D.C.

DEAR CONGRESSMAN DADDARIO: This is in further response to your letter of March 30, 1966, inviting comment on H.R. 13696, a bill to amend the National Science Foundation Act of 1950.

I again wish to begin by saying that I commend your objectives. A thorough review and revision of the Foundation's role and activities is warranted.

Any review of this nature begins with at least three general alternatives: (1) Changing the role and relationship of one member of a group of existing agencies; (2) changing the role and relationship of all of the members of the group; or (3) adding new agencies to the existing group. In this context, only the Foundation, of course, is readily within the control of Congress. A further proliferation of agencies is usually undesirable.

H.R. 13696 would authorize the Foundation to support basic research in the social sciences and to support applied research in certain cases. While I am in total agreement with the need for these objectives, I have reservations about whether NSF is the proper body to achieve maximum results in these fields. The Foundation's responsibilities for basic research are immense, when fully performed, without the addition of new duties.

Support of basic research in the social sciences was begun by NSF in August 1954. Given the fact that the Foundation has problems supporting all of the worthwhile projects presented to it, the addition of explicit authority to support the social sciences is not likely to substantially improve the present situation. While House Report 1236 states that the addition of the word "social" would not alter any NSF power or function, addition of the word does suggest a contrary intent. The Foundation traditionally has been oriented toward the natural sciences and this will continue to be its first concern. I feel that, while this additional authority is not undesirable, a different approach, perhaps a new group would be necessary to achieve the desirable strong support of the social sciences.

The strongest argument for the support of applied research is that it is impossible to separate basic and applied research. Given the nature of the Foundation, I again believe that while the language is not undesirable, a different approach would be necessary to achieve the desired maximum result. In both cases, if weather modification is a precedent, the grant of additional authority does not necessarily

mean extensive use of that authority. In some respects, weather modification represented applied research, but almost all commentators have indicated that this type of program appeared inconsistent with NSF's usual activities.

H.R. 13696 has many informational and reporting aspects: appraise the impact of research upon industrial development and upon the general welfare; evaluate the status and needs of the various sciences as evidenced by programs, projects, etc.; provide a central clearinghouse; record the amount of money received by institutions and contractors; and assess national scientific resources, progress, etc. Reports are mentioned in three places. I would recommend that these various items be grouped and correlated under one section that clearly spells out all of the details. Again referring to my committee's experience with NSF on the subject of weather modification, requesting special reports and information gathering activities is not always effective.

Section 3(b) makes specific mention of manpower. You might well consider the inclusion of some of the other scientific resources.

I agree with your efforts to strengthen both the Board and the Director. The broad authority of the Board to delegate its authority to the Director in section 4(b), however, may be somewhat inconsistent with this goal. A special staff for the Board is a necessary addition if the Board is to have the ability to effectively establish policy. Section 5(d), however, does not appear to further these goals. The inclusion of a monetary limit does not bear any necessary correlation to whether policy is being established, and that appears to be the basic issue. Enhancing the position of the Director is laudable, and I support this as well as the provision for assistant directors. These increases in prestige and manpower are necessary.

Section 8 would eliminate statutory divisions within the Foundation and let the Director establish appropriate divisions. The existing law does allow the Board to set up divisions. Section 8 will allow administrative flexibility, but establishing some statutory divisions would more clearly emphasize Congressional concern. Legislating certain divisions would clearly indicate areas of congressional concern and you may wish to give this further consideration.

The Foundation has been the subject of considerable attention during its lifetime. A frequent, regular review of its activities would seem to be desirable. I would seriously recommend that thought be given to the addition to this bill of a provision for annual authorization.

Finally, there are many other areas of concern that have been raised in your investigation, but which are not covered in the bill. Some of these matters relate to general questions of education, information, policy planning, etc. It might be helpful to include a provision in the bill requesting the Foundation to begin studying some of these other matters which must be decided in the future.

In conclusion, I wish to echo your own thoughts, "Lest these words * * * be considered unduly harsh, I must add that there have been good reasons why NSF has developed as it has * * * ." I intend these comments to be taken in the serious vein that you suggest: constructive criticism to improve upon an already impressive performance.

I wish also to thank you for the opportunity to express these thoughts.

Sincerely yours,

WARREN G. MAGNUSON,
Chairman.

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS,
Washington, D.C., May 2, 1966.

Hon. EMILIO Q. DADDARIO,
Chairman, Subcommittee on Science, Research, and Development, Committee on Science and Astronautics, House of Representatives,
Washington, D.C.

DEAR MR. CHAIRMAN: The National Society of Professional Engineers wishes to record its support for H.R. 13696, the bill now pending before the subcommittee to amend the National Science Foundation Act of 1950 to make changes and improvements in the organization and operation of the Foundation. We respectfully recommend that the bill be approved by the subcommittee, and offer one suggested amendment for your consideration.

As a national organization composed of more than 64,000 members, all of whom are qualified under applicable State engineering registration laws, we particularly wish to endorse the provisions of H.R. 13696 which authorize and direct the Foundation to initiate and support applied research. We believe expanded Foundation support for engineering and technology will be in the national interest, and will bring new impetus to the application of science resources to solving national problems.

In view of the increased importance which engineering and technology may be expected to play in the expanded activities of the Foundation under the bill, we do respectfully offer for the consideration of the subcommittee the recommendation that the National Academy of Engineering be included among the organizations designated in section 4(c) as potential sources of recommendations for nominations for appointments to the National Science Board. While the National Academy of Engineering undoubtedly falls within the general language of section 4(c), we believe including it among the organizations specifically designated would appropriately reflect the increased emphasis placed by the bill on applied research.

We would appreciate the inclusion of this statement in the record of the hearings on this legislation.

Very truly yours,

DONALD E. MARLOWE, P.E.,
Chairman, Legislative and Government Affairs Committee.

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