OCEANOGRAPHY 1961—PHASE 3

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HEARINGS

BEFORE THE

SUBCOMMITTEE ON OCEANOGRAPHY

OF THE

COMMITTEE ON MERCHANT MARINE AND FISHERIES HOUSE OF REPRESENTATIVES

EIGHTY-SEVENTH CONGRESS

FIRST SESSION

ON

H.R. 4276

TO EXPAND AND DEVELOP THE AQUATIC RESOURCES OF THE UNITED STATES INCLUDING THE OCEANS, ESTUARIES, AND RIVERS, THE GREAT LAKES AND OTHER INLAND WATERS, TO ENHANCE THE GENERAL WELFARE, AND FOR OTHER PURPOSES

JUNE 19, 20, 21, 22, 23, AND JULY 14, 1961

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OCEANOGRAPHY 1961—PHASE 3

MONDAY, JUNE 19, 1961

House of Representatives,
Subcommittee on Oceanography of the
Committee on Merchant Marine and Fisheries,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to call, in room 219, Old House Office Building, Hon. George P. Miller (chairman of the subcommitte), presiding.

Present: Representatives Miller, Dingell, Lennon, Casey, Vanik, Pelly, and Ellsworth.

Staff members present: John M. Drewry, chief consel; Paul S. Bauer, staff consultant; and William B. Winfield, clerk.

Mr. Miller. The subcommittee will be in order.

Today we shall start phase 3 of our hearings on the subject of oceanography in the 87th Congress. In particular, this week we shall hear testimony on a bill, H.R. 4276, which I introduced in the House of Representatives on February 13, 1961.

(H.R. 4276 follows:)

[H.R. 4276, 87th Cong., 1st sess.]

A BILL To expand and develop the aquatic resources of the United States including the oceans, estuaries, and rivers, the Great Lakes and other inland waters, to enhance the general welfare, 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 "Oceanographic Act of 1961".

DECLARATION OF POLICY

Sec. 2. (a) There is hereby established the National Oceanographic Council (hereinafter referred to as the "Council"). The Council shall be composed of the following members:

(1) The Secretary of the Treasury,
(2) The Secretary of Defense,
(3) The Secretary of the Interior,
(4) The Secretary of Commerce,
(5) The Chairman of the Atomic Energy Commission, and
(6) The Director of the National Science Foundation.

(b) The President shall appoint one member of the Council to serve as Chairman.

Sec. 3. The Council shall establish a National Oceanographic Data Center or centers. The functions of the National Oceanographic Data Center shall be—

(1) To acquire, assemble, process, and disseminate all scientific and technological oceanographic, and related environmental data, including but not limited to physical, biological, fisheries, hydrographic and coastal survey, meteorological, climatological, and geophysical data.

(2) To conduct research and other projects within the fields of its activities for any department, agency, or instrumentality of the Government of the United States on a cost reimbursable basis.

(3) To exchange or sell, on a cost reimbursable basis, such data, publications, or other information of the Center as the Council deems to be in the public interest, and such exchanges or sales may be made with any governmental or nongovernmental department, agency, or institution, or with any other person (including foreign governmental departments, agencies, and instrumentalities, and foreign persons).

SEC. 4. The Council shall establish primary standards of oceanographic measurements, and such standards shall be the official standards of the United States.

SEC. 5. The Council shall establish a National Instrumentation Test and Calibration Center. The functions of the National Instrumentation Test and Calibration Center shall be—

(1) To test, calibrate, and evaluate instrumentation concerned with the physical, chemical, biological, and other measurements in the aquatic environment.

(2) To test, calibrate, and evaluate such instrumentation on a cost reimbursable basis for any governmental or nongovernmental department, agency or institution or for any other person (including foreign governmental departments, agencies, and instrumentalities and foreign persons).

SEC. 6. (a) The Council shall—

(1) Develop long-range plans for research, development, studies, and surveys of aquatic environments to the end that all of the purposes of this Act can be more effectively carried out.

(2) Coordinate the efforts of the departments, agencies, and instrumentalities of the Government of the United States to the end that the greatest possible progress shall be made in carrying out the purposes of this Act through the fullest utilization of existing facilities and personnel.

(b) In carrying out its functions under this Act the Council is authorized—

(1) to delegate any of its functions to the head of any department, agency, or instrumentality represented on the Council, and

(2) to provide, on a cost reimbursable basis, and with the consent of the head of the affected department, agency, or instrumentality, for the fullest utilization of the facilities and personnel of departments, agencies, and instrumentalities in carrying out the purpose of this Act.

SEC. 7. The Council shall report annually during the month of January to Congress. Such report shall contain the following:

(1) The general status of aquatic sciences.

(2) The status of research, development, studies, and surveys conducted (directly or indirectly) by the United States in furtherance of aquatic sciences, together with application of such research, development, studies and surveys.

(3) A detailed analysis of the amounts proposed for appropriation by Congress for the ensuing fiscal year for each of the departments, agencies, and instrumentalities of the Government to carry out the purposes of this Act.

(4) Current and future plans and policies of the Federal Government with respect to aquatic sciences.

(5) Requests for such legislation as may be necessary to authorize the construction of any new facilities and vessels which may be necessary to carry out as rapidly as possible the purposes of this Act.

SEC. 8. Whenever any vessel is supplied by the United States to any governmental or nongovernmental department, agency, institution, or instrumentality, or to any other person, in carrying out the purposes of this Act, title to such vessel shall remain in the United States and shall be returned to the United States upon completion or other termination of the purpose for which so supplied.

SEC. 9. (a) In order to carry out the purposes of this Act the Secretary of the Smithsonian Institution is authorized and directed—

(1) to construct additional taxonomic facilities;

(2) to establish a program for the recruitment, training, and placement of taxonomists in such number as may be required to classify fishes and marine invertebrates collected in carrying out the purposes of this Act;

(3) to make grants of funds to qualified scientists, institutions, laboratories, or museums, such grants to be used for taxonomy relating to marine organisms; and

(4) to request and obtain cooperation from and cooperate with other governmental departments and agencies having a direct interest in the preservation, study, and classification of marine organisms, and to cooperate with the several States, educational institutions, laboratories, museums, and other public and private organizations and persons who may be of assistance in this field of marine science.

(b) There is authorized to be appropriated to the Smithsonian Institution such sums as may be necessary to carry out this Act.

SEC. 10. Each expenditure in excess of $50,000 made by the United States in any fiscal year in carrying out a purpose of this Act (whether by grant, contract, or otherwise) shall be subject to examination and audit by the Comptroller General of the United States (including but not limited to all books, records, papers, and other documents of the person to or on behalf of whom such expenditure is made).

(The departmental reports follow:)

THE SECRETARY OF COMMERCE,
Washington, D.C., May 29, 1961.

Hon. HERBERT C. BONNER,
Chairman, Committee on Merchant Marine and Fisheries,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: This is in response to your letter of February 15, 1961, requesting the views of this Department on H.R. 4276, a bill to expand and develop the aquatic resources of the United States including the oceans, estuaries, and rivers, the Great Lakes and other inland waters, to enhance the general welfare, and for other purposes.

This bill would establish the National Oceanographic Council, composed of the Secretary of the Treasury, the Secretary of Defense, the Secretary of the Interior, the Secretary of Commerce, the Chairman of the Atomic Energy Commission and the Director of the National Science Foundation. The Council would be required to develop long-range plans for research, development, studies, and surveys of the aquatic environment, and coordinate the efforts of all Government agencies in the field of oceanography. The Council would be directed to establish a National Oceanographic Data Center, whose functions would be to (1) acquire, assemble, process, and disseminate all scientific and technological oceanographic and related environmental data; (2) conduct research and other projects within the fields of its activities for any department, agency, or instrumentality of the United States on a cost reimbursable basis; and (3) exchange or sell, on a cost reimbursable basis, such data, publications, or other information of the center as the Council deems to be in the public interest.

The Department of Commerce does not favor enactment of H.R. 4276.

The President has recommended a coordinated national program for oceanography to the Congress, which contemplates a virtual doubling of the fiscal year 1961 program. The expanded activities of the various Government agencies under this program can and will be adequately coordinated by the Interagency Committee on Oceanography, a subcommittee of the Federal Council for Science and Technology, which is already performing most of the functions that would be exercised by the proposed National Oceanographic Council.

The National Oceanographic Data Center, located in the Navy Hydrographic Office and supported by agencies which have oceanographic programs, will begin its first full year of operation in 1962. This data center is presently collecting and utilizing information similar to that which would be acquired and studied by the data center provided for in the bill. Under the President's program, the amount recommended for activities of the National Oceanographic Data Center for fiscal year 1962 is almost double that of the fiscal year 1961 program.

For the above reasons, this Department believes that enactment of legislation along the lines of H.R. 4276 is unnecessary at the present time.

The Bureau of the Budget advises there is no objection to the submission of this report from the standpoint of the administration's program.

Sincerely yours,

EDWARD GUDEMAN,
Under Secretary of Commerce.

COMPTROLLER GENERAL OF THE UNITED STATES,
Washington, March 28, 1961.

Hon. HERBERT C. BONNER,
Chairman, Committee on Merchant Marine and Fisheries,
House of Representatives

DEAR MR. CHAIRMAN: Your letter of February 15, 1961, requests our comments on H.R. 4276. The purpose of the bill is to expand and develop the aquatic resources of the United States and the bill would establish a National Oceanographic Council.

We have no special information concerning the subject matter of the bill and, therefore, we make no recommendation with respect to its enactment. However, concerning section 10 of the bill under existing law (31 U.S.C. 67 and 72) we have the authority to initially audit all expenditures from the Treasury except where otherwise specifically provided by law. Also, under existing law we have the right to examine the books and records of certain Government contractors. See for example Public Law 245, 82d Congress, 65 Stat. 700. The provisions of section 10 would appear to have the effect of restricting this existing authority in the case of expenditures of $50,000 or less. We do not feel our existing authority should be so restricted. Further, in view of the increase in grant programs over the last several years we feel that in order to determine whether grant funds have been expended for the purpose which the grant was made the grantee should be required to keep records which would fully disclose the disposition of such funds. We also feel that the agency making the grant as well as the General Accounting Office should be permitted to have access to the grantee's records for the purpose of audit and examination. Consistent with the foregoing, we suggest that section 10 be changed to read as follows:

"(a) Each recipient of assistance under section 9(a)(3) of this Act shall keep such records as the Secretary of the Smithsonian Institution shall prescribe, including records which fully disclose the amount and the disposition by such recipient of the proceeds of such assistance, the total cost of the project or undertaking in connection with which such assistance is given or used, and the amount and nature of that portion of the cost of the project or undertaking supplied by other resources, and such other records as will facilitate an effective audit.

"(b) The Secretary of the Smithsonian Institution and the Comptroller General of the United States, or any of their duly authorized representatives, shall have access for the purpose of audit and examination to any books, documents, papers, and records of the recipient that are pertinent to assistance received under section 9(a)(3) of this Act."

In administering the above provision we do not contemplate making a detailed examination of the books and records of every recipient of a grant, or even a major part of them. However, selective checks may be made to provide reasonable assurance that grant funds are being properly applied or expended.

Sincerely yours,

JOSEPH CAMPBELL,
Comptroller General of the United States.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE,
June 26, 1961.

Hon. HERBERT C. BONNER,
Chairman, Committee on Merchant Marine and Fisheries,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: This letter is in response to your request of February 15, 1961, for a report on H.R. 4276, a bill to expand and develop the aquatic resources of the United States including the oceans, estuaries, and rivers, the Great Lakes and other inland waters, to enhance the general welfare, and for other purposes.

The bill would establish the National Oceanographic Council, composed of the Secretaries of the Treasury, Defense, Interior, Commerce, and the Chairman of the Atomic Energy Commission, and the Director of the National Science Foundation, among whom the President is to appoint the Chairman; direct the Council to establish a National Oceanographic Data Center or centers, and a National Instrumentation Test and Calibration Center; and assign their functions. The Council is directed to develop long-range plans for research, development, studies, and surveys of aquatic environment and to coordinate the efforts

of Federal agencies; the Council is authorized to delegate any of its functions to any Federal agency head and to provide for full utilization of Federal agencies' facilities and personnel. In addition, the bill authorizes and directs the Smithsonian Institution to conduct specific taxonomy programs and authorizes necessary appropriations.

This Department is a member of the Interagency Committee on Oceanography. Our interests in oceanography are in consideration of the importance of the vast estuarine and inshore ocean waters and areas as a future major resource for municipal, industrial, and recreational water supplies and our attendant concern as to their use for disposal of municipal and industrial wastes and the berthing of nuclear-powered ships. We are similarly concerned with the use of selected areas in the open ocean for the disposal of radioactive wastes and the use of the ocean fishery resources as they relate to the health of the people of the United States and of the world's underdeveloped countries which this Nation is aiding.

If a National Oceanographic Council is established, we suggest that, in recognition of our interests outlined above, the Council's composition be modified to include the Secretary of this Department. We contemplate actively contributing to the operation, and utilizing the facilities, of the already established National Oceanographic Data Center.

With the exception of the suggested modification, we defer to the appropriate agencies as to the desirability and advisability of enactment of the specific provisions of H.R. 4276.

We are advised by the Bureau of the Budget that there is no objection to the presentation of this report from the standpoint of the administration's program.

Sincerely yours,

ABRAHAM RIBICOFF, *Secretary.*

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington, D.C., June 8, 1961.

Hon. HERBERT C. BONNER,
Chairman, Committee on Merchant Marine and Fisheries, House of Representatives, Washington, D.C.

DEAR MR. BONNER: Your committee has requested a report on H.R. 4276, a bill to expand and develop the aquatic resources of the United States including the oceans, estuaries, and rivers, the Great Lakes and other inland waters, to enhance the general welfare, and for other purposes.

This Department has a vital interest in the field of oceanography. We are sympathetic to the objective of this proposal; however, we do not recommend the enactment of the bill for reasons hereafter stated.

This bill, which is broad in scope, would be cited as the "Oceanographic Act of 1961." It provides for the appointment of a seven-member "National Oceanographic Council." That Council would be required to establish a National Oceanographic Data Center or centers, the functions of which would be to acquire and disseminate scientific and technological oceanographic and related environmental data, to conduct research and other projects for any department or agency, and to exchange or sell such data and information as the Council considers to be in the public interest. The Council would be required to establish primary standards of oceanographic measurements. It would be required also to establish a National Instrumentation Test and Calibration Center. The Council would be required to develop long-range plans for research, development, studies, and surveys of aquatic environments, and to coordinate the efforts of the departments and agencies of the Government of the United States. Annual reports would be submitted to the Congress by the Council. The bill contains provisions concerning the supplying of vessels by the United States to governmental or nongovernmental departments or agencies. It would authorize the Smithsonian Institution to construct additional taxonomic facilities to establish a program for the recruitment, training, and placement of taxonomists, and the making of grants to qualified scientists and institutions.

Most of the objectives prescribed in this bill can be accomplished pursuant to existing authority. The Interagency Committee on Oceanography, a committee of the Federal Council on Science and Technology, has been an effective agent for closer cooperation within Government departments. Also, because existing authority allows for the funding of a national oceanographic program, and

existing grovernmental agencies can effectively coordinate such a program, there is no need for another Oceanographic Council, as specified in H.R. 4276.

Concerning section 3 of the bill that would authorize establishment of a National Oceanographic Data Center, it should be noted that such a center is already in existence, and is under the administrative control of the U.S. Navy Hydrographic Office. It receives direction from a special advisory board.

The need for a National Instrumentation Test and Calibration Center, as prescribed by section 5, is worthy of some consideration; however, we believe this provision does not justify an enactment on this subject at present. Many of our needs in this field are now being met by the use of facilities in the National Bureau of Standards. Also, private companies that are qualified to test and repair specialized instruments are of assistance in this matter. These are matters that warrant and are receiving attention by the Federal Council and the Interagency Committee on Oceanography.

We agree with the intent of section 9 which authorizes expansion of activities of the Smithsonian Institution. In this connection, it should be noted, however, that the Bureau of Commercial Fisheries has responsibilities for taxonomic research on fishes to meet specific objectives of the national oceanographic program. Our interpretation of this section, therefore, is that additional authority would be given to the Smithsonian Institution without restricting the activities of the Bureau of Commercial Fisheries or other agencies that have requirements to sponsor taxonomic research.

A coordinated and intensified program for oceanography has been recommended by the President in his recent message to the Senate and House of Representatives. We believe that, if adopted, this program will provide a balanced and effective use of our overall resources available for oceanography. We believe the adoption of the President's program will not require additional legislation.

We wish to emphasize, notwithstanding our recommendations on this bill, our great interest in the subject of oceanography and our desire that this form of research proceed efficiently and advantageously in the national interest. Four bureaus of this Department, the Bureau of Commercial Fisheries, Bureau of Sport Fisheries and Wildlife, Bureau of Mines, and the Geological Survey are directly concerned with programs of research in the field of oceanography. We are prepared to contribute our share, to the extent that funds may be appropriated, toward accomplishment of the objectives of oceanographic research.

The Bureau of the Budget has advised that there is no objection to the presentation of this report from the standpoint of the administration's program.

Sincerely yours,

FRANK P. BRIGGS,
Assistant Secretary of the Interior.

NATIONAL SCIENCE FOUNDATAON,
Washington, D.C., July 18, 1960.

Hon. HERBERT C. BONNER,
Chairman, Committee on Merchant Marine and Fisheries,
House of Representatives, Washington, D.C.

MY DEAR MR. BONNER: This is in further reply to your recent request for the comments of the National Science Foundation on N.H. 4276, entitled the "Oceanographic Act of 1961."

H. R. 4276 would establish a National Oceanographic Council, composed of representatives of six Federal departments or agencies, to develop long-range plans for oceanographic research and to coordinate the efforts of the various agencies and departments of the Government in this regard. H.R. 4276 would also direct the establishment of a National Oceanographic Data Center or centers and a National Instrumentation Test and Calibration Center, require that title to vessels supplied by the United States be returned to the United States upon completion or other termination of the purpose for which the vessel has been supplied and authorize the Secretary of the Smithsonian Institution to expand the taxonomic facilities of the Institution with particular emphasis on the taxonomy of marine organisms.

H. R. 4276 is aimed at insuring that the United States has a strong oceanographic program. We are in complete accord with this objective. In this connection, as you know, the President, on March 29, 1961, transmitted to the Congress his recommendations with respect to the appropriation of funds for fiscal

year 1962 to carry on the Federal effort in oceanography. The total amount requested for all Federal agencies is approximately $97.5 million. Of this amount, nearly $20 million is for the programs of the National Science Foundation. We believe that if the amounts requested by the President for the Foundation for fiscal year 1962 for support of oceanographic research activities are provided by the Congress, they will enable the Federal Government to continue to strengthen its oceanographic research activities in a sound manner.

In addition, one of the primary objectives of H.R. 4276 is to assure that there is a continuing national policy and program for carrying out the Nation's oceanographic effort. Coordination of the activities of the Federal agencies in this area is presently the responsibility of the Federal Council for Science and Technology, whose chairman is the Special Assistant to the President for Science and Technology. It is, of course, important, in the carrying out of the national program, that full information be available with respect to the status of the national effort, both public and private, and the needs in particular areas of this endeavor. The National Science Foundation, in carrying on its support of basic research in oceanography and related fields, keeps in close touch with oceanographic research activities throughout the world. In this connection, we are planning to issue, at appropriate intervals, reports on the status of oceanographic research together with assessments, as appropriate, of national needs in this area.

We are deeply mindful of the importance of oceanographic research to the national welfare and are prepared to cooperate in any way possible to assure that the oceanographic effort of the United States is second to none.

With respect to the proposed data center, such a center has been established within the Hydrographic Office of the Department of the Navy, funded jointly by the various Federal agencies concerned with oceanographic research activities. We believe that this arrangement is proving to be quite effective.

We feel that the matter of establishing a National Instrumentation Test and Calibration Center should be given serious consideration. However, we are not certain that a separate organizational arrangement should be established for this purpose but believe that such a center might usefully be established within one of the existing Federal agencies.

With respect to the matter of vessels supplied by the United States, it has been our general view that where such vessels are provided to educational or other nonprofit institutions for research purposes, the considerations of allowing the grantee to retain title outweigh the advantages to be gained should title to the vessel be retained by the United States. On the other hand, we agree that, as a general rule, such vessels should be utilized only for the research purposes for which they have been provided and that, when they are no longer being used for such purposes, the vessels should be returned to the United States. Similarly, such vessels should be available for Government use in time of emergency.

The matter of increased taxonomic facilities at the Smithsonian Institution we believe is one that the Institution is best qualified to assess.

The Bureau of the Budget has advised us it has no objection to the submission of this report.

Sincerely yours,

ALAN T. WATERMAN, *Director.*

DEPARTMENT OF THE NAVY,
OFFICE OF THE SECRETARY,
OFFICE OF LEGISLATIVE AFFAIRS,
Washington, D.C., May 26, 1961.

Hon. HERBERT C. BONNER,
Chairman, Committee on Merchant Marine and Fisheries,
House of Representatives, Washington, D.C.

MY DEAR MR. CHAIRMAN: Your request for comment on H.R. 4276, 87th Congress, a bill to expand and develop the aquatic resources of the United States including the oceans, estuaries, and rivers, the Great Lakes and other inland waters, to enhance the general welfare, and for other purposes, has been assigned to this Department by the Secretary of Defense for the preparation of a report thereon expressing the views of the Department of Defense.

The purpose of the bill is as stated in the title.

The Department of Defense subscribes to the objectives of this bill and indeed recognizes the salutary effect which congressional inquiry into the state of the marine sciences has in this area by its emphasis on oceanography as a program required in the national interest. The Department, however, is opposed to the enactment of H.R. 4276 for reasons stated in the subsequent paragraphs.

The bill proposes to establish a National Oceanographic Council to develop long range plans for and to coordinate the efforts of the Government in the marine sciences. There is already in existence an Interagency Committee on Oceanography, established in January 1960 by the Federal Council for Science and Technology in recognition of the fact that oceanography, is, indeed, an area which requires emphasis and support at the highest level. The Interagency Committee on Oceanography has effectively provided the coordinating mechanism among Government agencies engaged in oceanographic activities for the development of a meaningful national program. Its mission is similar to that which the bill proposes for the National Oceanographic Council and includes, additionally, the very vital function of coordinated budget planning so as to recommend to the Council the level of funding required each year to support the program. Basically, the Interagency Committee on Oceanography develops an annual program incorporating its best judgment as to balance and emphasis in terms of both long range scientific needs, requirements of Government agencies and fiscal resources.

The membership of the Committee comprises those Federal agencies which have the major interests in Federal oceanographic programs. Its working panels, organized to consider each of the areas highlighted in the bill, include members from all of the Federal agencies engaged in the marine sciences. In addition, the scientific community is represented both within the Committee and in its several panels by the National Academy of Sciences.

In his letter to the presiding officers of the Senate and House on March 29, the President of the United States recommended a $97 million fiscal year 1962 national oceanographic program. The Interagency Committee on Oceanography served as the focus for the formulation of this program. This program provides a substantial growth over the $55 million level of effort in fiscal year 1961.

The bill proposes to establish a National Oceanographic Data Center. A National Oceanographic Data Center is an existing organization. It was dedicated in its new surroundings at the naval weapons plant on January 16, 1961. The NODC is a distinct Federal activity, operating under a formal interagency agreement and sponsored by the Department of the Navy, Department of the Interior, Department of Commerce, the National Science Foundation, and the Atomic Energy Commission. Its administration is handled by the hydrographer of the Navy who receives technical and policy guidance from an advisory board representing the sponsors as well as the scientific community through membership of the National Academy of Sciences.

The bill proposes to establish a National Instrumentation Test and Calibration Center and to provide for the establishment of oceanographic standards. The Interagency Committee on Oceanography is presently actively considering the requirements and needs for such a center, its method of operation and in consultation with the National Bureau of Standards, the setting of primary operational standards for instruments and measurements. Until a determination of need is clearly outlined and until a determination of the most suitable method of operation is made, the Department believes that the establishment of the center or a predetermination of its character as a national organization is undesirable.

This report has been coordinated within the Department of Defense in accordance with procedures prescribed by the Secretary of Defense.

The Bureau of the Budget advises that, from the standpoint of the administration's program, there is no objection to the presentation of this report for the consideration of the committee.

Sincerely yours,

ROBERT E. M. WARD,
Rear Admiral, U.S. Navy,
Chief of Legislative Affairs
(For the Secretary of the Navy).

SMITHSONIAN INSTITUTION,
WASHINGTON, D.C., *June 23, 1961.*

Hon. HERBERT C. BONNER,
Chairman, Committee on Merchant Marine and Fisheries,
House of Representatives, Washington, D.C.

DEAR MR. BONNER: Thank you for your letter of February 15, 1961, asking for the comments of the Smithsonian Institution on H.R. 4276, a bill to expand and develop the aquatic resources of the United States including the oceans, estuaries, and rivers, the Great Lakes and other inland waters, to enhance the general welfare, and for other purposes.

The Smithsonian Institution is greatly interested in the field of oceanography and welcomes the opportunity to share in the expansion of research now going on in that important area of scientific knowledge. For more than a century, since its inception in 1846, the Smithsonian Institution has fostered and encouraged the increase and diffusion of knowledge in the realm of the natural sciences. Its sustained interest in oceanography has been evidenced by the many oceanographic expeditions in which it has participated and in the continuing related taxonomic activities of its highly specialized staff of scientists.

It is believed that statutory authority already exists for the Smithsonian Institution generally to engage in oceanographic activities. This authority is embodied in the act of August 10, 1846 (9 Stat. 105) and in the act of March 3, 1879 (20 Stat. 397).

In regard to the provisions of H.R. 4276, the following comments are offered:

Reference: Section 2.—The establishment of a high-level National Oceanographic Council seems unnecessary in view of existing administrative arrangements to coordinate national programs assigned to various agencies by law. However, if such a Council were to be created, it is suggested that the Secretary of the Smithsonian Institution be named to membership.

Reference: Section 9(a)(1).—The construction of additional taxonomic facilities is not required immediately. At least during the initial stages, activities incident to the expansion of the program of collecting aquatic and marine organisms could be accommodated within the facilities of the additional west wing of the Natural History Building.

Reference: Section 9(a)(2).—The Smithsonian Institution is not staffed to recruit, train, and place taxonomists in such number as may be required to classify fishes and marine invertebrates collected in carrying out the purposes of the bill. We suggest that this responsibility be left with universities and other agencies which are presently handling such activities.

Reference: Section 9(a).—By provision of the act of March 3, 1879, referred to above, the Smithsonian Institution has been designated as the official repository of the governmental collections of rocks, minerals, soils, fossils, and objects of natural history, archaeology and ethnology. However, it would be useful to redefine repository responsibility in this area and to assure that the collection and preservation of marine organisms is given proper emphasis in the expansion of oceanographic activities recently recommended by the President. We believe that repository responsibility of the Institution can be affirmed by administrative action and we shall continue our efforts in that direction. This would assure that specimens collected in the course of the various phases of oceanographic research which are no longer needed for investigations in progress would not be lost but would ultimately be available for continuing taxonomic study.

The Bureau of the Budget advises that there is no objection to the submission of this report to the Congress.

Sincerely yours,

LEONARD CARMICHAEL, *Secretary.*

THE SECRETARY OF THE TREASURY,
Washington, April 28, 1961.

Hon. HERBERT C. BONNER,
Chairman, Committee on Merchant Marine and Fisheries,
House of Representatives, Washington, D.C.

MY DEAR MR. CHAIRMAN: Reference is made to your request for the views of this Department on H.R. 4276, to expand and develop the aquatic resources of the United States including the oceans, estuaries, and rivers, the Great Lakes and other inland waters, to enhance the general welfare, and for other purposes.

The bill would create a National Oceanographic Council which would be given broad authority apparently designed to permit the Council to direct the national oceanographic effort.

The President in his letter to the Speaker of the House dated March 29, 1961, outlined an extensive national program in oceanography, including the construction of ships, shore facilities, and data centers; conduct of basic and applied oceanographic research; training of oceanographers; and surveys of the oceans.

The letter stated that the program would require the combined efforts of our institutions, both public and private, and the coordinated efforts of many Federal agencies. However, the letter did not recommend a new governmental organization such as would be established by the bill, but envisaged that the program

would be executed by the agencies concerned under present organizational arrangements.

In the circumstances, the Department would be opposed to the enactment of the bill.

The Department has been advised by the Bureau of the Budget that there is no objection from the standpoint of the administration's program to the submission of this report to your committee.

Very truly yours,

ROBERT H. KNIGHT,
Acting Secretary of the Treasury.

(For Bureau of the Budget report, see p. 170.)
(For Atomic Energy Commission, see p. 163.)

Mr. MILLER. As a result of testimony taken before the subcommittee in the 86th Congress, certain organizational and management holes were uncovered. In this bill I have sought to fill those gaps.

In addition, in this bill I have placed the study of inner space, which is dominated by the aquatic areas of the earth, on a comparable executive level with the study of outer space. This is a very difficult accomplishment, as one is always concerned with any proposed change in the line functions of the various departments and independent agencies in which are located the various subdivisions concerned with the aquatic environment. Yet we must have an integrated, well-planned, and properly funded program if we wish to continue as a nation.

The aquatic environment, its exploitation and use by other nations, friend or foe, is absolutely unconcerned with organizational methods on our part. In the race for an understanding of the phenomena of the sea, their cause and their effect on mankind, we must have a program which is flexible, simple, efficient, and utilizes all of our capabilities.

It is unfortunate that the position of all departments and agencies concerned, by the apparent direction of the Bureau of the Budget, seems to be: Everything is wonderful. No legislation is needed. The Congress should not be in the position of exerting congressional oversight, and so on. To this I cannot agree.

Today we shall start with certain parts of the management and funding problems as they exist.

Our first witness will be the Honorable James H. Wakelin, Jr., Chairman of the Interagency Committee on Oceanography. Following Secretary Wakelin, we shall hear from the Bureau of the Budget.

For the information of the members of the committee, there is in the appendix of the printed record on phase 1 of our hearings a great deal of information which will be helpful in this and future hearings. I have directed the staff to endeavor to anticipate future hearings with documentation that is available and will be currently germane, as well as for future hearings.

I am very happy to greet Secretary Wakelin, and I want to pay my compliment to him for the success which we have achieved in the field of oceanography.

As I told him a minute ago, I feel that it would not be necessary to have definitive legislation but for the fact that men come and men go. This subject is so important to me and to you that we had best tie it down in the American tradition of definitive legislation written on the statute books to make sure that we maintain the high position we hope to obtain in the field of oceanography.

Mr. Secretary, I welcome you.

STATEMENT OF HON. JAMES H. WAKELIN, JR., ASSISTANT SECRETARY OF THE NAVY FOR RESEARCH AND DEVELOPMENT; ACCOMPANIED BY CAPT. WILLIAM J. MORAN, AIDE, AND COMDR. S. N. ANASTASION, SPECIAL ASSISTANT

Mr. WAKELIN. Thank you, sir.

Mr. Chairman, I have a statement which I can read or I can leave with you for inclusion in the record, whichever is your desire.

Mr. MILLER. If you have the time, Mr. Secretary, I think we would like you to give your statement.

Mr. WAKELIN. Yes, sir.

Mr. Chairman, gentlemen, I welcome and appreciate the opportunity of appearing before you today to discuss the present status of Federal oceanographic activity. It is my intention, as Chairman of the Interagency Committee on Oceanography to comment on the operations of the Committee and the development of the national oceanographic program for fiscal year 1962. Following this, as Assistant Secretary of the Navy for Research and Development, I will briefly describe the Navy's oceanographic program, including its relationship to the overall national effort.

The United States has a vital need to know more about the vast ocean expanses of the earth. While we do not yet understand the marine environment to a degree we consider adequate, we all realize fully the implications of the ocean resources as they relate to our economic and military well-being. This relationship, the problems involved in attaining our urgent requirements, have been fully explored in this and past committee hearings, in specific reports developed by Congress and in the comprehensive survey recently published by the National Academy of Sciences Committee on Oceanography. President Kennedy, in several statements and addresses during the past few months, has highlighted the Nation's interests in oceanography and has forwarded to Congress his national program. I would like to draw upon this past fund of expert and well-documented testimony as the basis upon which now I will proceed to describe the development of our national program.

While I am certain that the past history of the Interagency Committee on Oceanography is well known to you, I believe that a brief review for the record would be appropriate. You will recall that in August 1959, the Federal Council for Science and Technology established a Subcommittee on Oceanography to review the proposed national oceanographic program recommended by the National Academy of Sciences Committee on Oceanography. Upon review of the subcommittee's report and in recognition of the fact that oceanography was indeed an area of science which required emphasis and support at the highest level, the Federal Council in January of 1960 established as a permanent committee under the Council the Interagency Committee on Oceanography, with the general mission of providing that coordinating mechanism among Government agencies engaged in oceanographic activities for the development of a meaningful national program. Its effectiveness in performing this broad mission has led to the reaffirmation on March 10, 1961, of its permanent status as a committee under the Council by the Chairman of the Council, Dr. Jerome B. Wiesner.

The Committee as organized initially consisted of members from the Department of Defense, represented by the Navy; the Department of Commerce, represented by the U.S. Coast and Geodetic Survey; the Department of the Interior, represented by the Bureau of Commercial Fisheries; the Department of Health, Education, and Welfare, represented by its Office of Education; the National Science Foundation, and the Atomic Energy Commission. Also the Committee includes assigned observers from the National Academy of Sciences Committee on Oceanography and the Bureau of the Budget. On November 29, 1960, the Treasury Department, in recognition of the U.S. Coast Guard's knowledge and continuing interests, its capabilities and potential in the oceanographic field, was also invited to become a permanent member of the Committee.

The national program, which President Kennedy presented to Congress on March 29, 1961, has as its basis the report of the National Academy of Sciences Committee on Oceanography, program planning by the Interagency Committee, and subsequent reviews by representatives of the National Academy of Sciences and by an ad hoc panel of the President's Science Advisory Committee. This represents a vigorous expansion of the Nation's efforts in oceanography; the program level of $97.5 million is an increase of $44.5 million or about 81 percent over fiscal year 1961.

The committee's approach to the development of the national program has been to consider general functional areas which are important to the growth in oceanography and common to participating agencies. During the past year the following functional areas were studied in detail: Research, ship construction, ocean surveys, facilities, data center, and education and training. The committee organized working panels of competent personnel from participating agencies and, indeed, from many other activities which we considered would make a significant contribution to our deliberations. An obvious, but most significant result of our organization has been an interchange of ideas and a recognition by each of us of the other's problems and programs. Our close working relationship has, by itself, encouraged increased coordination and cooperation which has existed between agencies performing work of mutual interest. A current example is the planning underway in the Hawaiian area whereby units of the Pacific Fleet will assist the Honolulu Biological Laboratory of the Bureau of Commercial Fisheries in the acquisition of data. Also worthy of note is the manner in which the Coast Guard is supporting the oceanographic program. In my letter written to this committee in support of Congressman Miller's bill regarding expansion of Coast Guard functions, I described the instructions by the commandant in relation to the 1961 Bering Sea patrol starting this May. You will recall that these instructions state that in addition to the routine hydrographic observations, the 1961 patrol will mark the first patrol wherein specific periods will be allotted to the scientific program in cooperation with other agencies.

The National Oceanographic Data Center dedicated on January 16, 1961, was established through the efforts of the Interagency Committee on Oceanography. The purpose of this Center is to provide to the scientific community a national operating agency which will facilitate the accumulation, processing, and retrieval of oceanographic

data from all sources, governmental and private, foreign and domestic. The Center's large scale introduction of machine processing techniques to oceanographic data will not only make significant contributions to the overall coordination of oceanographic research and surveys, but will also play a major part in the research and development of new instrumentation whereby data may be acquired in forms more readily adapted to such processes and thereby more rapidly available.

In the field of international cooperation as well, the National Oceanographic Data Center is taking a significant part. At present, exchange agreements for oceanographic data exist with Argentina, Canada, Chile, France, the United Kingdom, Netherlands, Union of South Africa, Norway, Yugoslavia, Sweden, Japan, and New Zealand. Exchange arrangements with the International Council for the Exploration of the Sea, an organization of 14 nations, and with the Fishery Branch of the Ministry of Food and Agriculture of Ghana are being considered.

The Interagency Committee on Oceanography believes that its work in the coordination of the national oceanographic program has just begun. With our past work as a basis, we are already planning for the next year's increment in this long-range effort on a more fundamental approach. In research we are formulating long-range objectives from which agency programs can be developed on an even better basis of coordination. For example, it is our intent to examine objectives and interests in the distribution of ocean properties and the dynamic processes involving circulation, tides, and waves; the interrelationship of ocean and atmosphere; the abundance and the variations in abundance of the living and mineral resources of the seas; and an examination of those properties which might be exploited to modify significantly the oceans for the benefit of mankind.

We have already in print a Committee pamphlet which sets forth in detail for fiscal year 1962 the operating schedules for research and survey ships. We have distributed this to all interested agencies and institutions with a firm belief that it will optimize the use of our existing seagoing platforms. We intend to continue in this endeavor in all fields of oceanographic studies.

We are engaged in the development of a national survey plan for the acquisition of data on a coordinated basis. As currently envisioned, the plan will be based on a thorough examination of the fundamental data requirements of all of the responsible agencies and will lead not only to a survey plan, but will encompass the requirements for modern instrumentation and for available instrument platforms as well. We intend also to examine feasibility and methods whereby this Nation's commercial shipping may contribute to our data acquisition requirements.

As strongly emphasized by President Kennedy in his program, there are urgent requirements in education and training in order that we, as a nation, may be able to conduct a meaningful expansion in the marine sciences. We in the Committee are currently engaged in an examination of the problems relating to the education and training of oceanographers—a review of the specific needs of the various agencies, institutions, and laboratories for trained personnel—as well as the possible ways in which these needs can be met.

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Further, we are considering requirements and methods for testing and calibration centers including, in consultation with the National Bureau of Standards, the setting of primary operational standards for instruments and equipment.

In all of this work of the Interagency Committee on Oceanography and in the national program, the Navy, as you are fully aware, has a vital interest and is the major contributor. The Navy must have a thorough understanding of the oceans as a unique operating environment. Our operations in the air, on the seas, and under the seas are heavily influenced by the oceans. The success of our powerful and modern Navy depends increasingly on our understanding of the ocean environment.

A study of the total Navy effort in oceanography has just been completed and is being published in the ten-year oceanographic plan (TENOC–1961). This plan provides a coherent and consistent definition of Navy objectives in oceanography. It includes long-range programs in research, facilities, shipbuilding, surveys, data acquisition and dissemination, and instrumentation development. It is a vigorous and imaginative expanding program. Its contribution to the national program is clearly defined. In addition to this contribution, the plan outlines and supports militarily oriented programs. For example, for fiscal year 1962, while the Navy contribution to the national oceanographic program is $32 million, its total budget including military oceanography is $54 million. While the additional increment will normally contain military projects directly applicable to defense requirements, the results of a considerable portion of these data will be introduced into the data center and will be available as part of the national program. The antisubmarine warfare environmental prediction study (ASWEPS), conducted by the Hydrographic Office, is a significant example. Another noteworthy example is the equatorial Pacific survey to be conducted by the Hydrographic Office in response to military requirements. In the process of this military survey the full scope of marine phenomena will be observed with a view toward obtaining a complete picture of oceanic environment in these areas. The information thus obtained will be incorporated into the data center's files for worldwide use. The hydrographer of the Navy has given wide distribution to this plan in order that oceanographers in other Federal agencies may participate in one or more phases of the survey.

The Interagency Committee on Oceanography has, I sincerely believe, demonstrated that it can effectively coordinate the oceanographic programs of the various Federal agencies. We all recognize, of course, that the Committee is still a young organization and, as I indicated before, is considering methods whereby it may increase its effectiveness. There is no question that we have the full cooperation of the agencies performing oceanography and the full support of our superiors in the administration. The national program for fiscal year 1962, submitted by President Kennedy, is responsive to the missions and resources of the participating agencies and is designed to probe those areas wherein the Nation's needs are urgent. A significant part of the President's program consists of capital expenditures for ships and facilities, forecasting continued growth in oceanography by providing a broader base for future operations.

I consider that our program is well founded and well organized not only through the coordinating processes within the Committee itself, but also due to the increases for oceanography achieved in difficult and complex budget competitions, an essential process in considerations relating to the expenditure of public funds.

The national oceanographic program reflects the growing stature of oceanographic research within the individual governmental agencies. It is a particular pleasure for me to acknowledge the contributions of the Congress to this growing awareness of the vital importance of oceanography to our country. We are especially indebted to Senator Warren G. Magnuson, chairman of the Interstate and Foreign Commerce Committee and to Congressman George P. Miller, chairman of the Subcommittee on Oceanography of the Committee on Merchant Marine and Fisheries, for their encouragement, interest, and support. Each of the several bills which are now under consideration has had the salutory effect of attacting and focusing attention to our oceanographic needs.

It is my belief, however, that the Federal agencies now have the authority necessary to go forth in the marine sciences as required in the national interest without additional and specific legislation. Of course, favorable action on Congressman Miller's bill relating to expansion of Coast Guard functions will provide additional national capabilities, as will favorable action on H.R. 4751, a similar bill relating to the activities of the U.S. Geological Survey. Organization for oceanography appears, at this time, not to be a problem, having been resolved within the permanent structure of the ICO. As you know, the members of the ICO occupy highly responsible positions in the organizational structure of the departments, representing the policy, program, and budget authority for their agencies in these areas. They are a group which sincerely believe in an enlarged and coordinated national oceanographic program, a group who recognize the problems, and who have demonstrated exceedingly well the ability to operate in an atmosphere of mutual respect and understanding.

The bill under consideration, H.R. 4276, also proposes to establish a National Oceanographic Data Center and a National Instrumentation Test and Calibration Center. With regard to the Data Center, as I indicated previously, this is now a going organization operating under a formal interagency agreement and administered by the hydrographer of the Navy for the sponsoring agencies. With regard to test and calibration facilities, the ICO is currently considering the desirability, means, and methods for providing such facilities to the oceanographic community.

In the above comments relating to this bill, I do not wish to imply that we do not need congressional support. We do need your support in very important ways. We do need your favorable consideration of our budget requests. We do need the benefit of your study of the national program through hearings such as this in order that it remain responsive to the Nation's requirements. And, we need your assistance in a problem area highlighted by the President: the training of young scientists. Although increasing numbers of students are being attracted to the marine sciences, the fundamental problem of adequate training remains. The educational institutions do not have the capability to accept within their present facilities the necessary enrollment

to sustain the growth of the national oceanographic program. I suggest that it is in this latter area, that of exploring the needs of educational institutions for this purpose and determining methods to provide for substantial expansion of educational facilities, that this committee could provide a significant contribution to the advancement of the oceanographic program outlined by the President.

In his message to Congress on February 23, President Kennedy described our problems and needs in natural resources, as follows:

> The sea around us represents one of our most important but least understood and almost wholly underveloped areas for extending our resource base.

Its importance to our military and economic well-being has been well and fully documented. The vast ocean areas are possibly the last frontiers on the globe which are not under control of a single sovereign authority. In a sense, the nations of the world striving for increased knowledge of the oceans are engaged in competitive free enterprise, with economic benefits and increased security accruing to those nations most rapidly gaining an understanding of the basic ocean processes and most effectively directing these processes to practical applications. It is our purpose within the Interagency Committee on Oceanography to provide the required national leadership to spur a continuing and orderly growth of such oceanographic activity within our country in order to meet our own requirements and those of the other nations of the free world.

Mr. Chairman, I have for you and for Mr. Bonner copies of the TENOC report which I would like to submit for your study and for your reference.

Mr. MILLER. Thank you very much. We shall be very happy to receive that.

Mr. Secretary, I congratulate you on a very fine statement. I congratulate you as Chairman of the Interagency Committee for the outstanding job which has been done in coordination and for the cooperation you have succeeded in obtaining among Government agencies with divergent and sometimes almost opposing interests. It is because of this important subject, as I told you a while ago, that this committee is concerned with perpetuating the work of the Interagency Committee. While we have an administration which is sympathetic to oceanography, while there is now a great drive on the part of the Navy for a knowledge of the sea or certain phases of oceanography, and I can foresee continued interest in this subject, we know there is competition for dollars and, as the Navy's interest in this begins to lessen because it will have acquired the basic data it needs, what agency in Government will spend the money or take the initiative in preserving this Interagency Committee? The matter of the biology of the ocean in the long run is as important as the physics of the ocean. Yet I think you in the Navy are primarily concerned with the physical aspects of the ocean.

It is for that reason I have introduced the bill which is before us, to try to freeze into law while this is a popular and knowledgeable subject, the work that you have so well done in bringing together the Interagency Committee.

I want you and the members of your Committee to know that this is the basic reason this bill was introduced. I have nothing but the

greatest admiration for the work you have done. We want to assist you in any way we can.

To me, one of the most significant statements you made appears toward the end of your statement on page 13, where you suggest that this committee may be of service in trying to provide further facilities for the training of oceanographers. I assure you the committee will undertake this, and we may call upon you and your Committee for advice because of your great knowledge, and see if we cannot give a push to this effort.

I am hopeful that before the month is out we will have on the President's desk a bill making it legal for the Coast Guard on its own initiative to enter the field of oceanography. I can foresee that perhaps a number of young Coast Guard officers can be sent in the future to oceanographic institutions just as you send young naval officers to management schools or to engineering schools for their further training. I think this then will be a source of additional information or additional competent data in this field.

I think we all recognize the fact that we need some standardization in calibration and instrumentation. I know that you are well on the way to doing this, just as we have established a fine oceanographic center under the hydrographer. I want to congratulate Admiral Stephan, whom I see here, for what he has done in this field. Yet some of us want to make sure that in the future we will maintain and continue for an indefinite time the very fine work that you, as Assistant Secretary of the Navy and Chairman of this Committee, initiated.

Mr. WAKELIN. Thank you, sir.

Mr. MILLER. Mr. Dingell, have you any questions?

Mr. DINGELL. No questions at this time, Mr. Chairman.

Mr. MILLER. Mr. Pelly?

Mr. PELLY. Mr. Chairman, I share your feeling of pleasure at having the Secretary here. We are all very much interested in this subject.

I read in the morning paper that a very distinguished admiral of the Navy, Admiral Rickover, has made some rather caustic remarks regarding the training that our young prospective naval officers are receiving at the Academy. Nothing in the nature of oceanography is taught at the Naval Academy, is there?

Mr. WAKELIN. Not as such, Mr. Pelly. There are some courses at the postgraduate school at Monterey, which include both meteorology and oceanography. However, there are at the Naval Academy three courses in oceanography which are offered to qualified midshipmen. These are, in a sense, elective courses. Also, considering the practical aspects of education at the Academy, courses such as seamanship and navigation lean heavily on certain aspects of oceanography.

Mr. PELLY. I was struck by your testimony with regard to the need for training scientists and for helping out in connection with the educational institutions where they do teach oceanography. I have in mind one in Seattle, the University of Washington, where there is apparently a great need for additional facilities. I believe this administration has provided some financial assistance looking toward expanding that work.

My perplexity is in how best can the presently existing educational institutions get the support of the Government for the assist-

ance they need under an existing coordinated program, rather than setting it up under law such as Mr. Miller's bill would do.

I am thinking in terms of whether or not the Interagency Committee is sufficiently organized to be recognized so there will be a louder voice in response to the need of some of these educational institutions as against the situation if it were established under law, such as this bill would do, in which case there possibly would be an organization where the needs could be better recognized and appraised and promoted.

Would you comment whether the present Interagency Committee is sufficiently organized to help out in the needs of the educational institutions in the training of young scientists?

Mr. WAKELIN. As you know, Mr. Pelly, we have a panel of the committee which is concerned with training and education. The chairman of the panel is a member from the Department of Health, Education, and Welfare. We have considered at some length the dual problem of training and facilities. It is not very feasible to bring in large groups unless additional shore facilities and educational facilities are provided.

The facilities problem relating to training was considered at some length, in fact in great detail, by our committee before the fiscal 1962 budget was assembled. We agreed that both training and facilities were areas in which we needed great help. We have increased our request for facilities substantially over last year.

However, in answer to your question about whether a group such as the ICO or a statutory group would have a greater effect in implementing training and facilities, I am not entirely clear, because each of the operating agencies at present would still have to contain within its budget the request for training and facilities as is now the case in the ICO, unless there is another mechanism envisioned in the bill which I have not seen.

Mr. Chairman, is it not true that the operating agencies would still be those concerned with the budgetary process in your bill, H.R. 4276?

Mr. MILLER. That is true.

Mr. PELLY. In other words, it would just have legal status and it would not really change the effectiveness of the program, as you see it?

Mr. WAKELIN. In these two areas; yes, sir.

Mr. PELLY. I must say I think all of us who have even a superficial knowledge of what has been going on feel a great sense of gratitude to the Navy for the emphasis it has given to this program. I do not know what the country would have done if it had not been for that. I know many of us on this committee would like to help in any way we can in getting additional facilities and increasing the number of students in this field. As evidence of this, we have the bill before us now. Perhaps it should be changed somewhat. I know the chairman of this subcommittee is vitally interested in this subject, and we want to give the bill all the study and consideration we can because of the need which exists.

Mr. Chairman, I have no more questions, but I would like again to express my personal gratitude to the Navy, and also gratification that in your testimony you have pointed up the need which I have seen in my own district.

Mr. MILLER. Mr. Pelly, as far as the bill itself is concerned, it is merely a vehicle. I am not tied to anything which is in it.

Mr. WAKELIN. May I make a comment, Mr. Chairman? I appreciate very deeply the kind remarks you and Mr. Pelly have made in my behalf. However, the Interagency Committee on Oceanography is truly a group effort. I want to relay, if I may, your comments to them, and I would like you to make them in their behalf as well as mine, because we have a wonderful coordinating and mutually respecting group, and they have done a marvelous job. Perhaps I may be taking more credit than is my due, and I am afraid I have in your eyes.

Mr. PELLY. A high percentage of research dollarwise has been fostered by the Navy, whereas the other members of the agency did not have the money to do it. I simply express appreciation that the Navy's efforts have been of a practical nature so organizations like Scripps and others could carry on.

Mr. WAKELIN. We are particularly fortunate, Mr. Pelly, in having Admiral Stephan as the hydrographer of the Navy. He has done a marvelous job in pulling our efforts together and in the Navy creating a new look at all of our oceanographic responsibilities. I think he has done a perfectly magnificent job.

Mr. PELLY. I think we have some very dedicated souls. As Mr. Miller has previously said, if you could count on the same personnel always being there, I do not think he or others would have concern about translating that into law.

Mr. MILLER. May I say, Mr. Secretary, when I paid you and the committee the compliment, I tried to imply I was speaking to the committee through you as its chairman. I realize it is a good effort, but I want to tell you it always takes a good man to pull a group together, so I still want to compliment you personally.

Mr. Lennon.

Mr. LENNON. No questions.

Mr. MILLER. Mr. Ellsworth.

Mr. ELLSWORTH. Thank you, Mr. Chairman. I have one or two questions, Mr. Secretary.

Mr. MILLER. Mr. Secretary, we welcome new men like Mr. Ellsworth to this committee, because they have already shown a great interest in oceanography. I am very happy to have them on the committee.

Mr. ELLSWORTH. Thank you, Mr. Chairman. I surely am very much interested in the development of oceanography.

Mr. Secretary, to go back to the question of the hypothetical relationship between the ICO and the chairman's bill, in a couple of places in your statement you referred to the ICO as a permanent organization. You used the phrase "permanent status" and "permanent structure." Yet on page 3 you said, "the reaffirmation * * * of its permanent status." How permanent is this? Is it really permanent, or is it just sort of permanent?

Mr. WAKELIN. We have a letter of authorization from Dr. Wiesner as Chairman of the Federal Council for Science and Technology, affirming the fact now that we are a permanent organization within the Federal Council. This is the permanency to which I referred in my statement, Mr. Ellsworth.

Mr. MILLER. If I may interrupt, this is still by Executive order.

Mr. WAKELIN. That is correct, sir.

Mr. MILLER. The Lord giveth and the Lord taketh away. This, then, stands on the basis of an Executive order which could be repealed tomorrow, not that I think it will be repealed tomorrow, but it has no more permanency than the man who makes the order.

Mr. ELLSWORTH. Just one other question, Mr. Secretary. You said on page 12:

> We do need your favorable consideration of our budget requests.

Then in your colloquy with the chairman just a minute ago you said you understood the organization set up by the chairman's bill, assuming it is passed, would not actually play a positive role in connection with the various agencies' budget requests for their activities in the area of oceanography. Yet, in subsection (5) of section 7 of the chairman's bill, one of the things to be included, I notice, in the annual report of the Council would be "requests for such legislation as may be necessary to authorize the construction of any new facilities and vessels which may be necessary to carry out as rapidly as possible the purposes of this act."

Would you not conceive that this bill might possibly require that those requests be channeled through this Council rather than through the departments?

Mr. WAKELIN. I am not entirely clear on this because the membership of the committee, which starts actually at the top of page 2 in section 2, indicates to me that those operating agencies of the executive branch would still in effect be the agencies through which funds would be allocated for the purpose of support of the oceanographic program. As I see it, Mr. Ellsworth, there is no other coordinate agency apart from the ones in the executive branch that would be concerned on a group activity with the disposition of funds.

Mr. ELLSWORTH. Your idea would be that this Council in the chairman's bill would be merely something of an informational agency to report to the Congress the information of what other operating agencies are requesting by way of funds or authorizations for facilities and equipment; is that right?

Mr. WAKELIN. Yes, sir.

Mr. ELLSWORTH. One final question. In your very wonderful and splendid statement this morning, you were speaking under two hats. One was as chairman of the ICO. I take it your views are the views of all the members of ICO.

Mr. WAKELIN. That is correct.

Mr. ELLSWORTH. Thank you very much, Mr. Secretary.

Mr. MILLER. Mr. Casey.

Mr. CASEY. I have no questions, but I wish to compliment the Secretary on his statement and the progress which has been made.

Mr. DINGELL. Could I ask one question? I was waiting for my colleagues, and I wanted also to have a chance to read over the statement and the bill.

Mr. Secretary, I assume you are familiar with H.R. 4276, are you not?

Mr. WAKELIN. Yes, sir.

Mr. DINGELL. As I read H.R. 4276 and as I read your statement, I noted several things. One is that I do not believe you refer to that bill. Am I correct in that?

Mr. WAKELIN. No. I did in effect refer to it, I believe, at the middle of page 12, Mr. Dingell.

Mr. DINGELL. Would I be correct in understanding that you do not make an official statement of endorsement or of opposition in regard to that bill?

Mr. WAKELIN. That is correct, sir.

Mr. DINGELL. Reading your statement, however, I note that the language of H.R. 4276 carries out precisely what you say is being done and what you say in your statement should be done. Am I correct?

Mr. WAKELIN. Yes, sir.

Mr. DINGELL. It would appear, then, that it is desirable for this committee to enact the bill; is it not?

Mr. WAKELIN. Sir, may I make a statement in this regard?

Mr. DINGELL. I would appreciate your comments.

Mr. WAKELIN. Certainly everything provided for in H.R. 4276 is in harmony with the current effort. This, then, thouches on a larger problem, and that is the relationship of the President to the Congress in this particular area. The relationship of the President to the Congress and the relationship of our Department to the Federal Council and to the President's Science Adviser, I think all have a bearing on the total problem here and in many other areas.

I should remark, then, in pursuance of this idea, that I would believe that the Federal Council and the President's Science Adviser should be considered in the same light as oceanography here, as the total effort in the executive branch in the White House. I think if other areas of more general character than this could be considered, oceanography and the work of our committee in reporting to the Congress through the President would immediately be cleared up.

Mr. DINGELL. You are familiar with the problem this committee has with regard to its jurisdiction and the fact that the other problems, if considered legislatively, would have to go to another committee. H.R. 4276 is probably the limit of the exercise of this committee's jurisdiction, as I read it in a cursory way.

May I tread a little bit the ground we have already gone over, just briefly, Mr. Secretary? As I read the bill, it appears to me as if H.R. 4276 was drafted to carry out what is being done now under the Executive order. Am I correct?

Mr. WAKELIN. Yes, sir.

Mr. DINGELL. It would appear what is being done is very desirable, as I read your statement.

Mr. WAKELIN. Yes, in general terms, it is very desirable. However, there is one point in the operation of the executive branch to which I feel I must make reference here, sir, and that is that a report to the Congress in January from a Committee on Oceanography which is a group agency committee, might conceivably be a report in advance of a budget submission which was then not cleared completely through the executive branch.

Mr. DINGELL. This would be your principal objection?

Mr. WAKELIN. This would be my principal objection.

Mr. DINGELL. Are you aware of other objections to the bill?

Mr. WAKELIN. No.

Mr. DINGELL. This would be the sole objection?

Mr. WAKELIN. Yes, sir.

Mr. DINGELL. In order to help the committee, would you see to it that some of your sharp pencil people, your good technicians down there in the Department, draft us an amendment carrying out and effectuating the position you have taken this morning?

Mr. WAKELIN. Yes, sir.

(The information follows:)

JULY 11, 1961.

HON. GEORGE P. MILLER,
Chairman, Subcommittee on Oceanography, Committee on Merchant Marine and Fisheries, House of Representatives, Washington, D.C.

DEAR CONGRESSMAN MILLER: I wish again to express my appreciation for your invitation which permitted me to appear before your committee and comment on H.R. 4276. The meaningful application of oceanographic research programs is vital to our country. It has been gratifying to me to witness the competent investigation being conducted by the Subcommittee on Oceanography in this area of scientific endeavor.

During my testimony on June 19, 1961, Congressman John D. Dingell requested that I provide the subcommittee with a suggested change to section 7 of H.R. 4276. Although the Department of Defense position was submitted to Congressman Herbert C. Bonner on May 26, 1961, I am happy to provide the requested changes for the subcommittee's consideration as possible amendments to H.R. 4276.

Section 7 of the bill states that "The Council shall report annually during the month of January to Congress." The remainder of the section outlines the substance of the report. In order to preserve the authority and responsibility of the Executive for the departmental functions relating to the conduct of a national oceanographic program, I suggest the following substitution for section 7:

(*a*) The Council shall submit to the President, for transmittal to the Congress, annually, a report containing the following:

(1) The status of research, development, studies, and surveys conducted (directly or indirectly) by the United States in furtherance of aquatic sciences, together with application of such research, development, studies, and surveys.

(2) A detailed analysis of the amounts proposed for appropriation by Congress for the ensuing fiscal year for each of the departments, agencies, and instrumentalities of the Government to carry out the purposes of this act.

(3) Current and future plans and policies of the Federal Government with respect to the aquatic sciences.

(*b*) Any report made under this section should contain such recommendations for additional legislation as the President may consider necessary or desirable to carry out as rapidly as possible the purposes of this act.

There are additional items which I respectfully offer for consideration if favorable action is contemplated on the bill.

(*a*) In order to provide consistency with the suggested change above for section 7, I submit the following as an alternate to section 6:

It shall be the function of the Council to advise and assist the President, as he may request, with respect to the performance of functions in the marine sciences, including the following:

(1) Develop a comprehensive program for research, development, studies, and surveys of the aquatic environments to the end that all of the purposes of this Act can be more effectively carried out.

(2) Coordinate the efforts of the departments, agencies, and instrumentalities of the Government of the United States to the end that the greatest possible program shall be made in carrying out the purposes of this Act through the fullest utilization of existing facilities and personnel.

(3) Delegate any of its functions to the head of any department, agency, or instrumentality represented on the Council.

(4) Provide, on a cost reimbursable basis, and with the consent of the head of the affected department, agency, or instrumentality for the fullest

utilization of the facilities and personnel of departments, agencies, and instrumentalities in carrying out the purposes of this Act.

(*b*) In reaffirmation of my remarks during the hearings, I suggest a review of the intended membership of the Council. Specifically, I recommend the inclusion of the Departments of State and Health, Education, and Welfare, as well as the inclusion of a statement providing for orderly changes in membership as the President may desire. Since the bill includes all aquatic sciences, perhaps the Department of Agriculture should also be considered.

(*c*) If new statutory authority is required for the Smithsonian Institution to participate in oceanography, it is suggested that such authority be provided in separate legislation as was done recently for the U.S. Coast Guard.

Finally, you will recall that on June 19 we discussed briefly the announcement of a report by Senator Henry M. Jackson which proposed the statutory creation of an Office of Science and Technology in the White House to strengthen the direction of the Nation's scientific efforts. Oceanography is a part of this overall and greater area of science coordination by the Executive. It would give me a great deal of pleasure to be able to meet with you personally at your convenience to discuss the implications of such a concept as set forth by Senator Jackson and its possible significance to the future of oceanography and other science areas.

With kindest personal regards.

Sincerely yours,

JAMES H. WAKELIN, Jr.

Mr. DINGELL. I would be very grateful to you for that, Mr. Secretary.

I want to commend you for a very fine statement and thank you for the help you have been to the committee.

Mr. WAKELIN. Thank you, sir.

Mr. MILLER. Mr. Bauer.

Mr. BAUER. Mr. Secretary, I have a few questions concerning the operation of the ICO as it exists now.

In order that we may be in concurrence with our thinking, on page 96 of phase 1 is the membership of the interagency committee, and also the working group membership. With respect to the organization, how much staff does the ICO have?

Mr. WAKELIN. The ICO Secretary is Mr. Robert Able, who is in the Office of Naval Research. He is the only full-time member we have apart from Commander Steven Anastasion in my office who spends more than 50 percent of his time in the ICO and on oceanographic problems.

Mr. BAUER. Don't you feel you are somewhat understaffed with the magnitude of the job?

Mr. WAKELIN. For the kind of work, Captain Bauer, we have been doing up to date, I think we have had an adequate staff. In the future, when we expand our efforts, as we have discussed in my statement, I think we are probably going to have to increase our central staff.

Mr. BAUER. With respect to coordination, I notice in the membership that the only biological interest in ICO is Mr. McKernan, and he is the Director of the Bureau of Commercial Fisheries.

Supposing problems of hydrobiology occur, which of course, is an important subject in the study of the oceans, as well as the lakes, would Mr. McKernan represent all hydrobiology on the committee?

Mr. WAKELIN. He is at present the representative of the Department of the Interior.

Mr. BAUER. I mean all hydrobiology. For example, the Office of Naval Research has hydrobiology and the Atomic Energy Commission does.

Mr. WAKELIN. Indeed. These interests are represented through the Office of Naval Research and Dr. Wallen of the AEC.

We have no specific committee or group under the ICO with a particular interest in hydrobiology as such.

Mr. BAUER. Don't you feel it would be advisable to have such a group? I am talking now from the point of view of the motivation of Mr. McKernan as the head of the Bureau of Fisheries.

You have basic biology and everything else, and it seems to me the ICO should coordinate those efforts.

Mr. WAKELIN. Yes.

Mr. BAUER. Now, the next question is on the budget review. During the previous administration you have had the preparation for the budget, and during the current administration, the change in the budget. How did you go about getting the budget review?

Mr. WAKELIN. The budget review for 1962 was a lengthy process of interagency support within the ICO, starting last June of 1961.

Then, as each of the agencies' budgets, and each of the problem areas in research and surveys and training, personnel, and facilities was brought forward as a result of each panel's investigation into these particular areas, the budget was assembled as a total document, using each of the components that I have just described as working elements as part of the program.

Then the Inter-Agency Committee on Oceanography presented this to the Federal Council and the Federal Council approved these budget items. At the same time, the representatives of each of the agencies returned to his own department and supported their parts of the program to their own secretaries. This brings us up to about the middle of December, when the final budget of the last administration was fully assembled.

Mr. BAUER. In other words, the Secretary of each department really decided on whether or not your recommendations as to the budget in his department would be presented to the President.

Mr. WAKELIN. Yes, sir.

Mr. BAUER. In the review you had with the budgets, did you have any outside experts?

Mr. WAKELIN. Yes. We had an observer from the Bureau of the Budget, Mr. Wendell Pigman. We had another review, a separate review of our program by Dr. Spilhaus representing the National Academy of Sciences on the Committee on Oceanography; and then Mr. Vetter quite often sits in with Dr. Spilhaus as a member of the National Academy's Committee.

Mr. BAUER. Is it the intention of the ICO to have the National Academy Committee on Oceanography currently scan the budget proposals?

Mr. WAKELIN. No. I think as far as scanning the budget proposals is concerned, their interest is in finding out whether proper emphasis on a program basis is introduced into the program, whether there is adequate support for training facilities and adequate support for ship construction and basic research.

They are less interested from the National Academy's point of view in the actual dollars as they are in our reseach, surveys, and ship construction program.

Mr. BAUER. Is there any reason why industry should not be represented on the panel of the ICO?

Mr. WAKELIN. We are hoping, Mr. Bauer, in August to convene a large group of industrial people who will confer with us on instrumentation and standardization in this whole area. We hope through this mechanism to get a much closer association with industry than we have had in the past. The only outside Government activities who are concerned in this program, as you know, are those laboratories such as Woods Hole, Lamont, university structures throughout the country, Scripps and APL in Washington. We have had no industrial people sitting in with us at all upon our general program.

Mr. BAUER. Don't you think that would be advisable, perhaps?

Mr. WAKELIN. I think there are a number of areas in which they could contribute. For example, the Geophysical people could contribute a great deal to this field. I think also those people who are in the instruments program could contribute a great deal to our problems that we are discussing currently and which we will bring up to focus in August on instrumentation and standardization.

Mr. BAUER. Let me ask you a further question on coordination: Let's consider the National Science Foundation and the Office of Naval Research. Both of these organizations are contracting agencies with respect to oceanography; is that correct?

Mr. WAKELIN. Yes, sir.

Mr. BAUER. Is there an overlap in their operations?

Mr. WAKELIN. Our review of the general programs for the 1962 budget included areas in which each panel and the whole ICO considered joint programs, either in the same field, or in different fields, that appeared to overlap. We have tried to cut down any overlapping or duplication we considered unnecessary. In certain areas there are efforts going along in the same fields by line item title as though they are exactly the same thing.

In these areas they are usually attacking the same problem from two different viewpoints. I do not believe, Mr. Bauer, there is a significant amount of duplication between NSF and ONR in this regard.

Mr. BAUER. Let me be specific, Mr. Secretary.

In your TENOC program, you show the following ships will be constructed for Woods Hole Oceanographic Institution, a ship of AGOR SCB–185 characteristics should be provided by 1965. A second AGOR SCB–185 should be provided by 1969.

Now, we have heard testimony, and will again later on this week, that the National Science Foundation is also financing a ship for the Woods Hole Oceanographic Institution. Is there any reason why the ships should not be financed from one or the other sources, or why should they be financed from both?

Mr. WAKELIN. Our program at Woods Hole with the AGOR SCB—185 is a replacement for one of the ships that is now at Wood's Hole, and a followon to that. The Science Foundation's ship is a little smaller than this, as I recall. Ours is 1,375 tons and I think theirs is around 1,100 tons. These are both ships of a general character to do about the same job, but of course Woods Hole operates

more than one ship and has to have more than one replacement in the next 3 or 4 years because their fleet is fairly old.

Mr. BAUER. Isn't it true that Woods Hole was slated to get an AGOR that is now going to Lamont?

Mr. WAKELIN. I am not sure about that, Mr. Bauer. I can look into it.

(The material follows:)

AGOR-3, which is being constructed now in Jacksonville, Fla., is scheduled for Lamont. In the initial considerations by the Office of Naval Research for the sponsorship of this oceanographic research vessel, probably back in 1955 or thereabouts, the most urgent requirement for a ship of this type appeared to exist at Woods Hole. I must emphasize that during these considerations no commitments were made to any laboratory. In the intervening time between these early considerations and the first stages of appropriations and program deliberations, Woods Hole made requests to the National Science Foundation for a grant of funds to provide for the design and construction of a research vessel. As a result of this, and since approval of the grant seemed probable, the Office of Naval Research determined that the next greatest need for a research vessel was at Lamont. The shipbuilding program for fiscal year 1960 included this ship for Lamont.

Mr. BAUER. I understand Lamont is very unhappy because of the compartmentation of the AGOR that was going to Woods Hole. It was approved by Woods Hole through the ship's characteristic board, is that correct?

Mr. WAKELIN. I am not aware of that, sir.

Mr. BAUER. Do you feel the title of the ships financed by the Federal Government should be passed to the recipient, or retained by the Federal Government?

Mr. WAKELIN. I believe title should be retained by the Federal Government.

Mr. DINGELL. I happen to be a member of the committee which reported out the legislation under which title is given to Woods Hole. I do not know how far you in the departments have gone in giving title in this particular bill to this very fine organization. I can tell you that the legislative history of the statute under which title is being given to Woods Hole does not authorize the Federal Government to give away ships. It authorizes the giving away of small scientific apparatus, microscopes, and things of that sort.

The reason it was enacted was to permit the Federal Government to give these to institutions of higher learning which have been utilizing them during programs they had been conducting under the Federal Government, rather than holding a wipeout sale of surplus commodities from which practically nothing could be returned to the Government. That is the history.

I intend to raise this question with every witness that comes before the subcommittee. I want you to be aware of the history, and aware of the very grave distortion of the legislative purposes of this particular statute by the National Science Foundation, and by other departments that are considering this particular program.

Mr. WAKELIN. Then your bill, Mr. Dingell, did not include a complete ship?

Mr. DINGELL. This is not a bill. This is a statute reported out of the Committee on Interstate and Foreign Commerce by a previous Congress 2 or 3 years ago. I have previously taken the National Science Foundation over the hooks on their program in this respect,

and I intend to give them a fresh reminder when they appear before us.

I keep forgetting to raise this question in the committee that has jurisdiction, the Interstate and Foreign Commerce Committee of the House, which had a Health and Science Subcommittee which has since lost jurisdiction over science. I intend to raise this to the chairman of that committee at the appropriate time.

I think you ought to be aware of this. You ought to know the limits and the authorities. I am aware of the fact that clear language permits you to do it, but the legislation history is vastly different. It did not apply to millions of dollars worth of ships. It applied to tens, twenties, fifties, and perhaps hundreds of dollars for optical equipment, and so forth.

Mr. WAKELIN. I am glad to know this.

Mr. MILLER. This is a matter that came out of the Interstate and Foreign Commerce Committee?

Mr. DINGELL. That is correct.

Mr. MILLER. You, sir, are on that committee?

Mr. DINGELL. That is correct.

Mr. BAUER. I have another question, Mr. Secretary.

We have a reply to a request for opinions from the various departments on H.R. 4276 which suggests that if the Council is established by H.R. 4276, then the AEC and the National Science Foundation should not be members of the proposed Council as oceanographic activities are such a small part of the operation of their program. Would you care to comment on that?

Mr. WAKELIN. I think in terms of the relative fraction of support of these institutions that goes into oceanography, that is perhaps correct. I am wondering whether the Navy support out of the total R. & D. budget is any larger.

Mr. BAUER. Thank you, sir.

The next question that AEC raises: They seem to be very unhappy about the possibility that the Data Center can conduct research as Mr. Miller's bill permits them to do.

Would you consider that research as to programing is not research? Shouldn't the Data Center be concerned with the validity of the data input that goes into the Data Center which would involve research?

Mr. WAKELIN. That is one of its prime responsibilities.

Mr. BAUER. At this time, I would like to introduce the comments of the Atomic Energy Commission.

Mr. MILLER. Without objection.

(The information referred to follows:)

U.S. ATOMIC ENERGY COMMISSION,
June 6, 1961.

HON. HERBERT C. BONNER,
Chairman, Committee on Merchant Marine and Fisheries,
House of Representatives.

DEAR MR. BONNER: The Atomic Energy Commission is pleased to have this opportunity to comment on H.R. 4276, a bill to expand and develop the aquatic resources of the United States.

The Commission does not believe that the establishment by this bill of the National Oceanographic Council and Data Center is needed. Some months ago the Departments of the Navy, Commerce, and Interior, the National Science Foundation, and the Atomic Energy Commission entered into an interagency agreement providing for the establishment of a National Oceanographic Data

Center, to be located within the U.S. Navy Hydrographic Office, and the creation of a National Oceanographic Data Center Advisory Board. The Advisory Board consists of one member from each of the following agencies: Navy Hydrographic Office, Coast and Geodetic Survey, Bureau of Commercial Fisheries, National Science Foundation, Weather Bureau, Office of Naval Research, and the Atomic Energy Commission. The agreement states that the National Academy of Sciences will be invited to name two nonvoting members to sit in with the Advisory Board. This interagency Data Center will, pursuant to the agreement, (*a*) receive, compile, process, and preserve oceanographic data submitted to it; (*b*) acquire oceanographic data from domestic and foreign sources; (*c*) establish procedures for assuring the accuracy and quality of the data in its repository meets the criteria established by the Advisory Board; (*d*) prepare data summaries and tabulations, and indexes, and other information; and (*e*) perform certain other useful functions in regard to oceanographic data. The Center's activities will not duplicate those of the Weather Bureau, Coast and Geodetic Survey, Smithsonian Institutions, or other agencies. In the Commission's opinion, the Data Center and the companion Advisory Board, recently inaugurated under the interagency agreement, are well organized and are capable of effectuating the basic purposes of the bill; the Commission believes they should not be replaced by the Council and Center the bill would establish.

In addition to the preceding general observations, the Commission would like to make these specific remarks: The provision in section 2 of the bill that the members shall be Secretaries of the named departments, the Chairman of the Atomic Energy Commission, and the Director of the National Science Foundation seems to us to be out of proportion to the fact that these oceanographic activities are, though important, but a relatively small part of the respective programs of each of these agencies; also, we think the chairmanship should rotate and that the Presidential appointment feature is unnecessary. In regard to section 3, conduct of research is not, in our opinion, an appropriate function of the Data Center. The interagency Center will not conduct research. The function specified in section 4, namely, the estabilshment of primary standards of oceanographic measurements, is also unnecessary in our opinion because the U.S. Bureau of Standards now develops satisfactory standards in this area. Nor do we consider the separate test and calibration center, provided for in section 5, to be needed; the specified testing, calibration, and evaluation work should, in our view, be performed by the National Bureau of Standards.

The Bureau of the Budget has advised that there is no objection to the presentation of this report from the standpoint of the administration's program.

Sincerely yours,

R. E. Hollingsworth,
Deputy General Manager.

Mr. Drewry. Mr. Secretary, early in your presentation you mentioned the TENOC program and you have presented a copy for Mr. Miller and Mr. Bonner. Do we understand from that, that it is no longer classified?

Mr. Wakelin. This is for official use only. The reason why it is for official use only is that it refers specifically to programs within institutions other than those in the Government structure and proposes to put a dollar figure on the sponsorship of programs in the whole field of oceanography. I think for this reason I would suggest it be held closely because there are data of a fiscal nature that might be prejudicial to future budget hearings.

Mr. Drewry. We just wanted to clear up that point.

Mr. Miller. And get it in the record so the committee can take cognizance of the Secretary's statement.

Mr. Drewry. In line with Mr. Bauer's questions concerning the Atomic Energy Commisison, what oceanographic activity does the Atomic Energy Commission engage in, just generally? Is it largely with waste disposal, or does it go well beyond that into creative and constructive as well as defensive and protective activities.

Mr. WAKELIN. I think you might say, sir, there are two general interests of the Atomic Energy Commission. I do not pretend to speak for them. I can tell you from the ICO's viewpoint their feelings about oceanography in research. There are two general areas in which they have a vital interest; one is, of course, a study of the ocean area and environment in terms of their requirements to understand methods by which wastes, materials of a fissionable or radioactive nature, can be disposed of; secondly, they are interested in helping all of us in other parts of the program in the use of tracer elements to study particular elements, either of a physical, or a biological nature. So one is for their particular interest in waste disposal, the other is a a companion activity to help all of us with their techniques, to introduce modern and more applicable methods by which our research data can be obtained, either on the biological side, or the physical side.

Mr. DREWRY. It is more than simply a question of trying to protect the wastes which they create.

Mr. WAKELIN. Yes.

Mr. DREWRY. I notice while the Department of Commerce is represented on the committee, the Coast and Geodetic Survey has the only representative. Why not Maritime from the ship construction standpoint, or the Weather Bureau, or does Admiral Karo speak for all interests?

Mr. WAKELIN. Admiral Karo speaks for his Department on the ICO which includes not only the Coast and Geodetic Survey, but liaison with the Weather Bureau, and with the Maritime Administration and the Bureau of Standards.

In that regard, we are hoping to have a much closer association with the Bureau of Standards in our instrumentation and calibration test center hearings that we are going to start with industry in August.

On that one point, which I think is important with respect to meterological connections with our program, I feel for the future of our national effort there must be a much closer working relationship with all of meteorology and our oceanographic program, not only in terms of those interphase problems of heat exchange and balance between the oceans and atmosphere, but the interplay of all meteorological conditions on a particular oceanographic environment in which we have an interest militarily.

We feel that the atmospheric sciences and oceanography should have a much closer working tie-in. We are striving toward that end within the Federal Council at present to provide such a liaison on a working basis.

Mr. DREWRY. That is a thought I had in mind. I notice several agencies that are represented on the interagency committee have alternates, but there are no alternate members from Commerce which has four agencies which have some considerable interest in oceanography generally.

Mr. WAKELIN. Yes, sir.

Mr. DREWRY. Back to a question Mr. Dingell raised; as I understood your reply, you feel there is nothing offensive about the bill, in fact, you are performing the functions set forth in here already, and have the same view on the question of the retention of title of vessels. The only adverse remarks I have heard you make has to do with whether the report should be made in January or some other month.

I wonder if there is any validity to this thought—you do depend considerably on Congress, whether you are an Executive order agency or otherwise. I wonder if you might not be better off under a statutory sanction where you would have a legislative committee to come home to rather than approaching the Appropriation Committee piecemeal through individual agencies. The interest of this committee is very strong and its present leadership will undoubtedly stay that way. Just as you may depart, or 4 years from now there may be some change in the Executive, and the same with regard to individuals on the committee, so a legislative base would give you someplace to come home to. So maybe in a sense, rather than any infringement on the Executive through this bill, it would actually strengthen the program you want to carry out. Is there anything worth while on that thought?

Mr. WAKELIN. Yes, there is. May I go back and comment first? I think my remarks were a little more general than in which month we should report to the Congress. My remarks concerned in essence the whole problem in science via the Federal Council on Science and Technology through which we work, and to which we report, and its relationship through the President to the Congress.

I believe it would be unworkable if we were reporting to you directly prior to the complete approval of the President on our national program. I think by way of reporting to you we should, in the executive branch, be careful that we report to you via the President. In that way the executive branch will have a coherent and cohesive effort to give the Congress, and we will not be bypassing one function in a particular area. Secondly, I do think the many committees to whom we all report present a real difficulty in a coherent oceanographic program.

For example, I go up to the Committee on Appropriations, Subcommittee on Military Appropriations, Mr. Mahon's committee. Our program in oceanography has always received their full support because in so many of the military operations, it is a necessary science that allows us to do our job. I think in other departments it is very difficult for many of the members to get as receptive an audience in their areas.

In this regard, I think if we could present to one committee of the House and of the Senate, separately, a coherent program for oceanography, that would be a great help in a national effort. Each one of us goes up in a separate segment, and we have to make sure that each committee knows that their particular program is tied in with all the other agencies that go to different committees.

Mr. DREWRY. That is just what we have been groping for for the past several years, to find some way to do that. I do not believe I can see anything in this bill that would interfere with the relation of the interagency committee, or the council, and the rest of the President's scientific program.

I do not believe I see any objection to the annual report coming from the President rather than the Council itself. The aim is to have a single place from which you can report, because from the appropriation standpoint, I believe most of us, on this side and your side, feel that the appropriation structure is better off as it is, where each agency makes its own approach for funds.

What we want to do is to see there is a relationship, and there is some single realization and appreciation of that relationship. If there

were a single committee such as this one that would receive an annual report through the Speaker, then it seems to me when the different constituent members of the group make their approach to the Appropriations Committee, you have more than one arrow in your quiver.

Mr. WAKELIN. How would this differ from the report Mr. Kennedy sent to the Speaker and to the President of the Senate this year? This does bring the national oceanographic program together in one coherent package.

Mr. DREWRY. I do not think it differs. I think that is what we have in mind. There is no statutory base, or sanction for this report.

Mr. WAKELIN. That is correct.

Mr. DREWRY. We were delighted when it came because it did set forth just the type of thing we are trying to approach with the bill.

Mr. MILLER. It is something we like to get anyway.

Mr. DREWRY. And know we are going to get.

Mr. WAKELIN. May I comment on another member we think is going to be very helpful to us, and that is, a member which is not included in the bill, which I think is terribly important as far as our international relations are concerned. That is a member from the Department of State.

In our international relationships, we feel we need the guidance of the State Department in areas in which we may be in cooperative effort with many other countries, particularly for programs like the Indian Ocean expedition.

Mr. MILLER. I can say, now that you have introduced it, as one of those privileged to go to Geneva last year—my colleague, Mr. Casey, was there, too, and I believe he will agree with me the State Department should be represented because there are international complications that come up with regard to the ocean and we got caught a little short because we had not given this consideration many years ago. The law of the sea is going to be involved in this picture.

Mr. WAKELIN. Might I also suggest, Mr. Chairman, a representative from Health, Education, and Welfare be included?

Mr. MILLER. I have a note right here to that effect.

Thank you very much, Mr. Secretary. Our compliments to your committee and to you.

Mr. Philip S. Hughes, Assistant Director for Legislative Reference, Bureau of the Budget.

You are accompanied by Mr. Berg? Do you have a prepared statement?

STATEMENT OF PHILIP S. HUGHES, ASSISTANT DIRECTOR FOR LEGISLATIVE REFERENCE, BUREAU OF THE BUDGET, ACCOMPANIED BY CLIFFORD L. BERG, STAFF MEMBER, OFFICE OF MANAGEMENT AND ORGANIZATION

Mr. HUGHES. I do not. I think the statement of Mr. Wakelin has very well set forth the viewpoint of the Interagency Committee on Oceanography and of the administration on this very important and interesting subject. We are here at the request of your committee, and would like to be of whatever benefit we can to the committee in reviewing the reasons for our views, I think I might simply say this: I believe Secretary Wakelin's statement and the discussions with the

committee have indicated pretty clearly that the objectives of the bill are in no way in conflict with the administration's own objectives in this area, and the issue, if any, seems to center around the question of the statutory versus the administrative structuring of this organization, and perhaps to an extent at least of the details of the organization.

Mr. MILLER. The Bureau of the Budget does not recommend the bill, or support the bill?

Mr. HUGHES. No, sir. It has been our view that the interagency committee has functioned very well.

With the support, as Secretary Wakelin indicated, of the President and the administration, there have been very substantial strides made by the Interagency Committee and by the Government in general in the field of oceanography, and our judgment would be that the flexbility that is inherent in the present arrangements makes desirable their continuance.

Mr. MILLER. One of the things that disturbs me and I would like to have you comment on is this: I serve on another committee that has to do with science, a committee that authorizes the expenditure of a great deal of money. NASA is within its jurisdiction. I am conscious of the fact even now, in spite of the fact we are confronted with a great effort by another nation in this field, and while there is a great demand in this country that we maintain our lead in the field of astronautics, there is a very definite feeling oceanography is a very expensive thing with no material gain to come from it, and we should take a complete new look at it. These things have aw ay of pyramiding outside of actual threats of aggression.

Do you think in 5 or 10 years from now we can continue to get money for oceanography with this drive for economy?

There are people who are not conscious of it and what it means. In the long haul, the sea is a source of food and chemicals. The things we can take from the sea are going to be very important. Other nations have learned to use them and use them successfully.

Would we then be better off, do you think, if the Interagency Committee is subject to the feeling of one man. Or is this of sufficient importance in its overall—I do not mean the physical, I am talking about the biological phases of oceanography—that law assure its continuance.

Mr. HUGHES. First of all, I think we who try to predict budgets recognize that prognostication 5 years ahead is a very risky business.

Mr. MILLER. Particularly in the field of biology, Mr. Hughes, life is a funny thing. We just cannot handle it on a year-to-year basis. We have to have some long-range plans just as we have in the fiscal side of this field, or in the development of a weapon system, or anything else. We realize the shortcomings of a program from year to year. Let's take a little longer on these things.

Mr. HUGHES. It is our feeling that the interest not only in the Government, but in the Congress and in a scientific community at large is sufficiently and clearly established to assure, as we see it, a major emphasis in the field of oceanography in the foreseeable future. I think you used the term "frozen in statute" in asking me your question. We see this problem to an extent at least as a matter of weighing the virtues on the one hand against the disadvantages on

the other as we see them of freezing this type of organization in statute.

It is our judgment with what we believe is assured interest in the Congress, as evidenced by you today and by the existence of your committee, an interest obviously in the scientific community, that the effort that is now taking place in the field of oceanography is assured of continuance. The President, whoever he may be, is not an individual isolated from the Congress and the scientific community, or from the rest of the executive branch. We feel confident as long as the circumstances of national life and scientific life are those that exist today this effort will continue and probably grow.

Mr. MILLER. Of course, I would like to think in the field of the biological phases of oceanography you would have some parallel to the farm problem and to agriculture. Unfortunately, we do not have the sea divided into 40- and 60- and 160-acre plots.

Mr. HUGHES. With quotas.

Mr. MILLER. With a vast push by people interested in making agriculture work. That has kept it to the forefront of our national life for many years.

The present drive in oceanography is really a matter of defense. I have never looked into the history of it, but I assume that the National Academy of Sciences had its impetus from the Navy Department, in the interest of national defense. I am not positive. Now we are in it. We begin to realize all its ramifications. It has to be a permanent thing if we are going to reap all the benefits we can from the oceans, those things in and on the floor of the ocean.

Do you think for the foreseeable future this interest will be maintained at that level?

Mr. HUGHES. First of all, let me say I do not know the extent to which the scientific interest in oceanography is a byproduct of a national defense interest. From the discussions that I have been a very nontechnical auditor at, I get the impression there has been all along, and there is a growing scientific interest apart from the defense significance of this study. But whether or not that is the case it would seem to me, and I am quite confident it would seem to us as an institution in the Bureau, that the defense interest in this area is not only a current but a continuing thing.

There are no foreseeable circumstances, to us that is, that will diminish this interest within a time period we can speculate on, or I can speculate on.

Mr. MILLER. I hope you are right. I do not want to give you the impression we are not dedicated men and have not been dedicated men for generations. Even some of the people who did the pioneering work in it did it as a byproduct of their own activities. They were men who made great sacrifices to go out to sea. As I look back, when I was in the State of California Legislature, I remember going down to the University of California and visiting Dr. Lawrence and Dr. Oppenheimer and nobody was very much concerned with splitting the atom. They initiated some of the work out there. They were in the forefront of it. War was the emphasis behind it.

It is going out into other fields making other contributions, now. I would like to think that may be true of oceanography. I would want to make sure.

Mr. BAUER. At this time, Mr. Chairman, I would like to introduce into the record the remarks of the Bureau of the Budget on H.R. 4276.

Mr. MILLER. Without objection.

(The information referred to follows:)

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington, D.C., May 9, 1961.

Hon. HERBERT C. BONNER,
Chairman, Committee on Merchant Marine and Fisheries,
House of Representatives, Washington, D.C.

MY DEAR MR. CHAIRMAN: This is in reply to your letter of February 15, 1961, requesting the comments of this office with respect to H.R. 4276, a bill to expand and develop the aquatic resources of the United States including the oceans, estuaries, and rivers, the Great Lakes and other inland waters, to enhance the general welfare, and for other purposes.

This bill would establish a National Oceanographic Council to develop and coordinate a long-range program in oceanography. Among its responsibilities the Council would establish a National Oceanographic Data Center and a National Instrumentation Test and Calibration Center.

In his letter of March 29, 1961, to the Speaker of the House, the President outlined a national program to strengthen oceanography on a long-term basis. He announced that additional funds were being requested for a number of agencies in 1962 to provide almost a doubling of the current year's level of effort in oceanography.

This national program was developed under the auspices of the Interagency Committee on Oceanography of the Federal Council for Science and Technology and through coordination of the plans and programs of the Federal agencies concerned with oceanographic research and ocean surveys. Significant progress in coordinating the efforts of several agencies has been achieved by the Interagency Committee on Oceanography as illustrated by the oceanographic program recommended by the President. This, in turn, is part of a broader integration of scientific activities undertaken by the Federal Council for Science and Technology.

Regarding the Council proposed in H.R. 4276, the Bureau generally considers it undesirable to have interagency arrangements for the management of common activities fixed by statute in view of the necessity for providing flexibility to meet the unforeseen needs of the future and for assuring clear Presidential authority over the management of the executive branch. This is particularly true in the case of national programs in science, such as oceanography, where the pattern of organization over the long term is still evolving and is under active study.

With regard to the establishment of the National Oceanographic Data Center, this center has already been established under those agencies involved in oceanography and, accordingly, the provisions of the bill regarding this center are not necessary.

Consideration is still being given to the need for and nature of a National Instrumentation Test and Calibration Center or centers. Should such a center or centers prove desirable, they can be established under existing legislative authority.

Finally, with regard to authorizing the Smithsonian Institution to initiate a program in oceanography, it should be noted that the Smithsonian Institution is already authorized to conduct such a program. Further study of the appropriate role of the Institution in this field is being conducted at present.

For the reasons given above, enactment of H.R. 4276 would not be consistent with the administration's objectives.

Sincerely yours,

PHILLIP S. HUGHES,
Assistant Director for Legislative Reference.

Mr. BAUER. Now, Mr. Hughes, with respect to the Bureau's position on H.R. 4276, you point out there is in existence a National Oceanographic Data Center, and the center has already been established under those agencies involved in oceanography, and accord-

ingly, the provisions of the bill regarding this center are not necessary. I am quoting from your comments.

Now, Mr. Chairman, with your permission, I should like to introduce at this time the Interagency Agreement for the Establishment and Operation of a National Oceanographic Data Center.

Mr. MILLER. Without objection.

(The information referred to follows:)

INTERAGENCY AGREEMENT FOR THE ESTABLISHMENT AND OPERATION OF A NATIONAL OCEANOGRAPHIC DATA CENTER

This agreement made and entered into at Washington, District of Columbia, on this the 23d day of December 1960, by and between the Department of Defense represented by the Department of the Navy; the Department of Commerce; the Department of the Interior; the National Science Foundation; and the Atomic Energy Commission.

Witnesseth: That,

Whereas there is a recognized and demonstrated need for the establishment within our Government of a National Oceanographic Data Center organized for the purpose of acquiring, compiling, processing and preserving oceanographic data for ready retrieval, this need for oceanographic data, available at cost, being common to the agencies of Government and to public and private interests, both foreign and domestic;

Whereas all parties to this agreement as enumerated above agree by and among themselves that only through their joint cooperation and coordination of means under their joint direction can this oceanographic data center be organized to serve effectively and economically the above purpose; and

Whereas immediate activation of such a center is in the public interest as represented by the responsibilities of the parties to this agreement;

Now, therefore, it is mutually agreed, as follows:

1. (*a*) All parties to this agreement as enumerated above, agree to sponsor jointly a National Oceanographic Data Center to be located administratively within the U. S. Navy Hydrographic Office, Washington 25, District of Columbia, to be operated for the purposes set forth in this agreement.

(*b*) The Navy shall retain full custody and control of all plant account property utilized by the National Oceanographic Data Center.

(*c*) For the purposes of this agreement, oceanographic data shall be defined as chemical, physical, biological, geological, and related information pertaining to the seas.

2. In order to afford all parties to this agreement as enumerated above, or their authorized representatives, an effective means of formulating, expressing and transmitting joint policy and technical direction to the said data center, there is created a National Oceanographic Data Center Advisory Board. The said Board shall consist initially on one (1) member from each of the following governmental agencies:

(*a*) Navy Hydrographic Office.
(*b*) Coast and Geodetic Survey.
(*c*) Bureau of Commercial Fisheries.
(*d*) National Science Foundation.
(*e*) Atomic Energy Commission.
(*f*) Weather Bureau.
(*g*) Office of Naval Research.

In addition, the National Academy of Sciences will be invited to name two (2) nonvoting members. Other representatives may, upon recommendation of the said Board and approval of the participating agencies as enumerated in this paragraph, be appointed to the said Board. The terms of membership and election of the chairman and vice chairman shall be established by the said Board. The Board shall meet semiannually and at such other times as designated by the chairman. All matters coming before the said Board will be decided by majority vote.

3. The center's operations shall be the responsibility of the Department of the Navy to be funded by reimbursements from the participating agencies; such reimbursement shall be for the pro rata share of the estimated cost of acquiring, compiling and preserving oceanographic data by the center, which pro rata share

measures the cost of the work done by the center for the contributing participating agency. The reimbursement shall be made pursuant to the provisions of Sections 686, 686a, 686b, and 691 of title 31, United States Code. The initial estimated annual cost of these services to each of the participating agencies is:

(*a*)	Department of the Navy	$250,000
(*b*)	Coast and Geodetic Survey	80,000
(*c*)	Bureau of Commercial Fisheries	80,000
(*d*)	National Science Foundation	80,000
(*e*)	Atomic Energy Commission	10,000
(*f*)	Weather Bureau	10,000

Proper adjustment on the basis of the actual cost of the services performed shall be made on the ratio of the pro rata shares of each of the participating agencies. Actual cost shall not be incurred in an amount greater than ten percent (10%) in excess of the estimated cost without specific approval of the participating agencies. These estimates shall be redetermined annually and reapportioned, as necessary, by amendment to this Interagency Agreement to reflect actual cost experience of the previous year and prospective changes in operational requirements. In addition to the foregoing estimates and elements of cost, the participating agencies will pay for data obtained from the Center at the cost of the services performed. The Department of the Navy shall advise the participating agencies of the date of activation of the Data Center. Each of the participating agencies may, at its election terminate its participation under this agreement upon reasonable advance notice to the other agencies, and, in such event, the amount apportioned to it for payment for the year in which such termination takes place shall be adjusted to such extent, if any, as the parties hereto consider appropriate under the circumstances.

4. Management and support of the Data Center shall be furnished by the Department of the Navy through the U.S. Navy Hydrographic Office in accordance with the provisions of this agreement as amplified by the policies and procedures established by the National Oceanographic Data Center Advisory Board. The National Oceanographic Data Center shall be under the direct supervision of a scientifically and technically qualified U.S. Civil Service employee who will devote full time to supervising the operations of the Center as distinct from other functions of the Hydrographic Office. With no intent to restrict by enumeration, support shall include suitable space for offices, data storage and processing and appropriate facilities to make the data at the Center readily available, such as a reading room, a reference library and a catalog of Center holdings. Any action taken by the Advisory Board in regard to the policies and procedures which requires work to be done by the Department of the Navy shall be considered as orders made by participating agencies within the provisions of Sections 686, 686a, 686b, and 691 of title 31, U.S. Code.

5. The National Oceanographic Data Center shall perform the functions enumerated below:

(*a*) The Center shall receive, compile, process and preserve appropriate oceanographic data submitted to it.

(*b*) The Center shall be responsible for acquiring by exchange, gift or purchase oceanographic data of scientific value from domestic or foreign sources.

(*c*) The Center shall establish procedures for insuring that the accuracy and general quality of the data incorporated into the Center's repository meet the criteria established by the Advisory Board and shall undertake analytical studies necessary for this purpose.

(*d*) The Center is directed to prepare data summaries and tabulations showing annual and seasonal oceanographic conditions. This may include annual and seasonal means, departures from normal and examples of conditions existing within a specified interval of time (synoptic observations).

(*e*) The Center shall prepare and make available to requestors, indexes of its holdings and other information necessary for requesting data or services. It shall perform or make arrangements for the performance of appropriate data processing services at cost.

(*f*) The Center is authorized to promote and encourage the routine collection of time series and oceanwide survey data.

(*g*) The Center is authorized to exchange or sell to the general public, in accordance with existing law, summaries and tabulations prepared by the

Center. In the case where work is done for parties outside of the Government, such work shall be performed through the Navy Working Fund if such work is not considered a sale of a publication. Receipts from work done for third parties shall be used to reimburse the National Oceanographic Data Center for the work done.

(*h*) The Center shall not duplicate the functions of other official repositories such as the Weather Bureau, the Coast and Geodetic Survey, the Smithsonian Institution and similar agencies. The Center shall be cognizant of other sources of relatable information for referral purposes. Only data authorized for release to the public shall be retained in the Center repository.

(*i*) The Center will notify the Archivist of the United States of its holdings. As the oceanographic data retained by the Center do not, however, come within the definition of records as contained in the Act of July 7, 1943, 57 Stat. 380, as amended, (44 U.S.C. 366–80), no other disposition of reports will be required.

(*j*) The Center shall provide all secretarial services required by the Advisory Board.

(*k*) The Center is authorized to reimburse the National Academy of Sciences for the cost of the services of the two nongovernmental representatives.

(*l*) The Center shall on 30 June of each year submit a written report to all the contributing agencies as listed in paragraph 3 herein. The format of this report will be established by the Advisory Board.

6. Except as otherwise provided herein, this agreement shall remain in full force and effect until terminated by written agreement of the parties hereto.

In witness whereof, the parties hereto have hereunto set their hands on this the 23d day of December 1960.

WILLIAM B. FRANKE,
Secretary of the Navy.
FREDERICK H. MUELLER,
Secretary of Commerce.
ALAN T. WATERMAN,
Director, National Science Foundation.
FRED A. SEATON,
Secretary of the Interior.
ROBERT E. WILSON,
Acting Chairman, U.S. Atomic Energy Commission.

Mr. BAUER. Let me ask you, Mr. Hughes, suppose the next President does not want an Oceanographic Data Center; we wouldn't have one, would we?

Mr. HUGHES. A short answer to your question is, no, we would not. I would like, though, to point out if I might, and elaborate briefly on my comment to the chairman, that I think even Presidents are not in a position to move on a completely arbitrary and unilateral basis. The very existence of a center of this sort, its establishment, its staff and machinery which go to make it up, are some assurance of its continuance, and coupled also with this assurance is, we feel, the assurance of continued Government interest as well as scientific interest.

Mr. BAUER. However, it could be wishful thinking.

Mr. HUGHES. It could be.

Mr. BAUER. Now, under the terms of the current interagency agreement with respect to the Oceanographic Data Center, any contributing agency can withdraw from contributing to the data center upon reasonable notice; is that correct?

Mr. HUGHES. That is correct.

Mr. BAUER. Supposing the withdrawal occurs. Where does the money come from to keep the data center going? Say you have four people contributing to the data center. One decides to pull out and remove the funds; what happens?

Mr. HUGHES. I think the consequences of a fund withdrawal in this circumstance are essentially the same as the consequences of any withdrawal of funds, no matter how this organization was set up.

Mr. BAUER. Wouldn't it be better, then, to have the data center established by statute?

Mr. HUGHES. It doesn't seem to me the statutory designation of the center, per se, would affect the availability of funds. The funds could be granted, or not granted in either circumstance just as they are granted or not granted to one of the departments of Government.

Mr. DINGELL. Just a minute. You are a very experienced man in this field of budget, and I imagine your experience goes beyond that of any of the members of this committee. I do not think you intend to sit there and give us the understanding that an agency could arbitrarily withhold funds from a statutorily composed organism of the Federal Government to which it was a contributor. I do not think you want us to infer from your testimony this morning that a contributor to an informal organization of this sort, set up by an agreement of this kind, could be denied the right to withdraw if it were so minded under the terms of the agreement we have here, and with which I am sure you happen to be familiar. Am I correct?

Mr. HUGHES. You are quite correct. I thought the import of Mr. Bauer's question was: What happens if funds are not requested by one of the contributing agencies, or funds are not granted by one of the contributing agencies, and what I intended to convey was failure to provide funds, whether this failure be failure of request within the executive branch, or failure of appropriation in the Congress, it seems to me is a contingency which confronts this and other agencies, and would have to be dealt with in the same way whether or not the organization were statutory or otherwise. I would certainly concede a statutorily designated organization has a firmer foundation than an administratively designated one.

Mr. BAUER. What we are interested in in this committee is establishing as firm a foundation as possible so this organization could go forward and carry out the functions we feel it should have. I am sure you agree with us that is a laudable purpose in order to protect the interests of the United States, and to carry out our scientific research on a more stable and permanent basis and intelligently organize and plan a permanent collecting agency, responsible not only for the collection of data, but also for the intelligence processing of this data. So studies are necessary in carrying out the intelligent handling and management and compilation and collection of this data which is a very laudable purpose, I am sure you will agree.

Mr. HUGHES. We certainly have no quarrel with the objectives of the legislation.

Mr. BAUER. Thank you very much.

One further question. In your reply to our request for your feelings from the Bureau of the Budget in the matter of Congressman Miller's bill, you mentioned an authorized program of the Smithsonian Institution in oceanography. Could you give us a little help as to what that program is?

Mr. HUGHES. I am afraid I cannot, Mr. Bauer. I will be glad to furnish for the record a brief description if the committee wishes.

Mr. BAUER. I would appreciate it very much if you would supply that for the record.

(The information requested follows:)

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington, D.C., July 14, 1961.

Hon. GEORGE P. MILLER,
Chairman, Special Subcommittee on Oceanography,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: When I appeared before you on June 19, 1961, you and other members of the subcommittee requested that I furnish certain additional language and comments respecting H.R. 4276, a bill to expand and develop the aquatic resources of the United States including the oceans, estuaries, and rivers, the Great Lakes, and other inland waters, to enhance the general welfare, and for other purposes.

As pointed out during our testimony before your subcommittee, the Bureau of the Budget fully supports the objectives of the bill but believes those objectives can best be attained by administrative measures, especially in rapidly evolving fields of science and technology. In particular we would urge that a statutory interagency body not be assigned operating responsibilities which are most effectively carried out by agency heads acting under the direction of the President.

A basic difficulty with the bill as drafted is that the relationship of the National Oceanographic Council to the President is not spelled out. As a result, the bill appears to except the heads of departments and agencies serving on the council from Presidential direction. It is, therefore, suggested that one section provide that "functions assigned to the Council by this Act shall be performed under the direction of the President."

However, if the President is to oversee the activities of the Council a number of other provisions of the bill should be amended. With respect to Council membership needed flexibility could be provided by adding the phrase "The heads of such other departments and agencies as the President may designate" at the end of the listing of Council members in section 2(a). Appropriate prerogatives of the President would be maintained in the reporting procedure of section 7 by providing that the annual report "be submitted to the President for transmittal to the Congress."

Sections 4 and 5 of the bill do not appear to conflict with the responsibilities of the National Bureau of Standards. That Bureau would continue to provide basic standards, tests, and calibrations which could be supplemented by the Council to meet specialized requirements in oceanography. However, to make clear the specialized nature of the proposed test and calibration center its title might be revised to be the "National Oceanographic Instrumentation Test and Calibration Center." Sections 4 and 5 when considered in conjunction with section 6(b) of the bill make clear that the Council could utilize services of the National Bureau of Standards and other appropriate agencies.

Section (6(b)(2) could be interpreted as providing that the Council is to transfer funds to agencies for the performance of oceanographic activities. We assume that this is not intended but rather that the Council is to serve as a coordinating mechanism in facilitating transfer of funds among agencies as appropriate.

With reference to section 8 of the bill, the Bureau of the Budget agrees with the general policy that title to sizable vessels should remain in the United States. However, there may be circumstances in which transfer of title to a nonprofit institution would be in the national interest, particularly if provision were made for return of the vessel in case of emergency. This could be accomplished by authorizing transfer of title whenever the agency head made a specific finding that transfer would be in the public interest and substantially further the purposes of the act.

With respect to the provisions of section 9 affecting the Smithsonian Institution, we have arranged with the Institution to furnish you directly with an outline of its current and proposed future activities in the aquatic sciences.

In regard to section 10, we understand that the General Accounting Office has submitted a report concerning this section and assume that this will provide the subcommittee with the comments on this section which it desires.

Sincerely yours,

PHILLIP S. HUGHES,
Assistant Director for Legislative Reference.

Mr. DREWRY. I will bring up the same point I did with Secretary Wakelin: You concede a statutory base is a firmer base than an administrative base. What real objection can there be to having a statutory base other than the function can be built up or torn down as the Executive sees fit?

Mr. HUGHES. The latter advantage is a very real advantage, the matter of flexibility in structure and membership and organization in an evolving area, an area where many of our efforts are exploratory, we feel that flexibility is a very real advantage.

Obviously the Congress has the last say which organization shall be statutory and which administrative, but apart from this, the interest in statutory designation of coordinating groups of this sort is extensive. The range of possibilities is very wide. I can name some of them for you if you would like. They are individually and collectively very important.

We feel in these areas of evolving programs the interests of the Government are better served through flexible arrangements if flexible arrangements of an administrative nature can effectively do the job. While I am not an expert at all in the field of oceanography, there seems to be generally accepted the fact that the Interagency Committee with the support of the agency heads and the President, has done an effective job. We feel this type of arrangement, therefore, should be permitted to continue.

Mr. DREWRY. I do not know if I can recall a situation where both sides were so thoroughly in agreement on the objectives, and on what has been going on and still we seem to have two definite sides. The Congress, I believe, likewise can be flexible and evolving. I again bring up the point I raised with the Secretary, you have to come to Congress for the money. I wonder if it doesn't really strengthen the base by having a statutory base so you not only have a collection of appropriation subcommittees, but also a legislative committee that is not only deeply interested now, but will have a continuing responsibility to stay interested because the Congress enacted a law that said they must.

Mr. HUGHES. I think there is certainly no disagreement that the existence of direction in the nature of a statute does provide a firmer foundation for an organization. At the same time, though, it carries with it certain problems. I do not wish in any way to quarrel with the forward view of this committee or the Congress in saying what I said. The fact remains that the very rigidities which the statute introduces are some of the things the committee is seeking. We are confronted with a difference in judgment here as between us on the merits of these types of firmness, let us say, the rigidities that a statute would introduce here, as distinguished from the flexibility that exists under the present arrangement.

Mr. VANIK. I do not understand that answer, Mr. Chairman.

Mr. HUGHES. I will try again. I am sorry.

One of the reasons, as I understand it, that the committee wishes to designate in statute an interagency council on oceanography is to insure that the existence of such council will be continued and not subject to Executive action by this or a successor President. By definition, then, the statute imposes time limits, if nothing else, on the possibility of changing the statute, changing the membership of the

advisory group, changing its relationship in certain ways to the President, perhaps its relationship to the science adviser or the scientific community. The point I was trying to make was that the judgment as between the chairman and the committee members and the Bureau is the difference in weighing the advantages of administrative flexibility versus the statutory authority.

Mr. VANIK. The same objection could be raised against almost any kind of legislative authority one wanted to impose on an organization. They are not unique or special to this particular problem. If you want this high degree of flexibility, then probably we should eliminate legislation and go ahead and carry on everything by Executive decree. Sooner or later, I think what we will search out for is accountability. I think this legislation seeks to establish accountability to Congress for achievement. How can you get that high degree of accountability for achievement and development, research, and all the other things involved, if you have this loose type of organization that you advocate. Something with an open end. Something which can be changed every hour? How can you do what the President says we ought to be doing with respect to this subject? We are trying to carry through his mandate. That is the purpose of this legislation. Do you object to an effort to centralize this thing? What are you trying to tell us, that you do not want this legislation?

Mr. HUGHES. The first thing I would try to convey is, whatever its disadvantages as the committee looks at it, the present arrangement apparently by mutual agreement is working very well. There is an aggressive program involving a considerable number of agencies and apparently producing a very good end quality product.

Mr. DINGELL. Are you not now making a whale of an argument for enactment of the legislation which Mr. Vanik, Mr. Miller, and I have been discussing this morning?

Mr. HUGHES. I did not think so.

Again I come back to the fact that we are differing in judgment, as I see it, over the advantages of the permanent, the specificity of a statute, versus the flexibility and the lesser permanence, I would certainly concede, of an administrative arrangement.

Mr. DINGELL. It is not inconceivable that in your lifetime and in mine and in our public lifetime collectively—and I expect to be in Congress for quite a while, or at least I hope to—this business of a concentrated and strenuous endeavor in the field of oceanography will be important to the security of the United States. Am I correct in that?

Mr. HUGHES. I would think so.

Mr. DINGELL. In fact, it is not inconceivable that this endeavor will become more important rather than less, at least in terms of dollars spent and in terms of activity. Am I correct?

Mr. HUGHES. That is correct.

Mr. DINGELL. Over the last few years we have witnessed a sharply rising curve of activity by the Federal Government, including ONR, including the physical and biological sciences, which has reflected itself in a very real way in the budget, with which you are familiar.

We come now to a situation where we have a program which is working very nicely, one which conceivably will require continued

and increased emphasis in terms of effort and finance over the long haul.

To continue, let me ask you just one more question. Do there appear to you to be any changes in the existing system which demand to be considered at this moment?

Mr. HUGHES. I am not aware of any at this particular point in the present Interagency Committee arrangement. Secretary Wakelin might have some thoughts on that, but I am not aware of any.

Mr. DINGELL. In the consideration of this committee, if we could find no strong objections to this addition to the existing program, or if we can find no flaws or bugs in it, in the view of the important witnesses who are participating in it, there would be no strong reason against enacting this, other than just the loss of flexibility of which you are so fearful. Am I correct in this?

Mr. HUGHES. I think the loss of flexibility is the principal objection.

Mr. VANIK. Has Congress indicated any lack of understanding of the need for flexibility in this area in the past? Is there any historical objection? We have given them about everything they have wanted, have we not?

Mr. DINGELL. That is my recollection.

Mr. VANIK. There has not been any obstruction on the part of this committee, as I recall, that would indicate that you could not quickly get any change that you wanted.

Mr. HUGHES. No, I am not aware of any particular problems in this area, but there simply remains the fundamental fact that one of the reasons the committee wishes to put this in statute is to reduce the possibility for change in the structure of the interagency committee on oceanography or in the existence of that committee.

Mr. VANIK. Is not the reverse true? If we take something which has been established by Executive decree and establish it as a statutory matter, we are firming up the organization and seeking to preserve it. We are strengthening it and giving it a real bulwark in the law. Then you can go ahead and use Executive authority from there on and expand beyond that. We are giving you a firm bulkhead in the law. There conceivably is a time when you might have to resort to it in this area of research. Some successor may come along in the Executive Office and decide to do away with it. We are trying to firm up this thing by statute.

Mr. HUGHES. I think what we are discussing, sir, if I may put it this way, is whether this is the time and the circumstance in which to firm up this type of organization, as the bill would do, by establishing a council of the Secretaries of the Departments, which by necessity would function in much the same way through their designees as the Interagency Committee.

Mr. DINGELL. Mr. Hughes, there is no loss, really, in Executive flexibility in this program, because preserved here is the President's control of the executive departments, the full control of the budgetary structure. If he wished he might say, "We are just not going to give this program any money." Or he might advise the Secretary of Defense, for example, or any of the other Secretaries or other participating agencies, that "this is the administration policy and this is the way this committee will act."

If my recollection of the actions of former Presidents is any good at all, the committee will carry out the will of the President of the United States. Am I correct in that?

Mr. HUGHES. I am certain the committee would remain a part of the executive branch and would be subject to Presidential guidance. It would remain as essentially an advisory group, a coordinating agent. The question of whether a statutory base for this type of group is warranted and desirable is again a matter of judgment, as we see it. The relationship of a statutory group of this sort to the President's Science Advisory Committee is involved in this question. The whole matter of scientific organization has been under study within the Congress as it has been within the executive branch. As we see it, the scales balance a little in favor of flexibility and administrative discretion here, rather than statute, at this point.

Mr. MILLER. For 3 or 4 years we had an ad hoc committee on oceanography. You know that, do you not? What did it accomplish?

Mr. HUGHES. I am sorry.

Mr. MILLER. You know that we had an interagency committee for about 4 years.

Mr. HUGHES. Yes.

Mr. MILLER. Until we got a little emphasis on this and until Congress began to take some cognizance of it, too, and then Secretary Wakelin organized the Interagency Committee, what did the old committee ever accomplish?

Mr. HUGHES. I cannot answer your question in any technical sense. I am certainly aware of the fact that the accomplishments of the group as presently constituted have been lauded and have been very substantial.

Mr. MILLER. Very highly lauded as presently constituted, but the old committee, I am afraid, did what a good many committees do—they sat down and talked and resolved, and that is all they did, because it was not at high enough level. I do not know whether the bills which were introduced both in the Senate and here, looking to set up a slightly different concept through permanent legislation, had a little goading effect in getting the present committee established. They may not have, but they did not deter it, anyway. It did not hurt the situation any.

Mr. HUGHES. I think that is certainly true, Mr. Chairman. I am sure there will be a continuing evidence of the interest of this committee and the Congress.

Mr. DINGELL. Mr. Hughes, let us refer to H.R. 4276. Referring first of all to page 2, let us disregard for the moment the actual establishment of the National Oceanographic Council, which appears to be your principal objection. Let us go down to line 11 on page 2:

> The Council shall establish a National Oceanographic Data Center or centers.

That appears to be an entirely desirable purpose and aspect of this legislation, does it not, sir?

Mr. HUGHES. It has been done.

Mr. DINGELL. It has been done, so we are giving that legislative status. Can you see any loss of flexibility in giving a data center, which probably will have 100 million IBM file cards and God knows

how much else in its library of scientific material, permanent status—if for no other reason than it will cost you people in the Bureau of the Budget a lot of money to move this stuff around?

Mr. HUGHES. That is true, whether or not it is on a statutory basis.

Mr. DINGELL. Obviously it will be a permanent organization, I am sure.

Then going on down, the data center will have certain functions, but I see nothing in the bill limiting it to these functions only. Obviously that is not a loss of flexibility. Am I correct in that? The Executive can assign additional functions or can handle, manage, or limit the functions in reasonably intelligent budgetary fashion. That would follow from line 14 on page 2 to line 6 on page 3.

Mr. HUGHES. I think the description of functions is quite general in terms.

Mr. DINGELL. Yes, and it is reasonably flexible.

Do you see anything that is not desirable in the functions that we have assigned to this organization, or do you think of any other functions that we should give it?

Mr. HUGHES. I think the point was made by Dr. Wakelin that the Council's advisory function to the President was not specifically mentioned here, which is a problem of sorts.

Mr. DINGELL. This is the acquisition and retention of data by the Oceanographic Data Centers. Have you any objections to the functions assigned to the data center?

Mr. HUGHES. In section 3, I have not.

Mr. DINGELL. Coming down to section 4 on page 3, line 7, it says:

> The Council shall establish primary standards of oceanographic measurements, and such standards shall be the official standards of the United States.

That certainly is not objectionable.

Mr. HUGHES. There is some question of overlap here with Commerce and the Bureau of Standards.

Mr. DINGELL. I was not aware that the Bureau of Standards functioned outside the United States.

Mr. VANIK. Within the 3-mile limit.

Mr. HUGHES. These would be measurement standards of the United States.

Mr. DINGELL. This could be worked out very comfortably, because the Secretary of Commerce is going to have a representative on the Board.

Mr. HUGHES. Undoubtedly it could be resolved. It is a question whether the structure here is desirable.

Mr. DINGELL. Actually, you will have that problem whether we set up the data centers and we give them this function or not. It is just a question of whether we will give this to the Department of Commerce, or have it reside actually in the hands of the people who are skilled in this area and who have devoted their attention to oceanographic matters. Am I correct, sir?

Mr. HUGHES. Yes. I think the question is whether you would wish to fragment or split off this part of the standards-setting function and separate it from the Bureau of Standards.

Mr. DINGELL. In order to be perfectly fair to you, would you like to look at this particular section and perhaps give us some comments on it?

Mr. HUGHES. Section 4?

Mr. DINGELL. Yes, section 4, which we have been discussing.

Mr. HUGHES. You mean on the assumption——

Mr. DINGELL. There might be a fragmentation of functions.

Mr. HUGHES. What you would like is our suggestions as to how this might be amended?

Mr. DINGELL. Yes; if you feel that would be helpful either to you or to this committee.

Mr. HUGHES. I think it would be well to do that.

Mr. DINGELL. Do you see any objection to the National Instrumentation Test and Calibration Center in section 5?

Mr. HUGHES. My understanding is that the question of establishment of this sort of center and its functions and organization is under consideration in the executive branch now. I think, again, the objective here is an obvious outgrowth of the effort which is underway in the field of oceanography. If you would like the same kind of comments on section 5, as on section 4, I would be glad to provide them.

Mr. DINGELL. It could be very helpful to the committee, I am sure.

Now I would like to refer you to section 6, assigning specific responsibilities to the Council, if you would like to comment on that now or if you would like to give us subsequent comment. Do you see any objection to section 6 insofar as duties assigned to the Council to develop long-range plans for research, development, studies, and surveys of aquatic environment? Do you see any straitjacket into which we are casting the Council or the executive departments of the Government by enacting this section?

Mr. HUGHES. I think this is the section in which the question of advisory function to the President would come up.

Mr. DINGELL. Do you conceive more possible flexibility than you get under section (b) on page 4, line 9, wherein appears the following:

> In carrying out its functions under this Act the Council is authorized—
>
> (1) to delegate any of its functions to the head of any department, agency, or instrumentality represented on the Council, and
>
> (2) to provide, on a cost reimbursable basis, and with the consent of the head of the affected department, agency, or instrumentality, for the fullest utilization of the facilities and personnel of departments, agencies, and instrumentalities in carrying out the purposes of this Act.

Can you conceive of more flexibility than we give there?

Mr. HUGHES. If it be determined by the Congress that there would be a statutory Council, the desecription of functions here is a very general one and, subject to some discussion with the experts in this field, should fill the bill. There is the question still as to whether it is desirable to formalize the Council and statutorily designate its membership. Secretary Wakelin mentioned the State Department as a possible additional member. Conceivably that Department or other departments might have varying interests in matters of concern to this group that might make it desirable to add to or take away from the membership as time passed.

Mr. DINGELL. Will you give us your full views as to additional membership or restriction of membership on the Council?

Mr. HUGHES. I am not sure of the question.

Mr. DINGELL. Any additional members you feel should be included in this Council or any restriction on the number of members of the Council.

Mr. HUGHES. This gets to the question of whether it would be desirable now to designate in statute all conceivable members of this committee and make them permanent members. This is where we feel there is some virtue in not so doing.

Mr. DINGELL. We might be able to iron out your objections and still come up with something which would meet the approval of this committee by putting in a flexible section to provide for change of members by the President, subject to the approval of the Congress, or to add members and powers of various kinds. Do you think that is something you should devote your attention to? Would you want to have your sharp pencil people get to work on that for us? I think it might be helpful to the committee and desirable for you.

Mr. HUGHES. I will try it.

Mr. VANIK. I would like to inquire, would this kind of change make this legislation conceivably acceptable, or would your objection still continue, or would you prefer to answer that later?

Mr. HUGHES. You ask me really two different questions here. First of all, let me again say we are discussing a matter of judgment and probably fairly close judgment on this question of flexibility versus statutory authority. It would be our view that our preference would probably continue to be for administrative designation. Certainly the more opportunity there would be to take cognizance of developing events, the better the statute, as far as we are concerned.

Mr. DINGELL. I want to direct your attention to just two other sections. I want to commend you for the very helpful way you have approached this, and for the assistance you have been to the committee.

Refer to section 8, page 5, line 14:

> Whenever any vessel is supplied by the United States to any governmental or nongovernmental department, agency, institution, or instrumentality, or to any other person, in carrying out the purposes of this Act, title to such vessel shall remain in the United States and shall be returned to the United States upon completion or other termination of the purpose for which so supplied.

That is a very desirable section; is it not?

Mr. HUGHES. Certainly we have no objection to that.

Mr. DINGELL. I do not have any liking for the United States investing several millions of dollars or more in an expensive ship and giving it away. I have no objection to having it utilized freely, but I think this is a particularly desirable section for the protection of the taxpayers.

The last section I want to refer you to is section 10, which appears in line 18, page 6. It says:

> Each expenditure in excess of $50,000 made by the United States in any fiscal year in carrying out a purpose of this Act (whether by grant, contract, or otherwise) shall be subject to examination and audit by the Comptroller General of the United States (including but not limited to all books, records, papers, and other documents * * *),

and so forth.

That is also a very desirable portion of this bill; is it not, sir?

Mr. HUGHES. A query of my colleague here——

Mr. DINGELL. I do not want to get you standing on one foot if you need time to answer the questions.

Mr. HUGHES. My query of him was whether the GAO needed this authority in order to make the operation of this group subject to audit.

It would be my understanding that they have general authority which would cover this. This would be subject to check.

Mr. BAUER. Will the Congressman yield? GAO does not have authority to examine grants. Under the public law, any contracting agency is authorized to give grants. They are empowered to examine contracts but not grants.

Mr. DINGELL. I certainly think so. I think this committee would be happy to keep the record open for 10 days or so after closing so you will be able to correct anything you feel you have not covered appropriately in your discussion this morning.

Does it appear desirable, if this authority is lacking at this time, to give GAO this authority for not only grants and so forth in this field, but in other fields, too?

Mr. VANIK. In all fields.

Mr. HUGHES. I think there is a real problem of intergovernmental relations here at some point, if you are talking about State and local matters for instance. I would rather not even try to respond to that.

Mr. DINGELL. Let's talk about grants in the scientific field. It would appear to be very desirable there; would it not?

Mr. HUGHES. We probably would have some problems of relationships with some of the schools and scientific agencies here, also.

Mr. DINGELL. It would appear useful at least to protect the taxpayers.

Thank you, Mr. Chairman.

Mr. MILLER. Mr. Hughes, I want to thank you. We look forward to any other comment you may have.

The committee will stand adjourned until 10 o'clock tomorrow morning.

(Whereupon, at 12:32 p.m., the subcommittee adjourned to reconvene at 10 a.m., Tuesday, June 20, 1961.)

OCEANOGRAPHY 1961—PHASE 3

TUESDAY, JUNE 20, 1961

House of Representatives,
Subcommittee on Oceanography of the
Committee on Merchant Marine and Fisheries,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to adjournment, Hon. George P. Miller (chairman of the subcommittee) presiding.

Present: Representatives Miller, Dingell, Vanik, Pelly, and Ellsworth.

Present also: John M. Drewry, chief counsel; Paul S. Bauer, consultant; and William B. Winfield, chief clerk.

Mr. Miller. The committee will be in order.

The hearings held in the 87th Congress presented to the committee a small part of the capability of one of our most valuable national oceanographic assets, namely, the geophysical industry.

One could imagine from some of the presentations we have heard that oceanography is confined to Government operations and nonprofit institutions. Much to my surprise, and I should have known, I found that the continental shelves of a large part of the world have been surveyed in detail, with positive geodetic control to a depth of eight to ten thousand feet below the bottom of the sea. These surveys have included magnetic and gravity signatures, bathymetry and structure of the underlying sediments and at times the basement rock.

These surveys have been conducted by the geophysical industry with a profit motivation. The industry has as it employers the petroleum, gas, and sulfur industries of the world.

If we are going to accomplish a national objective of ocean surveys and the development of proper instrumentation for a synoptic look at our aquatic environment, we cannot fail to use the industry in our over-all program. In the geophysical industry, the competition is keen, and the results found belong to their employer as a proprietary right.

With this knowledge, I have requested the Oceanographic Subcommittee of the Society of Exploration Geophysicists to give us a presentation on what they have done and what they can do.

This society has over 5,700 members. Of these, 3,121 reside in the United States, 358 in Canada, 125 in Latin America, and 279 in the Eastern Hemisphere. A truly global organization.

I am happy to welcome the geophysical industry to testify as to their capabilities. Following the testimony of the geophysical industry we shall hear from a representative of the Pacific American Steamship Association as to what their contribution can be to the national program.

Our first witness this morning will be Dr. F. Gilman Blake of the California Research Corp.

Dr. Blake, you are one of the outstanding geophysicists of the country. We are happy to welcome you here. We are very happy to have you proceed as you will.

STATEMENT OF DR. F. GILMAN BLAKE, CALIFORNIA RESEARCH CORP.

Dr. BLAKE. Thank you, Mr. Chairman.

It is a pleasure for us to be here, and a novel experience, as you have indicated that it might be for us.

My name is F. Gilman Blake. By profession I am a physicist. By occupation, I am supervisor of geophysics research for California Research Corp., which means in effect the Standard Oil Co. of California, and/or its operating subsidiaries.

What I had planned, subject to your pleasure, for us to do this morning, is for the Subcommittee on Oceanography of the Society of Exploration Geophysicists to give to you a picture of the capabilities of the oil industry and of the geophysical industry in the general area of oceanographic research and surveys.

Now, as I mentioned, I am employed in the oil industry itself. However, I am here primarily as a representative of the society, rather than the oil industry.

The other members of the Subcommittee on Oceanography are Carl Savit of the Western Geophysical Co., Fred Romberg of the Geosciences Division of Texas Industries, and Dr. Lewis Mott-Smith of the General Geophysical Co. They will follow me in our presentation this morning.

Now, because we have not made any appearances before you or other bodies here on this general subject, I thought perhaps it would be well for me to start off by telling you who we are, what is the SEG, why are we concerned with problems in oceanography, and in particular why our sudden concern, you might say, with problems encountered by the Government in the field of oceanography.

Mr. MILLER. Doctor, I have a very sketchy idea of the work of the exploration geophysicists. I do not know whether my colleagues have or not.

Perhaps you had better start giving us a little primary education in this field. Tell us just what your society, or the people who compose it, have as their objectives, the basic work that they do, and perhaps just a little history of its development.

Dr. BLAKE. Briefly, then, the Society of Exploration Geophysicists is a professional society. If I may, I would like to read from article II of our Constitution and bylaws the objectives of the society.

> The objectives of this society shall be to promote the science of geophysics, especially as it relates to exploration and research, to foster the common scientific interests of geophysicists, and to maintain a high professional standing among its members.

Now, there are, of course, other professional societies in the field of geophysics, such as, for example, the American Geophysical Union, of which I also happen to be a member. But the SEG is primarily

concerned with mineral and petroleum exploration geophysics, as opposed to the broader interests of the American Geophysical Union.

A great many members of the SEG belong to the AGU as well; also to the Seismological Society as well. There are a number of societies. But this one in particular is concerned with the interests of the minerals exploration industry. By "minerals," I am including oil as well as solid ores.

Mr. MILLER. Before this was reduced to a science for the application of applied research in the field, seismic work, by exploding a charge, measured the density of the earth?

Dr. BLAKE. It is an echo sounding thing.

Mr. MILLER. Prior to that, did you try to locate water with a divining rod? How did the people originally determine how to drive wells?

Dr. BLAKE. Largely by surface geology, and there is still a lot of surface geology done, of course.

Mr. MILLER. But you put down a lot of dry wells in surface geology?

Dr. BLAKE. The primary function of an exploration geophysicist is to predict structure and rock type and so on at depth on the basis of physical measurements which he can make on the surface of the earth.

Now, the tool that is most widely used, as mentioned, is seismology. However, we also work with measurements in the gravitational field of the earth, the magnetic field of the earth. We work with artificial and natural electric currents in the earth and other physical phenomena of this nature, which we hope will give us clues to the "inner space" in which we find what we are seeking.

The membership of the society comprises geophysicists both among the consumers of geophysical services, you might say, that is to say, the oil companies and mining companies, and also the purveyors of these geophysical services, the geophysical contractors and the geophysical instrument manufacturers.

Now, in some instances the user, the purveyor, the manufacturer, are all one and the same company. Some oil companies, for example, do their own data gathering in the field. They build their own instruments. Some of them do this only in part. Other oil companies use the data, but they rely on geophysical contractors to gather it for them, and they rely on geophysical instrument makers to provide the instruments that they need. So that the membership then covers the whole spectrum of the geophysical industry from the instrument manufacturer through the instrument user to the data user.

Now does that give you a picture, then, of what the SEG is and what our business is?

Mr. PELLY. I would like to clear up a statement that the chairman made, a very caustic statement, with regard to the willow wand being used for locating water. Are there any instruments by which you now can determine the presence of the water under the earth?

Dr. BLAKE. There are electrical methods in which we can establish roughly relative probabilities. We cannot definitely say, "There is water here," or "There is not water there"—it is all a matter of probabilities—and whether it is oil or water or metals or whatever it is, that we are looking for.

What we are trying to do primarily is to keep the risk rate down as much as we can. Even in the very best circumstances in the oil industry, for example, in wildcat drilling, we hit any oil at all about once in five times. We get a good commercial show maybe once in a hundred times. We get a really good find maybe once in a thousand.

Now these are pretty poor odds, but they would be an awful lot worse if it were not for the geophysical profession.

Mr. PELLY. I live on an island where we have 5,000 or 6,000 people. Probably 90 percent of us think that we have a man with real powers to locate with a willow wand where there is water.

Dr. BLAKE. Well, the willow wanderers are with us, and while I do not attribute any magic to the willow itself, I will say that there are many people who, through an innate empirical knowledge of surface geology experience, do get a feeling better than just throwing darts at a wallboard as to where water might be. A lot can still be done with surface geology, but there is a limit to how deep you can extrapolate what you see on the surface.

Well, to continue: Up to the present time, or fairly recently, at least, the field of oceanography has been almost exclusively a concern of the Government, a few universities, and the fishing industry.

Now I am making some rather general statements. There are exceptions, of course. But by and large, most of the active interest in the field of oceanography has been restricted to the Government, the universities, some of the universities, that is, and, as I say, the fishing industry.

Now our interest in the Government program in inner space, as it is being called now, is somewhat broader than just oceanography. We have rather broad interest in earth science, as you can readily imagine, and specifically the geophysical industry has become quite interested in the VELA–Uniform program, which is concerned with the seismic detection of underground explosions.

Now why is it that our interest in this field of oceanography, the VELA–Uniform, and so on, has increased rather rapidly in the last, oh, let us say, 2 or 3 years? Partly, I think, it is a generally increasing awareness in the industry of the Government's needs in this field. There has been more publicity about it. We have heard more about it.

But I think that our interest has been aroused in large part through the efforts of one man. This is Dr. Charles C. Bates, who is now program director for VELA–Uniform. He is by profession an oceanographer. And he has been actively seeking, going out and beating the bushes for industry support, on the basis of a national defense need. He has been making us aware of this problem.

Our interest has been aroused almost completely on this basis alone of the national need for help.

With very few exceptions, we have very little economic incentive to go into the field of general oceanography or related problems of this nature. I would like to make a few more remarks on this subject later in more detail.

Now, Dr. Bates, when I first me him, was in the Office of the Chief of Naval Operations for Development. This was about 2 years ago. At that time, he began trying to arouse the mutual interest of the Navy and the oil industry, the geophysical industry, in the antisubmarine warfare program, one phase of oceanography.

It was through him, for example, that in December of 1959 I spent a week aboard the U.S.S. *Tarawa*, Task Force Charlie, in the North Atlantic, watching ASW exercises. At the conclusion of this rather interesting cruise, I filed a lengthy report with the Navy on my observations. I got a polite letter of thanks, saying, "This is being distributed." I have heard nothing more since.

In this letter I made some suggestions as to where the abilities of the geophysical industry might be put to use. I also made some suggestions, which probably did not set too well with some people, about the quality of the training that some of the officers had in their technical jobs, and so on.

Specifically, in this report, and in separate correspondence, we offered the Navy a free look at a geophysical instrument that we have developed, the ultrasensitive magnetometer, which might be very useful for MAD work. Again we got a polite thank you, but no one has even come to see it.

Now shortly after this time Dr. Bates went over to the Advanced Research Projects Agency to head up the VELA–Uniform program. Since then, since his departure from the Office of CNO, we at least—I cannot speak for everyone in the industry—have heard nothing further from the Navy about our possible contributions in the area of oceanography or ASW or anything else.

And I might mention parenthetically that we are cooperating informally with NASA in connection with this sensitive magnetometer in connection with space shots. This is done strictly on an informal basis; no contract or anything.

Now since Dr. Bates went over into ARPA, the industry has heard a lot about VELA. He has come and talked to us at our meetings and so on, and he has gotten a program going. It can be done if someone in the Government will come and tell us what their problems are. They must not wait for us to come and drop everything in their laps. An aggressive communication program gets results.

Now I should say that with respect to the field of oceanography, since we have become interested in looking into what is going on, what we can find out, we have become a little uneasy.

I would like to indicate why it is that we are not confident that all is well in the present oceanographic program or in earth science generally, for that matter.

To illustrate one reason for our uneasiness, I would like to say a word or two on a subject which is not really oceanography, but a little bit about this VELA–Uniform program and its history. I hope you will forgive me. This is one I am fairly familiar with.

The problem of seismic detection of underground atom bomb tests began, let us say, at least 4 years ago, at the time of the Rainier test, in the fall of 1957. The Geneva conferences began in the summer of 1958. At that time, when, of all times, the Government could have used the experience of the best explosion seismologists—I say "explosion," because I want to distinguish them from earthquake seismologists, the best explosion seismologists in the country who are in industry, not a one of us was called upon. They relied upon some theoretical nuclear physicists, a few earthquake seismologists from the universities. And they came a cropper.

The primary test for distinction between an earthquake and an explosion, which was proposed in Geneva, simply will not work; and any experienced explosion seismologists could have told them that in 2 minutes, but they did not have the opportunity. We were not aware of the existence of this problem. Nobody asked us. And it does not get blazoned over the newspapers—the details of a technical problem. We did not know about this.

Now, since that time, when the Government realized, late in 1958, after the Hardtack series of explosions, that they were in very hot water, and later on in 1959, when it was realized there was something they did not perhaps understand about explosion seismology, then began the first inquiries into: What could the geophysical industry do? And as I say, Charles Bates had a lot to do with that.

In due course of time, in March of last year, when it was decided that an accelerated program in seismological research was needed, in other words, the beginning of the current expansion of VELA–Uniform, then and only then did the Government finally call on the oil industry for help.

There was an ad hoc panel of the Federal Council set up to recommend a program, consisting of 25 or 30 members, with one representative from the oil industry. I happened to have the honor of being that representative.

Now, since then, the participation of the oil and geophysical industries has grown. It has not yet reached the level to which we feel it will grow, but it has been growing. And I feel that this is a healthy change in that part of earth science. And we would like to see the same sort of a change going on in oceanography, but it is going to take some aggressive work by someone in a Government agency to get this thing going.

All right. Now, there is another reason, aside from our knowledge of this background of what happened in explosion seismology, for our uneasiness.

Quite frankly, our contacts with the universities—and we do have many, especially in our attempts to recruit personnel, to follow what they are doing in basic research and so on—our contacts with the universities have not given us confidence in their abilities to handle certain important phases of the oceanographic program, getting back to the proper subject of this meeting.

Particularly, we feel that they are not best qualified to handle the survey problems, as distinguished from the basic research problems. We do not feel that they are fully qualified to provide the necessary technology, instruments, and that sort of thing, or the business know-how on how to run an efficient operation on a large scale.

I will have a little bit more on this later on.

Now, as an example of what I mean on the subject of technology, I would like to quote briefly, if I may, from a statement by Dr. Ewing during the Senate hearings on S. 901. And I should perhaps preface this remark with the statement that I do know Dr. Ewing personally. I have the greatest respect and admiration for him. I think he is one of the most dedicated and most valuable scientists we have in this whole field. However, I do not think this qualifies him as an instrument expert.

Let me, if I may, read, here, an excerpt from his testimony.

He says:

In several parts of the bill—

this is S. 901—

research costs and estimates are listed separately and the costs for the instruments is far too high with respect to other research costs. I have continuously and consistently supported the idea that useful instruments are likely to originate in the minds of potential users and nowhere else. If industry, or the "systems and instrument" men, are called in too soon, or are given control of instrumentation budgets, waste will result. Therefore, I propose that the sums labeled "instruments" be combined with those labeled "research" and controlled by the research scientists. The man who wants to create an instrument just to create an instrument, assuming or hoping that someone else will adapt that instrument for some useful purpose, is usually harmful. An instrument or instrument system for research is only useful if it provides information that is wanted and provides it as conveniently as possible. It is the people who want that information who should either create the instruments or decide on their main operating characteristics and contract their construction out to industry.

Well, now, I agree with Dr. Ewing that there are certain, shall we say, vultures in the instrument industry who—I am speaking not of the geophysical instrument industry, now, but the instrument industry in general—who are hanging around the fringe yapping at the skirts of Government contractors, looking for any kind of business they can pick up. And if that is the only kind of instrument contractor he has ever had contact with, I could not agree with him more in his philosophy. I have encountered some of them, myself.

To cite one example, one eager beaver approached me one day on the subject of a gravity meter device. I asked him, "What are you going to use it for?"

He says, "Just between you and me, I am going to detect some submarines."

He apparently never heard of Archimedes' principle, according to which a submarine displaces its own weight in water and would not give a gravity reading at all.

However, I think that Dr. Ewing's remarks do not apply very well to the geophysical instrument industry, by which I mean people who are building instruments for geophysics, rather than just for the sake of building instruments. We have some representatives of this industry with us this morning, and we will hear from them later.

I might point out that some of the principal instruments that Dr. Ewing and other university oceanographers use actually come from industry. The magnetometers used were developed by the Gulf Oil Co., the older ones. The newer ones, the proton precession, and so on—the proton precession comes primarily from Varian Associates, which is an instrument manufacturer of high reputation, not entirely geophysical, by any means. The rubidium vapor instrument comes also from Varian. We have developed one ourselves. And Texas Instruments has developed another type of electron resonance magnetometer. These are being used in basic research.

The gravity meters which the universities are using at sea are primarily the Graf instrument, which is made by Askania, a German instrument manufacturer, and La Coste, an American geophysical instrument manufacturer. The seismic instruments which the universities are using come almost exclusively from the American geophysical instrument industry.

So despite what Dr. Ewing says, he is using our industrial instruments for his best work.

Furthermore, in a visit which I made there last February or March, he showed me some new seismic records that he had gotten from the Campeche Gulf, which were, he said, by far the best they had ever been able to achieve in deep ocean work. I asked him to what he attributed this improvement in quality over what they had been able to achieve earlier.

He described to me a technique which he said they had recently developed, a method of field operations, which has been common practice in the industry for 10 years.

So I believe we can contribute something to the technology of oceanographic research. We already have. We can do more.

Now, to a lesser extent, a much lesser extent, I believe that some of the Government agencies, the Hydrographic Office, for example, are also unaware of the full capabilities of the geophysical industry. I will say that they have kept up with our capabilities considerably better than the average university has; but I do not feel that they have done as good a job as they might.

Now, how did this situation come about? Why is it that there has been this lack of communication between two major groups interested in common problems?

Now, for the moment, I would like to take off my hat as a representative of the SEG and stand before you bareheaded as a private citizen, because I want to give you a personal opinion.

I believe that in the Government there has been a tendency to place too heavy a reliance on the National Academy of Sciences, much too heavy. I have the greatest respect for the academicians as scientists. But I am not overawed by them. I know quite a few of them personally. If you will excuse a very personal reference, my father used to be an academician before he passed away.

Now I am afraid that in certain fields in the Government, people tend to stand too much in awe of the National Academy, to feel that "the king can do no wrong"; not to question anything that they propose.

Now this is not true of all Government agencies. I do not know why it should be true of this one, really.

For example, in the fields of electronics, aircraft, missiles, and so on, the Government makes very extensive use of industrial R. & D. facilities. But not in the earth sciences. Not in oceanography. Not in other branches of the earth sciences.

I do not know why this tight little clique exists in this field, but it seems to. I think it is highly undesirable. People tend to review their own proposals.

There is perhaps—I am still speaking now personally; not as a representative of the society—a possibility of some conflict-of-interest problems here. I would suggest that some of the universities' ethics in this area are not so strict as that of industry; not the industry that I am in, anyway.

Professors are not exempt from difficulties of this nature just because they are professors. I used to be one myself; so I know what they are like.

And parenthetically, I might remark that I am in sympathy with what I take to be the aims of this committee, Mr. Chairman, to increase the accountability to the Congress in the area of oceanography.

I was present at the hearings yesterday, and I must say that personally, as a citizen and as a taxpayer, I am in favor of what you gentlemen are driving at. Self-evaluation is not a good way to tell whether or not you have got a good program. And the only testimony I hear as to whether or not it is a good program comes from the people who are carrying out the program.

All right; so much for the background of why we are interested. Let us get down to the real purpose of our being here, which is to tell you something about the capabilities of the geophysical industry.

Our plan is this: That I will tell you something about the capabilities of the oil industry side of the geophysical part, and the other members of the subcommittee will tell you something about the capabilities of the contractors and the instrument manufacturers.

Perhaps you will better understand the capability that we have developed if you understand our incentives for developing it.

We have a tremendous incentive for developing a rather complete capability in the field of earth science, particularly in geophysics. As you mentioned in your introductory remarks, it is economic.

The motivation, you might say, is one of the strongest motivations known to man, self-preservation. This is just as true of a corporation as it is of an individual. If we do not do a darned good job of searching for the raw materials that are our lifeblood, we are not going to survive. It is this strong motivation for self-preservation that has caused us to develop a very strong capability in the field of earth sciences.

There are rather large sums of money at stake here. To indicate what I mean, I would like to give you an example or two.

For the current fiscal year, Standard Oil Co. of California's budget for oil exploration amounts to some $100 million, from one company. Of this total of $100 million, some $12 to $15 million is an expenditure for geophysical data gathering and analysis. The other expenses are for geological work, for land, for exploratory drilling.

To support this $12 to $15 million of geophysical work, we, that is, the California Research Corp., which is the research subsidiary of Standard of California, have an annual R. & D. budget in geophysics of a little over a million dollars.

Now the industry total—I do not have any firm figures for that, but we are by no means the biggest oil company. There are half a dozen others that are bigger. My guess is that the industry overall totals perhaps 10 to 20 times ours. So that this means something on the order of $200 to $300 million per year for surveys in the field of oil exploration. This includes on land as well as offshore. And $10 to $20 million for research and development.

Over the last 10 years, the oil industry has operated domestically, that is to say in North America, an average of 500 seismographic crews, who go out and gather seismic data, by the echo-sounding method. This means an expenditure of approximately $150 million a year, just for seismic data gathering.

We will hear some more details from this later from our colleagues on the committee. I just wanted to give you a brief outline.

Actually, the money spent on the geophysics itself is peanuts compared to the money that is committed as a result of the geophysical expenditures. That is to say, on the basis of the geophysical data, we commit, for land, for drilling, and so on, sums which are far larger than the geophysical expenses themselves. It is damned important to us to have geophysics done right.

I have heard of a commitment as large as $83 million on the basis of one seismic survey. It had better be right. Even in Government terms, that is pretty coarse gold.

Now when I say it had better be right, I mean it had better have a chance of being right at least once in five times, or we go under. That is the kind of odds we are playing with. If we could just increase our reliability by 10 percent—10 percent, mind you—it is worth an awful lot to us to get an increase of that small amount.

All right. So much for the incentive. Let us consider now what are some of the broad areas of oceanographic investigation in which we in particular might contribute.

One broad area is research. Another is the technology, or basic engineering, you might say. And the third is the surveys.

The research function is properly a university function. But I am convinced that the industry can contribute more than it is sometimes given credit for.

To illustrate this point, I would like to tell you a little about our own organization, as being typical of a major oil company research laboratory.

The laboratory where I am located is at La Habra, Calif. It is the oilfield research division. Our concerns are with exploration, which means geophysics and geology, drilling, and the production of oil. None of the refining research, chemicals research, and so on, is at this laboratory.

At this laboratory, our professional staff for both research and development, including the engineers, is 54 percent Ph. D.'s. I think even a university operated laboratory could be proud of that percentage; 18 percent master's, 28 percent bachelor's.

In certain branches of the more "researchy" ends of the work, as opposed to the engineering, for example, in my own section, the professional staff is 100 percent Ph. D.'s. That is a little unusual in industry, but it is true, nevertheless.

Outside of the general field of geophysics as such, where we feel that we do have a strong capability, as I have already mentioned, in the field of seismology, electrical methods, and so on, outside of strictly the field of geophysics, there are other areas in which a typical oil industry laboratory could contribute to oceanography. I am now wearing my laboratory hat, instead of my SEG hat.

Examples would include problems in sedimentation, the processes of mineral concentration on the ocean bottoms, problems in geochemistry. We have a number of competent people in this field. Physical chemists, organic chemists, crystal structure people, and so on. We have some very competent people in the field of the physical properties of rocks, porosity, permeability, density, mineralogy. We even have a microbiologist in our laboratory, who has been concerned with the effects of bacteria in earth sediments.

We have some experts in foraminifera, the small ocean-borne animals which some of our marine biologist friends are so interested in. We have some experts in isotope geology.

We are particularly concerned with variations in nitrogen, carbon, oxygen, sulfur, hydrogen-deuterium ratios, and so forth. All of these people, while not primarily oceanographers, could contribute significantly, I feel, to the technology of research, basic research, in oceanography.

I do not mean to suggest that the universities should not be the leaders in basic research, but I do feel that we can make a contribution if it should be desired.

In the field of technology, or engineering, oil industry laboratories can make quite a contribution in the field of instruments. I will not go into detail, there. Other types of instruments that would be of use in oceanography, but which we do not consider to be geophysical primarily, would include some of our well logging instruments. These are instruments which we lower down a well to make physical or chemical measurements on the surrounding rocks and the fluids in them.

For example, we have developed instruments for measuring chlorinity in the waters in the rock. I have no idea whether these would satisfy the requirements of the oceanographers, but it has been estimated that by a neutron absorption method which we know a little bit about, we could measure chlorinity to perhaps one-tenth of 1 percent in situ. In other words, the instrument can be lowered down into the ocean, and the salinity can be measured in situ, without having to bring the instrument back and run it through a laboratory.

Density measurements might also be made. I do not know whether the requisite accuracy could be arrived at by a gamma absorption method. As I say, I do not know whether these would satisfy your requirements, but we would be most happy to discuss it with appropriate people from the Government to see whether there is a possibility for a contribution here.

The field of temperature measurements: I understand that the BT problems are some of the more difficult problems encountered.

For studies of underground combustion of oil, a method of improving recovery, we have developed a down-hole thermometer. Perhaps this could be used in oceanography. I do not know. We would be gald to discuss it.

Another area, outside the field of geophysics but still pertinent to oceanography, is in the field of wave forces. Our basic drilling research or basic engineering of drilling, rather, has been carrying out an extensive program for a number of years on the effect of wave forces on piles. Interest, of course, is in offshore drilling platforms.

I have a little material here to illustrate what is going on, which I would like to show you, if I may.

We have had two programs in this field, Wave Forces I and Wave Forces II. This is a magazine article taken from Petroleum Week for January 20, 1961, which has a picture of the general setup used in our Wave Forces I program.

This is an offshore drilling platform off the southern coast of Louisiana, Bay Marchand, to be exact, which is a field owned by our company. This program operated from 1954 to 1958. And here is an-

other photograph here that is a little bigger. On the platform we installed special columns, 1, 2, 3, and 4 feet in diameter, with instrumentation contained in segments, for measuring the force of waves against these pilings.

We ran this, as I say, for some 4 years and collected some 15,000 feet of records like the sample here. We recorded forces during several hurricanes.

In addition to forces, we also recorded wave heights and orbital velocities in the water.

The wave height staff originally was based on the Beach Erosion Board design, but we found we had to make modifications to their design, and we changed to another version which worked a little better.

Here is a sample record from Hurricane Flossie in late September of 1956. On this chart, these represent the wave heights. The largest one on this record, I believe, was a 22-foot wave.

The upper part of the chart here is an indication of the forces on the different segments of the pilings. These are the higher ones. Nothing hits them except where the waves are really high. When a real big wave came along, we have recordings of the forces, like this. We have recorded hurricanes with many feet of records, like this.

This was done on a cost-sharing basis. We offered the data to the members of the oil industry and to the Navy on a cost-sharing basis.

The participants in this particular program were Shell, Humble, and the U.S. Navy. This was set up in Bay Marchand in 30 feet of water. It was closed down in 1958, and we felt we had acquired all the data that was useful from this depth of water. The results were such that we found our platforms had been overdesigned. We found that some of the oil companies and other agencies have been underdesigned with some of their towers.

The type of data that results, or the type of information that results, from that data analysis is shown in this sample profile of a wave, here. These contours represent the forces exerted on the pilings at various depths.

For example, for this 14-foot wave, the pressure exerted up here near the top of the wave amounts to 120 pounds per square foot.

An interesting point is that down underneath the trough, because of the back flow, there is a back pressure in the opposite direction of 60 pounds per square foot, half as much as the slam you get from the top of the wave.

At the conclusion of this work, we felt that we needed to get some additional data, and so we set up another project last summer at South Timbalier, which is in 100 feet of water. These are 3-foot pilings, but it is the same sort of thing.

On this wave project II, we have to do it at different depths, to extrapolate. Again, we have offered the data to anyone interested on a cost-sharing basis. The total cost is divided by the number of participants. So far, Shell Oil Co. has joined up. The Navy at first told us no, but we understand very recently they have changed their minds. We are happy to have them do so.

So this is another area of oceanography in which we feel the industry can make a contribution.

We also feel, because of the strong economic incentives we have had to do so, we have learned a great deal about how to anchor ships,

more than you might think, perhaps. And what information we have on that we will be glad to share, too.

When it comes to drilling the university people have their core barrels. But when they wanted a little piece of hard rock in preparation for the Moho hole, they called in the oil industry.

The subject of ship requirements, which is one of the big questions, I understand, in this whole oceanography program, I do not feel qualified to say a great deal about, except that we get along without any gold-plated ships.

There are certain activities that oceanographers wish to conduct, involving bottom sampling at great depths, which will require a special maneuverability capability which ordinary ships do not have, and I have no quarrel at all with the desire for special ships of this nature. But for geophysical surveys, in which we have far more experience than universities, we get along very well with converted war surplus vessels of one sort or another. We will hear more about that later.

The second major area in oceanography where work needs to be done is the question of the large scale surveys, the data gathering on a large scale, which Dr. Ravelle himself, in testimony before the Senate, said is "not really research." I could not agree with him more.

On the area of making surveys, that is our business. This is where we can really make a contribution. I am speaking now for the geophysical industry.

The contractors can get the data. They know how to do it accurately and efficiently. With people like me breathing down their necks, they damn well better get it accurately, efficiently, quickly.

The oil and the mining industries are, I believe, in the best position, through experience and incentives, to evaluate these large-scale surveys in terms of possible natural resources. That is our business.

The academic oceanographers have told us that there exist large reserves of such minerals as manganese, cobalt, phosphates, and so on, in the oceans.

But the samples they have gathered for research purposes are far too small and unrepresentative for any sort of an economic evaluation that has any meaning whatsoever. It would be like counting the number of bushels of corn stored in one bin in Kansas and extrapolating that to cover the whole country.

You may well ask: If the oil and the mining industries are the best qualified to do this sort of work, and if there are large economic reserves, why have we not done anything about it? Why should the Government sponsor surveys of this nature on the mineral resources of the oceans?

The reason we have not done much about it is because, for the present and the immediately foreseeable future, there is very little economic incentive to do so.

In the first place, we are in no position, so far as I know, although I am no lawyer, to lay claim to any mineral resources in the deep oceans. This is an area of international law, if you like, which has not been explored very deeply. We do not feel we are in a position to lay claims, and we are not going to risk a lot of money looking for something if we do not know that we can claim it.

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Furthermore, the areal distribution of these minerals is on a very broad scale. There is no competitive advantage in spending a lot of money to work out methods, and so on, to stake out a claim in this area, when you could not possibly cover all possible areas, and one of your competitors, having taken advantage of your expenses in learning how to do this, could then come right in and claim the block right next to you. Unless you can gain a competitive advantage for developing the methods for doing this, you are not likely to do it.

Thirdly, these minerals are not in short supply at the present time. But our long-range security is perhaps none too good. A lot of cobalt comes from the Congo, for example.

These deep sea deposits, the ones that are known so far, at least, are near islands in the equatorial Pacific, away from continental sedimentation, which would have covered them up. But they are near islands which are not controlled by us; that is, by the United States.

The areas where they are, are not claimed by anybody, as yet. But as I say, the nearest land is controlled by other nations. If we wish eventually to make use of these resources, we had better establish a claim by use before somebody else takes it into his mind to extend his territorial limits to 500 miles instead of 3 miles or 12 miles, or whatever it might be.

If we have actually started, at least on a semicommercial scale, making use of these resources before such claims are made, we are in a lot better position to defend our right to continue doing so.

Now, one hears a good many different statements as to when the technology for deep sea mining might be available. One of my more optimistic colleagues says 5 years. I think he is a little overoptimistic. But he is relying on developments of new materials, new power methods, such as fuel cells, and so on.

But I do not think it is too soon to start thinking about this. It may not be 5 years. It may not be 10. But we have to look farther down the road than that.

And support is needed, as I say, from the Government, for an economic and technological evaluation of these resources.

I would not, in my opinion, consider the U.S. Geological Survey qualified to make the economic evaluation. Technologically, maybe, yes; but not economic. That is not their primary business.

All right. I have gone on now at considerable length. Some of my colleagues are beginning to wonder when I am going to shut up and let them have their say.

We are going to hear from some geophysical contractors on their methods of know-how for effective and efficient surveys, on instrument technology, on the manpower facilities, our state of readiness to contribute.

There is one general area in oceanography that we would like to beg off on, I think, and this is the fisheries problem. Our only contact with the fishing people has been arguing with them over how many fish our seismic shots kill. Actually, it is usually less than a boatload of sport fishermen in a weekend, but that is our only contact with fisheries, and we do not feel competent to say anything on the subject of marine biology; so I am going to leave that out.

Now, before I turn the floor over to my colleagues, the subject of company policy with respect to Government research will perhaps

need a word or two. I will restrict my remarks to the scientific and engineering side of it.

I might note that we are not in the contract research business as such, except on our own account. That is to say, we do research in geophysics and other fields of interest to the oil industry only for our own company. We are not in the business of going out and seeking research contracts.

However, it is our policy, if it is in the national interest, to be willing to take on projects in areas in which we feel we have a special competence, where we feel that we do have a chance to make a real contribution, provided that the proposed work is not so large as to completely disrupt our own operations, and also provided that our proprietary rights in our own research on our own account are not endangered.

At the present time, we do have two or three Government research contracts. One is in the area of theoretical seismology for the VELA-Uniform program. Another one of our laboratories has a contract on fuel cells. They also work on jet fuels, radiation resistant greases for the AEC, and so on.

However, it is our policy, if it is in the national interest, to be percent of our annual research budget, which amounts to about $20 million.

As you can see, we are not dependent on outside research contracts for any significant amount of support.

Now, in this I am speaking primarily on behalf of my own company. I cannot really speak for others, other oil companies, but I imagine that their attitude in this area would be somewhat similar. And I certainly do not want to imply that the geophysical contractors and instrument makers should do research as we do on a cost-plus-no-fee basis, because doing these surveys and providing their instruments is their business.

We do research contracts for the Government on the cost-plus-no-fee, because doing research contracts is not our business. We do it as a service. It is not our business.

But doing surveys and providing instruments is their business. It is a perfectly legitimate business. So I do not want you gentlemen to get the impression that I feel that the geophysical instrument industry should conduct surveys purely as a courtesy.

It would be quite proper to ask for competitive bids. It is these fellows' way of life. We surely ask for competitive bids. There is no reason why the Government should not do the same in the area of geophysical surveys. But this is their business, just as our business is selling to the Government and to others jet fuels and things of that sort. We do not supply you with jet fuels at no profit. It is small enough, but we do not supply it at no profit. The same for the geophysical industry.

Thank you, Mr. Chairman.

Mr. MILLER. Thank you very much, Dr. Blake.

I was very happy to hear what you had to say about Dr. Bates, because I join you in my admiration for him and his ability and his drive. And I was very much interested in, among other things, your reference to the Moho. I think that this is a great breakthrough, one that perhaps, had it taken place in other parts of the world, would

have gotten many more headlines in the papers than in this country. But unfortunately this is not as spectacular as sending a man up in a rocket; any more than the two young men who went down in the bathyscope for 37,000 feet were spectacular. This made a few headlines, but again this was not as spectacular, maybe, as sending a man aloft.

Dr. BLAKE. To us, at least, what has been done so far on the Moho is interesting mostly as a promise of what is to come.

Mr. MILLER. I think that is all that we can expect, now. We have made a probe. That is all. We have developed a technique. I think we have learned a lot that will be valuable in the future.

Dr. BLAKE. Well, with the possible exception of the special outboard motors that were put on the *Cuss*, the technique used so far has been standard oil industry technique. It is what comes when you get to a real deep hole that will be interesting.

Mr. MILLER. That is right. And let us say that putting the outboard motors on the *Cuss* and learning how to put her in position was pretty much of a breakthrough; but the fact that we did get down into deep water and do the things that we were able to do was a big breakthrough.

I found your statements interesting and provocative.

Dr. BLAKE. I hope they were provocative.

Mr. MILLER. I think they were very well made; because perhaps some of us do get into ivory towers. And it is pretty good to knock at the base of these things and find that the foundation, perhaps, is not as attractive as the shining light the sun throws off at greater heights.

So I was very much interested in what you had to say.

Mr. Dingell?

Mr. DINGELL. I will yield to Mr. Pelly, Mr. Chairman.

Mr. PELLY. Mr. Chairman, I am only sorry that there were time limitations, because I can see where this committee could get a great deal from questioning Dr. Blake.

I know that he has colleagues to come on, and therefore it is necessary to limit ourselves.

I would like to indulge myself, however, in one particular question, which may not be relevant. And that is: You are so forthright in your statements that I would like to get a comment as to your evaluation of a crash program to land a man on the moon.

If it is not out of order, Mr. Chairman.

Dr. BLAKE. Well, I will appear bareheaded, with no hat, on that one. This is personal opinion. I can think of better ways to spend that money.

Mr. PELLY. Well, that was not really fair. But the question that I would like to put to you that really does have a bearing is as it relates to legislation to formalize an interagency arrangement, whether it is by Executive order or whether it is under a statute.

In evaluating the present arrangement for an interagency information center, I wonder whether private industry and private research groups are able to communicate and contribute to the information available for oceanography.

Dr. BLAKE. I am sure that we would be more than willing to contribute in any way that we could.

Mr. PELLY. I take it from that that you have not been invited to turn over your information.

Dr. BLAKE. That is right; except for the one instance I mentioned, where Dr. Bates got me an invitation to ride aboard a carrier for a week. To my personal knowledge that is the only instance of an attempt to get the geophysical industry some know-how on what the problems of the Navy were.

I also mentioned that the Hydrographic Office in particular, from a few documents I have seen, does seem to be more aware of what is available in the geophysical industry than the universities are.

In particular, they are making use of some of our seismic equipment, such as the Sonoprobe, developed by the Magnolia Research Laboratories of the Standard Oil Co. of New York.

They are using a number of La Coste gravitimeters at sea. I believe they have the use of some five instruments, and so on.

However, I do believe that more could be done along these lines. For example, I mentioned the magnetometer, which would be useful for submarine identification work; more sensitive and I believe more reliable than the ones they are using at the present time.

Mr. PELLY. Well, I am sure, as a result of your rather forthright testimony, there will be some developments in better communication in the future, because I think everybody has a common interest as a matter of how to establish communication.

Dr. BLAKE. I think this would be especially true if you gentlemen are watching what is going on in the field of oceanography.

Mr. MILLER. You are familiar, of course, with the fact that the interagency committee has set up an oceanographic data center, which is just in the process of getting underway. We cannot expect too much of it. It is to my way of thinking in very competent hands.

One of the things that this bill proposes, and one of the things that I think the interagency committee has in mind, is the establishment of an instrument calibration center. Do you think that this is an essential in this field, that we do something in the line of standardization and calibration? You think this is a step forward?

Dr. BLAKE. I most certainly agree with you on that, that the standardization of instruments, the common calibration of instruments, is essential to meaningful progress in oceanography, especially when so many different agencies are involved using different equipments.

If the work of one group in one area is to be coordinated with the work of another in still another area, it must be done on the basis of a common method of comparison of the data. In our own industry this is a very important and serious problem.

For example, in gravity surveys over the surface of the earth, it is relatively easy to make a good gravity survey in a given area, let us say of so many square miles, at a certain time, with a given instrument, which will remain stable and well calibrated over that time. At another time, with another instrument, perhaps with another contractor, an adjacent area will have a gravity survey made. Now, unless we have means for comparing the calibration of the instruments in these two adjacent areas, we are not able to make any meaningful tie between gravity observations in the first area and the second area.

Mr. MILLER. Well, has the Society of Exploration Geophysicists tried to establish standards?

Dr. BLAKE. They have in certain fields. I will not say they have been completely successful; but at least they do recognize the need for this, and there is an effort in that direction.

Mr. MILLER. I have in mind the fact that in the early days of the automobile industry, every manufacturer adopted his own standards. There was one company that had all its bolts built with the nuts with a left-hand twist on them, in the hopes that when you had to get a replacement you would be told that this is the only one that would fit. And they tried to maintain a monopoly. They soon gave that up.

And then the Society of Automotive Engineers itself established standards that are accepted. I think this is true in several other industries.

Dr. BLAKE. A parallel example in seismology, for example, might be the standardization of the types of magnetic tapes that are used for recording data. When we started out in this field about 10 years ago, there were perhaps half a dozen different types of tapes in use. The situation that resulted soon became intolerable to the industry, and we are now making efforts to standardize on not more than two different kinds of tape.

Mr. DINGELL. If the gentleman will yield very briefly: With regard to this business of a national data center, and as provided in the bill before the committee, H.R. 4276, can you conceive of another organization within the Federal Government or outside the Federal Government which could do this precise work as well as the organization that is contemplated in 4276?

Dr. BLAKE. I am not familiar with all the organizations that exist in Government that might do this. But I would certainly agree that some such centralized agency is needed. And I do not know of any existing at the present time. That may be because I do not know of all the agencies that exist in the Government.

Mr. DINGELL. Are you aware of any work that the Bureau of Standards or the Department of Commerce has done in this field?

Dr. BLAKE. Not in this particular area, no.

Mr. DINGELL. Thank you very much.

Mr. PELLY. Do you happen to know, Dr. Blake, whether private industry, such as your own research corporation, was consulted, either prior to or for an evaluation after the Texas tower disaster?

Dr. BLAKE. I am not familiar with all the details. But I mentioned this wave forces I program. The Navy did participate in that. When we started the wave forces II, that blue booklet I showed you was a proposal for that program, which was submitted to the Navy as well as other oil companies.

This proposal is dated December 15, 1958.

Initially, the Navy declined to participate in this program. Very recently, I understand that they have come back and indicated, now, that they do have a strong interest in participating in the program.

Mr. PELLY. You have said that on the basis of your findings you found your own company was probably using design factors of unnecessary strength in engineering, where some were maybe a little delinquent. On the basis of the information that you developed, would it

have been possible, had you been consulted, to avoid such a disaster, by proper engineering?

Dr. BLAKE. I cannot give you a positive answer to that, but I do feel that at least it would have contributed significantly to a better design.

Mr. PELLY. Well, I think that you have given us all something to think about, here. I am particularly convinced that maybe there is a great deal back of this legislation that will be helpful to private industry and to our educational institutions, if we can get a proper communication between Government and the two other interested parties.

Dr. BLAKE. As I mentioned earlier, we found that in our own case we were using perhaps too large a safety factor. We were overdesigning. However, we did come to the conclusion that some other parts of the oil industry platforms were a little underdesigned. As was pointed out in the magazine article I showed, the range of design factors that were being used in the industry covered a range of 4 to 1, which means that those on the low end were perhaps a little underdesigned.

I should point out that in the Texas tower case the oil industry was consulted, not us, but the oil industry. And perhaps the ones they consulted were those that were undersigning a bit.

Mr. PELLY. If the data is available generally to all, certainly it seems that we are headed in the right direction.

Dr. BLAKE. We are willing to make it available on a cost-sharing basis.

Mr. MILLER. Mr. Vanik?

Mr. VANIK. Dr. Blake, I am among those who believe that there is a taxpayer equity in corporate research, because it is paid for in good measure out of funds that would otherwise flow to the Treasury perhaps as taxes, and I think it is a terrible neglect that we do not take advantage of it.

Now, with respect to this donable scientific data, the accumulation of material that you have, that you deem of considerable value, what can you do with it? In what way can you make it available to the Federal Government or the agencies of the Government at the present time?

Dr. BLAKE. It depends somewhat on the nature of the information.

Mr. VANIK. Yes, I understand.

Dr. BLAKE. If it is in the nature of information which is not, let us say, of immediate competitive or economic advantage, in areas of basic research in seismology, for example, we are, speaking for our own company, now, willing to make that available on a cost basis only; no fee. That is, if it is new research.

If it is information which we already have, in the normal course of events we publish it in the scientific journals. It is therefore available to anyone who is willing to read the journals.

Mr. VANIK. Those are professional journals?

Dr. BLAKE. Professional journals, yes.

Now, we also accumulate a good deal of data in the course of our survey work, which is really ancillary to our main purpose of finding oil. Let us say water depths, for example; data that we already have in our files I am sure we would be more than willing to make available merely for the cost of collecting it and handing it over.

Mr. VANIK. Is it your experience that this information is being rejected by the Government, or ignored?

Dr. BLAKE. So far as I know, we have not even been asked.

Mr. VANIK. There have been no inquiries or requests for you to furnish any of this data?

Dr. BLAKE. I cannot say that positively for the company as a whole. Of my section of the company, there have been no such inquiries.

Mr. VANIK. And this probably applies not only to the particular work you are doing, but to all fields of science?

Dr. BLAKE. I would not be surprised.

Mr. VANIK. That there is no central collection agency.

Now, does this not point up the need for such an assimilation of information?

What about the National Science Institutes? Is there no gathering of this that we could follow or check up on?

Dr. BLAKE. Not that I am aware of, in this field, in a systematic manner. There are sporadic attempts to gather information from one agency or another. As I say, the Hydrographic Office has done some work in this field. However, so far as I am aware, there has not been a concerted, organized effort to gather the available information in the industry files that will be of use.

Mr. VANIK. If we were to take it on a figure basis, the total amount of scientific data that we know about in this one area, what percentage of it do you suppose is in private corporate research files, as distinguished from public research?

Dr. BLAKE. I imagine more than half.

Mr. VANIK. More than half. And this tremendous resource is just untapped. It is just unused, uncorrelated and, you might say, immobilized.

Dr. BLAKE. For example, the Western Geophysical Co. alone, in the last 10 years, has run something like 600,000 miles of seismic profiles in the oceans.

Mr. DINGELL. If the gentleman will yield to me, is not a collection or compilation of this industrial data in one place one of the functions that this data center, as provided in 4276, can accomplish?

Dr. BLAKE. So I understand, yes.

Mr. VANIK. Will the gentleman yield?

Mr. DINGELL. I am transgressing on the gentleman's time.

Mr. VANIK. But as a matter of fact, is not this data processing business being undertaken now?

Mr. MILLER. It has been established. It was only established early this year. And I am certain that Admiral Steffan, who is out here and who is in charge of it, is quite conscious of all of these things. He has to build a layout and an organization, and I think he is to be complimented for the way in which he has tackled the job. So I have a hunch that before they are through he will be after them.

Dr. BLAKE. On the subject of the data processing center, one of its functions will be to process the data as well as to assemble it; otherwise, it will not be meaningful. And one of my colleagues on this committee, Carl Savit, will give you an example of how we do data processing in an integrated exploration system. You might be interested to hear what he has to say on the subject of systematic processing of data.

Mr. DINGELL. Mr. Chairman, I would like to ask this: Are you familiar with the provisions of 4276?

Dr. BLAKE. I have read it; yes, sir.

Mr. DINGELL. Did it occur to you that there ought to be language in there authorizing this data center and a National Council and the instrument test and calibration center, to utilize the fruits of industrial research, to give them specific authority to exchange information with industrial agencies, and so forth, and to enter into cost-sharing contracts with these industrial researchers, so that there might be some benefits mutually given and shared between the Government and the Government agencies and the data center, and so forth, and the private firms engaged in this same operation?

Dr. BLAKE. Well, I am not a lawyer, so I am not qualified to comment on the legal aspects of such a provision. However, I think the thought that you expressed sounds like a very good one, with one possible exception. You mentioned entering into contracts on a cost-sharing basis. Now, while we, as an oil company, have historically been willing to do that, it is not for me to say that other oil companies or geophysical contractors will be willing to do this merely on a cost-sharing basis. However, if you said, "enter into contracts to do this," I would have no objection.

Mr. DINGELL. Of course, if we say, "Do this on other than a cost-sharing basis," it will be done on other than a cost-sharing basis, with a resulting increase in the cost to taxpayers. Is that correct?

Dr. BLAKE. That is correct. But I do not think I can speak for companies other than my own on their willingness to do it on a cost-sharing basis.

Mr. DINGELL. One last question.

You mentioned in your testimony that there is no reason why war surplus ships could not be utilized for research. Am I correct in that?

Dr. BLAKE. For certain types of research. I will concede that for specialized types of research involving bottom sampling in deep ocean, there may very well be a good case for a requirement of special ships having special maneuverabilities.

However, for conventional geophysical surveys, such as we in the industry are accustomed to carrying out, I do not believe that special vessels are essential.

Mr. DINGELL. Thank you very much, sir.

Thank you, Mr. Chairman.

Mr. MILLER. Thank you very much, Dr. Blake. We appreciate your coming here and the forthright manner in which you have given us a very interesting slant on this whole picture.

Mr. Carl Savit, of the American Geophysical Co., Los Angeles, is next.

As long as only one of my colleagues is here now, Doctor, may I say that as a Californian I welcome you.

STATEMENT OF CARL SAVIT, WESTERN GEOPHYSICAL CO.

Mr. SAVIT. Mr. Chairman and gentlemen, there is very little that I can add to what Dr. Blake has said. He has covered a great deal of territory, and extremely well.

However, I have a short statement in explanation of the approach that the professional surveyors, if you wish, of the ocean, have used in the past.

Perhaps as a word of introduction: I am director of systems research for Western Geophysical Co. Our company has been doing oceanographic surveying, of a specialized type admittedly, for a number of years. We started in the water in 1938, and during the past 6 or 7 years we have done more than half of all the contract geophysical exploration at sea in the world. And at the present moment, as of yesterday—I cannot guarantee that it is true today—we are operating 19 vessels.

Mr. MILLER. Where are these located? Not all of them, individually, but in what areas do you operate?

Mr. SAVIT. At the moment there are several in the Persian Gulf, several in the Mediterranean, some in South American waters, some along the Atlantic coast, and some in the Gulf of Mexico. There may be some along the East Coast of Africa. I am not sure.

Mr. MILLER. What I wanted to bring out was that your operation specifically is a worldwide operation. Even though your headquarters are in Los Angeles, it is not confined to the Pacific coast.

Mr. SAVIT. As a matter of fact, sir, it just happens that there are none operating on the Pacific coast at the moment. We have operating bases in various foreign countries and various cities in the United States, logistic bases.

I will proceed with the short statement that I have prepared. It may overlap the statement of Dr. Blake somewhat.

American industry has during the past decade expended more than $300 million on oceanographic exploration. Motivated by the search for petroleum and other valuable mineral resources, commercial geophysicists have measured water depths, magnetism, and gravity at sea. They have probed the earth beneath the seas with coring tools and with both the reflection and refraction seismographs.

In the course of these activities, commercial marine geophysicists have had to study such ancillary matters as propagation of sound in the water, as well as other physical, chemical, and biological aspects of oceanography.

While the physical quantities measured by commercial oceanographers are essentially the same ones measured by academic oceanographers, the differences in motivation have in the past resulted in two distinguishing characteristics of commercial oceanographic data.

Commercial data had to be obtained in extremely fine detail, and as a result vast quantities of data had to be processed in incredibly short times.

Thus, fine detail and overall speed have served to distinguish the commercial effort from the academic.

As an example, one recently completed commercial seismic refraction survey in the Persian Gulf has, in a few months, resulted in more individual oscillographic traces than have been produced by all universities and oceanographic institutions since oceanographic surveying began.

In the past 10 years, Western Geophysical Co. alone has obtained more than 100 million oscillographic traces at sea.

To be sure, commercial interest has been confined largely to the continental shelves; while academic interest has ranged over all the ocean.

For some types of measurements, such as undersea coring, the difference between the continental shelves and the deep ocean is formidable; while for other measurements, such as seismic studies, the differences are merely those of technical detail.

In order to cope accurately and rapidly with the masses of data acquired in commercial operations, the industry has been forced to develop integrated systems of operation. All phases of data gathering and data handling have been coordinated and automated to the maximum possible extent.

Shipboard operations are conducted in such a way as to produce data in a form best suited to automatic or semiautomatic processing. Data processing equipment in turn is specially designed to handle the acquired data and to provide finished presentations.

The first example submitted here is a time-distance seismic refraction section prepared by one such system.

Some 500 oscillographic traces have been plotted to scale, with all necessary corrections and adjustments accurately made.

Conventional academic style processing of seismic data is done manually from directly recorded individual traces.

To prepare a handmade plot analogous to the one presented here normally requires many days of work on the part of a skilled seismologist. This presentation was prepared in a total working time of less than three-quarters of an hour by one technician and his assistant.

The automatic presentation in addition offers vastly more useful information than does the manual one, and is far less subject to human error.

My second example of automated system operation in oceanography is one which is more readily understandable to the layman. This is a seismic reflection cross-section through the floor of the Gulf of Mexico.

Essentially, this represents what one would see if he were to slice down through the ocean floor to a depth of 25,000 feet below the bottom.

During the 40 years of its existence, the commercial geophysical industry has evolved to a high state of development without the use of outside funds. Millions of dollars of research and development money have been invested by private organizations in order to improve and perfect techniques, instruments, and equipment. Our motivation has been the incessent urge driven by competition to obtain better data at less cost.

We have developed our own ships, hydrophones, cables, amplifiers, tape recorders, cameras, computing devices, and countless other items, all of which have to function together smoothly as a unit and have to be used in many different types of operation.

Moreover, every item has to have an extremely high reliability, since a single breakdown can be very costly indeed.

For example, a 10-minute breakdown on some marine operations may entail a total loss of one-half hour in returning to position; all at a total cost of about $250.

Because we cannot afford to waste research men on routine survey work (not that we could get them into routine work if we tried) our

instruments have to be capable of operation, adjustment, and maintenance by technicians and other nonprofessionals. We cannot and and would not send the inventor to sea with an item of equipment.

Another factor influencing the industry is the necessity to operate under extremely adverse conditions. The petroleum industry often cannot wait for the best operating season; with the result, for example, that we have had to work in Alaskan waters, amid ice floes, in the dead of winter, and in the steaming Persian Gulf in midsummer.

It is my considered opinion that the geophysical industry can make a major contribution to the national oceanographic effort. The principal ingredient of this contribution is the way of life, the modus operandi, if you will, of the commercial geophysicist, who must operate efficiently with fool-proof equipment at minimum cost, and with the attitude that he goes to sea to do a specific piece of work. He does not look upon his job as a form of vacation. His recreation is obtained on shore during rest periods. He goes to sea to obtain specific data accurately and inexpensively, and nothing else.

Mr. Chairman, that concludes the formal statement. I have one or two comments based upon the previous testimony.

Mr. MILLER. We will be very happy to have them. Go right ahead, sir.

Mr. SAVIT. I would mention incidentally that the Hydrographic Office has contacted people in the industry in search for items of information. This was unknown to Dr. Blake. Prior to the hearing, that is.

There are many difficulties, and we have been asked to see if we can find certain items of information for them.

Mr. DINGELL. How long before these hearings?

Mr. SAVIT. Contacts were made a few weeks ago on one item.

Mr. DINGELL. Was that the first contact, to your knowledge?

Mr. SAVIT. There have been some informal discussions several times in the past, but this was the first request emanating from the Hydrographic Office that was not as a result of someone calling on them.

Mr. DINGELL. Are you implying that there is not sufficient utilization by the Hydrographic Office and other Government agencies concerned with the information readily available from private industry?

Mr. SAVIT. No. First of all, the information is not readily available from private industry. It takes rather involved negotiations.

It appears to me that the Hydrographic Office, in my opinion, has operated with some speed; that since the installation of the oceanographic data center, first they had to find out what it was they wanted, and then start to ask for it. And I do not see how they could reasonably have been expected to ask for anything much sooner.

Mr. MILLER. I am very happy to hear you say that, because I think it has functioned with dispatch, and I think it was a tremendously challenging undertaking. To set up such an organization in this period of time is a great undertaking.

I take it that you subscribed that this center is going to have great value.

Mr. SAVIT. Yes. As a matter of fact, in some discussions we had with the Senate committee, we pointed out that it was our opinion that the Hydrographic Office was the proper place for the national oceanographic data center. This was 7 months ago.

One other item arising from previous testimony: It is conventional in our type of operation to gather data, have preliminary results available in usable form within 3 days, and to have final reports completed within 30 days after the ships return to port.

This is the type of speed standard required in the petroleum industry.

Mr. MILLER. Are you familiar with the provisions of the bill that is before us at this time?

Mr. SAVIT. I am, sir.

Mr. MILLER. Do you want to comment on any of them?

Mr. SAVIT. Unfortunately, my training is not in the law or in legislation, and I cannot really gauge the effects of the specific provisions. I certainly see no objection to any provision and am strongly in agreement with the necessity for establishing a permanent oceanographic coordinating agency.

Mr. MILLER. You think that a calibration center is desirable?

Mr. SAVIT. Yes; I think that is probably one of the critical areas, if not the most critical area, of need. We have had the experience of having one of our instruments built which we felt we could not calibrate well enough for our own purposes. We sought out places in the Government. We found one laboratory doing Government work which was willing to calibrate this instrument for us. They sent it to the calibration center in the United States. This was presumably the outstanding calibration in the place. They sent the calibration back to us, and we were not able to reconcile their calibration with ours.

A few inquiries to them indicated that their calibration equipment was not quite as good as ours. And so the picture is that there is either no or very inadequate calibration equipment at all. And certainly every laboratory that we know of has its own calibration standards, no two of which agree to any reasonable extent.

Mr. DINGELL. That makes interchange of data and information extremely difficult, does it not?

Mr. SAVIT. It does; yes.

Mr. DINGELL. And costly and time consuming, too?

Mr. SAVIT. Yes. A great deal of time is spent, not only discussing calibrations between laboratories, but discussing the methods by which the calibrations were obtained, so that one can decide whether or not they are at least consistent.

Mr. DINGELL. Do you run into problems in equating one set of calibrations with another?

Mr. SAVIT. Yes.

Mr. DINGELL. Sometimes they are insurmountable, I imagine.

Mr. SAVIT. That is probably true; yes.

Mr. DINGELL. And as a result the information obtained is practically useless?

Mr. SAVIT. No. The information is useful for the purposes for which it is obtained, in many cases. As, for example, in the oil industry, where any particular piece of calibration is required, it has been made, because, for example, the operator that Dr. Blake mentioned is not going to risk $82 million or $86 million on an uncertain calibration.

So, for our purposes, we will calibrate. The question is whether or not these individual surveys can be used as part of a whole; whether they agree with each other.

An oil company does not really care whether the survey in the Persian Gulf agrees with the one in the Bay of Fundy or the waters off Trinidad, or something of the sort.

Mr. DINGELL. No; but the scientist concerned with that same survey for another purpose might be very vitally concerned, might he not?

Mr. SAVIT. Yes.

Mr. MILLER. You might go out and determine the height of a mountain or the height of a plane; but if you know the height of the plane above sea level and the height of the mountain above sea level, you can refer it to something else.

Mr. SAVIT. This particular factor is especially important in the field of the earth's gravitational field.

Mr. DINGELL. I am very interested in the way you as an industry plot these figures in these charts that you presented to us today. Are you implying that when a survey is made by, let us say, scientists attached to a university or an institute of some kind, they do not do it in this way?

Mr. SAVIT. They do not. There are several reasons. One, of course, they have not had the funds or inclination to develop the system. This is not a cheap system. There is probably a quarter of a million dollars worth of equipment, in addition to the ships and nontechnical equipment, that went into producing these particular things.

Secondly, the universities have not had the problem of having to survey in detail very large areas. They are going out and doing reconnaissance work. Generally there are several graduate students aboard the ships who can do the manual work, and the results can be plotted in a reasonable amount of time, sometimes within a month or two after the end of the cruise.

Mr. DINGELL. I note that you plot a cross-section of the ocean's floor. Is that correct?

Mr. SAVIT. One of those is a cross-section; yes.

Mr. DINGELL. Your dealings with your clients are principally with the oil companies? Is that correct?

Mr. SAVIT. That is correct.

Mr. DINGELL. In order to explore this thing fairly, would I be fair in assuming that you generally have a pretty good idea of what you are looking for when you go out?

Mr. SAVIT. In a sense, we do. That is, we are looking for certain types of irregularities or anomalies, if you wish, in the earth beneath the ocean floor.

Mr. DINGELL. At economically feasible depths for drilling and so forth?

Mr. SAVIT. For drilling, yes. Generally, the depths that we handle considerably exceed the economic bounds for the present, because at very small additional cost we can get additional data which may be useful 5 years from now when the oil companies can do a little better on depths.

Mr. DINGELL. All right. Let us talk, now, in terms of when the universities and the scientific institutions and so forth go out. Do they know what they are looking for, exactly, when they go?

Mr. SAVIT. Generally, in the reconnaissance-type surveys that have been done to date, they do not. This is pure research.

Mr. DINGELL. In other words, you are related more closely to applied science?

Mr. SAVIT. That is correct. We are surveyors.

Mr. DINGELL. I am very much concerned that they are not applying sound economic practice to their ways of surveying. And I intend to explore the reason for this.

But what I want to know is: Is there not some intelligent justification for their behaving in a little different way with regard to their surveys than you folks do in regard to your survey of the ocean floor?

Mr. SAVIT. There is every reason in the world for them to do their surveys in the way they do them; as long as they are out doing pure science reconnaissance work, they more or less have to, with simple instruments, play the thing by ear, be able to change at any moment, and examine every point. They have Ph. D.'s out on the ships. They can study the whole thing through.

We go out to do a specific survey. We are not suggesting that we would be equipped or desire to do the kind of work that the universities do. We only suggest that we are equipped to go out and gather data if the nature of the data can be specified.

If someone wants to obtain a site for a particular type of oceanographic study, or for a missile range, or for drilling to the Moho, or something of the sort, the geophysical industry can go out and get this specific data at very low cost per mile, as compared to the manual way of doing it.

Mr. DINGELL. Now, with regard to survey vessels, is it your opinion that the industry needs brand new vessels specially designed for their work?

Mr. SAVIT. The industry has built over the past years a number of specially designed vessels, all-steel vessels.

Mr. DINGELL. Do you find that war surplus vessels are generally satisfactory?

Mr. SAVIT. We have not so found. We have built our own vessels. We own six vessels. We charter 13 more. They are all of about the same type. We prefer to use our own. We have used war surplus vessels in some areas and in some instances. We think we can do a few more shots per day or something of that order if we have the specially designed vessels. We can accommodate the crews a little better, and so on.

Mr. DINGELL. As I read your testimony, then, you support the provisions of H.R. 4276 dealing with the data center, with the instrumentation test, and the calibration center. Am I correct on that?

Mr. SAVIT. That is right.

Mr. DINGELL. Am I also correct in understanding that you would support the purposes generally of this bill, H.R. 4276?

Mr. SAVIT. Yes; very enthusiastically.

Mr. DINGELL. Thank you so much.

Mr. BAUER. Mr. Savit, one question.

Would you explain to the committee how good your geodetic control position is, your survey work; and how you accomplish this?

Mr. SAVIT. Geodetic control in our work is accomplished by radio location means appropriate to the specific area. We use shoran, loran, raydist, decca. The AEPI is now being released. These methods

generally will give control to the order of a few hundred feet. We could get accuracies of 300 feet at about 500 miles from the shore.

Now, most of these methods are not suited to distances beyond about 500 miles. But in the closer inshore areas, we have to be able to locate within a few hundred feet in order that the oil company client shall be able to return to the site and drill its well in the proper location. It would be tragic indeed if they missed by 1,000 or 2,000 feet and lost an oil well by that reason.

Mr. BAUER. Now, one further question along the same line: When you move from country to country, do you carry your own means of establishing geodetic control with you, usually?

Mr. SAVIT. About half the time we do. Other times we use existing geodetic controls, if available. If not, we have to carry our own.

Mr. MILLER. You have to put up your own loran installations?

Mr. SAVIT. We have to put up our own antennas. Our company magazine at one time showed a camel-back expedition where some of our people had to go by camel for 12 days in Baluchistan to set this thing up.

Mr. BAUER. In the Persian Gulf you are using Decca?

Mr. SAVIT. Yes.

Mr. BAUER. And all of your survey work has had close geodetic control?

Mr. SAVIT. That is right.

Mr. MILLER. I am afraid this is all we can do. Those bells are very emphatic, you know. There is little we can do about it.

Mr. Romberg and Dr. Mott-Smith, could you come back tomorrow morning?

Mr. ROMBERG. I am due to go to a physical society meeting in Mexico.

Mr. MILLER. If you have a prepared statement, may we have it?

Mr. ROMBERG. Yes, sir.

Mr. MILLER. We will file it for the record.

(The statement referred to follows:)

MEMORANDUM

JUNE 16, 1961.

To: Dr. F. Gilman Blake, Jr., Chairman, S.E.G., Subcommittee on Oceanography.
From: Mr. F. E. Romberg, S.E.G., Subcommittee on Oceanography.
Subject: Potential of geophysical exploration industry for oceanographic instrumentation.

Outline:

1. Geophysical instruments now used at sea:
   - (*a*) Gravity meters.
   - (*b*) Magnetometers.
   - (*c*) Acoustic arrays.
   - (*d*) Data processing methods.
2. Oceanographic instrumentation by the exploration industry:
   - (*a*) Examples.
   - (*b*) Development facilities.
   - (*c*) Automatic recording, computing, storing.

The exploration industry's potential for oceanographic instrumentation can be divided into two categories, one for building regular geophysical sensors for use at sea, and another for inventing and developing new instruments for oceanography. In order to get into operation, the exploration industry invented and built a variety of geophysical sensors for use in its regular operations. When the search for oil led into the ocean, these were adapted for use at sea, so that now seagoing gravity meters, magnetometers, and especially acoustic arrays of advanced design are now in operation. Development of these instru-

ments for speed, reliability, automatic operation, and refined methods of sensing is now going on at an accelerated rate. In order to build up the capability for such development, the exploration industry had to establish research laboratories and acquire highly trained scientists. This resulted in the ability to attack all kinds of problems in instrumentation, oceanographic or otherwise, so that now the industry has produced such items as bathythermographs, sonar gear and magnetic submarine detection devices.

Regular exploration instruments adapted by the industry for use at sea include principally magnetometers, gravity meters, acoustic arrays, or seismographs, and computing and data-processing gear.

Gravity meters were first used in water by giving them remote reading devices and lowering them to the bottom from ships that anchored for the purpose or from hovering helicopters. It was found that if the bottom were muddy it responded to swells with so much motion that the gravity meter had to be modified so as to be readable while its frame was moving. This led to the invention of devices to compensate for larger and larger motion, so that gravity meters were adapted first to submarines and then to surface ships. At present, gravity can be read in surface ships of moderate size, without stable platforms and in average sea states, with an accuracy of two parts in a million.

In a similar way magnetometers were adopted for seagoing use, except that a new instrument had to be devised instead of merely modifying the reading method of the old one. The flux-gate magnetometer was invented by the exploration industry and adapted for use in airborne submarine detection in World War II. It was operated by being towed in a "bird" behind an airplane. Since the instrument could be read in spite of the motion of such a bird it could be used without modification in the water by being towed behind a ship, and it has been so used by geophysicists and by physical oceanographers since. Later developments have included new types of magnetometers such as the proton-precession, the rubidium-vapor, and the metastable helium magnetometers. The last named is again being used in airborne submarine-detection systems. It has the advantage of giving an absolute omnidirectional reading, and it is from 100 to 1,000 times as sensitive as the first airborne or water-towed magnetometers.

It is the adaptation of seismograph systems or acoustic arrays to ocean use that the most satisfactory results have been achieved by the exloration industry. Today's waterborne acoustical arrays, the result of 25 years' development, are housed in a cable half a mile long containing 24 detectors. This is towed by a ship traveling at 6 knots which pays out the cable from a reel while a dynamite charge is fired and the signals from it are recorded, and reels the cable back in automatically during the 2-minute intervals between shots. Thus a continuous-coverage map of the bottom and the subsurface geologic structure to a depth of 3 or 4 miles below the bottom is made at the rate of 60 or 70 miles a day. A recent development involves the use of a gas gun instead of dynamite; the gun is cheaper than dynamite but does not have as much penetration.

The success of the oceangoing seismometer, and the large quantities of data it brought in, made it necessary to invent automatic data-processing systems for correcting, computing, and plotting the data so as to eliminate the quantity of hand computing and hand plotting previously needed. The processing of records led to the invention of a type of inverse-filter processing whereby a signal could be lifted out of a noise level so high that the signal would have been imperceptible on a visual record of the old type.

In addition to the geophysical instruments now used by physical oceanographers at sea, the exploration industry manufactures a number of instruments that are specifically oceanographic. One example of this is the electric bathythermograph. This is an instrument which can be lowered into the ocean from a ship or a hovering helicopter and which records the temperature of the water at different depths, an important item in antisubmarine warfare. Another example is the application of the new accurate magnetometers to submarine detection, whether towed from a ship or airplane or lowered from a helicopter. A third example is the development and application of sonar gear. The problems of sonar in the water are the same as the problems of sound in the earth; in both technologies a deduction is made from hearing a noise that has traveled through a dense medium, water in the case of sonar and rock in the case of oil exploration. In each case the signal must be amplified, filtered, and displayed, before the observer may make a deduction from it. If an array is available the

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direction of arrival can be determined, and if the velocity structure of the water or the rocks is understood, further deductions may be made about the position of the source. If the signal is weak with respect to the noise its relative level can be raised by suitable treatment. All these techniques have been exploited by the exploration industry for the knowledge it must have about the attitude of the hidden geologic layers. Mapping the ocean bottom, the geologic structure below it, and any anomalous bodies such as submarines which may be present under the surface is in a sense exactly the same problem. In general, the same kind of research facilities and the same kind of research workers are required to solve it.

It is in the problem of data processing that the capabilities of the exploration industry could perhaps have the most important effect on oceanographic instrumentation. The central problem of oceanography to date is to provide in as much detail as is usable, a synoptic picture of the entire ocean. This means a knowledge of the temperature, salinity, current vector, biological content and other variables, for any point at any time. To collect such knowledge, process it, and make it available, without making the result prohibitively cumbersome, can obviously be done only by automatic methods of data recording, computing, and storing. These methods are receiving full development in exploration geophysics today and could be applied without difficulty to oceanography.

FREDERICK E. ROMBERG.

Mr. MILLER. Dr. Mott-Smith?

Dr. MOTT-SMITH. As far as I am concerned, sir, I think the subject is very well covered.

Mr. MILLER. May I just ask you this: Do you subscribe generally to what Dr. Blake and Mr. Savit have said?

Dr. MOTT-SMITH. Yes, sir, I do.

Mr. MILLER. How about you, Mr. Romberg?

Mr. ROMBERG. Yes, I think I concur with what they said, and I think they stated the case very well not only for my company but for the industry as a whole.

Mr. MILLER. The meeting, then, will stand adjourned until 10 o'clock tomorrow morning.

(Whereupon, at 12:15 p.m., the subcommittee was recessed, to reconvene at 10 a.m., Wednesday, June 21, 1961.)

OCEANOGRAPHY 1961—PHASE 3

WEDNESDAY, JUNE 21, 1961

House of Representatives,
Subcommittee on Oceanography of the
Committee on Merchant Marine and Fisheries,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to adjournment, Hon. George P. Miller (chairman of the subcommittee) presiding.

Present: Representatives Miller, Dingell, Lennon, Vanik, McDonough, Ellsworth, and Morse.

Present also: John M. Drewry, chief counsel; Paul S. Bauer, consultant; and William B. Winfield, chief clerk.

Mr. Miller. The committee will be in order.

In the continuation of our hearings on the Oceanographic Act of 1961, H.R. 4276, we shall conclude the presentation of industry by hearing from Dr. Frank Olsen of the Radio Corp. of America, Princeton Laboratories.

We shall now turn to an area of great importance, namely, how should a marriage of disciplines spread through so many departmental and agency pockets of vital importance to our Nation, "aquatic science," be managed without a serious disruption in the line functions of existing departments and agencies?

To glean all possible ideas, sometime ago I asked Prof. Edwin J. B. Lewis of the George Washington University School of Government, Business, and International Affairs, if he would be willing to help us. His answer in the affirmative has resulted in his appearance today at my request.

Professor Lewis is singularly qualified to offer his advice. For 19 years he defended the Bureau of Aeronautics and later the Bureau of Weapons Budget of the Department of the Navy before both the House and Senate Appropriations Committees. He has now retired from his capacity as the top civilian in budget matters of these Navy bureaus and is devoting his full time to teaching, research, and consultation in the field of financial management. In preparation for his appearance here today at my request I know he has done his homework well.

The next area of inquiry concerns section 8 of H.R. 4276. The National Science Foundation represented by Dr. Randal M. Robertson, Assistant Director of the Division of Mathematics, Physics, and Engineering Sciences, and associates will give the answers to the problem and congressional question developed during the last session of Congress and reiterated in the first hearing of the current hearings on phase 3 oceanography, namely, on H.R. 4276, which is:

If a vessel is purchased with Federal funds, why should the title be passed to the recipient of a Federal grant, thereby increasing the capital assets of the so-called nonprofit institution which is the grantee?

This is a matter that has been in discussion, here, for some time, and one that we hope to resolve.

Professor Lewis, we are very happy to have you here, and we will be glad to hear from you now.

STATEMENT OF PROF. EDWIN J. B. LEWIS, GEORGE WASHINGTON UNIVERSITY SCHOOL OF GOVERNMENT, BUSINESS, AND INTERNATIONAL AFFAIRS

Professor LEWIS. Thank you, Mr. Chairman.

Mr. Chairman, members of the committee, I deem it not only a public duty but a high privilege to come here at your invitation to discuss the financial and related management aspects of the proposed Oceanographic Act of 1961, H.R. 4276.

Those who serve on this committee or who work with it are well aware of the vital significance of oceanography to the advancement of our national welfare. The very existence of this committee gives emphasis to the great national importance of the resources contained in the seas that surround us and contributes immeasurably to the growing public recognition of the urgent need for mastering the largely unknown aquatic forces of our planet.

The various witnesses who have preceded me in these hearings have abundantly demonstrated the problems inherent in the existing fragmented approach to the task of mastering the ocean environment. Although a number of witnesses have referred to the national program in oceanography, there exists today no agency of Government which can appear before the Congress to testify comprehensively and knowledgeably on the progress of the program in all of its many ramifications. Earlier committee reports fully document the fact that the oceanographic program is being conducted by numerous scattered agencies having varying interests and overlapping jurisdiction, but they fail to provide any reasonable assurance that these scattered agency efforts are being integrated into a purposeful, appropriately balanced, national program.

An evaluation of the strengths and weaknesses of the oceanographic program now being conducted is beyond my professional competence. I am not a scientist, and I know relatively little of scientific endeavors. My professional specialty is financial management, which is of course inseparable from administration and management in general. Management, however, is an element common to all business and Government endeavor, and there is no reason for regarding scientific endeavors as being in any way immune from the influence of basic management considerations. The factors conducive to effective program management, and therefore to constructive program achievement, must be sought in any program, scientific or otherwise, if that program is to achieve its full potential.

As a practical matter, the characteristics and magnitude of the oceanographic efforts required to obtain mastery of the aquatic resources defined in the proposed act are such that the program must be the responsibility of the Federal Government. Only the Federal Government can make sure that the overall program is adequate, that requirements have been fully and systematically determined, and that the necessary facilities have been established—regardless of

ownership—so as to be reasonably available where and when required.

Both the interest and responsibility of the Government in the oceanographic field has, over the years, been somewhat uncertain. The interest fortunately is now well established, but the responsibility unfortunately is not. The problem of fixing responsibility becomes more urgent with the expanding scope of the program and the increasing eagerness on the part of governmental agencies to extend their participation in it.

Three basic approaches to the problem of fixing responsibility may be delineated for evaluation by this committee. The first and perhaps easiest approach would be to continue present arrangements whereby each of the numerous agencies participating in various phases of oceanographic effort develops its own program for participation with primary regard for its major agency objectives, none of which include oceanography as a basic program responsibility.

At the other extreme, the national oceanographic effort may be deemed a program of such overwhelming importance as to require consolidation of effort in a national oceanographic agency. This approach was followed with notable success in organizing our national space program.

The third approach is the one contemplated in the proposed act: to establish a policy coordinating council with responsibility for integrating the varied agency efforts into a balanced national program.

There undoubtedly is strong sentiment among the participating agencies to continue the status quo. Inertia is a most powerful force and long-established agency interests are best protected under this arrangement. No agency loses and each agency may hope to benefit from the increased resources being invested in oceanography. But whether this status quo arrangement is most conducive to an effective national program is at best highly questionable. Certainly the progress achieved by these agencies over the many years they have variously engaged in oceanographic pursuits has been far from satisfactory, or the need today would not be so urgent. The greater public emphasis on and the increased resources for oceanography will accelerate oceanographic accomplishment in any event, but there would remain the problem of effectively integrating these diverse efforts into a truly national program without duplication or omission.

The second or single-agency approach has many attractive features, but would involve a radical change in agency structure. Overlapping jurisdictions and orderly assignment of priorities to all facets of oceanographic effort are largely resolved when full responsibility and authority are centralized in a single agency. There would be one budget for oceanography presented for congressional review and continuous analysis and adjustment of oceanographic operations in terms of available or feasible resources, both very important advantages.

These benefits could be achieved either by establishing a new agency, following the pattern of the National Aeronautics and Space Administration, or by reassigning all oceanographic functions, personnel, and facilities to one of the existing agencies, following the pattern often used in the military departments in consolidating overlapping and duplicating responsibilities. A fully integrated massive oceanographic

effort could probably be carried out by a single agency at less cost and with more prospects of success than under any other arrangement, but at the expense of considerable disruption to related programs being conducted by existing agencies.

It is difficult to balance the relative values of autonomy, with its attendant vigor, against integration, with its attendant opportunity to achieve the reinforcing effects of coordinated operation. It is difficult also to weigh the desirability of preserving a going concern against the utility of establishing a fully rationalized structure organized with primary regard to oceanographic needs. In dealing with these questions, many factors besides theoretical managerial virtues must be taken into account, and the final decision undoubtedly will be less than fully satisfactory to all concerned. No matter what the decision may be, the process of change does not have a clear-cut beginning and end. Adjustment always is gradual and the accommodation to changing conditions necessarily evolves over time.

As between the desirability of preserving a going concern and the manifest utility of establishing a fully integrated structure, the proposed act would take a middle course. It seeks to preserve the going concern, but to improve coordination through the establishment of an interdepartmental committee having a statutory basis.

The interdepartmental committee is one of the chief coordinating devices available to Government when related functions cannot conveniently be brought together within a single agency. The strengths and weaknesses of the committee approach are those of any system which seeks to secure cooperation and compliance through voluntary means. Its strength is that officials, departments, and agencies are generally inclined to cooperate fully in carrying out decisions in the making of which they have participated. The principal weakness is that the process generally involves endless discussion, which is time consuming and not infrequently irrelevant, with the result that needed decisions often go unmade.

On the balance, the use of some form of interdepartmental committee to obtain greater coordination of oceanographic effort would appear to offer considerable promise, provided the committee charged with this responsibility is given the requisite authority to carry out the functions expected of it. The committee approach best protects the sizable existing investment in going facilities and projects, and this is a most important consideration; but a committee without staff or authority is only too prone to degenerate into a mere debating society, accomplishing little that is constructive.

The problem, then, may be resolved into one of preserving the advantages of the committee approach while avoiding its pitfalls. Perhaps what is needed most of all is purposeful leadership and integrated planning of an overall program. My recommendations accordingly are directed toward strengthening the committee structure contemplated in the proposed act with respect to membership, staffing, and financing, each of which will be considered in turn.

Before proceeding to the specific recommendations, however, I should like to comment on a particularly important characteristic of the proposed National Oceanographic Council from the standpoint of congressional oversight.

When your Subcommittee on Oceanography was established, it was done in recognition of the vital significance of oceanography to our

national welfare. Your committee is charged with reviewing the Nation's oceanographic assets, evaluating oceanographic progress, and providing through the Congress appropriate policy guidance for this rapidly developing program.

If your committee is to carry out these functions effectively, it must have some responsible agency to which it can look for authoritative and comprehensive information on the status of the program and through which it can establish the degree of accomplishment or lack of accomplishment. Unless some centralized agency is made responsible for the program, the problems confronting your committee in providing effective congressional guidance are likely to prove unsurmountable. There must, in other words, be program accountability, for without program accountability there can be no assurance that adequate progress is being achieved.

The proposed National Oceanographic Council would in my opinion constitute an agency which could appropriately be held accountable for program performance. It would have the requisite statutory basis and would be constituted at a level at which accountability could be exacted. It would have continuing responsibility and clearly defined relationships not only with existing agencies but with the Congress. In this respect the proposed Oceanographic Act of 1961 would provide a reasonable means for your committee to carry out its responsibilities on a continuing basis and in so doing would overcome a major deficiency existing in program organization at the present time.

The accountability provisions of the bill before you would be strengthened, however, if membership on the proposed National Oceanographic Council were expanded to include every department and independent agency participating in oceanographic endeavors to any significant extent.

The Department of Health, Education, and Welfare, an important participant in oceanography through its Public Health Service and its Office of Education, is not in the bill proposed for membership on the Council, even though many of the projects carried out under its auspices are essential to the overall oceanographic program. Its program participation, moreover, is expanding, from $340,000 in 1960 to $699,000 in 1961 and $1,150,000 in 1962. The Smithsonian Institution also will have an important oceanographic role if the provisions of section 9 in the bill before you are implemented. There would be considerable merit, therefore, in adding both of these agencies to Council membership by amending the provisions of section 2 of the bill accordingly.

These comments on Council membership have been limited thus far to agency representation on the Council. I should like to now raise briefly the question of whether the level of representation should be held to Cabinet officers and the heads of independent agencies.

All of these officials, with possibly one exception, and here, Mr. Chairman, I have in mind the Director of the National Science Foundation, have so many major responsibilities which are rather far removed from oceanography that they cannot as a practical matter be expected to devote any significant portion of their time to oceanographic matters, or to have more than broad familiarity with the oceanographic projects prosecuted under their overall jurisdiction.

Their time necessarily must be allocated to their major responsibilities.

Under the circumstances it may be well to consider permitting the Cabinet officers and agency heads to designate a representative to serve on the Council, if not as principal at least as an alternate.

Precedent for providing authority to designate an alternate already exists in the legislation establishing the National Aeronautics and Space Council, on which alternates may serve by and with the advice and consent of the Senate unless already in an office in which the designee has been confirmed by the Senate. A provision limiting delegation to an official confirmed by the Senate would seem adequate to protect the authoritative status envisioned for the Council and yet would permit Council membership to be held by indviduals who could participate knowledgeably in Council deliberations.

A closely related area of consideration is that of Council staffing, of which no mention is made in the bill before you for consideration. The absence of any provision in the bill for a Council staff would not preclude the Council from establishing an appropriate staff by its own action. The Air Coordinating Committee, for example, operates with a staff financed from funds contributed by member agencies out of their individual agency appropriations.

Nonetheless, the absence in the bill before you of any provision authorizing and requiring a proposed staff constitutes, in my opinion, a major deficiency in the bill as it now stands. No Council composed of officials whose primary responsibilities, and doubtless personal interests, lie in other fields can give more than occasional attention to matters within the purview of the Council. This very real limitation on membership participation in Council activities might perhaps be acceptable if Council responsibilities were restricted to occasional consideration of matters of basic policy, but the program role envisioned for the National Oceanographic Council is inherently far more comprehensive and requires continuing attention at Council level.

Programing is probably the most important function to be performed by the Council, particularly in view of the extent to which oceanography is fragmented both among and within agencies. There is ample evidence supporting the urgency of planning a comprehensive and thoroughly integrated program for the numerous agencies participating in oceanographic endeavors.

The scientists who have testified before your committee have been unanimous in their view that oceanography must be regarded as a long-range program which must be guided by a long-range plan. In the absence of a Council staff, the development and monitoring of the necessary long-range plan passes by default to the hands of part-time volunteers who cannot be relied upon to formulate without bias a fully balanced program and who in any event are not accountable either to the Council or to the Congress. Program monitoring likewise is a continuing responsibility and in this field is exceptionally difficult because of the more than 18 individual agencies participating in the program. I can only conclude, therefore, that the bill before you urgently requires amending in this respect if its objectives are to be reasonably assured.

It may be pertinent here to observe that the original legislation establishing the National Aeronautics and Space Council appropriately provided for a staff to that Council. Although this provision

has not yet been implemented, recent hearings conducted by the House Committee on Science and Astronautics have disclosed that the Kennedy administration is in the process of activating the authorized staff, in order to give the Space Council an effective lease on life.

The experience of the Space Council to date confirms the view that any high level coordinating committee which attempts to operate without an appropriate staff is for all practical purposes impotent. The staff need not be a large one and in my opinion should not exceed more than 18 to 20 personnel in all categories combined, professional and clerical. It should, however, be capable of providing responsible leadership and synthesizing the interests and activities of professional oceanographic personnel throughout the Federal Government and in our universities, industry, and other nongovernmental organizations.

The Kennedy administration's decision to create a staff for the Space Council somewhat along these lines in the space field is the most promising step in its efforts to revitalize the lagging Space Council and highlights the soundness of making similar provision for a staff to the proposed National Oceanographic Council.

The third recommendation being presented for your consideration is prompted by much the same reasoning that underlies this recommendation for an appropriate staff. The establishment of an appropriate staff would facilitate program development and program monitoring, which are the essential continuing responsibilities of the Council, but these in themselves do not provide adequate assurance that a fully balanced national program will be prosecuted.

The only program that can be prosecuted is the one that evolves out of the vagaries of the budget process in more than 18 separate agencies. These agencies operate at different levels within the Government and are affected by varied budget considerations. Their oceanographic interests and oceanographic funding are submerged in their respective primary program areas and inevitably are subject to policies devised for the primary programs involved, with little attention to possible oceanographic import.

The existence of a National Oceanographic Council would assist in eliminating duplication of effort and would contribute to more effective program orientation, but much more than this is needed if there is to be in fact the "national program in oceanography" which your committee seeks to have established and which the national interest requires.

Although oceanography is integrally related to many agency programs and is substantially advanced through numerous agency projects established in furtherance of these primary programs, the aggregate of separate agency projects dealing with phases of oceanography does not become a balanced national program of oceanography other than by fiat. The projects may be fully coordinated and may in the aggregate contribute to a balanced national program, but a balanced national program comes into being only when all of the projects needed to advance oceanography uniformly are prosecuted systematically in their proper sequence.

There must, then, be some mechanism for establishing and financing the necessary complementary projects to give substance to the

required overall national program. The proposed National Oceanographic Council cannot accomplish program implementation by directive without violating the autonomy of its member agencies and should not be forced to rely on mere persuasion to provide the necessary impetus for agency action when that action may not from an agency standpoint be entirely productive.

These facts lead to the conclusion that the most effective mechanism for this purpose can be created only by authorizing and appropriating to the National Oceanographic Council sufficient funds to supplement the partial oceanographic program that comes about from the efforts of the various participating agencies in the normal course of events. The amount that would be needed for this purpose can best be determined by oceanographic and budget specialists working together, but on the basis of the program information I have seen, I would venture the opinion that $5 to $10 million might suffice. Since the National Oceanographic Council should not be allowed to become an operating agency, whatever amount is determined to be proper should be made available for transfer by the Council, with the approval of the Bureau of the Budget and possibly your committee and its Senate counterpart, to any appropriation of any department or agency of the Government having the facilities to contribute to oceanographic accomplishment.

Provision of an appropriation restricted in availability to transfer to other agency accounts is not without precedent in the Federal Government. The military assistance appropriations have traditionally been made on this basis, and the emergency fund in the Department of Defense has been employed for a number of years to achieve much the same objectives in the defense research, development, test, and evaluation programs. This defense emergency fund exists for the sole purpose of enabling the Secretary of Defense to supplement the appropriations of the several military departments in order to defray the cost of preliminary exploitation of new developments and other contingencies. A similar arrangement would readily enable the proposed National Oceanographic Council to fuse the numerous scattered agency projects now comprising our national program on oceanography into a fully balanced national program in the most meaningful sense of the term.

In summary it may be said that no organizational structure, regardless of architectural perfection, can possibly substitute for the leadership, judgment, and understanding of the individuals who give it vitality. Nor can competent men, no matter how well trained they may be, function effectively in organizational chaos. The principal virtue of the proposed Oceanographic Act of 1961 in my opinion is the orderly structure it provides for resolving the multiagency confusion that now besets our oceanographic endeavors. The National Oceanographic Council contemplated in this act could not do otherwise than improve our oceanographic program, and would, if strengthened as herein recommended with respect to membership, staffing, and financing, contribute immeasurably to the hoped-for mastery of the aquatic forces of our planet.

Mr. MILLER. Professor Lewis, I want to thank you for a very fine, constructive statement, one that I am sure this committee is going

to give great consideration to. Out of your long experience in Government, you have been able to make some very constructive suggestions, and I am sure that the committee will give them consideration.

I serve on the Science and Astronautics Committee, along with serving on this committee, and I am familiar with the provisions of the National Space Council and some of the things that have been done to give it vitality.

As you know, it became ossified at some places up and down the line, and was not allowed to really function. But its necessity is evident, and it is being brought back and given life and will give direction to some of the activities in that field.

One of the things, as we have gone into this, that struck me, is: Just how long is a program of oceanography going to be with us? We start out with a 10-year plan. I know in the field of biology this is a day in the life of the history of the world. In other words, this is something that will have to go on and on for a long time, and I am not too certain that we can foresee the time when it will not be necessary to have an oceanographic program.

Right now we all recognize the Defense Department's great interest in this field, and the necessity for getting certain data just as rapidly as we can in the interest of national defense. But the field is so broad and the problem is so complicated that perhaps we should take a new look at the whole program and accept the fact, just as we have in the case of space, the Space Agency, that we need a permanent establishment of some kind to carry out the unlocking of the secrets of the ocean and the earth sciences generally.

I have nothing further, other than to thank you for this fine paper and to tell you that it will receive serious consideration.

I have no questions at this time.

Mr. Dingell?

Mr. Dingell. Thank you, Mr. Chairman.

Professor, I am very much impressed with the thought and care that you have put into this very fine statement you have presented to the committee this morning.

I am concerned with a number of the things that you have said, and I would like to ask you to elaborate on them if you can.

The first is on page 1 of your statement, where you say:

> The various witnesses who have preceded me in these hearings have abundantly demonstrated the problems inherent in the existing fragmented approach to the task of mastering the ocean environment. Although a number of witnesses have referred to the "national program in oceanography," there exists today no agency of Government which can appear before the Congress to testify comprehensively and knowledgeably on the progress of the "program" in all of its many ramifications.

Now I agree with you on that, but one of the problems we have in this committee is that the Bureau of the Budget and the other agencies say that they have an unofficial agency existing under Executive order which is competent to do everything that this bill provides. And I was wondering if you could give me your views on that.

Professor Lewis. It is partly a matter of competence. I would question, however, whether the unofficial or executively established organization to perform this function is adequately equipped to carry out that responsibility, because it lacks the staff to give it continuing

attention, which is one of the points I made with respect to a change in the proposed legislation.

Mr. DINGELL. I intended to discuss that with you, too, because it is my experience that when you set up a committee here on the Hill, or a group to do something on any level, if you do not have staff people to carry it out, it falls flat on its face. Is that correct?

Professor LEWIS. That is very correct, sir.

Mr. DINGELL. Because committee members by and large do not have the time or the inclination or the ability or the dedication that is usually required to carry out a staff level approach, in view of the many other things that they have to do. Am I correct on that?

Professor LEWIS. You are, sir.

I would hesitate to criticize the administratively established committee, but I would suggest that perhaps the best approach to evaluating how effective it may be is to raise the question of how many meetings they have, and the subjects discussed at those meetings.

Mr. DINGELL. I would like to have the staff get that.

Do you think it would be possible for us to get the schedule of meetings, the subjects discussed, and the number of staff members and the duties that the staff members have assigned, as well as other duties that the staff members might have? Do you think we could get that?

Mr. MILLER. I think we could make a very comprehensive request and include all those.

(The following was furnished for insertion.)

DATES OF MEETINGS OF THE ICO, AND ITS WORKING PANELS

January 5: Ships Panel.
January 10: ICO.
January 16: National Oceanographic Data Center Advisory Board.
January 18: Survey Panel.[1]
January 26: ICO.
January 27: CCO.
February 6: Ships Panel.
February 7: ICO.
February 12: National Oceanographic Data Center Advisory Board.
February 20: Research Panel.
February 21: Research Panel.
March 10: National Oceanographic Data Center Advisory Board.
March 13: Instrumentation and Facilities Panel.
March 14: CCO.
March 23: Working Group.
April 10: Instrumentation and Facilities Panel.
April 11: CCO.
April 14: ICO Staff—BuBud—Beach Erosion Board.
April 18: Training Panel.
April 26: Research Panel.
April 27: ICO—NASCO.
May 2: Training Panel.
May 4: Smithsonian Institution—BuBud—ICO Staff.
May 5: Survey Panel.
May 8: ICO.
May 10: Hydro, PHS, BCF, BEB, ICO Staff, Meeting.
May 11: ICO.
May 12: National Oceanographic Data Center Advisory Board.
June 2: Instrumentation and Facilities Panel.
June 14: CCO.
June 14: Instrumentation and Facilities Panel.

[1] Survey Panel met weekly during October, November, December of 1960.

Professor LEWIS. The problems of taking the fragmented agency programs and welding them into one comprehensive balanced program are very difficult; and the programs that are carried out necessarily evolve from the budget process. There simply is no time provided in the budget process for a committee such as the one now existing on an administrative basis to provide effective guidance in that budget process for the different facets of the programs that are presented separately to different organizations within their own departments, separately to different organizations within the Bureau of the Budget, and separately to different subcommittees within the Appropriations Committee of the Congress.

Mr. DINGELL. Furthermore, you would lose continuity between meetings. Unless you have an adequate staff, you loss continuity.

Professor LEWIS. That is correct, sir.

Mr. DINGELL. You mentioned on page 5 the weaknesses of this interdepartmental committee. The thrust of your comment, at the end of your first paragraph and at the end of your second paragraph, is that not infrequently these interdepartmental committees get to be nothing more or less than debating societies, with interminable discussions that boil down into one of these "Who's going to bell the cat?" sort of operations.

Do you think that is sufficient justification for this committee to put additional safeguards in the bill against this, and, if so, what can we do by way of guaranteeing that this will not develop into a high class debating society?

Professor LEWIS. I think that these additional safeguards are essential if the Council you have in mind in this legislation is to function in the manner that you expect it to. And the safeguards that I would suggest are, first of all, to consider dropping the membership level one echelon, because at the assistant secretarial level there is more possibility of finding an individual who is knowledgeable of the subject matter.

I think the more knowledgeable an individual can be on the Council, the more effective the Council operations can be.

Mr. DINGELL. Of course, you are going to have an awful lot of irritated bureaucrats, if you do that.

Professor LEWIS. Would you have that, sir, if the department head were permitted to make his own choice. his own designation?

Mr. DINGELL. Of course, you have the problem, too, that the lower you get in the echelon, the more difficulty there is in achieving decision, because it has to be cleared up and down.

Professor LEWIS. Yes, sir. And that is why I suggest that if you do consider dropping the membership by departmental selection one echelon, you provide that the members of the Council be in a position in which they have been confirmed by the Senate; or, lacking that, that the names be submitted to the Senate for confirmation.

I think that restriction would provide adequately for an authoritative level for the Council.

Even if you do that, I think it is most important that the Council have a staff, and I think also that it is important that the Council have some resources of is own which it can use to round out the program that evolves in the agency.

Mr. DINGELL. You mean that it be authorized to receive appropriations at least for purposes of carrying out its housekeeping functions?

Professor LEWIS. Yes, sir; but I think even beyond that it should have $5 to $10 million out of which it could establish——

Mr. DINGELL. Discretionary funds?

Professor LEWIS. Yes, sir; out of which it could establish projects to be carried out by the other departments and agencies. That, then, would provide for closing the gap in the oceanographic program that evolves through this unwieldy process of the budget cycle.

Mr. DINGELL. As an alternative, would it not be better to give this Council authority to superintend generally the programing of these various agencies, and in addition to that give it authority to request transfer of, let us say, not over 5 percent of the total budget available to all of these agencies to different programs, and thereby still maintain control of your budgetary process? And you would achieve some additional flexibility in achieving a united national purpose objective under the program?

Professor LEWIS. That provision would have a lot of merit. The difficulties inherent in it stem from the fact that there are so many agencies involved, each of which has its own statutorally assigned responsibilities. And, secondly, much of the oceanographic effort that is accomplished is done as an incidental part of some other undertaking of the department involved.

We want, I would think, to take advantage of all of these contributions to oceanography, but we must recognize that these contributions do not in themselves become a national oceanographic program. There needs to be some provision for supplementing these various projects which are generated from other considerations. And it is for that reason that I am suggesting that the Council have a limited appropriation available for transfer.

Mr. DINGELL. What about, rather than having a discretionary fund, letting them enter into the budgetary programing? Make them actually a budgetary programing unit, and let them come up to the office for funds not only to maintain staff, but funds to actually conduct briefly, or as necessary, certain limited projects to round out and help these other programs into a unified structure to carry out the national objective?

Professor LEWIS. That essentially is what I am suggesting for your consideration, with this one reservation: that so long as the agencies participating in oceanography are parts of executive departments and independent agencies, I believe the facts of life are that the amounts of money they are going to obtain are going to be determined by the individual actions of the Cabinet officers or agency heads, and it would generate considerable conflict if there was an overlapping responsibility.

It is for that reason that I think the most effective way of accomplishing the objective is to provide a small sum which is not in competition with the decisions of the Cabinet officers and agency heads with respect to their own primary programs.

Mr. DINGELL. You raise on page 12 of your statement the following point:

> The principal virtue of the proposed Oceanographic Act of 1961 in my opinion is the orderly structure it provides for resolving the multiagency confusion which now besets our oceanographic endeavors.

Now, question: That is a pretty strong statement. I happen to agree with you on it. But is it your opinion that we are in a welter of confusion in this oceanographic program of ours?

Professor LEWIS. The reading I have done on the subject has led me to that conclusion, Mr. Dingell.

Mr. DINGELL. All right. Now, let us go a step further. Is it your conclusion that the ad hoc agency set up by Executive order is going to clear up this problem?

Professor LEWIS. I would say that the ad hoc agency set up administratively has been functioning for some time, and there has been little apparent improvement in the program organization during that interval of time.

Mr. DINGELL. Now, one last question. I would like to have you give the committee, this morning, your background, not only in the field of education but also in the field of governmental activity.

Mr. MILLER. I think I read some of that into the record at the beginning.

Mr. DINGELL. Then I would be happy to let it stand at that.

Thank you very much.

Mr. MILLER. Mr. Lennon?

Mr. LENNON. Mr. Chairman, since I have been a member of this committee, since early last year, I have waited patiently for just the statement that Professor Lewis has brought out today. We have wallowed in a morass of testimony from the various agencies of the Federal Government as to what it was doing and intended to do in this field of oceanography, and all the while I sat and listened I have been wondering when someone at the management level would come here and suggest how we could put this program together.

The gentleman to my left was very charitable in his remarks, in which he stated he agreed with you, in substance, with respect to your statement as found on page 12.

I think the guts of your statement are found on page 6, beginning at line 6 and ending at line 14. I do not see how anyone who attended a majority of these hearings could fail to agree with you.

The Chairman of the Interagency Committee on Oceanography, the Assistant Secretary of the Navy, testified day before yesterday, and he indicated that even this legislation was not necessary, in his judgment. The representative of the Bureau of the Budget on the same day testified that in his opinion the legislation was not necessary; that we were making all the progress that seemed to be necessary in this important field.

I think we have got to decide once and for all: Is this an important program, sufficiently so to establish a separate and independent agency for the administration of it?

I am led to believe that it is. Perhaps others may not be.

You say this is the minimum. You have made three suggestions. You say this is the moderate course, the minimum that we can do. And you say even the provisions of this bill, in your judgment, will not meet what you see for the future in this program, unless it is amended along the lines that you have suggested in your statement. And I agree with that.

I am inclined to go the full way, myself, but I can perhaps see, as you have pointed out so clearly, the disadvantages certainly for the

next reasonable period of time in going that far, in establishing a separate and independent agency such as we have in the National Aeronautics and Space Administration.

I want to commend the gentleman, Mr. Chairman. I think he has brought us a very important policy statement, here, as to how we should proceed, and I just regret that all the members of the committee are not here to hear what he has said.

I for one hope very much that the counsel of this subcommittee and our technical adviser, here, will confer at length with Professor Lewis, in the hope that this bill, as a minimum, can be amended to meet the criteria that you have established here. If we do not, I think we have just wasted time, last year and again this year.

I do not think that anything could be clearer to all of us than that if we do not at least go as far as you have recommended in the passage of this bill, we have just simply wasted the taxpayers' money in our efforts to arrive at a conclusion as to what should be done in this important field.

I was very greatly impressed by the gentleman's statement.

Mr. MILLER. I am very happy to hear you say this, Mr. Lennon. I want to subscribe to what you have said.

It is my intention to direct the staff to submit Professor Lewis' statement to the members of the committee, and I personally am going to ask them to read it. I think I have indicated my interest. We do not have enough copies this morning to go around. I gave my copy to Mr. Ellsworth and asked him to read it even before I called on him, because I wanted him to get this background.

Mr. LENNON. I wish you would go further. I wish you would submit to the agencies involved, who are enumerated in the bill as possible members of this Council, the professor's statement, and tell them that in the judgment of the committee this ought to be required reading on their part.

Mr. MILLER. Well, I may say that as I look out over the audience I see representatives of nearly all of these agencies, and I think that the interest that they are showing in the present proceedings of the committee indicates their great interest in it, and I am hopeful and know that they will all take it back with them.

I shall make it a point to see that this is brought to the attention of the present committee, whose duty it would be to circulate it among the agencies.

Mr. LENNON. I note, Mr. Chairman, that Professor Lewis referred to HEW, which of course is the suggested person to be a designee. Is that in your bill?

Mr. MILLER. No, it is not in my bill, but it is one of the suggestions I made to Dr. Wakelin the other day, and frankly, it is one of the things when we get down to rewriting the bill that I hope to recommend or that I shall recommend be placed in the bill.

Mr. LENNON. Would the professor tell me, please, to what extent HEW now, on the basis of the increased budget to this particular field, is actually doing work in the field of oceanography?

Professor LEWIS. They are functioning now to the extent of between $600,000 and $700,000 in the current year; and for 1962 the budget amount is somewhat over $1 million.

Mr. LENNON. Now, is that in the field of health as related to oceanography?

Professor LEWIS. It is in the field of oceanographic projects that are related to health considerations, both from the standpoint of developing drugs that will be useful in the treatment of disease and in developing possible sources of food.

But the significant thing, Mr. Lennon, is that these projects, even though directed toward those specific ends, do contribute to the knowledge of the ocean and therefore are a significant part of oceanographic effort.

It is significant also that these projects are in the basic research area, if I may use that term, and therefore contribute much more knowledge as to the ocean environment than many of the Navy's projects of much larger magnitude dollarwise, but involving more expenditures on hardware and therefore less directly related to the basic science of the ocean.

Mr. MILLER. Will the gentleman yield?

I think, Professor, that in the over-all field of oceanography, in its long-term haul, the biological phases will offset the physical phases of it.

Here is a source of food, a source of chemicals, all of which must be exploited in the future to meet the population growth of the world, and not only of the United States. There is the matter of pollution control, that we have just barely touched on. And all of these things have a direct bearing, particularly the biological phases of it, in HEW, and a good many of them in the Public Health Service. That is the reason they must be brought into the picture.

As I reiterated before, our present effort has been along the line of the national defense features, the physical oceanography. We have to know the oceans, their tides, their depths, their currents, and their geodesy. But in the long haul, in the biological phases of the ocean, its fisheries and its other sources of food, food that other nations have learned to exploit.

One of the ingredients that keeps the icings on cakes from running, is primarily a product of agar found in seaweed. It is harvested in this country off the coast of California. It also finds its way in medical preparations.

All of these things we seldom associate with the sea, but they do come from the sea. And the Japanese are far ahead of us in this field. There are products that come from the sea that can be used to supplement our food that are very valuable, that in this country we have never touched.

Is that not right? You know of this from your own experience.

Professor Lewis. I would certainly subscribe to that, on the basis of what I have read. However, I do not purport to be a scientist, and my views on that are somewhat less than authoritative.

Mr. MILLER. Well, mine are, too, but I have listened to it not only here, but in another capacity for a long time, and have come to firmly believe it.

So I think, Senator, this is one of the reasons why HEW should be included in this bill.

Mr. LENNON. Mr. Chairman, I think it is significant that the Department of the Interior is listed in here, and certainly ought to be,

because they are engaged now, as we all know, in the actual physical construction of some five pilot salt water conversion plants. And the scuttlebutt has it that they are even thinking in terms of establishing laboratories in connection with these salt water conversion pilot plants, to consider other aspects of the minerals in the sea and how they can be used in medicines and other food products.

This thing is just terrific, when you think of the impact and import of it. And unless we have a strong central agency that the Congress can look to for guidance and advice, and that we can call and ask to appear and say, "What progress are you making in this field, that field, or the other field," without having to bring in all the seven or eight agencies at one time and examine them with respect to what progress they are making——

Mr. DINGELL. I was going to make the observation that we are at this moment utilizing saline water right now for municipal purposes and one of our medium sized cities on the West Coast is now supplied largely if not principally by desalted ocean water.

Mr. MILLER. There is one in the mid-continent, too.

Mr. ELLSWORTH. I heard on the radio as I was coming down to the office that the Secretary of the Interior and the Vice President are today in some town down in Texas, where they have been providing them with water from the sea unbeknownst to the citizenry, and now it has been revealed, and they are having a big celebration today.

If the gentleman will yield further, while we are talking about additional people to be added in here, I am reminded of some of the testimony we heard yesterday and also of a constituent of mine who was in my office last week, who is affiliated with a company that is working on providing drinkable water from the sea by other methods than those being used by the Government, and I am asking that we not overlook the possibility of including some sort of representative of industry on this Council, along the lines of some testimony we heard yesterday.

Mr. MILLER. Mr. Ellsworth, I purposely wanted to give you an opportunity to read the statement.

Mr. ELLSWORTH. Thank you.

I am sorry I was not here to hear your whole statement. The chairman has provided me with his copy of it, and I just have had time to scan it. I regret I was not able to hear your explanation of it.

The day before yesterday, when the chairman of the ICO was here, I asked him about subsection 5 of section 7 of the Miller bill, where provision is made for an annual request from this Council set up by the Miller bill for such legislation as may be necessary to authorize the construction of new facilities and vessels to carry out the purposes of the act. And I asked him if he did not think that that was just purely an informational provision and would not really have any positive or separate effect on the budgeting of these oceanographic programs.

Now, do I understand, from my brief scanning of your statement, here, that you feel that perhaps is the weakness of the Miller bill; as more positive, and, you might say, power-oriented provisions are made for direct budget requests on behalf of the oceanographic program? Would that be a fair statement of a portion of your statement?

Professor LEWIS. It is, Mr. Ellsworth.

I think in order to give the proposed National Oceanographic Council the requisite means of exerting effective leadership, it should have financial resources at its disposal to transfer to these other agencies, and through that means provide for the projects that are required to prosecute a fully balanced national program on oceanography.

Mr. ELLSWORTH. Thank you. I wish I had more understanding of your statement to question you more at length, but I did want to bring that one point out and clarify myself on it.

Thank you, Mr. Chairman, for the opportunity to ask questions and for providing me with the statement, too.

Mr. BAUER. There is just one question I want to raise, Professor Lewis, and that is: In your statement you imply the importance of congressional oversight. We have had testimony before us indicating to me, at any rate, that the present setup does not desire congressional oversight. I feel it is important.

Would you talk to that, please?

Professor LEWIS. I can speak to the importance of congressional oversight.

I am very mindful of the 19 years I spent in the Navy and the impact that congressional oversight had on the caliber and effectivity of our naval programs. And I would think that congressional oversight is equally important in this field, particularly in view of the fractionated nature of the program as it is now organized.

Mr. BAUER. In other words, the Congress should be in a position of continually scanning the importance and effectiveness of the programs. Is that correct?

Professor LEWIS. It should, sir, and I would say the absence of such scanning in the past might be accountable for the lack of progress to date in this important field of our national welfare.

Mr. DREWRY. Professor Lewis, somewhat along those lines, did you hear the testimony on Monday?

Professor LEWIS. I had the opportunity to read the testimony that was given Monday.

Mr. DREWRY. The emphasis on the part of Dr. Wakelin and the Bureau of the Budget witness was on the constant reference to the need for flexibility. One of the things that I believe I recall was mentioned was the desirability perhaps of adding new members to the council and not having to wait for legislation.

But as I undertstand your testimony, it is your feeling that that is a fairly simple matter to take care of right now, to include within the membership of the Council, in the legislation itself, every agency that has any oceanographic activities at all. Is that not correct?

Professor LEWIS. It is, sir. And I would suggest that the relative ease with which the membership in the National Aeronautics and Space Council was amended this spring fully confirmed the fact that full flexibility can be provided promptly through congressional action.

Mr. DREWRY. Then further, your proposal to have vested with the Council funds which could be allocated as appropriate and on a discretionary basis—that would provide still further flexibility, would lead still further toward the flexible situation which Dr. Wakelin was concerned about. Is that not true?

Professor LEWIS. It would. It would provide a very much needed flexibility, that does not exist at the present time.

Mr. DREWRY. Not only flexibility, but actually give an element of greater virility to the Council.

Professor LEWIS. And it is in that latter respect that I consider the provision most needed.

Mr. DREWRY. Now, is it your thought that the Council membership should be made up at the Assistant Secretary level rather than the Secretary level, or would it be sufficient to have more delegation powers provide for alternates or provide greater delegation powers in the membership of the Council?

Professor LEWIS. I am inclined to think that the Council would be more effective if it were, in many departments at least, manned by the most scientifically knowledgeable member of the secretariat of the Department.

For example, in the Department of Defense, it would be difficult to find somebody who is more competent than Dr. Wakelin to serve as a Council member.

Mr. DREWRY. I might say that our thinking, in drafting the bill, to specify the Secretaries as the members, was that we wanted to place the responsibility at the very top, where the ultimate responsibility lies in the Department.

And yet I do think your point is extremely well taken, the working membership should consist of the most knowledgeable people.

Now, would not both purposes be accomplished if there were provisions to delegate as alternates to the Assistant Secretary level?

Professor LEWIS. Yes; and I believe in submitted the suggestion I equated the recommendation that the delegation be either on a principal or on an alternate basis. I think that either one would effectively accomplish the objective.

Mr. DREWY. The Space Council—is the membership of that made up of Secretaries?

Professor LEWIS. Secretaries or alternates, under the authority that exists in the enabling legislation.

Mr. MILLER. They can designate?

Professor LEWIS. They may designate, yes, sir.

Mr. DREWRY. Then you mentioned that the alternates may serve by and with the advice and consent of the Senate, unless already in an office in which the designee has been confirmed by the Senate. Do you think that that provision should be made in this situation, too?

Professor LEWIS. It exists in the Space Council legislation, I assume to protect the authoritative status of the Council. And I would think, in view of the authoritative status that this legislation seeks for the National Oceanographic Council, that a similar provision would be useful.

Mr. LENNON. Would the counsel yield to me at that point?

Such a provision or requirement would necessitate the appointment of the principal or the alternate of at least the Assistant Secretary level, someone who had been confirmed by the Senate?

Professor LEWIS. It would; yes, sir.

Mr. LENNON. Which would lead to the selection of an alternate from the Secretary's level of a scientific individual, at the Secretary level or at the Assistant Secretary level. That is your objective, is it not?

Professor LEWIS. It is; yes, sir.

Mr. MILLER. And it stops them from getting it too far down the ladder.

Mr. Morris?

Mr. Vanik?

Thank you very much, Professor. And I appreciate your fine statement. It has given us a lot to think about.

Professor LEWIS. It was a privilege, sir.

Mr. MILLER. Dr. Frank Olson, Radio Corp. of America.

Doctor, would you state for the record your name and affiliation and some of your background?

STATEMENT OF DR. F. C. W. OLSON, RADIO CORP. OF AMERICA, PRINCETON LABORATORIES

Dr. OLSON. My name is F. C. W. Olson. I am employed by the Radio Corp. of America in the advanced military systems group.

My background is, briefly: I got a bachelor's degree in mathematics from the University of Chicago in 1933; worked 8 years as a physicist for the American Can Co.; 1 year with Stewart-Warner Corp.; 3 years in the Committee on Medical Research of the Office of Scientific Research and Development during the war on an air sterilization project; 1 year as assistant professor of physics at the University of Illinois; 3 years as research associate at the Stone Institute of Hydrobiology on Lake Erie; 7 years as professor of oceanography at Florida State University; 3 years at the Mine Defense Laboratory in Panama City, as head of the Oceanographic Branch; and about a year and a half now with RCA.

Mr. MILLER. We welcome you and your rich background, Doctor.

Dr. OLSON. May I make one statement to clarify my position here? I have been asked to read a statement which was prepared for me, and it is this:

I have been asked to appear before you today to give the members of this committee the benefit of many years of experience which I have had in the field of oceanography. In appearing before you, I am doing so in my individual capacity, rather than testifying on behalf of my employer.

My testimony expresses my own personal views, and has not been checked with and does not necessarily represent the views of my employer.

Mr. MILLER. We appreciate that.

Doctor, do you wish to make a statement with respect to oceanography? Are you familiar with the bill that we have before us?

Dr. OLSON. I have been following quite a few of these bills, and quite a few of the developments, and up until now I have been quite disappointed. I read the Miller bill last Friday, and I am happy to state that I expressed my opinions publicly before coming here, and I thought the bill showed signs of great wisdom and understanding. I am very pleased with it. I think that it is one of the few bills that seems to be completely devoid of any hysteria or any shotgun effort, trying to catch up with the Russians. I think that this more than anything else will satisfy the needs of our country.

I think that is all I can say about my general opinion of the bill right now.

Mr. MILLER. I may say that although the bill bears my name, it represents the thinking of a lot of people. I am very happy to hear you say this. We realize that the bill is not perfect. I think that you have heard Professor Lewis' statement, here. I think that he has made a lot of very constructive recommendations, as did Dr. Wakelin the other day.

Of course, some of us were a little disappointed that the bill did not get a favorable report. On the other hand, the report on the bill is not one that is entirely unfavorable. It has a neutral approach.

Do you feel that there is a necessity for positive legislation in this field to coordinate its activities?

Dr. OLSON. I feel strongly that there is such a necessity.

Mr. MILLER. You heard me speak a minute ago of the biological phase of oceanography. Would you care to address yourself to that?

Dr. OLSON. Yes, I can. I would like to state also that as far as physical oceanographers are concerned, I have had perhaps more experience with the biological end than most of them. I have long been associated with the biological oceanographers, and at the Florida State University I was minor professor for I do not know how many, perhaps 15, masters and several doctors who got their degrees in biological oceanography. So I think I have been fairly conversant with some of the aspects of that field.

I was pleased, in this bill, that biological oceanography has been given the consideration which it is due. I believe biologists are very poor press agents.

Mr. MILLER. I agree.

Dr. OLSON. They have not been selling themselves properly. And I think biological oceanography is a very important field, and it has been neglected terribly.

As an oceanographer, I believe that we should look at all fields, but we cannot neglect one completely.

I would like to make one remark about certain expressions which I have read about the seas as a food source for our world. And there seems to be a bit of hysteria connected with that, too; that eventually we are going to run out of food and we will have to go to the seas for food. Now, I like to be right, and I like to be right for the right reason.

And I think there is a danger in emphasizing this aspect of the seas, because this is my personal opinion, but I think that with good engineering practices and good scientific practices there is plenty of space on this earth for raising all the food that humans could use for a long time, if we do it right. We do not have go to the seas for food.

But I think the fact is that many of us like shrimp and like oysters, and we like fish, and it is a good food source, and it is readily available, and we should use it, and we should use it sensibly and to its fullest extent.

But I am afraid that if, shall we say, the pitch is, on biological oceanography, that it is going to save the world from starvation, that is a wrong slant, a completely wrong slant.

We should look at the oceans, as far as a food source is concerned, as a source of very good food, tasty, delectable, nutritious food, a valuable supplement and a valuable source of other foods and materials. But we can do without it if we have to.

Mr. MILLER. Well, we can. I talked with a man about 10 days ago who just got back from Africa. And he spoke of the lack of protein in the diet of many of the peoples on the shores of Africa who had never learned to fish, with oceans alongside of them with fish that could provide this protein so necessary to their health. And he was surprised that over the thousands of years they have been there they have neglected this source.

Now, this is perhaps one of the places in the world where this can be done. I think that in our present program, we might find out that the fisheries have been overlooked in many parts of the world.

Dr. OLSON. You are not speaking of Liberia, now, are you?

Mr. MILLER. That is one of the countries.

Dr. OLSON. One of my students did some work in Liberia, and he came back with the same story. It was utterly fantastic, that the seashores were just teeming with fish and nobody went out to get them.

Mr. MILLER. Doctor, this bill provides for the setting up of a center for calibration and standardization of instruments used in oceanography. Do you think that is a necessary function that should be carried out?

Dr. OLSON. I do not think it is an urgent function, but it is certainly a useful one.

Mr. MILLER. Through the efforts of the present committee—I want to pay my compliments to Dr. Wakelin for the leadership and impetus that he has given it, and I am certain if we were always assured we would have a Dr. Wakelin available we would not worry too much—we have established a data center. And I think that this is one of the things that were sadly lacking in the field of oceanography, whereby we can collect and coordinate the data that has been collected by the many agencies that have been functioning in the field.

Have you any observation you would like to make on that?

Dr. OLSON. Yes, I believe that seems to be the major feature of the bill. Certainly such an agency is desirable. In fact, it would be almost sad not to have such a thing.

I know what the Japanese have been doing for many years, and the Japanese data I have used for many purposes, because it is so copious. But as soon as a ship comes in with data, that data is sent to a central agency, and the raw data is published immediately. Or rather, they publish it monthly. They assemble all the raw oceanographic data. That is the unprocessed data. And there it is.

So people can find out immediately what sort of work has been done, what sort of data are available, and if they find that they can use it, of course, they are free to do so.

Now that is one thing that we suffer from very much. We really do not know who has been doing anything. For instance, Texas A. & M. has a very fine oceanographic establishment, and they go out and get data of various sorts, and we do not know exactly what they are getting. We do not know what they are running into. There is a small organization out at Oregon, and they are getting data, but we do not see it, not unless you happen to have a special interest or you come across it by accident.

Now, I think a centralized agency, as we are describing here, would help tremendously, because I would expect it would put out some sort of a summary of the types of data which have come in and which are

available. And I think that would give oceanography a very great boost.

Mr. MILLER. I am certain that one was established last January. It was a great job in getting it underway. I am hopeful that this is one very valuable cooperative effort.

Dr. OLSON. May I make one more remark?

I noticed nothing in the bill about classified information. Now, a lot of oceanographic data has been obtained on classified missions. The data itself does not deserve classification, but it just happens to be piled in with a lot of other stuff. And if the data center could make a point of retrieving as much of this oceanographic information as possible from the classified missions, it would help a lot, too.

Mr. MILLER. Thank you very much.

Mr. Ellsworth?

Mr. ELLSWORTH. Dr. Olson, I always like to find some kind of common personal ground with witnesses who come before the committee. I would like to say that I was down in Panama City when it was a mine countermeasure station. When were you down there?

Dr. OLSON. I was there shortly after it turned into the Mine Defense Laboratory. I was there in 1957 to 1960.

Mr. ELLSWORTH. That is a very beautiful beach down there.

Dr. OLSON. The world's most beautiful.

Mr. ELLSWORTH. Also, I do not want, in the discussion of marine biology, to overlook the chairman's birthday cake icing from his seaweed out in California. I would not want the record to stand without further reference to that.

Now, Dr. Olson, we have had testimony here indicating that there was a need in some formal way to structuralize, so to speak, procedures so that industry, the various branches of industry that are interested in oceanography, could make a contribution and at the same time be kept informed of progress being made in connection with the national program. I observed that you have operated in the field of oceanography, in the academic field, in the Government field, and in private industry. Would you have any thoughts on this subject?

Dr. OLSON. That is a pretty broad subject.

Mr. ELLSWORTH. Specifically, would you think that there should be any provision made in this Miller bill to formally structuralize a method whereby industry could participate in this Council?

Dr. OLSON. My feeling right now is that there is no necessity for that. The bill impressed me as a wise one, in that it seemed to leave a good deal up to the discretion of the Council and up to the discretion of individuals.

There are so many things that we cannot legislate. I think if you simply set up the machinery for accomplishing a task and then leave the people involved alone, they have their broad mission outlined, and you can then let them carry that out. I think if we try to legislate in too much detail in a field so broad, all encompassing, and yet diffuse, as this is, we could run into great difficulties.

Now, I think industry should be certainly given a chance to speak up, and it should be made aware of the needs of oceanography and its possible contributions to oceanography; but I do not see that there is any need right now for making any formalization of anything like this.

Mr. ELLSWORTH. Thank you, Dr. Olson.

Mr. MILLER. Senator?

Mr. LENNON. Doctor, you opened your remarks by stating that you had followed and you had read of the general activity of these hearings, and that up until quite recently you had been disappointed. That is the way you phrased it, I believe.

Dr. OLSON. Yes.

Mr. LENNON. Would you say what you attribute your disappointment to? Was it the legislation that was offered, or was it something we had done, or something we had not yet done?

Dr. OLSON. My disappointment, I believe, was due primarily to the lack of funds that I have tried to get. That was particularly so when I was working with the Navy. And the Navy had prior commitments. We were permitted to work, and we were given our standardized equipment, but it was very difficult to expand. I think that was simply because the funds were not there.

Mr. LENNON. You know, Doctor, that there are a number of agencies of the Federal Government which are interested in oceanography, in one facet or another. Presently they seem to be vying among themselves for funds to project their further interest in this field. That is one of the reasons that most of us feel it is necessary to bring an agency together, such as this Council, which the committee, which has the legislative responsibility, can look to and can examine from time to time to determine what is being done. There has got to be a responsibility somewhere for the members of this committee to deal with a responsible governmental agency.

You heard the testimony of Professor Lewis?

Dr. OLSON. Just partly.

Mr. LENNON. He made specific suggestions, and, like you, he said that this legislation was the minimum that the Congress should do. And then he highlighted his statement by calling our attention to certain amendatory language that could be used that would strengthen the centralized responsibility for this committee dealing with this Council.

You heard that explanation of his bill, did you not?

Dr. OLSON. That was I think just before I came in.

Mr. LENNON. Let me read you what I think I described as the guts of his statement. It is found on page 6, between lines 6 and 14.

If your committee—

meaning the Committee on Oceanography, the congressional committee—

is to carry out these functions effectively, it must have some responsible agency to which it can look for authoritative and comprehensive information on the status of the program and through which it can establish the degree of accomplishment or lack of accomplishment. Unless some centralized agency is made responsible for the program, the problems confronting your committee—

meaning the legislative committee—

in providing effective congressional guidance are likely to prove insurmountable. There must, in other words, be program accountability, for without program accountability there can be no assurance that adequate progress is being achieved.

Do you agree with that statement in principle, in your vast experience in Government and in private industry?

Dr. OLSON. As I understand it, yes, I do.

Mr. LENNON. I think you understand it, because I read it verbatim. And it is something that can be used out of context, and yet you can get the purposeful meaning of it.

I would appreciate it, if you gentlemen do not know each other, you and Professor Lewis, if you would meet after we adjourn and exchange views, because I am very much impressed with this legislation, but I do think it needs the amendatory language that Professor Lewis has suggested, if we are to hold some central agency accountable for the progress of this program.

It is so difficult, Doctor, as I think you can reasonably understand, for a legislative committee to bring in a dozen agencies to ask, "Tell us about your progress in this field."

We need a coordinating agency to bring it together. You spoke a while ago about having been in oceanography with the Navy, and that you found a lot of biological subjects in connection with oceanography were put in the classified list.

Dr. OLSON. Oh, yes.

Mr. LENNON. That is what we want to avoid. We cannot avoid it unless we have a council with authority to say to the Navy: "This shouldn't be classified. This should belong to the world, to humanity."

Dr. OLSON. Certainly, the Government has so many agencies that are doing work, some of which could be classified as oceanography. For instance, Public Health. I know they are doing some work on marine schistosomes—swimmer's itch— which apparently one can get in certain salt waters. There are various parasites which are being watched rather closely. The Army Corps of Engineers is getting all kinds of data. They do lots of dredging. They do bore holes and things like that. All of that is good data.

Mr. LENNON. But there are bound to be, in all of these agencies that are interested in one facet of oceanography or other—there is bound to be an overlapping.

Dr. OLSON. Oh, yes; you cannot help the overlapping.

Mr. LENNON. But if you had a central agency of representatives at a high level of these various agencies meeting frequently in the form of a council, there would be, obviously, less overlapping, if you had a single agency, and therefore in the necessary expenditure of public funds you might get away from overlapping.

Dr. OLSON. There might be some help in that. But overlapping is one thing it is almost impossible to avoid.

By a central data agency, you can certainly avoid duplicating experiments and things like that. Oh, yes. There you would.

The other point that I would like to emphasize, again: There must be many governmental agencies that are doing work which could be classified as oceanographic, and they do not even have any idea of that. I am thinking in terms now of some of the work done by the Army Corps of Engineers, very fine work, in harbors. But a good deal of that is kept to themselves. When I have had to go to them, I have always had the very best of cooperation. They have given me all the data they had. And much of it was very good.

But who knows what they have?

Mr. LENNON. Thank you very much, Mr. Chairman.

Mr. MILLER. Mr. Vanik?

Mr. VANIK. I would just like to ask: Is your employer engaged in a research program in which there would be great public interest? Are there portions of your research you are engaged in now that might have value to the Government or to the public, over and beyond your employer's needs or requirements?

Dr. OLSON. Your question is going to be a bit difficult to answer because of the specialized nature of the group that I am in. The Advanced Military Systems Group——

Mr. MILLER. This is highly secret work.

Mr. VANIK. The question I was leading up to is whether or not we take advantage of all of the available resources in private corporation research that we should.

Do you feel the governmental agencies involved are using, to the degree that they should, the availability of private research? I am not talking about research under Government contract: I am talking about your own research.

Dr. OLSON. I have not noticed anything wrong in that line.

Mr. VANIK. Is there an effort, or an adequate effort, to marshal the information? Let me put it that way.

Dr. OLSON. I am afraid I really cannot answer that.

Mr. VANIK. Earlier witnesses have testified that in their research activity there were quantities of research that would have great public value which were never called for, never requested, by the governmental agencies involved. My question is whether or not, in your opinion, there is a sufficient marshaling of this information or gathering of this information by the governmental agencies involved, as they are now constituted.

Dr. OLSON. I think this is largely a personal matter. Now, I happen to be acquainted with quite a few people in the governmental agencies, and we talk. And if there is anything that they need, well, of course, we will give it to them. I cannot recall any specific example, but that has been done.

Mr. VANIK. Is this information documented in such a way that it can be preserved?

Dr. OLSON. I do not think any of this information that industry might have, let us say that might be of oceanographic value—that information, I would guess, would deal mostly with various types of instrumentation that might be of some value in oceanography. That is about all that I can think of—or with various types of computers.

I am afraid that I will just have to beg off, because either I do not understand your question fully or I have just had too little experience in this particular matter.

Mr. MILLER. Thank you very much, Dr. Olson. We appreciate your coming here.

There is a statement by J. Monroe Sullivan, of the Pacific American Steamship Co., that will be filed for the record at this point.

(The statement of J. Monroe Sullivan follows:)

STATEMENT OF J. MONROE SULLIVAN, VICE PRESIDENT, PACIFIC AMERICAN STEAMSHIP ASSOCIATION, JUNE 21, 1961

Mr. Chairman, my name is J. Monroe Sullivan. I am vice president of the Pacific American Steamship Association, which is a trade association representing a large majority of the dry cargo vessels in the domestic and foreign trades serving our commerce from the Pacific coast.

We appear here today in support of this legislation. It is appropriate that the interest of the operators of merchant ships in the field of oceanograpy should be recorded in these hearings. Our organization, at the request of member companies, organized a weather reporting service for the Pacific Ocean in 1956 which was an attempt to provide shipowners with the same data pertinent to routing of vessels as is enjoyed by airlines. This service is still being performed by a private firm and has proven a major aid in saving vessel damage, weather deck damage to cargo, and quicker dispatch of vessels in heavy weather.

Although the results of this weather routing service have been excellent, we have found that there are certain voids in the availability of oceanographic data in the routing of merchant ships, particularly in the lack of knowledge of wave action and its effect upon vessel operations. We would hope that the studies which are envisioned by this legislation will develop greater knowledge on this subject as part of the overall program of this committee.

Admittedly, the program for oceanographic research presently is much broader than that which would directly benefit the operator of merchant ships. However, from our cursory analysis, a great many benefits would ensue and our purpose in appearing at these proceedings is to indicate our support of this program and to offer whatever assistance merchant ships can provide in conducting research on the sealanes of American commerce.

Thank you for permitting us the opportunity to express our views.

Mr. MILLER. Dr. Randal M. Robertson, Assistant Director for Mathematical, Physical, and Engineering Sciences, National Science Foundation.

And the doctor is accompanied by Dr. John T. Wilson, Assistant Director for Biological and Medical Sciences, Mr. Charles Ruttenberg, Deputy General Counsel, and Dr. John Lyman, associate program director for the earth science program.

I am sorry that it is so late, Dr. Robertson. I do not know whether you have a prepared statement or not.

STATEMENT OF DR. RANDAL M. ROBERTSON, ASSISTANT DIRECTOR FOR MATHEMATICAL, PHYSICAL, AND ENGINEERING SCIENCES, NATIONAL SCIENCE FOUNDATION; ACCOMPANIED BY DR. JOHN T. WILSON; ASSISTANT DIRECTOR FOR BIOLOGICAL AND MEDICAL SCIENCES; CHARLES RUTTENBERG, DEPUTY GENERAL COUNSEL; AND DR. JOHN LYMAN, ASSOCIATE PROGRAM DIRECTOR FOR THE EARTH SCIENCE PROGRAM

Dr. ROBERTSON. I have no prepared statement, sir. However, I would like to say a few words.

Mr. MILLER. If we cannot hear all of the very fine testimony I know you are prepared to give today, we will have to ask you to come back later; but we will stay here until the bell starts ringing, and then we will have to leave.

Dr. ROBERTSON. I would like to say a few words about our National Science Foundation position in support of oceanography. The Foundation is now one of the major sources of funds for the support of basic research both in physical and biological oceanography.

Our fiscal year 1962 budget will, we hope, permit us to provide about twice the $9 million which we provided in fiscal year 1961. Funds are included for research grants and for research facilities, including both ship and shore facilities, as well as for our share of the National Oceanographic Data Center.

In addition, many of our programs which are not identified as oceanography, such as our fellowships program, give support to the field.

The magnitude of our research support in oceanography is second only to that of the Navy Department. We recognize the vital interest which the Navy has in this field of science, and applaud the splendid support they have given it.

On Monday, the chairman raised the question of who would take the initiative if the Navy should lag in its interest in oceanography. I would like to answer that and state that the National Science Foundation feels a strong responsibility for the adequacy of the overall national program in this area, and would seek to obtain funds to make up for any possible future reduction in support given by the Navy or other agencies.

I am happy to be with you today and would be glad to answer any questions you may have.

Mr. MILLER. Thank you very much, Doctor.

I realize that the National Science Foundation today is doing a great deal and pulling a very heavy oar in this field; but one thing that concerns me is: What of the future?

Today there is great impetus given to the field of science, not only this field, but all other fields. But what assurance have we that if peace comes in the world within the next 10 years or the next generation, this is going to be so? We have seen tides rise and ebb in this field and in other fields.

When we need them, we come to you in a hurry. We need the Army. We need the Defense Department. We need the shipping. We open our purse and put on crash programs, and we are going through these today.

But the oceans are going to be with us. We are looking to stabilize and perhaps relieve the National Science Foundation from this responsibility that it has undertaken and prepares to accept in the future.

I think now is the time to study this and see if legislation is necessary. We found it necessary in the case of the National Aeronautics and Space Agency to consolidate in it certain functions that were being successfully taken care of in the Defense agency and other agencies of Government.

I am going to ask Mr. Bauer if he has some questions.

Mr. BAUER. Thank you, Mr. Chairman. I have a few.

Dr. Robertson, when you receive a proposal from a prospective recipient of one of your grants in the field of earth sciences, how do you evaluate the proposal? What mechanism do you go through to decide whether or not the proposal merits a grant?

Dr. ROBERTSON. Each proposal is submitted first to our staff group, our Earth Sciences Program Office. This group in turn submits it by mail to three or four outstanding authorities in the particular field of the proposal. On the basis of these recommendations, the staff formulates a judgment concerning the support of the proposal, and then, in the case of the earth sciencies, practically all proposals are submitted for the consideration of our Earth Sciences Panel, which assembles from time to time and reviews proposals and makes recommendations to our staff. After that, we decide whether or not we can provide the support requested.

Mr. BAUER. Now, with respect to the Earth Sciences Panel, who is on the Earth Sciences Panel?

Dr. ROBERTSON. Dr. Julian Goldsmith has been the Chairman. I do not have here a list of the panel, but I will provide it for the record.

(The following was furnished for insertion:)

ADVISORY PANEL FOR EARTH SCIENCES, FISCAL YEAR 1961

(Chairman: Dr. Julian R. Goldsmith)

Dr. A. Francis Birch,[1] Division of Geological Sciences, Harvard University, Cambridge, Mass.

Dr. Julian R. Goldsmith, Department of Geology, University of Chicago, Chicago, Ill.

Dr. Charles B. Hunt, U.S. Geological Survey, Federal Center, Denver, Colo.

Dr. Leon Knopoff, Institute of Geophysics, University of California, Los Angeles, Calif.

Dr. Henry W. Menard, Jr., Scripps Institution of Oceanography, La Jolla, Calif.

Dr. Francis J. Pettijohn, Department of Geology, Johns Hopkins University, Baltimore, Md.

Dr. Robert R. Shrock, Department of Geology and Geophysics, Massachusetts Institute of Technology, Cambridge, Mass.

Dr. John Verhoogen, Department of Geology, University of California, Berkeley, Calif.

Dr. William S. von Arx, Woods Hole Oceanographic Institution, Woods Hole, Mass.

Mr. BAUER. Now, the next question is: Are any members of the panel recipients of any of the grants?

Dr. ROBERTSON. Yes, sir. We have panel members who are recipients of NSF grants. They do not take part in the review of their own proposals, however.

Mr. BAUER. In other words, the people that pass upon the advisability of a grant could be the people who receive the grant. Is that correct?

Dr. ROBERTSON. In the case of any particular proposal, if such a man were on our panel, he would stand aside, perhaps leave the room, during the consideration of his proposal. Since we support most of the outstanding people in the field of earth sciences, it would be impossible to get together a representative panel of people who had no support from the National Science Foundation.

Mr. BAUER. I was purely thinking of a question of conflict of interest, that this Congress of course is very much interested in.

Mr. DINGELL. If you will yield to me very briefly: This sounds to me like a device for logrolling, in that you have a body which passes on these things, that has inherent in it, I feel, every opportunity for a "You scratch my back—I'll scratch your back" operation.

Mr. VANIK. We only limit that to Congress, you know.

Dr. ROBERTSON. If we have a member from Cal Tech on our panel, and a proposal from Cal Tech is under discussion, it is the custom that he absent himself during the discussion and take no part in the decision.

Mr. DINGELL. Of course, he is in no way limited from lobbying before, during, and after the meeting, to see to it that the interests of the institution that he happens to represent are protected, is he?

[1] Dr. Birch resigned from the panel effective Apr. 27, 1961.

Dr. ROBERTSON. Well, everyone has the opportunity to argue for his proposal, but we try to see to it that there is no logrolling or special interest.

Mr. BAUER. Doctor, what prompted the National Science Foundation to go into the boatbuilding business?

Dr. ROBERTSON. Back in 1958, in formulating the budget for fiscal year 1960, we recognized that there was a great need for additional support for oceanographic ships, and included in our budget an oceanographic ship. At that time, studies were being made by the Woods Hole Oceanographic Institution looking toward a ship to replace the *Atlantis*. And we had in mind at the time that the first grant for a ship would probably be made to Woods Hole.

Mr. BAUER. Now, was your entry into the supplying of oceanographic ships to Woods Hole, we will say, in any way competitive with the Office of Naval Research?

Dr. ROBERTSON. No, this was done in full consultation with the Office of Naval Research. In fact, I myself joined the National Science Foundation from the Office of Naval Research on July 1, 1958, and had the opportunity, therefore, to participate in a sense on both sides of the discussion. This was with full knowledge and collaboration with the Navy.

Mr. BAUER. In other words, we have two agencies, essentially, that supply ships to the nonprofit institutions, the Office of Naval Research, and the National Science Foundation?

Mr. ROBERTSON. That is correct.

Mr. BAUER. Is there any difference in the title of these ships?

Dr. ROBERTSON. The Navy builds the ships and retains title, loaning them, essentially, to the oceanographic institutions. Our policy is to make a grant to the institution to build the ship which they want, and to allow them to have title to the ship, with certain restrictions, including the fact that they must continue to use it for research purposes or return it; and in the event of emergency, the Government may recover title.

Mr. BAUER. Why do you feel that it is advisable to pass title to these institutions?

Dr. ROBERTSON. We feel that the oceanographic research ship is a scientific tool. Our general program of support for facilities and research equipment provides that the institution receiving the grant have title to the equipment. This applies to small equipment, to large facility installations, such as computing facilities and nuclear accelerators for universities and to our program for the development of graduate laboratories, in which we make grants to assist in the provision of laboratory buildings.

We regard the ships as another facility of this type, which can best be provided to the nonprofit institution.

Mr. DINGELL. Mr. Bauer, would you yield to me?

Tell us why it is more in the public interest to give these ships away than to retain title to them on a bailment arrangement with the institution concerned? Why is the public interest better served by giving away a $5 or $10 million ship?

Dr. ROBERTSON. Well, we believe that the scientist should have control of his own tools.

Mr. DINGELL. All right. Now, why does he not have control over the bailment? Apparently the Navy finds this situation satisfactory.

Dr. ROBERTSON. If we were to retain title, I feel that we would have to set up administrative controls to approve generally the cruises. We would have to approve major alterations in the ship, which might be undertaken for scientific reasons.

Mr. DINGELL. Does not the Navy have to do this?

Dr. ROBERTSON. The Navy does this, and I imagine that it is expensive and to a certain extent time consuming, although I am sure from my experience with the Navy that they do this with wisdom and dispatch.

Mr. DINGELL. Now, why do you have to approve, let us say, a cruise or a major alteration under a bailment, any more than you would have to approve a major alteration or a cruise under a grant arrangement, with these people?

Dr. ROBERTSON. I think this is matter of administrative judgment.

Mr. DINGELL. I think it is a fairly simple question to answer. Is there any reason why you have to approve a cruise of a ship under a bailment program when you do not have to do it under a gift or donation program?

Dr. ROBERTSON. Well, my own opinion is that if you own the ship, essentially, and someone else is using it under bailment——

Mr. DINGELL. As a matter of fact, you do not have to approve that at all, do you, when you own the ship? That can be a part of your general contract with the recipient of the vessel, whether it be bailment or grant. Is that right?

Dr. ROBERTSON. I am not sure of the legal aspect there.

Mr. DINGELL. It would appear to me that you should be familiar with this, and the National Science Foundation should know about this very well before they start giving away $3 or $4 million of the Government's money.

Mr. RUTTENBERG. It would seem to me you could not alter Government property without permission.

Mr. DINGELL. I do not think that is a valid point at all.

Mr. RUTTENBERG. He had mentioned that as one consideration.

Mr. DINGELL. I do not see any validity to it, and I would like to hear him address himself to that point.

Dr. ROBERTSON. I think administratively, if we have title to the ship, we should require a certain approval for major alterations. And as far as I am concerned, I think that administratively there would be considerable wisdom in knowing at all times where the ship that you owned was going.

Mr. DINGELL. Why should you not do this if you made a bailment of the ship? Why does making a grant of a ship give you any greater or less responsibility to the taxpayer to see that it is properly utilized?

Dr. ROBERTSON. There you have the point of confidence in the oceanographic institution.

Mr. DINGELL. I have fully as much confidence when I give them a million-dollar ship as when I loan them a million-dollar ship, do I not?

Dr. ROBERTSON. Yes.

Mr. DINGELL. Then why should you not superintend the one just as closely as you do the other? Is there any reason? I am very critical of your agency for giving title to these ships.

Dr. ROBERTSON. I realize that, sir.

Mr. DINGELL. And I think that you are breaching the taxpayers' trust. I think that you are justifying the Congress in looking a great deal more closely at your appropriations, and I think if you persist in this, they will.

Mr. MILLER. Remember, Doctor, we are talking about $100 million in a 10-year program. Some people are quite critical of this, and the resistance that has come up when this committee suggested that this not be done.

Now if you grant to some school money to buy some microscopes, or some very simple instruments, you do not try to follow through on this and tell them what to do, do you? On the other hand, if you make that grant, and somebody takes them out and says, "We don't need these any more," and sells them or trades them off for something else, I trust you would take a good look at it.

Dr. ROBERTSON. I would like to go back and look at this as part of our over-all program for providing research facilities.

Mr. DINGELL. Now let us not talk about this as part of an overall program for conducting research facilities. If you give away a cyclotron or something like that, that cyclotron is sunk in bedrock. Am I correct? And they are not going to pick it up and move it around the country?

Dr. ROBERTSON. That is right in many cases, although several cyclotrons have actually been moved.

Mr. DINGELL. Now a vessel is a great deal different; is it not?

Dr. ROBERTSON. Yes.

Mr. DINGELL. And indeed a vessel can be used for tuna fishing or light cargo hauling or God knows what, with certain appropriate modifications. Is that not a fact?

Dr. ROBERTSON. That is correct, but a considerable expenditure is necessary for conversion.

Mr. DINGELL. Now let us assume that a cyclotron is fixed and stationary and that they are going to use that over a long, long period of time for certain specific kinds of research. But a vessel is an altogether different type of entity; is it not? It is capable of movement. It is capable of sale. It is capable of widely divergent types of use.

Now you told us that you feel that if you make a bailment of a ship, you have got to supervise the utilization of that ship.

Dr. ROBERTSON. In a limited way.

Mr. DINGELL. Now if the public interest requires you, when you make a loan of a ship, to supervise the utilization of the ship, why does not the same thing exactly obtain in connection with a grant of a ship? I would like to have just one reason.

Dr. ROBERTSON. Of course, the reason we make the grant——

Mr. DINGELL. Is to get away from supervision and responsibility for the management of the entity. Is that correct? And to escape your responsibility to the taxpayer?

Dr. ROBERTSON. No, sir. That is not correct.

Mr. DINGELL. All right. Then you tell me why you make a grant instead of a bailment.

Dr. ROBERTSON. We believe that the scientists at these institutions can progress better in science if they have the responsibility for super-

vising the design and construction of their ships and for utilizing them.

Mr. DINGELL. Now that is not a valid statement at all, because they can have precisely the same responsibility and the same integrity of purpose and the same skill and knowledge and control of the project and the construction if they get a bailment as if they get an outright grant; can they not? Just "yes" or "no."

Dr. ROBERTSON. Under a bailment?

Mr. DINGELL. Yes. You can make bailment on fully as broad and generous terms as you can an outright grant; can you not?

Dr. ROBERTSON. I do not believe so.

Mr. DINGELL. I am a lawyer, and I think so. And I would like to get the views of your counsel, who is sitting next to you.

Mr. Counsel, is that not a fact?

Mr. RUTTENBERG. I think you have to put in a few more restrictions if it is Government property.

Mr. DINGELL. Well, now, that is a silly statement; is it not?

Mr. RUTTENBERG. No; I do not think it is.

Mr. DINGELL. I think it is, because as a matter of fact, you can make a bailment on any terms in the public interest; can you not?

Mr. RUTTENBERG. But if it is Federal property, there are restrictions on it.

Mr. DINGELL. I would like to have these witnesses back tomorrow, Mr. Chairman. I think we have some more to go over on this point.

Mr. MILLER. Would you be available tomorrow morning?

Dr. ROBERTSON. We have a hearing before the Senate Appropriations Committee, which Dr. Waterman expects us to attend.

Mr. DINGELL. I hope you will address yourself more carefully to the public interest tomorrow before the Appropriations Committee than you have this morning.

Mr. MILLER. Next week or at a time convenient, we may ask you to come back and continue this. I think it is something that is very important.

Dr. ROBERTSON. We will be glad to appear, sir.

Mr. DINGELL. I would like to have them furnish the committee counsel with the authority under which they are making these gifts of these ships.

Mr. RUTTENBERG. I can give you that now, Mr. Dingell. The National Science Foundation Act of 1950 is our basic legislation.

Mr. DINGELL. I would like to see the section, and so forth. You can furnish that to counsel.

Mr. VANIK. How many vessels are involved? How many have been granted?

Dr. ROBERTSON. Two.

(Whereupon, at 12:20 p.m., the subcommittee was recessed, to reconvene at 10 a.m., Thursday, June 22, 1961.)

OCEANOGRAPHY 1961—PHASE 3

THURSDAY, JUNE 22, 1961

House of Representatives,
Subcommittee on Oceanography of the
Committee on Merchant Marine and Fisheries,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to adjournment, Hon. Charles A. Vanik presiding.

Present: Representatives Vanik, Ellsworth, and Morse.

Present also: John M. Drewry, chief counsel; Paul S. Bauer, staff consultant, and William B. Winfield, chief clerk.

Mr. Vanik. The committee will be in order.

Today we shall hear from the Navy concerning some of the details of their oceanographic program which are germane to H.R. 4276.

The hydrographer of the Navy will present information on the National Data Center for Oceanography, which is currently operating as a result of a joint venture agreement which has already been placed in the record. I feel that the establishment of this center is a most laudable achievement on the part of Admiral Stephan. The groundwork was laid by the preceding hydrographer, our good friend, Captain Munson. Admiral Stephan on taking office took the ball, ran with it, and made a touchdown. I also expect to hear from the hydrographer about his thinking about the problem of instrumentation.

Then Admiral Coates, the Chief of Naval Research, will discuss in detail some of the areas in which the Office of Naval Research is active in the study of the aquatic environment. Certain elements of the TENOC program mentioned by Secretary Wakelin will be considered.

We then shall hear from Dr. Paul Fye, the able director of the Woods Hole Oceanographic Institution, that great contribution of New England to the science of the sea.

Finally Dr. Athelstan Spilhaus, Chairman of the National Academy of Sciences Committee on Oceanography, will discuss the proposed legislation, H.R. 4276.

I want to point out to our witnesses today that our distinguished chairman, the Honorable George Miller, of California, had a misfortune in his family and could not be here. We regret his inability to be present on the occasion that this testimony is presented.

Now the first witness is Rear Admiral Stephan.

Will you proceed, Admiral?

STATEMENT OF REAR ADM. E. C. STEPHAN, U.S. NAVY, HYDROGRAPHER OF THE NAVY AND HYDROGRAPHER IN COMMAND OF THE U.S. NAVY HYDROGRAPHIC OFFICE

Admiral STEPHAN. Thank you, Mr. Chairman.

I have a brief statement which I will read, if I may.

I am Rear Adm. E. C. Stephan, U.S. Navy, Hydrographer of the Navy.

Mr. Chairman, I appreciate this opportunity to appear before you and discuss: (1) the National Oceanographic Data Center, and (2) our participation in the oceanographic instrumentation program.

Acting on recommendations of the working group on data recording and standardization of the National Academy of Sciences and with the unanimous endorsement of the Federal Council for Science and Technology, Dr. James A. Wakelin, Jr., Assistant Secretary of the Navy for Research and Development and Chairman of the Interagency Committee on Oceanography, requested through the Chief of Naval Operations that the Hydrographer of the Navy establish the National Oceanographic Data Center (NODC) under the administration of the U.S. Navy Hydrographic Office.

The NODC was conceived in a spirit of cooperation, having been founded on the basis of discussions and numerous conferences among scientists and prominent representatives of Government. The NODC is supported by six Government agencies: The Department of the Navy (U.S. Navy Hydrographic Office and Office of Naval Research), the Weather Bureau, the Coast and Geodetic Survey, the National Science Foundation, the Bureau of Commercial Fisheries, and the Atomic Energy Commission. Its policies of operation are determined by an advisory board consisting of representatives of the contributing agencies.

The NODC was officially established on November 1, 1960. It occupied renovated quarters at building 160 of the naval weapons plant on January 16, 1961.

It began its work with a nucleus of data contributed by the Hydrographic Office, which represented over 10 years' work in oceanographic data processing. Two types of data processing are now in progress at the Data Center. These are oceanographic station data (physical and chemical data from the ocean's surface to varying depths) and bathythermograph data (temperature from the surface to varying depths up to 900 feet). Oceanographic station data are currently processed at the rate of over 5,000 stations per month. The total holdings of oceanographic station data now consist of over 150,000 stations. Bathythermograph data are also processed at the rate of over 5,000 observations per month. Present holdings of bathythermograph data now number over 670,000 observations. With new programs on modern computers, the NODC hopes to process from 7,000 to 8,000 oceanographic stations per month. The goal for bathythermograph processing is 6,000 bathythermographs per month.

The NODC has been assigned the task of processing the data from the International Indian Ocean Expedition (IIOE). In cooperation with the National Academy of Sciences, the NODC is currently designing and printing reporting forms and conversion tables to be distrib-

uted to participants in the expedition. The forms and tables will considerably facilitate the processing of the data.

Methods for processing marine biological and marine geological data are currently under investigation. These data are generally reported in qualitative terms and are difficult to reduce to terms for machine processing. The NODC expects to begin processing of these data late in fiscal year 1962 or early in fiscal year 1963.

The NODC currently employs 52 people. These consist of oceanographers, physical science technicians, tab machine operators, and typing and clerical personnel. By the end of June it is expected that the staff will number about 60. A staff of 70 will be required to handle the "data in" requirements of the NODC. We expect this number to be on board early in fiscal year 1962.

Although by title the Data Center is a national organization, it cooperates in oceanographic data programs at the international level. For example, in addition to conducting exchange programs with U.S. oceanographic organizations, the NODC also carries on exchange programs with foreign organizations and international societies. At the present time, over 16 exchange agreements are in effect.

Mr. VANIK. At this point, Admiral: Those 16 member European nations are from the West, are they not?

Admiral STEPHAN. Yes, sir.

Mr. Chairman, since this statement was prepared, Dr. Woodrow Jacobs, presently with the congressional reference section of the Library of Congress, has been employed to be the Director of the National Oceanographic Data Center. Dr. Jacobs is a distinguished oceanographer and meteorologist, and we are delighted to have him coming as the head of the Data Center, and he is expected to be on board about July 9 of this year.

My next subject is the oceanographic instrumentation program.

The Hydrographic Office has over the past 10 years acquired approximately $3 million worth of oceanographic instrumentation. In the course of procuring and using these instruments for survey and research type operations, it has been continually apparent that the majority of these instruments are only partially satisfactory for the needs of the Hydrographic Office. During this 10-year period, limited in-house facilities have been established and staffed for maintaining the available instruments, researching and developing a few new devices and initiating a program of test, evaluation, and calibration of existing as well as newly developed instruments.

In October of 1960 the Office published special publication No. 41 entitled "Oceanographic Instrumentation" which represented 2 years of careful study of the problem by an intraoffice committee. Special Publication 41 was then utilized as a basis for a joint Office of Naval Research-Hydrographic Office meeting in November 1960. At this time, approximately 40 experts in the field of oceanographic instrumentation gathered in Washington, D.C., to further clarify the instrumentation needs in oceanography. The final report of these deliberations will be available by July 1961.

The formal opening of the National Oceanographic Data Center in January 1961, brought a realization that while the facility for collecting, digesting, and disseminating large quantities of oceanographic data was a reality, a large part of the input to the center would be

coming from rather archaic instrumentation. It is obvious that modern instrumentation is required to collect data which is valid because of proper calibration and which can be rapidly processed by facilities at the Data Center.

Establishment of the Interagency Committee on Oceanography, Panel on Facilities, Equipment, and Instrumentation resulted in a careful study of the oceanographic instrumentation problem in the light of the participating agencies' specified instrument requirements and the need for instrument calibration and standardization.

Also resulting from the Panel meetings was the agreement between the Hydrographic Office and the ICO Panel that an early meeting with industry was required to present the first phase of the requirements for survey and research instrumentation. The briefing for industry has been set for mid-August 1961. It is felt that the $1.5 million planned by Navy for the instrument program in fiscal year 1962 as well as succeeding year appropriations will be more effectively expended as the result of the meeting with industry.

Mr. Chairman, that concludes my prepared statement. I would be delighted to try to answer any questions.

Mr. VANIK. Admiral, the committee certainly appreciates your very able presentation of the work of your organization.

Going specifically to the bill, H.R. 4276, what is your position with respect to this legislation, and the establishment of the policy set forth in the bill?

Admiral STEPHAN. Mr. Chairman, my position is strongly in line with the position expressed in the letter to Mr. Bonner, the chairman of the committee, in which we state that we strongly support the objectives of the bill.

The question as to whether these agencies should be set up by law or by Executive order is a difficult one. I do not feel competent to advise on that basic question between the executive branch and the legislative branch. I do feel that this oceanographic program is very complicated, and it will need strong coordination and strong leadership, and anything that will enhance this leadership I think is desirable.

Mr. DREWRY. Admiral Stephan, in connection with a survey, as perhaps contrasted with research, what is your position, or what are your views, with regard to the advantages, if any, of instrumenting American merchant vessels which ply over regular trade routes on regular services, from the standpoint of keeping abreast of the developments, and so on, in various parts of the oceans of the world in which those vessels travel?

Admiral STEPHAN. Mr. Drewry, I believe that if we are going to collect the data, the vast amount of data, that is required to furnish to our scientific community the basic facts from which they must derive the knowledge from which we will develop the operational concepts and hardware to exploit that knowledge, we must use every facility that we can to collect data.

I think some of this data has to be collected by survey ships that have no other job than oceanographic survey. I think some of this data can and should be collected by what I like to call ships of opportunity, such as vessels of the fleet and of the merchant fleet.

I think that we should look for every opportunity to collect data for all agencies involved with the most modern instruments that we can get. Only in this way do I think we will get into the enormous data-collecting job.

Specifically, I think there is a large part which our merchant fleet, our tanker fleet, and even our fishing fleet, can play in the collection of data.

Mr. DREWRY. Are instruments sufficiently advanced to be able to fit out these merchant ships and ships of opportunity, so that they can effectively collect useful data without interfering with their regular operations? By that I am thinking particularly in terms of speed, rather than availability of space on board.

Admiral STEPHAN. Currently some of our instruments lend themselves to that sort of use. But they have almost archaic read-out. The problem of handling the data and putting it in a usable form in the data center would be very heavy. We have got to get more modern instruments that lend themselves more readily to be operated by a ship which has speed to make, and which will read out in such a way as to facilitate our handling at the data center. We cannot continue the archaic methods, or we will simply find that we have a tremendous amount of data that we cannot rapidly process, and we have got to go to more modern methods, both of collecting data and of handling it through the data center.

Mr. DREWRY. Are the Hydrographic Office or others working on this problem right at the present time?

Admiral STEPHAN. Yes, sir. In connection with the collection of all types of data, both by the agencies whose principal business is the collection of data, such as the Hydrographic Office, the Coast and Geodetic Survey, the Coast Guard, and the Bureau of Commercial Fisheries, we are working on basically three suits of instruments.

We want, first, a modern suit of instruments for the ship, whose primary job is the collection of oceanographic data, such as our hydrographic office survey ships; second, a suit of instruments for ships of opportunity, whether they be merchant fleet, U.S. Navy, Coast Guard, fishery, or other; and, third, a suit of instruments for a synoptic network of data collection, where your objective is not to simply put it into the data center to be later digested but to get this data out promptly to the fleet so that they can have what is, in effect, something comparable to what the Weather Bureau does in getting weather information today for use today. It has to be handled rapidly, so that we understand the weather of the ocean in our operations at sea.

Mr. DREWRY. Have the Hydrographic Office or others in the Navy interested in this subject had any discussions with the merchant marine or tankers or dry-cargo carriers toward what they can do by way of cooperation with the ships-of-opportunity program?

Admiral STEPHAN. Yes, sir. We have had discussions with the oil companies and with the geophysical industry. There is a great deal more to be done in this area. I think that I learned a lot up here in the testimony of Dr. Blake. I think there is more to be done.

To date, we have more or less concentrated on our effort to determine from all of the agencies involved what data is needed to be collected. I think we could have done more with industry than we have

done, but in our conference in August we intend to expand that and develop it further.

Mr. BAUER. Admiral, with respect to the TENOC program, of which I have given you a copy, there, if you will turn to pages 81 and 82, I notice that you are the coordinator of effort of the Navy in the TENOC program in the field of instrumentation. Is that correct?

Admiral STEPHAN. Yes, sir.

Mr. BAUER. Now, under your item 2 on page 2 of the shipborne system, you put a speed of 12 knots as the indicated speed of the ship underway. Why do you not make it higher? Is it not possible to design instrumentation to fit modern freighter operation or passenger ships or vessels? Twelve knots seems rather slow, does it not?

Admiral STEPHAN. I am inclined to agree with you. I think it ought to be higher. I think this is something that we will develop at the instrument conference. I think as we work more with industry we will find that we can move higher. But I agree 12 knots is going to make it difficult for a lot of ships to help us without interfering with their other mission.

Mr. BAUER. It seems to me that that would be particularly true with respect to ships of opportunity, would it not?

Admiral STEPHAN. Yes; I agree.

Mr. BAUER. But you would not want to have a freighter or a passenger ship slow down.

Admiral STEPHAN. This would reduce the amount of help we could get, if this was the speed at which the data had to be collected.

Mr. BAUER. The next question is with reference to the data center. Will your data center accumulate the data that was collected during the IGY? Has that question been resolved?

Admiral STEPHAN. I believe that has not been resolved. I believe that we will eventually have the data. I think we are beginning to get it now. We are still having growing problems at the data center, and at the present time I think we are moving as rapidly as we can with the staff. We are having difficulty in getting the right people on board.

Mr. BAUER. I raise the question because when I was at Texas A. & M. several years ago they were getting an input of data from the East, Russia and so on.

Admiral STEPHAN. Yes, sir.

Mr. BAUER. And that would be your only input of data transmitted from the East, would it not?

Admiral STEPHAN. Well, it would certainly be one of the principal ones. We hope, through international arrangements, to get any data that we can from any source that we can.

Mr. BAUER. Would there be any objection, do you think, on the part of the Communist bloc, we will say, to supplying data to a data center which is run by the military? I am just trying to anticipate roadblocks.

Admiral STEPHAN. I do not know the answer, Mr. Bauer.

Mr. BAUER. I mean: Do you exchange data with Moscow, for example?

Admiral STEPHAN. I think we would exchange data with anybody in order to improve our worldwide information. Now, in the data center we are going to have classification problems. But generally

I think our approach should be that the United States will profit most from the greatest knowledge of the ocean, and to this end we should try to keep the classification problem to a minimum and accumulate the most data that we can on the oceans.

Mr. BAUER. Now, you received data, I suppose, as input from the Coast Survey and other agencies?

Admiral STEPHAN. Yes, sir.

Mr. BAUER. This includes the bathymetric data that they have of the Continental Shelves of our country?

Admiral STEPHAN. Yes.

Mr. BAUER. I notice you are the coordinator of ocean surveys in the TENOC program. Is it contemplated that perhaps you might call on industry at some time in the future to assist you in the surveys, if you have money?

Admiral STEPHAN. Yes, sir. I think we ought to keep an open mind as to how this can be best done. I think we ought to recognize the tremendous amount of work that has been done by the geophysical industry and cooperate with them. I think that we will have problems of a proprietary nature with some of their data, but I think that these problems can be handled to their satisfaction so that we can use a great part of their data.

Mr. BAUER. Now, with respect to data inputs, and so on, Congressman Miller's bill calls for research to be done by the data center, and I think his intention is that research should be of a twofold nature. That is, the first would be of the nature of methods of programing, and so on, that can be done here. But on the other hand, would not the data center be very much concerned with the question of quality control and how good the data input is?

Admiral STEPHAN. Yes, sir; I feel that there has to be research by the data center with the scientific community to determine what data you need, with what accuracy, what are the quality controls, what are the best ways to handle it, and what, if any, avenues there are to reduce the amount of data that we have to collect. In other words, what specific data can we stop collecting because we can deduce it by formula or by our growing understanding of what is going on in the ocean.

Mr. BAUER. Would you, or one of your staff, perhaps, talk to the current situation, as to whether or not data obtained from various sources are compatible? In other words, if you measure the concentration of oxygen in the vertical cast in the Atlantic Ocean and you come up with a certain value of the oxygen in parts per thousand, would that be the same amount of oxygen that would occur under similar actual concentrations that would be measured in the Pacific Ocean by another institution?

In other words, is there any compatibility across the line between things of that nature?

Admiral STEPHAN. Mr. Bauer, I would like to ask Mr. Harold Dubach, who is the acting director of the data center, if he would either talk to that or give you something for the record on that subject.

Mr. DUBACH (acting director, data center). In this regard, this is our basic problem now in data processing. The units are incompatible, in many instances, in the historical type of data; and this is one of our big problems in amalgamating this data for the "data in." It is

a problem across the whole international field of oceanography, historically speaking.

Mr. BAUER. Thank you.

Then, Admiral, you say there is certainly merit in the idea of having standardization of oceanographic equipment, would you not?

Admiral STEPHAN. I think this is absolutely essential.

Mr. BAUER. And at the current time apparently there is no standardization as such set up?

Admiral STEPHAN. At the Hydrographic Office, we have long felt this need. I have at the present time for the Hydrographic Office a request for funds to establish an instrument test and evaluation center. We have done this in order to get our hat in the ring, and we contemplate that the Interagency Committee on Oceanography will take up this problem. In fact, we were discussing it at one of their recent meetings. I think that their position on it will be firmed up in the next couple of weeks; and I am sure they will strongly support the need for these test and calibration centers.

I think we will wind up recommending that there be one on each coast so as to try to reduce the cost of freight, of shipping instruments back and forth, and the difficulties of keeping instruments in calibration with shipping them successfully.

Mr. BAUER. Now, it is my understanding, Admiral, is it not, that you are currently standardizing for certain South American countries certain of the oceanographic instruments?

Admiral STEPHAN. We are trying to. We have had two people from the Hydrographic Office visit the countries in South America that are principally involved in oceanographic programs, and we are trying to work with them and have had a great deal of success in working with them. I think a lot more will be done in the future than has been done in the past to standardize with them.

Mr. BAUER. Thank you, Admiral.

I understand that you have some charts that could be of assistance to us on the flow of data input and so on. Would you care to show them to us at this time?

Admiral STEPHAN. Mr. Chairman, in trying to keep the Hydrographic Office focused in this problem, we have sort of outlined what we consider to be the objectives of the national oceanographic program. They are: To acquire the understanding of the ocean and to translate this understanding into operational concepts and hardware which will enable the United States and its allies to exploit our peculiarly oceanic position militarily, economically, and politically.

This is not an official thing. It is something which we use to try to keep ourself focused on the national problem.

Functionally, if this program is going to be accomplished, there must first of all be collection of data. This data must be fed into an oceanographic data center in a modern, fast method and presented in such a form that the scientific community in both pure and applied research can study it, develop the understanding, formulate the rules that govern the ocean, and out of this, in cooperation with industry, develop the hardware and the operational concepts that will exploit this knowledge.

Data by itself will not help us solve our military and economic and economic-political problems. The data has to be handled properly.

Even if it is handled properly, it will not solve this problem unless the scientific community studies it and develops the operational concepts and designs of hardware, and that will not do it unless industry gets into the act and develops the equipment, whether it be military equipment or fishing equipment or mining equipment, to capitalize on what we know.

Mr. VANIK. Your charts seem to make a good case for the bill.

Admiral STEPHAN. Well, there is no argument on my part. I am in complete support, Mr. Chairman, with the objectives of the bill. I believe this is the position expressed in the letter by the Bureau of the Budget. They are in complete accord with the objectives.

This gives a rough picture of the coordination that is necessary. These are the principal agencies of Government, Atomic Energy, National Science Foundation; Health, Education, and Welfare; Defense; Interior; Commerce; and Treasury. These are the agencies which the ICO attempts to coordinate in the oceanographic program.

These are the subagencies within them that have to be coordinated. I am sure there are others that are not on this chart, but it gives you some idea of the cooperative aspect of the program.

These are helpful to us in trying to keep our part in this thing fully coordinated with the other agencies that are involved.

Mr. VANIK. Is it possible, Admiral, that we could have that reduced in size and make it part of the report?

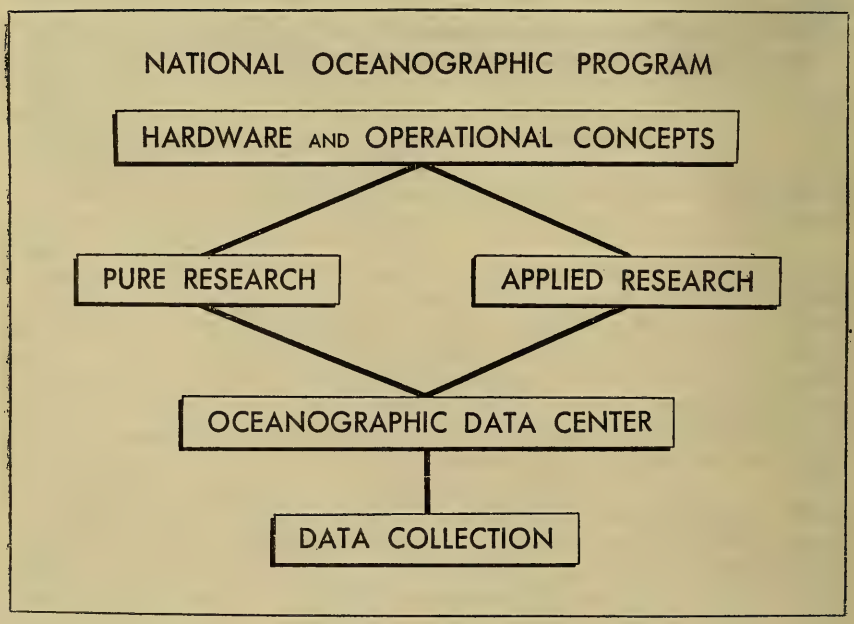
Admiral STEPHAN. We will do that, Mr. Chairman, and send them to you, sir.

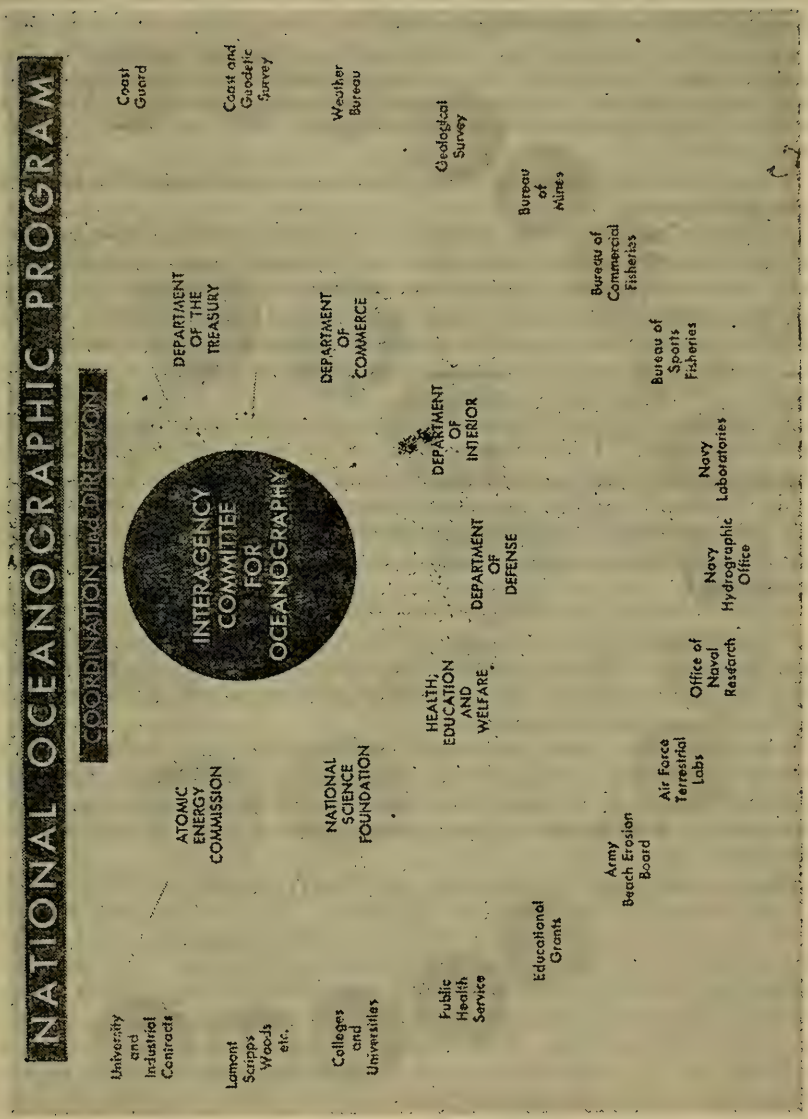
Mr. VANIK. Thank you very much.

(The charts referred to above are as follows:)

NATIONAL OCEANOGRAPHIC PROGRAM OBJECTIVE

To acquire the understanding of the ocean and to translate this understanding into operational concepts and hardware which will enable the United States and its allies to exploit our peculiarly oceanic position militarily . . . economically . . . and politically.




NATIONAL OCEANOGRAPHIC PROGRAM
COORDINATION and DIRECTION
INTERAGENCY COMMITTEE FOR OCEANOGRAPHY
University and Industrial Contracts
Lamont Scripps Woods etc.
Colleges and Universities
ATOMIC ENERGY COMMISSION
NATIONAL SCIENCE FOUNDATION
Public Health Service
HEALTH, EDUCATION AND WELFARE
Educational Grants
Army Beach Erosion Board
Air Force Terrestrial Labs
DEPARTMENT OF DEFENSE
Office of Naval Research
Navy Hydrographic Office
Navy Laboratories
DEPARTMENT OF INTERIOR
Bureau of Sports Fisheries
Bureau of Commercial Fisheries
Bureau of Mines
Geological Survey
DEPARTMENT OF COMMERCE
Weather Bureau
DEPARTMENT OF THE TREASURY
Coast and Geodetic Survey
Coast Guard

Mr. Ellsworth, do you have any questions of the Admiral?

Mr. ELLSWORTH. No, thank you, Mr. Chairman.

Mr. VANIK. Mr. Morse, do you have any questions of the Admiral?

Mr. MORSE. Yes, Mr. Chairman.

Admiral Stephan, in your statement, which I have read, I notice on the third page you identify the problem in the processing of marine biological and marine geological data:

> Methods for processing marine biological and marine geological data are currently under investigation. These data are generally reported in qualitative terms and are difficult to reduce to terms for machine processing. The NODC expects to begin processing of these data late in fiscal year 1962 or early in fiscal year 1963.

What kinds of things? This is not an insurmountable problem, I would hope.

Admiral STEPHAN. I do not think it is an insurmountable problem, but in the past we have been collecting biological data through towed nets. These do not lend themselves to the same type of electronic readout that such chemical or physical qualities as temperature or salinity or depth to the bottom or the shape of the ocean floor would do.

I think, as we take this problem to industry, they have coped with similar and more difficult problems. I think the important thing is that we take this problem to the very able instrumentation industry of this country. I think they will devise ways of simplifying this and making it a more rapid process and still an accurate one.

Mr. MORSE. Has that not been accomplished yet, Admiral? Have you had any discussions with, let us say, Systems Development Corp. or any of these people who are in this business of information processing?

Admiral STEPHAN. We have had discussions with them, Mr. Morse, but at this conference with industry in August we plan for the Bureau of Commercial Fisheries, which are thoroughly familiar with this problem, to discuss and lay the whole problem in all of its variations as best they can before industry.

I am sure they have had consultations with them before, but we intend to put the whole package together for industry, if we can, because I think it is important that the Navy, for instance, collect biological information to the greatest extent that it can for two reasons.

First of all, it is important to the Navy, and second, it assists the whole Government in getting a job done. It would be very wasteful if we failed to collect biological information that we could collect. We should not be limited by our immediate concern. We should be limited by what is an efficient data collection package to put aboard a ship. How much can you do without terribly running up the cost, or something like that. And I think it is very important that we try to collect all the data that we can in order to avoid the big expense of having to plow the ocean again to collect some data that we could have collected in the first place.

Mr. MORSE. You said in your response to Mr. Vanik's question that you agree in principle with the bill. Do you honestly feel that a council of this kind can accomplish the needs in the oceanographic area, rather than an agency in the usual structure could accomplish?

You have had experience in the hydrographic area with the coordinating function.

Admiral STEPHAN. I certainly feel that the existing ICO needs a staff. I think that actually as the Hydrographic Office we have tried to furnish a staff for the ICO. Captain Hendrix of my office, and others—the job they have been doing in putting together the national instrumentation requirement has been practically as a staff for the ICO. There is no question in my mind that they need a staff.

Mr. MORSE. Without resorting to the bureaucratic niceties which guide us all, what kind of contribution has AEC, for example, made to the effort? AEC, I notice, was one of the agencies that are coordinating. How much active interest has there been on the part of the Atomic Energy Commission to the efforts in this field?

Admiral STEPHAN. I honestly feel that all of the agencies that have been involved have contributed. In putting together the instrument requirements,we have sent numerous letters. We have gotten replies. They have expressed their requirements. And I honestly feel that the cooperation among the agencies involved has been excellent.

We have had tremendous help from other agencies. Captain Hendrix has been working with people from each of these agencies. They have been available. They have answered the questions. They have made a contribution. We have not done it all alone. We have had a lot of help in doing it.

Mr. MORSE. Do you see any place for a single agency oceanographic activity?

Admiral STEPHAN. That is a difficult question. I am certainly not an expert on this subject. But I have the feeling that for every problem that it solved, it might add additional problems. I think this might get very complicated.

Mr. MORSE. To a greater extent, or to any greater extent, than the problems that have been created by the establishment of the National Aeronautics and Space Agency?

Admiral STEPHAN. I think the only answer I can give you is: I do not know, Mr. Morse. I do not know whether it will.

Mr. MORSE. I have read the bill. I think we are dealing with a highly important subject which bids well for the future of this Nation and this world. I just have some apprehensions as to whether or not this can be properly exploited, properly advanced, in the entire field, by the council concept, with coordination among several agencies.

Thank you, Admiral.

Mr. VANIK. Admiral, we certainly appreciate your frank and full testimony this morning. I know that every member of the committee appreciates the fine work and leadership you have provided in your office.

Thank you very much.

Admiral STEPHAN. Thank you, Mr. Chairman.

Mr. VANIK. The next witness is Rear Admiral Coates, Chief of Naval Research.

I understand, Admiral, you have with you Dr. Galler and Dr. Maxwell and Miss Pruitt.

STATEMENT OF REAR ADM. L. D. COATES, CHIEF OF NAVAL RESEARCH; ACCOMPANIED BY DR. S. R. GALLER, DR. ARTHUR MAXWELL, AND DR. EVELYN L. PRUITT

Admiral COATES. Yes, sir.

Mr. VANIK. Will you proceed, Admiral? The committee will be pleased to have your testimony.

Admiral COATES. Mr. Chairman, I have a brief statement that I would like to read.

Mr. VANIK. Do we have copies of your statement, Admiral?

Admiral COATES. Yes, sir.

Mr. Chairman and gentlemen: I am grateful to have the opportunity to appear before you today to discuss the program of oceanographic research being conducted by the Navy, and, in particular, the program within the Office of Naval Research.

On Monday, Assistant Secretary of the Navy Wakelin gave the committee an excellent review of the organization and coordination of efforts in oceanography that exist throughout the Federal Government. Furthermore, he described the importance of the Navy's overall program and how it fits in with the national oceanographic program. Today, it is my intention to elaborate on some details of the research portion of the Navy's oceanographic program.

As you are aware, the marine sciences cut across many fields of interest. This is well illustrated within the Office of Naval Research. Here, we have programs in oceanography, meteorology, hydrobiology, acoustics, coastal geography, and Arctic research, to name but a few which are concerned with problems of the sea.

Our largest and most intimately concerned program, of course, is the oceanography program. This program encompasses all phases of oceanographic research and is carried out by contract at 11 major oceanographic institutions and a dozen other organizations, including universities, nonprofit institutions, and private industry.

Because the scope of this program is so great, I will tell you only of its broad objectives. They are—

1. To describe the distribution of physical and chemical properties of the ocean and to understand the dynamic processes which affect this distribution.
2. To determine the interrelationship of the ocean and atmosphere.
3. To determine the distribution, kind, interrelationship, adaptation, and life histories of the living population of the sea.
4. To describe and to understand the evolution of the sea floor, including its topography, nature and subsurface structure, with particular regard to the surrounding land masses.
5. To determine if the oceans have been, or are being significantly modified and how they can be exploited to benefit the Navy.

From these objectives it is readily seen why so many other programs in the Office of Naval Research contribute significantly to, and in many cases actually are a part of, our oceanographic program. A great deal of the meteorological research, for example, is directed toward the study of exchange processes taking place at the air-sea interface. The Navy must have a thorough understanding of these processes if we are to predict the acoustic conditions near the ocean surface which affect sonar operations. Similarly, the knowledge is needed to

be able to predict waves and the weather needed for ship routing and amphibious operations.

The hydrobiology program within ONR is an integral and essential part of our overall oceanographic effort. In recent years the Navy has developed a substantial interest in marine biology extending significantly beyond the traditional concern with marine fouling. This interest is a result of realization that a variety of problems which confront the Navy in carrying out its assigned missions stem from hydrobiological origin.

Included in this interest are—

1. Biological interference with underwater acoustic systems;
2. Biological influences upon mine actions;
3. Biological deterioration of marine structures and equipment;
4. Bioluminescence;
5. Poisonous, venomous, and noxious marine organisms;
6. Biological orientation, detection, and target evaluation phenomena.

All of these facets of marine biology are being investigated to determine their exact influence on equipment and operations.

Our acoustics research program has a vital relationship to oceanography because the physical properties of the oceans and its boundaries have a tremendous effect, usually adverse, on the transmission of sound from our acoustic detection systems. In this particular field of science, it is always difficult to define clearly just whether one is performing acoustic research or oceanographic research.

There are several programs devoted to the study of shore and beach processes which are of interest to us because of Navy shore installations and amphibious operations. In addition, much of our Arctic research has oceanographic implications. We are supporting a substantial oceanographic program in the Arctic, using drift stations and small aircraft capable of landing on the ice pack for the purpose of taking oceanographic and meteorological measurements. Only recently, through this program, we have discovered a new ice island in the Arctic Ocean which we have occupied to further develop our knowledge of this area.

The programs which I have just mentioned represent what I like to think of as the core of our basic marine sciences program within the Office of Naval Research. In order that the Navy be able to achieve maximum benefits from this basic research, we also pursue many programs that apply the knowledge we acquire of the oceans to the solution of Navy problems. It is this close coupling of the basic research to be applied problems that makes for an efficient research operation for the Navy.

We have maintained this interrelationship between basic and applied research by supporting, at the major oceanographic institutions, programs which bear directly on Navy problems. The Marine Physics Laboratory of the Scripps Institution of Oceanography, Woods Hole Oceanographic Institution, and Hudson Laboratory of Columbia University all represent excellent examples.

In many cases, the same scientists, who spend a part of their time moving forward the frontiers of oceanography, also devote their efforts to increasing the effectiveness of naval operations. Most of our applied programs in oceanographic research are in the field of anti-

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submarine warfare, where we require the greatest need for additional knowledge of how the environment affects operations and equipment design.

In many cases, operational programs requiring considerable additional oceanographic research have evolved from our basic and applied research programs. For example, the Artemis program of submarine surveillance has been a direct result of our oceanographic-acoustic research efforts. Similarly ASWEPS, or the antisubmarine warfare environmental prediction system, has grown from the research program, as has the AUTEC program to establish an underwater sound test range. These examples serve to illustrate how the Navy can keep abreast and make best use of scientific achievements by maintaining intimate relations with the leading scientists in oceanography.

Along with the Office of Naval Research, many other offices and bureaus of the Navy are concerned with oceanographic research. You have already heard Rear Admiral Stephan, the hydrographer, describe the programs of his office. In addition to these, the Bureau of Ships and the Bureau of Weapons have substantial programs in oceanography. Much of this research is carried out in Navy laboratories such as the Navy Electronics Laboratory, San Diego; the Underwater Sound Laboratory, New London; the Mine Defense Laboratory, Panama City; the Navy Ordnance Test Station, China Lake; and both the Navy Ordnance Laboratory and David Taylor Model Basin here in Washington.

The programs at these laboratories are, for the most part, directed at specific Navy problems. However, they are not carried out in a vacuum independent of the research at the civilian institutions. Close liaison has been accomplished through joint programs between the Navy and civilian laboratories.

Within the Navy, the diverse oceanographic programs of the various offices and bureaus are coordinated by an Oceanographic Policy Board. Membership on this board consists of: Deputy Chief of Naval Operations for Development, Chief of Naval Research, Hydrographer, Chief of the Bureau of Ships for R. & D., and the Chief of the Bureau of Naval Weapons for R.D.T. & E.

The effectiveness of this policy board has been demonstrably evidenced by their report, TENOC 1961–1970. This long-range plan containing programs of research, facilities, surveys, shipbuilding, and instrument development clearly outlines a coherent and imaginative program that will benefit the Navy and the Nation.

Gentlemen, I have briefly described the oceanographic research program of the Navy and its mechanism for coordination. In so doing, I do not wish to leave the impression that everything is proceeding without difficulties. As you know from previous hearings before both the Senate and the House, there are several aspects involved in the expansion of effort in oceanography which are particularly troublesome. These are the basic materials necessary to carry out the research program; instruments, ships, facilities, and manpower.

To alleviate the problem of inadequate instrumentation, staff members from both my office and the Hydrographic Office are drafting, jointly, a workable program for the development and procurement of new oceanographic instruments. Rear Admiral Stephan has described this program to you.

The TENOC plan contains funding necessary to insure adequate ships and facilities for our expanded program. But as you are all aware, authorization and appropriation of these funds do not always come easily.

In the matter of manpower, my office has a long history of encouraging both the establishment of new oceanographic laboratories and entrance of additional scientists into the field. During the past year, discussions between the Office of Naval Research and the Massachusetts Institute of Technology led to the establishment of an oceanographic program at that institute. A contract has just been negotiated in which ONR will support the research programs of three oceanographers along with eight promising research assistants who are striving for advanced degrees.

In the same vein, we have recently held discussions with officials from the University of Alaska concerning oceanographic research and they are now establishing a department of marine sciences, which will undoubtedly develop a research program meriting our support.

In addition, the Office of Naval Research and the National Science Foundation have jointly sponsored a meeting of Midwest universities to determine what part those institutions can take in the national oceanographic program.

By the methods I have described, we will continue to encourage the expansion of oceanographic research in this country. There is no question in my mind concerning the importance of the oceans to the welfare and economy of the United States. We must take the necessary steps to insure that we remain ahead of other countries of the world in the exploitation of this vast resource for both civil and military purposes.

Mr. VANIK. Thank you very much, Admiral.

At this time do you wish to have the other witnesses testify, in addition to your statement, or are they here to assist?

Admiral COATES. They are here to answer questions, sir. They do not have prepared statements.

Mr. VANIK. Now, with respect to the bill that we have before us, what is your position on the bill? Are you for or against the bill?

Admiral COATES. I am in favor of the objectives of the bill, sir. I have not had a chance to read all of the testimony. I have just skimmed through this morning the testimony of Professor Lewis, whom I have known for a long time. I have a very high regard for his intelligence and for his experience in fiscal and management problems. And I am told that his testimony was well received by this committee. I assume that there would be some modification of the bill in accordance with some of the suggestions made by Professor Lewis.

I also know that Secretary Wakelin disagreed with one point in the bill and was asked to suggest revised wording.

But in general, with such revisions, I certainly do support the bill.

Mr. VANIK. Now, Admiral, this Policy Board: How frequently does the board meet? When did you have your last meeting?

Admiral COATES. When was that, Dr. Maxwell?

Dr. MAXWELL. The last meeting of the Policy Board was about 2 months ago, I believe, when the TENOC document was completed.

Mr. VANIK. How frequently did the board meet in the last year?

Dr. MAXWELL. The board met twice this calendar year, and the

working group have met together I would say at least six times this calendar year.

Mr. VANIK. During the calendar year?

Dr. MAXWELL. Yes, sir.

Mr. VANIK. Let me get this straight, now. Let us go back to, say, fiscal 1961, or since last July 1. How many times has the Policy Board met since July 1, 1960?

Dr. MAXWELL. I believe the Policy Board has met about three times. But it has a working group, and the working group has met many more times.

Mr. VANIK. And how many times has the working group met?

Dr. MAXWELL. I can only give you an approximate answer for that period, and I would say it has met at least a dozen times.

Mr. VANIK. A dozen times in this same period?

Dr. MAXWELL. Yes, sir.

Mr. VANIK. Now, let me ask this further question: Who are the members of the working group? Could you identify the usual members of the so-called working group?

Dr. MAXWELL. I do not have a list of these members on hand. I can supply this for the record. In general, Captain Ruble from the Office of Naval Research, Captain Stephan and Commander Alexander for the Chief of Naval Operations, Captain Fusselman from the Hydrographic Office, Mr. Hanson from the Bureau of Weapons, Mr. Couper and Commander Coil from the Bureau of Ships have attended the meetings.

(The following was furnished for insertion:)

WORKING GROUP
OF THE
NAVY OCEANOGRAPHIC POLICY BOARD

Capt. C. R. Stephan, Chairman	CNO
Comdr. R. J. Alexander, Executive Secretary	CNO
Mr. C. Sandler	BuNavWeps
Comdr. J. Coil	BuShips
Cmdr. M. O. Johnson	CNO
Mr. F. Knoop	BuY&D
Capt. G. J. Dufner	BuMed
Capt. M. F. Thompson	CNO
Capt. H. E. Ruble	ONR
Capt. R. D. Fusselman	USNHO
Mr. R. B. Abel	Ex officio

Mr. VANIK. Neither the working group nor the Policy Board has any staff?

Dr. MAXWELL. The working group actually acts as the staff for the Policy Board.

Mr. VANIK. All right.

Mr. Ellsworth, do you have any questions?

Mr. ELLSWORTH. No, thank you, Mr. Chairman.

Mr. DREWRY. Admiral, just one thing. With reference to TENOC, which is described as TENOC 1961 to 1970, a 10-year program, is it contemplated that a year from now TENOC would be TENOC 1962 to 1971?

I mean: Will it roll as time goes on, or is the present thinking that at the end of the 10-year program you will have another 10-year program? Will you keep flexible?

Admiral COATES. We will keep flexible, sir. Any time you make a 10-year program, you must contemplate you will want to make some changes in it before the full 10 years is completed.

Mr. DREWRY. If we called you up next year and said: "What are you planning to do in 1961, "for instance, would you have formulated any plans? Would you keep always looking ahead on the 10-year basis?

Admiral COATES. We will revise it every 2 years, sir. So if you called us next year, we would not be able to tell you about 1971.

Mr. DREWRY. That is what I wondered. You do plan to keep revising it.

Mr. BAUER. Admiral, I have one or two questions.

Would you tell us something about the organization of the Office of Naval Research and its mission? In other words, I am thinking now that you operate on R.D.T. & E. money exclusively.

Admiral COATES. Yes, sir.

Mr. BAUER. Yet many of the problems in the problem areas that you look into and finance are also financed by O. & M. money. Is that not correct?

Admiral COATES. Our departmental operation, that is, the pay of the people who work in the Office of Naval Research, is financed by O. & M. money, and our training devices center, its installation, repair, spares, and maintenance, come out of O. & M. money. However, our program is all R.D.T. & E. money.

Mr. BAUER. That is what rather confused me. That is why I was wondering if you could tell us what your mission is.

Are you concerned only with basic research?

Admiral COATES. No, sir; basic and applied research. The Office of Naval Research was established by law, Public Law 588. I have forgotten the United States Code number. The purpose of the office is to conduct research for the Navy and to coordinate research for the Navy.

The Bureaus also conduct research, mostly in the applied end of the spectrum. The Office of Naval Research conducts research heavily at the basic end of the spectrum and in the applied.

We do not develop actual production prototypes of hardware items, whereas the Bureaus do. We do some exploratory development, but we leave off with what you might call the laboratory feasibility demonstration device. And the Bureaus pick it up from there.

Mr. BAUER. Well, are you in competition in any way with the support of the nonprofit institutions in oceanography with the National Science Foundation?

Admiral COATES. No, sir, we are not in competition. We are in cooperation with the National Science Foundation.

Mr. BAUER. What I mean to say is that you both fund the same institutions, do you not?

Admiral COATES. Yes, sir.

Mr. BAUER. Over the same general spectrum of research?

Admiral COATES. Yes, sir; each for our own purposes.

Mr. BAUER. How do you contract with nonprofit institutions?

Admiral COATES. We write contracts with them. The National Science Foundation deals in grants. We are authorized by law to make grants, but we make very few.

Mr. BAUER. In other words, you feel that the contracting with these institutions gives you the additional control that the Navy requires over the granting process? Is that right?

Admiral COATES. Yes, sir. I think, from our point of view, and speaking only for the Navy, there are many advantages to the contract, and very few to the grant.

Mr. BAUER. Now, these contracts: Are they of the task type, usually? They run for a term, and then you give additional tasks as you get funding?

Admiral COATES. Yes, sir. Most of our contracts, nearly all of our contracts with universities run for more than a year. This guarantees them stability of employment. They can take on people to do a research job in the knowledge that they will not be suddenly cut off on the 1st of July and then have the problem of reassigning their people.

Mr. BAUER. Well, your R.D.T. & E. money is no-year money. Is that not correct?

Admiral COATES. Yes, sir; that is correct.

Mr. BAUER. So it would be possible to finance these contracts with various universities for more than 1 year, would it not, as long as you have the assets to pay for them?

Admiral COATES. That is true. And when we begin, if I may explain this so-called longevity funding, when we issue the initial contract, it is for more than a year's operation by some amount, some number of months. Then each year, as we renew that contract, we put in additional money for 1 year's operation. They always have that forward-funded period, though, extending beyond the nominal end of the contract.

Mr. BAUER. Well, in your internal work, do you commit the funds for more than a year?

Admiral COATES. No, sir; for a year. Once the contract is established, for a year's renewal.

Mr. BAUER. Now, in this TENOC program, of which you have a copy there, table 3 on page 43, there is a survey program of TENOC funding.

Now, up until you get to the areas of the research laboratories—

No, the survey program is all funded by O. & M. money, is it not?

Admiral COATES. That is Hydrographic Office, on table 3.

Mr. BAUER. Are you entering the survey program at all?

Admiral COATES. No, sir.

Mr. BAUER. Is the Indian Ocean survey being funded by you?

Admiral COATES. Maybe you had better say, Dr. Maxwell, the extent of our participation in that.

Dr. MAXWELL. Yes, the Navy's participation in the Indian Ocean expedition, at least a part of it, is being supported by the Office of Naval Research on a research basis. We consider that the Indian Ocean expedition is not all survey. There is a research aspect to it.

Mr. BAUER. Who funds the survey aspect of the Indian Ocean?

Dr. MAXWELL. I think it is anticipated that the Hydrographic Office may have one of their ships in the area of the Indian Ocean sometime during this period, and they would certainly fund their own program.

Mr. BAUER. Well, the research function and the survey function in the Indian Ocean: As far as the nonprofit institutions are concerned, you fund the complete operation, do you not?

Dr. MAXWELL. That is correct; as far as the universities and nonprofit institutions are concerned, the Office of Naval Research funds the complete Navy part of this. But in addition, the National Science Foundation is supporting a part of the Indian Ocean expedition.

Mr. BAUER. By grant?

Dr. MAXWELL. By grant; that is correct.

Mr. BAUER. So essentially for doing the same thing, having the same ship in the same place on the seas of the world, there are two sources of finance, one a grant, the other a contract. Is that correct?

Dr. MAXWELL. This is correct, but these may be, the contracts and the grants may be, so written so that they are not covering the same aspects. For example, the ship costs may well be covered by contract, whereas some of the equipment and salaries of the research people might be covered by grants. So that it is not a duplication.

Mr. BAUER. But if Hydro sends ships to the Indian Ocean, it would come out of O. & M. money, would it not?

Dr. MAXWELL. That is correct.

Mr. BAUER. Admiral, how do you decide that a project is meritorious and worthy of contracting?

Admiral COATES. In general, across all fields of research I believe that we get about four times as many proposals as we let contracts. In other words, one-fourth, roughly, of all proposals received result in ONR contracts. So we have the opportunity to be very highly selective.

And the basis for our selection is, of course: No. 1, how much are we interested in the particular program? How well is that field already covered? Two, does the proposal appear to be a potentially productive proposal? No. 3, what do we think of the reputation and skill of the investigator?

And I would like to make it clear that in all consideration of proposals we pay little or no attention to the reputation of the institution or corporation or university out of which the proposal comes, but only to the competence of the man who is proposing to do the research.

And on those bases we make our selection of the best of the proposals in the various fields to the amount that we have funds allocated for the purpose.

Mr. BAUER. Well, who makes the selection, again? Is it your staff, or do you have advice?

Admiral COATES. It is our staff. Our staff makes the final decision. They do seek advice in appropriate areas.

Mr. BAUER. Do you have any formalized advisory board for that purpose?

Admiral COATES. No, sir, we do not.

Mr. BAUER. Then ultimately, the Assistant Secretary of Navy for Research and Development would be in a position to be the top man on the decision you make?

Admiral COATES. Yes, sir. He is my boss.

Mr. VANIK. Miss Pruitt, you are head of the Geography Branch. I wonder if you would not give us a brief description of your work in your office.

Miss PRUITT. The work of the entire office, Mr. Chairman, goes into five separate fields, and at least two of these are important here.

These have already been mentioned by Admiral Coates, that is, coastal geography and Arctic geography. Both of these programs are administered by the Geography Branch.

In coastal geography, our principal focus is on that section of the world, throughout the world, where the land and the sea influence each other. We are concerned with the three interfaces of land, sea, and air. The land adds a complication to, say, midocean oceanography. Yet the oceanographic aspects and the terrestrial aspects are both of concern to us in our efforts in coastal geography to understand the processes that control the behavior of the coastal zone.

We pay particular attention in our program to beaches and their structures.

We include studies of a wide variety of sites, since the structure of the coast is important, the climate of the coast is important, and the oceanic or wave-current situations are important, and these conditions working together make quite a variety of circumstances. We have spread our research program around the world in order to get sufficiently varied sites to, we hope, learn something that is true for all situations.

In this, we are practically interested, as I said, in beach structure. We have reached the point where industry can be very important in this, since we are at the stage where we must begin to measure some of the important properties of breaking waves through the surf zone.

Here I believe we have the industrial competence to do this. Certainly, surveys and contacts with industries indicate we have, even to the point of measuring such things as turbulence, a property that is extremely important in the coastal process.

Mr. VANIK. Is your work coordinated with that of the Beach Erosion Board?

Miss PRUITT. Very closely.

In the other program, our Arctic geography program, a good deal of what goes on is of concern to and is part of an oceanographic program.

Our interests are broad throughout the Arctic Basin. This is a particularly interesting ocean, because in a sense it has an ice lid. This means that we have abundant platforms from which to work.

The United States has a real asset in the Arctic Research Laboratory, which is located at Point Barrow. This is the only laboratory that this Nation has with easy access to all parts of the Arctic Ocean. It is a natural focal point for research in the Arctic.

A program has gone on for several years there, concerned with Arctic oceanography, with the added feature of sea ice.

Not only do we have the classic oceanographic approach, including acoustical problems, bottom problems, and marine biology problems, but we are also concerned with ice physics, behavior of ice, and the understanding of the ice interface, water interface, and air interface problems.

Under this program, we now have developed a competence at ARL to establish austere stations on the ice, and as Admiral Coates mentioned, we have just completed the establishment of a station on an ice island.

Mr. VANIK. Thank you very much. We appreciate that.

Admiral, we certainly appreciate your testimony before the committee this morning, and we appreciate the cooperation of the members of your staff who came with you.

Thank you very much.

Admiral COATES. Thank you.

Mr. VANIK. The next witness is Dr. Paul Fye.

Is Dr. Fye in the room?

Dr. Fye, we are very happy to have you here this morning, and you may proceed directly to the presentation of your statement.

STATEMENT OF DR. PAUL M. FYE, DIRECTOR, WOODS HOLE OCEANOGRAPHIC INSTITUTION

Dr. FYE. Mr. Chairman, gentlemen, as Director of the Woods Hole Oceanographic Institution it is indeed a high honor and great privilege to meet with your distinguished committee again. The entire staff of our Institution has been heartened and inspired by the keen interest shown by this committee in the subject which is the sole mission of our laboratory. The sympathetic response to the desires of oceanographers was especially noted by them during the hearings before Mr. Miller's Subcommittee on Oceanography held at Woods Hole 2 years ago.

It should be noted that the interest and response of this committee has made a great impact not only with oceanographers but also in the entire scientific community. This has been especially apparent in the Undersea Warfare Research and Development Planning Council established by the U.S. Navy 2 years ago this month.

This Council is composed of the scientific directors and commanding officers of the 13 laboratories principally concerned with undersea warfare problems, and therefore vitally concerned with the complexities of the oceans. Eight of these laboratories are within the Navy, and five are nonprofit research laboratories such as ours at Woods Hole. It has been my privilege during the past year to serve as Chairman of this Council, and I can thus personally testify to extensive appreciation and importance of the work of this committee.

Once again you have before you an important piece of legislation in H.R. 4276, a bill which is important not only to the small number of scientists who actively go to sea in order to solve its mysteries, but also to the entire Nation—indeed, to the whole world. I need not emphasize to this committee the importance of oceanography. The fact that you have this legislation before you is evidence of your awareness of the important role marine sciences will play in shaping our entire civilization.

Fortunately, your work, together with the work of several other groups both within the legislative and executive branches of Government and on the outside, have made it no longer necessary to demonstrate in detail the important role the oceans play in our daily lives. Especially noteworthy in this connection have been the work of the

National Academy of Sciences Committee on Oceanography, the groups within the Navy who prepared the TENOC program, the program directors of the National Science Foundation, and all of the governmental agencies participating through the Federal Council for Science and Technology in preparing the recently issued national program in oceanography.

The work of these groups has resulted in carefully considered programs which reflect the intensive study and thoughtful collaboration of distinguished legislators, scientists, and Government leaders. The implementation of these programs is essential for their potential benefit to mankind and is mandatory for our national security.

Therefore, my comments should in no way be interpreted as evidencing other than appreciation and satisfaction that your committee has studied with such care these recommendations for oceanography.

The bill before you, H.R. 4276, proposes the establishment of a National Oceanographic Council which shall, in addition to other specified responsibilities, develop long-range plans for research and development, coordinate the marine efforts of various governmental departments and agencies, analyze budget proposals and report annually to Congress regarding the status of marine science.

I would not presume to advise this committee on the detailed matters of governmental organization but would note the unusual status this proposal gives to oceanography, a status seldom given to any scientific discipline or technical specialty. This is a status accorded the engineering problems related to flying many years ago through NACA and more recently to space technology in NASA. There is no comparable national council for physics, chemistry, mathematics, or biology.

We should explore the question in retrospect as to whether physics would have advanced more quickly or with more benefit to mankind if such a council had been established 30 or 40 years ago, when physics was the specialty of a select few. Would a National Council for Chemistry, established 50 years ago, when the center of chemical research and chemical industry was in Germany, have assisted in the spectacular rise of chemical science and associated industries in this country during the ensuing 20 years? I do not know, but I am sure that the freedom to plan individual research programs and, to a certain extent, the lack of coordination, contributed to the free-wheeling advances that have been so impressively a part of our strength in the physical sciences today.

The scientific research worker thrives on good communication, collective thinking among his peers, and constructive criticism. He is, however, easily thwarted by too much coordination and heavy-handed long-range planning. The creative thinker needs above all else the freedom to develop his own thoughts, to plan his own personal work, and to control with the personal attachments of ownership his tools of research.

The head of a large laboratory in the chemical industry recently said:

> The man of affairs, whether he be a business executive or military officer, is rarely in a position to know what research can do to help him. He knows very well what his current problems are, but his extrapolation to what his problems will be in 5 or 10 years is seldom accurate.

I doubt very much whether any national council could have guided research so that penicillin would have been found more quickly, or indeed found at all in moldy bread, or if Dr. Menard's interest in sea mounts could have been coordinated in advance with large schools of tuna.

A fundamental truism sometimes forgotten is that projects based on a rationale of justification are seldom basic in nature. "Projectitis," which is the inevitable result of high-level coordinating bodies and with which we are already plagued, tends to reduce the amount of basic research we can undertake.

The coordination envisioned by the proposed Council may indeed be useful in connection with survey work, but could be lethal to research programs.

As I have tried to illustrate, research into the mysteries of the oceans differs greatly from surveying. For research superiority we depend entirely on the new ideas of the creative worker, while in surveying we want to methodically execute well-conceived plans.

Thus the Council, if created, would wish to treat very differently these two closely related but widely different areas of oceanography, and I would think would be greatly assisted by some added membership of scientists engaged in oceanography.

Recognizing the need for coordination in Federal spending and its useful role in surveying the oceans, I would submit a fervent hope that coordination of research would be limited to the exchange of information, which we are now doing, and that the freedom of the research worker will not be infringed or coordinated.

This legislation also proposes to establish under the Council a National Oceanographic Data Center, primary standards for oceanographic measurements, and a National Instrumentation Test and Calibration Center. The objectives of these proposals are excellent, and ones which we endorse enthusiastically. It is obvious that the excellent start made by the existing Data Center under six agencies of the Government should be protected and that any new legislation regarding such a center should be enacted only if the mission of the center can be enhanced and strengthened.

The need for the establishment of primary standards for oceanographic measurements is not self-evident, and needs further analysis. In order to analyze properly such a requirement, it is necessary that the nature of oceanographic work be thoroughly understood.

We believe oceanography not to be a scientific discipline in a basic sense, but rather to be an area of interdisciplinary research which unites and utilizes the fundamental scientific disciplines, such as biology, chemistry, physics, and mathematics in its exploration of the oceans. Thus, the primary standards of these basic disciplines are also those of oceanography. The oceanographer, who may be a seagoing physicist, uses the primary standards of length, time, and mass in his work just as any other physicist. Or, again, the chemical oceanographer uses the standard atomic weights along with all other chemists.

The national responsibility for primary standards has for many years rested with the National Bureau of Standards. To establish special standards for oceanography would only confuse and limit the functions of this Bureau, which has done a job the excellence of which

is recognized throughout the world. Therefore, I see no need for this portion of H.R. 4276.

Perhaps I can illustrate this point by mentioning the well-publicized difference in oxygen analysis on the two sides of the Atlantic—a difference recognized by the scientists at an early stage of their research and one in which our chemists at Woods Hole have taken a lead in correcting. This difference was not due to a lack of primary standards, but, rather, to a lack in understanding of the chemical processes involved in the analysis which could only be resolved by research investigations into these basic processes themselves.

An Instrumentation Test and Calibration Center could be helpful in some aspects of oceanographic research and development. This is especially the case in the instrumentation required for large-scale survey work. Of course, such an instrumentation center does not relieve the individual investigator of the responsibility for accuracy of his results. Quality control must be maintained by those directly conducting the surveys, and cannot be transferred to a calibration center. Again, it seems to me that no research establishment should be diverted by wholesale calibration of equipment, and that the National Bureau of Standards is uniquely capable of undertaking this project.

Finally, section 8 of H.R. 4276 requires that the title of any vessel supplied by the United States to any activity in order to carry out the purposes of this act, which includes oceanographic research, shall remain in the United States.

I am aware that the grant for a new research vessel by the National Science Foundation to our institution in Woods Hole has been under discussion in this connection, and, therefore, I find myself in an awkward position in discussing this section. This is, however, a point on which we in Woods Hole, together with the vast majority of oceanographers throughout the country, do feel strongly. Therefore permit me, gentlemen, to present our opinions on this point as forthrightly and as constructively as I possibly can.

As you know, we operate the research vessel *Chain* in behalf of the U.S. Navy, with whom title for this converted rescue and salvage vessel rests. In the course of over three decades of oceanographic research, we have operated 17 other major research vessels at one time or another, all of which we have owned outright. Of these, only the research vessel *Atlantis* was especially designed for oceanography—the others being conversions from a wide variety of other uses. The replacement of the *Atlantis* is an urgent project with us, and the assistance from the National Science Foundation in this regard has been greatly appreciated.

Thus, we have experienced in operating both publicly owned and privately owned vessels. On the basis of this experience, we believe that existing policy which provides for both types of ownership is wise.

As we understand it, the Navy plans to retain title wherein they can provide ships to private research laboratories, such as ours at Woods Hole, and the National Science Foundation plans to give title to the research institutions. Thus, both methods can be tried and utilized and by experimental evidence we can determine a future-wise course.

There is one great difference in these methods which we believe makes private ownership and accompanying control far more desirable and efficient. Operational control of the vessel remains with ownership. In the case of the *Chain*, operational control is with the U.S. Navy, as required by law. Each cruise plan is approved in advance by the Navy, each port of call is identified, and each modification of such a cruise plan is subject to approval.

I would hasten to point out that such approval, resting as it does in the hands of the Office of Naval Research, has been wisely used, and we have had no difficulty in mutually agreeing on the important research work to be done. It has, however, added to the redtape of operation, both in Woods Hole and in Washington, and serves no useful purpose beyond that already served through our contractual arrangements with the Navy.

As I noted earlier, the creative research worker needs to control in a very personal way the tools of his research. A ship, to an oceanographer, while possessing the personality endowed by all mariners to his craft, is still just a tool of research and should be so regarded.

Creativity is essentially a personal and private process. The innovative research worker is keenly sensitive to his environment. Even though he has a firm conviction that research will pay big dividends, he can be diverted quickly to areas of low risk and small thinking if management shows more interest in quick-fix improvements rather than in freewheeling endeavors, which may add greatly to the storehouse of human knowledge. This becomes increasingly worse as management control is removed further and further from the researcher's immediate domain.

Thus I speak with conviction when I urge you to eliminate section 8 from this bill. This is a conviction shared, I believe, by all directors of oceanographic establishments, and endorsed essentially universally by oceanographers. Whereas we know both systems can and do work, we strongly support placing the responsibility for research planning and the control by ownership within the hands of the research workers themselves. This type of confidence, when placed squarely on oceanographers by this committee, cannot fail to produce a maximum effort for the expansion and development of the aquatic resources of the United States so earnestly desired by the authors of this legislation.

In conclusion, may I again express our appreciation for the interest of this committee in marine science. The emphasis you have placed on oceanography is both timely and valuable. As oceanographers and private citizens, we wish for you both wisdom and discretion in enacting appropriate legislation.

Mr. VANIK. Dr. Fye, thank you very much for your statement.

I am just going to be very brief, it is near the close of our session.

You make a great case here for uninhibited, unrestrained, unbridled, free enterprise research.

Would you tell me something about your funds within which you operate? What portion of your budget comes from private sources, and what portion comes from public sources?

Dr. FYE. During the calendar year 1960, just past, our operating budget was close to $5 million. Of this, better than 90 percent came from various Federal agencies.

Mr. VANIK. That looks like public research, then, does it not?

Dr. FYE. It does, indeed. We are very conscious of this, very aware of it. Our total endowment and resources, gifts, and other funds resulting from that, is very small compared to the public funds which we are handling and spending.

Mr. VANIK. It has been my own concern that where there is so much public investment there should certainly be a stronger effort to coordinate, to marshal the information, to make it readily accessible to all other public and private sources to which it may be important.

I will yield at this point to Mr. Ellsworth.

Mr. ELLSWORTH. No question, Mr. Chairman. Thank you.

Mr. VANIK. Mr. Bauer, will you proceed with your questions at this point?

Mr. BAUER. Thank you, Mr. Chairman.

Now, if 90 percent of public funds go into the operation of Woods Hole, how much of that 90 percent a year goes into increasing the capitalization of the assets of Woods Hole?

Dr. FYE. None of that money. I was speaking, sir, of the operating budget alone.

Mr. BAUER. Have your assets grown in the last 5 years?

Dr. FYE. Sir?

Mr. BAUER. Have your assets grown in the period of the last 5 years?

Dr. FYE. Our assets have grown. Our endowment now is about $5¼ million in market value, which, as you see, is about comparable to our operating budget.

Mr. BAUER. Then, if the National Science Foundation gives you this ship, that is an asset of Woods Hole, I presume.

Dr. FYE. Yes, sir, in that sense.

Mr. BAUER. Well, is there any other sense, Dr. Fye?

Dr. FYE. I think it is also an asset of the country as a whole, because we are very conscious of the fact that we are spending public funds, and we do our very best to arrange our program in the national interest.

Mr. BAUER. True. But you do have the title, do you not?

Dr. FYE. That is the current plan, yes.

Mr. BAUER. How much is the ship costing?

Dr. FYE. I do not know the actual costruction cost. The budget for the ship, together with design, is $4¾ million.

Mr. BAUER. That has gone up since the last year's testimony, has it not? It started off at $3½ million, as I remember.

Dr. FYE. The original grant from the Science Foundation was $3 million. There has been an increase in the actual cost of the ship because of a change in design from the original proposal which was submitted some 2 years ago.

Mr. BAUER. Now, if the Government supplied the ship and did not give it to you, that $5 million would certainly finance a lot of operations in the field of research, would it not?

Dr. FYE. $5 million would support Woods Hole for about 1 year at our current rate.

Mr. BAUER. So by increasing the capital assets, then, essentially, if you have that much money appropriated by the Congress for research in oceanography, if you could take some of that out and make it into a capital asset of a particular institution, you have depleted the funds available to all institutions, have you not, by $5 million?

Dr. FYE. Of course, oceanography rests like a three-legged stool on three——

Mr. BAUER. I hope it is not Texas Tower No. 4.

Dr. FYE. I think that it is very clear that to do oceanography we must have good scientists to start with. This is a most important factor. We must have facilities, primarily ships. And third, we must have laboratories ashore to analyze the data. It is impossible to appropriate moneys solely for operation without adequate ships to go to sea to conduct the researches. A balance between budget for operation and budgets for facilities is quite necessary to be achieved.

Mr. BAUER. Now, Dr. Fye, were you not going to get a ship on bailment from the Office of Naval Research prior to the award of the grant from the National Science Foundation?

Dr. FYE. As I stated, we are operating the research vessel *Chain*, which is owned by the Navy, title held by the Navy.

Mr. BAUER. No; I mean a new one.

Dr. FYE. No, there is no such plan at the present.

Mr. BAUER. But was there?

Dr. FYE. Before there was a grant or money budgeted within the National Science Foundation, there were discussions with the Navy for awarding the use by Woods Hole of one of the research ships planned in the Navy budget.

Mr. BAUER. Did Woods Hole participate in the design characteristics of the ship as far as compartmentalization with the ship's characteristics under the Bureau of Ships?

Dr. FYE. In the AGOR design, going back 5 or 6 years, the Bureau of Ships very graciously invited oceanographers from all the institutions in the country to submit their requirements, and, through discussions, to participate in the establishment of the needs for the research vessels funded by the Navy.

Mr. BAUER. I mean in particular the ship that was going to come to Woods Hole prior to the award of a grant by the National Science Foundation.

Dr. FYE. The Woods Hole Oceanographic Institution, as far as I am aware, was in no different position, in no favored position, in the design for the Navy research vessels.

Mr. BAUER. Did not that ship have certain compartmentalization that Woods Hole desired?

Dr. FYE. Not to my knowledge. And of course, sir, the design was completely in the hands of the Bureau of Ships after receiving the advice through discussions with oceanographers throughout the country.

Mr. BAUER. Now, I notice in the TENOC program you are due to receive two more AGOR type ships in the next few years. Do you contemplate receiving those on bailment, or are you going to go to the National Science Foundation for additional grants in the next 10 years?

Dr. FYE. The plan as I understand it, and as I indicated in my statement, would be that in the case of ships furnished for institutions such as ours through the Navy, title would be held within the Navy. The current plan within the Science Foundation, which I believe is a wise one, would be to, within certain limitations, transfer titles.

I think it is important to realize that this is not a transfer of title without some restrictions and commitments. It is required that the

ship be used for basic research, and if this use ceases, the title returns to the United States, if there is no privilege to use this as an asset of a research institute in terms of sale, without approval and complete acquiescence on the part of the Science Foundation. So that this title is one which is held only in terms of the use planned for basic research in oceanography. It could be diverted to no other use, nor could it be diverted to an asset of a private institution.

Mr. BAUER. How about the depreciation rate? Are you going to follow the Government procedure of never depreciating a ship but carrying it at its full value?

Dr. FYE. That has not been discussed with the Science Foundation. We have not thought of doing it in any other way. I would be very pleased to have any advice on that point that could be offered.

Mr. BAUER. How about the maintenance?

Dr. FYE. The maintenance of all of our ships is supported through our operating budgets, which I have already mentioned.

Mr. BAUER. In other words, the Office of Naval Research would maintain the ship that was given you by the National Science Foundation?

Dr. FYE. I would not anticipate that the Navy would supply specific funds for a ship funded by the Science Foundation. No, sir.

Mr. BAUER. Well, regardless of that, if they give you the money and you take the money out of that pot to maintain the ship, that comes from the Navy, does it not?

Dr. FYE. The way we budget for our ships, we determine as best we can in advance the operating cost for a year. This is allocated in terms of the cost per day of a ship at sea. Our ships are running anywhere from 250 to 300 days at sea, a very heavy use factor.

The total costs are reviewed at the end of each 6-month period, and then the cost per day at sea, which includes maintenance, which includes crew costs, which includes all the costs of operating a ship, are allocated to the various contracts or grants that we have in hand, or our own institution funds, depending upon the actual usage of the ship in each of the research projects.

Mr. BAUER. Thank you, Dr. Fye.

That is all the questions I have.

Dr. Fye, I forgot one thing. You mentioned that there is no need for standardization with respect to oceanographic essentials, as you are using nothing but physics and chemistry and so on. Is that correct?

Dr. FYE. I stated that I believe the primary standards of science in the fundamental disciplines on which oceanography depends are adequate in this science, as in all other sciences.

Mr. BAUER. What is your standard of salinity?

Dr. FYE. The standard of salinity is determined by first of all obtaining so-called standard water from Copenhagen, which is used throughout the world. But this in turn is only a reference standard, which is analyzed in terms of the multiple constituents of sea water. And you must actually determine by other means, and as many scientific chemical means as possible, the total constituents, to understand what is meant by using standard water now obtained from Copenhagen.

Mr. BAUER. Last year, in the testimony before this committee, Admiral Hayward pointed out that during the IGY there was a question of the oxygen values being consistent between you and your British confreres in the surveys in the North Atlantic, and he pointed out that even occupying the same stations, the same oxygens, as determined by Woods Hole and by the British, at the same depth, at the same time, were out by 5 percent one from the other. And Admiral Hayward further went on to say that it was time that standardization of the determination of oxygen was established.

Do you feel that way?

Dr. FYE. In the interest of time I omitted that particular point from the reading of my statement. The entire statement, I hope, will be in the record.

As I indicated in the statement, we at Woods Hole have taken the lead in attempting to correct this difference. But this is not a difference of primary standards. In determining the oxygen content of sea water you use, as all chemists use, the primary standards of chemistry. This was a difference in the real technique used in analysis. In order to solve this technique, it was quite necessary to do research in the basic chemical processes which were involved in the analytical techniques. It was not a matter of difference of standands.

We now believe that this difference is in great part understood, and the differences more closely resolved. They are not eliminated.

Mr. BAUER. I have not thought of the method of measuring oxygen for years, but I thought Winkler's method had been in existence for years. Does that mean that all of our oxygen values all over the world are apt to be out?

Dr. FYE. There are special difficulties in determining oxygen in sea water and particularly in the collecting of sea water; and, as is necessary on almost all research ships because of their size, to transport this water, sometimes after a long period, back to the laboratory for analysis. There is exchange with gases of the atmosphere, and there is the problem of interference of the other multiple and very complex constituents of sea water interacting in a very complicated way with the oxygen content of the water itself.

Mr. VANIK. Doctor, we certainly appreciate your testimony this morning, and we would like to go on further, but in the interests of time, we must proceed.

Our next witness is Dr. Spilhaus.

Doctor, do you have copies of your statement?

STATEMENT OF DR. ATHELSTAN SPILHAUS, CHAIRMAN, NATIONAL ACADEMY OF SCIENCES COMMITTEE ON OCEANOGRAPHY

Dr. SPILHAUS. I have no prepared statement, Mr. Chairman. In the interests of your time schedule I will touch briefly on a few points.

Mr. VANIK. We will be pleased to have your testimony.

You may proceed, Doctor.

Dr. SPILHAUS. I am Athelstan Spilhaus, from Minnesota. Mr. Chairman, I am delighted to see that the Representatives here on this committee are from Ohio and Kansas, about as far from the sea as I am.

I have just a few brief points to make on H.R. 4276. For example, it is well titled, "An Oceanographic Act of 1961," but by referring to "aquatic" resources the scope of the bill is made too broad. It leads to, let us say, the inclusion of the Great Lakes, smaller lakes, ponds, rivers, and streams. One does not know where to stop on "aquatic" resources. I believe this bill should simply refer to oceanography as such.

I merely want to reinforce what Dr. Fye said about ship titles and only add this thought: The National Science Foundation is to be commended for going about its award of a ship to Woods Hole in the way it has. A ship is merely an instrument for oceanography. It is no different than a large computing machine. In both cases, the title must rest with the using institution if the instrument is going to be used to get the best research value for the dollar. This will be the case for research sponsored by public money or private funds.

We have had experience with computing machines given by the military, in which the military retained title and control of their use. This was not as satisfactory as when the title to the computing machine, however the funds were derived, rested with the using institution.

On the matter of the Council: I have been the representative of the National Academy Committee on Oceanography, on the Interagency Committee on Oceanography. I am the only member not in Government. I feel that the work of that committee has been extremely useful. I am not an expert on how this kind of thing could be made permanent. I commend those who wish to make it permanent.

I suggest that there be more representation on the council from the people doing science. There needs to be a better balance between the people who are doing science, who come from the institutions, and, what I would call the "Potomac" oceanographers. The council is now entirely "Potomac" oceanographers.

On the matter of industry and oceanography: Mr. Chairman, I read the testimony given by an "oceanographer" by the name of Savit, whom I do not happen to know. He took issue to Dr. Ewing's comment in regard to instrumentation, that instruments for oceanography should arise from research problems.

Mr. VANIK. Can I correct you, sir, for the record, that it was not Mr. Savit.

Dr. SPILHAUS. Well, it was the other industrial representative. Thank you very much.

I want to reconcile these two statements. I have been the member of the National Academy Committee on Oceanography that has urged the involvement of industry in standard oceanographic instrumentation for survey work. I think there is no conflict in these two views. Dr. Ewing is quite right that instruments for research must be developed in institutions of research.

In the past industry has been unwilling to get into the oceanographic instrumentation business because the volume is not sufficient for them to make it pay.

I think the time has come, now, when we have large surveys, when we can involve industry, and very usefully, in standard instrumentation. This is not in conflict with Ewing's statement.

No, it was Savit who made, I thought, a rather interesting jibe. He said yesterday that when industry goes to sea, it goes for business reasons, and implied that when oceanographers go to sea, they go on a vacation. I have been to sea on the *Atlantis* in the early days, and I can assure you it is no vacation. I can, as a trustee of Woods Hole, issue a continuing invitation to Mr. Savit to come to sea with our scientists. We will put him on the worst bucket we have got, and some of them are pretty bad, and we will see if he has a vacation. The scientists work, and work hard, at sea.

One thing that is very important about this bill, and is to be commended in general, is that the interest in biology and fisheries is emphasized. In general, the Government agencies that have supported oceanography have neglected biology and fisheries. We, in the basic sciences, feel that we need additional support on the biological side of oceanography. It is not much use knowing about the physical environment in the sea, if we do not relate it to the things that live in it.

On standardization, I am afraid that Dr. Fye took the words out of my mouth. I quite agree with him. I happen to have developed an instrument that has been very widely used, called the bathythermograph. It was developed in Dr. Ewing's terms in 1937, because we wanted to do research on the Gulf Stream. The Navy used it for other purposes very extensively later on, but it never would have been developed if it had not been that we were interested in studying the Gulf Stream.

Had it been developed without regard to a research need, and had we had to standardize it in the beginning, it probably would have been stillborn.

One of the fundamental difficulties with this bill is that it starts with operations and hardware. Just as Admiral Stephan's chart shocked me a little bit, because it, too, started with operations and hardware and then research came down below. I believe that paragraph 6, which relates to the coordination of research, is the real crux of this bill, and that operations and hardware are just things that are necessary after you have laid your research program, and should be minor things.

Mr. Chairman, I hope this bill passes, in spite of these criticisms that we have made of it, and in spite of differences on some of the points. I hope it passes and I hope the corresponding bill in the Senate passes, because both have the same objective in mind, namely, to help oceanography, which is necessary for our defense for many other things that we need nationally. I think if they both pass, then you can get together and iron out the differences, and I am sure that it will be beneficial to the national program in oceanography.

Thank you.

Mr. VANIK. Doctor, we certainly appreciate your frank statement.

Do you have any questions, Mr. Ellsworth?

Mr. ELLSWORTH. No, Mr. Chairman.

I would like to say for the record that I read Admiral Stephan's chart as flowing up, rather than starting from the top down. That is the way I read it. I would certainly agree with your comment if it read from the top down.

Dr. SPILHAUS. I am sorry. As an oceanographer, we always work from the top down.

Mr. ELLSWORTH. We enjoyed having you with us.

Mr. BAUER. At this time, Mr. Chairman, I would like to introduce Dr. Bronk's comments on the bill.

Mr. VANIK. Without objection, Dr. Bronk's comments will be admitted into the record at this point.

(The comments of Dr. Bronk, referred to above, follow:)

NATIONAL ACADEMY OF SCIENCES,
Washington, D.C., May 28, 1961.

Hon. HERBERT C. BONNER,
Committee on Merchant Marine and Fisheries,
House of Representatives, Washington, D.C.

DEAR CONGRESSMAN BONNER: Sometime ago you were kind enough to send us copies of several bills that were before the Committee on Merchant Marine and Fisheries, including H.R. 4276, H.R. 4340, and H.J. Res. 234, all having to do with the furtherance of research in the general field of oceanography and marine resources. These I made available to our committee on oceanography so that they might have the opportunity to formulate comments for your consideration if they wished.

Inquiring into the developments that followed, I find that our committee has not taken a position as a group on any of the bills in question, but that the comments and views of its members and staff have been made available to you in ways that we hope have been helpful.

You will appreciate, I know, that it is not practicable to convene a committee like ours to consider an expression of views on each such bill as it comes to us. We are glad, however, when individual members, or other qualified scientists, as individuals, can be of use in discussing the issues with which your committee is dealing. I hope you will continue to feel free to call upon us for whatever assistance we are able to give.

Yours sincerely,

DETLEV W. BRONK, *President.*

Mr. VANIK. Thank you very much, Doctor. We are ahead of our schedule, and we certainly appreciate your testimony and the testimony of the witnesses that preceded you in this hearing.

There being no further business before the committee, the committee will be adjourned until tomorrow morning.

(The following was furnished for insertion by Carl H. Savit and Athelstan Spilhaus:)

WESTERN GEOPHYSICAL CO.,
Los Angeles, Calif., July 18, 1961.

Dr. ATHELSTAN F. SPILHAUS,
Institute of Technology, University of Minnesota,
Minneapolis, Minn.

DEAR DR. SPILHAUS: A transcript of your testimony before the Subcommittee on Oceanography of the House of Representatives on June 22 has just come to my attention. It is with some interest that I read your comments concerning portions of my testimony made several days previously.

Please accept my apologies for any of my remarks which would lead you to believe that I was implying that the oceanographic institutions consider research cruises as an opportunity for a rest. I recognize and freely concede that oceanographic cruises by the various institutions involve a great deal of very hard work.

The principal difference, to my mind, between the attitudes of research people and of commercial survey people is that research people approach a cruise with pleasure and derive a great deal of personal satisfaction from seeking out and discovering new information. The work tends to be varied, very intense for given periods, and slack for others. New lines of investigation can be opened up and old ones abandoned as circumstances warrant. It is not surprising, therefore, that I have received letters and post cards, as well as personal accounts, from

oceanographers, uniformly describing their cruises in terms of pure pleasure. Even the hardships are cherished and savored.

Needless to say, I wholeheartedly agree that research, to be of any value, must be approached with precisely such a mental attitude. If research is allowed to become a chore or routine, it ceases to be research and becomes mere labor.

On the other hand, when surveying of the oceans is necessary, and by surveying I mean the gathering of specific data in preselected areas, according to preset standards, the research attitude is of no use whatsoever. Such a routine task will be badly performed by research people and will, in turn, have a stultifying effect on creative minds.

Dr. Spilhaus, in return for your kind invitation to join a Woods Hole cruise (an invitation which I hope to accept soon), I invite you to visit an oceanographic survey party of Western Geophysical Co. I am sure that such a visit will demonstrate to you the essential difference between the mentality, attitude, and behavior of an oceanographic surveyor and an oceanographer. You will see highly skilled technicians, each operating in a very narrow sphere, intricately coordinated, with efficient, reliable, and highly automated machinery gathering data at very high rates of speed. The operation is the same hour after hour, day after day, week after week, month after month.

These are the kind of men who will have to survey the oceans of the world. The oceanographer must precede the surveyor as a scout, must guide the surveyor in the pursuit of meaningful data, and must interpret, understand, and use the surveyor's data after it is gathered.

These are the concepts which I had hoped to put across before the committee. In part, other members of the geophysical industry who were present to testify were to have helped build this picture. Unfortunately, scheduling did not permit the entire picture to be presented as planned.

By a copy of this letter, I am informing Mr. Paul S. Bauer, consultant to the Subcommittee on Oceanography, of my views on this apparent misunderstanding. Perhaps something can be done to amplify the record.

Yours very truly,

CARL H. SAVIT.

NATIONAL ACADEMY OF SCIENCES,
NATIONAL RESEARCH COUNCIL,
COMMITTEE ON OCEANOGRAPHY,
Washington, D.C., July 27, 1961.

Hon. GEORGE P. MILLER,
Old House Office Building, Washington, D.C.

DEAR CONGRESSMAN MILLER: At my request, Sumner Pike, Milner Schaefer, and Roger Revelle of the National Academy of Sciences' Committee on Oceanography, reviewed and prepared comments on H.R. 4276. I wish their findings to be incorporated in my testimony before your Subcommittee on Oceanography June 22.

In general, they indorse the concept of a National Oceanographic Council as a means of continuing the long-range development of a coordinated national oceanographic program.

Specifically, they recommend that:

(1) The proposed Council should have an Advisory Committee made up of leading nongovernmental marine scientists. The members of this Committee should be selected from a slate of nominations prepared by the National Academy of Sciences.

(2) The members of the Council should either be Presidential appointees at the time of their appointment to the Council or their appointment to the Council should be submitted by the President to the Senate for confirmation. There should be one member from each of the Federal Departments and independent agencies concerned with oceanography.

(3) In addition to those Council members identified in H.R. 4267, the Council should have a member from the Department of Health, Education, and Welfare, and the Department of State. These Departments have a substantial stake in a coordinated national oceanographic program. The Public Health Service is actively studying pollution problems in coastal waters and it is supporting research in marine biology. The Office of Education in HEW is concerned with the education and training of oceanographers. The State Department has cognizance of various international fisheries commissions which

do oceanographic research. Moreover, the national oceanographic program will require international cooperation and the help and participation of the State Department will be needed.

(4) The prime mission of the Council should be to develop and coordinate a cooperative interagency national oceanographic program. We believe that the Council can be particularly effective in maintaining a balance between applied research, basic research, facilities, ships, survey operations, international cooperation, and education.

(5) A substantial annual appropriation should be authorized to the Council to enable it to better develop a balanced program by direct transfer of such funds to various agencies for their authorized purposes.

(6) Adequate provision should be made for a small qualified staff for the Council headed by a highly qualified scientist.

(7) The Council should report on the progress of the national oceanographic program directly to the President and via the President to the Congress.

(8) The Council and its staff should be located administratively within the Executive Offices of the President.

I appreciate this opportunity of bringing these views on H.R. 4276 to your attention.

Sincerely yours,

RICHARD C. VETTER,
(For Athelstan Spilhaus, Acting Chairman).

(Whereupon, at 11:55 a.m., the subcommittee was recessed, to reconvene at 10 a.m., Friday, June 23, 1961.)

OCEANOGRAPHY 1961—PHASE 3

FRIDAY, JUNE 23, 1961

House of Representatives,
Subcommitee on Oceanography of the
Committee on Merchant Marine and Fisheries,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to call, room 219, Old House Office Building, Hon. John D. Dingell (acting chairman) presiding.

Present: Representatives Pelly and Lennon.

Staff members present: John M. Drewry, chief counsel, Paul S. Bauer (staff consultant).

Mr. Dingell. The committee will be in order.

The first witness this morning will be Dr. Leonard Carmichael, the Secretary of the Smithsonian Institution.

Doctor, we are very happy to welcome you to the committee this morning but before you testify I would like to make a brief remark or two.

By testimony before this committee, eminent biologists indicated their unanimous concern for the deterioration of our national position in taxonomy and systematics of aquatic biological life.

With a view to correct this apparent slippage in our aquatic scientific program, H.R. 4276 contains proposed legislative assistance.

Inasmuch as the Smithsonian Institution and its National Museum is the repository of all Government collections and has associated with it a staff of outstanding scientists, it was considered that the Smithsonian should be the logical agency to give the necessary spark to this important program.

We shall hear from Dr. Leonard Carmichael, the able and outstanding Secretary of the Smithsonian, then from Dr. Hiden Cox, Director of the American Institute of Biological Sciences and finally the Honorable Robert M. Paul, special assistant to the Assistant Secretary for Fish and Wildlife, Department of Interior.

We had hoped to hear from Dr. Juan Rivero, director of the Institute of Marine Sciences of the University of Puerto Rico but we learned yesterday afternoon that he would be unable to come.

I want to welcome and thank you for your appearance and courtesy to this committee in being with us this morning.

Do you have any members of your staff with you that you would like to introduce to the committee?

STATEMENT OF DR. LEONARD CARMICHAEL, SECRETARY OF THE SMITHSONIAN; ACCOMPANIED BY JAMES BRADLEY, ASSISTANT SECRETARY, SMITHSONIAN INSTITUTION

Dr. CARMICHAEL. Mr. Chairman and gentlemen, may I introduce Mr. Bradley, Assistant Secretary of the Smithsonian Institution.

Mr. BRADLEY. Thank you, Mr. Chairman.

Dr. CARMICHAEL. Thank you very much for allowing us to appear. I should also like to thank you for your letter asking for the comments of the Smithsonian Institution on H.R. 4276, a bill to expand and develop the aquatic resources of the United States, including the oceans, estuaries, and rivers, the Great Lakes and other inland waters, to enhance the general welfare, and for other purposes.

The Smithsonian Institution is greatly interested in the field of oceanography and welcomes the opportunity to share in the expansion of research now going on in that important area of scientific knowledge. For more than a century, since its inception in 1846, the Smithsonian Institution has fostered and encouraged the increase and diffusion of knowledge in the realm of natural sciences. Its sustained interest in oceanography has been evidenced by the many oceanographic expeditions in which it has participated and in the continuing related taxonomic activities of its highly specialized staff of scientists.

It is believed that statutory authority already exists for the Smithsonian Institution generally to engage in oceanographic activities. This authority is embodied in the act of August 10, 1846 (9 Stat. 105) and in the act of March 3, 1879 (20 Stat. 397).

In regard to the provisions of H.R. 4276, the following comments are offered:

Reference: Section 2. The establishment of a high-level National Oceanographic Council seems unnecessary in view of existing administrative arrangements to coordinate national programs assigned to various agencies by law. However, if such a Council were to be created, it is suggested that the Secretary of the Smithsonian Institution be named to membership.

I feel a little embarrassed to say that——

Mr. DINGELL. Mr. Secretary, I think you are perfectly correct in your position and I hope that you will be very vigorous in asserting it.

Dr. CARMICHAEL. Thank you.

Reference: Section 9 (a) (1). The construction of additional taxonomic facilities is not required immediately. At least during the initial stages, activities incident to the expansion of the program of collecting aquatic and marine organisms could be accommodated within the facilities of the additional west wing of the Natural History Building.

This west wing is now being constructed. I hesitate to define the word "taxonomy" since I learned the word late in life, but it is a word that refers to the whole science of correctly classifying, in biology, all living organisms.

Reference: Section 9 (a) (2). The Smithsonian Institution is not staffed to recruit, train, and place taxonomists in such number as may be required to classify fishes and marine invertebrates collected

in carrying out the purposes of the bill. We suggest that this responsibility be left with universities and other agencies which are presently handling such activities.

Reference: Section 9 (a). By provision of the act of March 3, 1879, referred to above, the Smithsonian Institution has been designated as the official repository of the governmental collection of "rocks, minerals, soils, fossils, and objects of natural history, archaeology and ethnology." However, it would be useful to redefine repository responsibility in this area and to assure that the collection and preservation of marine organisms is given proper emphasis in the expansion of oceanographic activities recently recommended by the President. We believe that repository responsibility of the Institution can be affirmed by administrative action and we shall continue our efforts in that direction. This would assure that specimens collected in the course of the various phases of oceanographic research which are no longer needed for investigations in process would not be lost but would ultimately be available for continuing taxonomic study.

The Bureau of the Budget advises that there is no objection to the submission of this report to the Congress.

Mr. Chairman, that is my official report but I would like to say a word or two more about the Smithsonian's work in this area.

I like to think we are a biological Bureau of Standards, in a sense, for all that lives in the sea. It is, of course, life in the sea that makes the sea most important from the standpoint of economic biology. It is important from the standpoint of conservation. It is important from the standpoint of many of the related sciences.

We have in the Smithsonian in organized scientific collections over 9½ million specimens in the general field of mollusks.

When I say "specimens" I do not mean just one similar shell after another, but I mean specimens that have been collected and that are maintained in study collections so that others who are puzzled about the identification of an animal can here compare the new specimen with the known specimens. That is the basis of the understanding of zoological and biological life. It is for this reason that our collections, which are certainly among the greatest in the world, are valuable—of course, there are similar great collections in the British Museum and in Russia and in most of the major countries, but our collections are certainly among the greatest in the world and, in many cases, they are the greatest.

When I speak of this large collection of mollusks I refer to the class of animals that includes oysters, scallops, periwinkles, squids, octopuses, and so forth.

We have over 1,700,000 fish specimens and ours is one of the greatest centers for scientific study of ichthyology in the world.

These collections are very important for the sort of study that is contemplated in all of this newly discussed work in oceanography. We also have over 1,700,000 specimens, cataloged and scientifically organized specimens, in the field of marine invertebrates.

The definition of the words "marine invertebrates" is a little hard, but I think it includes, and the layman may understand it best, by saying they are the animals that live in the sea that are not fish and that are not in that class of mollusks I just described, but do include such animals as worms, jellyfish, starfish, shrimp, lobsters, and crabs.

We have fine collections here of extreme importance in economic biology as well as in the general understanding of the science. I am sure that the members of the committee realize the significance, for example, of the shipworm. A good many years ago, a study was made of the losses occasioned by an outbreak of these worms that bore into pilings and all wood that is under water. In just one large area of the San Francisco (Calif.) Bay area, in a single year, it was estimated the loss occasioned by these animals was $21 million. This is significant, of course, but is not apparent when I just name off the classification of the objects with which we deal at the Institution.

We also have experts in the field of sea mammals and my colleague, Dr. Remington Kellog, is one of the world's greatest experts in whales. He is not here this morning because he is presiding at an international congress to deal with whales. The congress is being held in the city of London.

America has from its earliest days, particularly in New England, been very much interested in whaling and yet whales cannot be understood without understanding the environment in which whales live. The whole life of the sea is an organized system. We feel the role of the Smithsonian is what I have called a biological Bureau of Standards and is so important. It assists in all stages of untangling this great complex that is the wonderful life of the sea; the ecology, to use the modern word for the organization of living things in the sea.

At the Smithsonian we are also interested in the plants of the sea and I am sure the members of the committee realize that all life in the sea goes back to plants, just as all life on the land goes back to plants. The study and classification of algae, seaweed, one of the forms of living green plants in the sea, is fundamental to the understanding of everything that lives in the fresh waters of the globe or in the sea. We have been at this work at the Smithsonian for 115 years and one of the first research programs undertaken by the Institution was in the classification of mollusks to which I have already referred.

We have a worldwide reputation in all of the sciences related to living organisms of the sea and we have a long record of scientific publications in these fields.

We have established lines of cooperation with other Government bureaus, with universities, with private research organizations, and with expeditions.

Mr. Chairman and gentlemen, I may say that when we talk about some of these programs in oceanography, with which I happen to be familiar because of my general interest in the National Academy of Sciences and in the Federal Council of Science and Technology, we must not forget that people must do the work and there are not many people trained in many of the subsciences with which we are concerned.

It interested me very much when I came to the Smithsonian in my present position that there may be certain sections in biology, for example such as in echinoderms, where possibly there might be only two or three experts in the entire world.

Somebody will sweep into our place for a couple of months and work on a special part of our collection; somebody else will come from the British Museum; somebody else will come from France. These are very specialized fields, and if we are going to have a good oceanographic program, it is necessary to foster in every possible way ad-

vanced training and graduate training of scientists in these biological specialties and to allow them to augment existing staffs of exports to deal in an effective way with these subjects.

I am willing to say that if we collect numerous samples of sea water, collect large amounts of living organisms from the sea, and do not know what they are, we can easily be misled in regard to the likelihood of the occurrence of such organisms in the same area again, and the importance, for example, of the temperature of the water in producing those organisms.

The fact is that organisms are not all in the same place at the same time in the oceans, for example. These things can only be determined by scientists who understand what marine organisms are and what their behavior is.

In other words, Mr. Chairman and gentlemen, I think that the physiology, the ecology, economic biology, the radiation biology of all living forms of the oceans are fundamental in oceanographic science.

I feel that in all of these fields, the basic scientific work of the sort that is done at the Smithsonian is fundamental in making a program effective and of advantage to all of the citizens of our Nation.

Thank you, sir.

Mr. DINGELL. Doctor Carmichael, I certainly want to commend you for a very fine statement and for the help you have been to this committee in understanding these problems of oceanography, particularly insofar as it affects the great Institution of which you are a very high ranking officer.

The Chair will recognize Mr. Lennon.

Mr. LENNON. Thank you, Mr. Chairman.

Doctor, I guess it would be safe to say that of the vast multitudes who come to Washington every year, 80 percent of them want first of all to visit the Smithsonian Institution. It is a great institution in America and that is certainly my point of view.

You indicated earlier you believe the voluntary Inter-Departmental Agency Committee was sufficient, but if the Congress moved to a National Council of Oceanography, certainly you folks ought to be made an essential part of it.

The Inter-Departmental Voluntary Committee was established in January of last year and have you folks been invited to participate in their regular meetings they have held now for these last 15 or 16 months?

Dr. CARMICHAEL. We have been to some of the meetings, but I do not know if we have been invited to all of the meetings.

Mr. LENNON. Have you been asked to be made a part of this Voluntary Committee and participate with the members of your staff at a certain level in the Committee?

Dr. CARMICHAEL. I must say I do not know. I know that we have been kept informed, but the degree to which we have been an active member of the Committee, I cannot say.

I am the general administrator of the Smithsonian Institution but I cannot answer that question.

Mr. LENNON. You would make the decision as to what person on your staff would be a member of this Committee?

Dr. CARMICHAEL. Yes.

Dr. Remington Kellogg represents us in oceanographic matters, but, as I said, he is in London attending a meeting and attending to our Nation's interests in whales.

Mr. LENNON. Do you now have at your high level a member of this Voluntary Inter-Agency Committee?

Dr. CARMICHAEL. I will have to supply this information. I do know that Dr. Kellogg has attended most of these Committee meetings but whether he has actually been a member or not is a technical question which I am just not in a position to answer.

Mr. LENNON. Then you do not know whether you are a part of this present Voluntary Committee or not officially?

Dr. CARMICHAEL. Mr. Chairman and Mr. Lennon, I do not know the official connection. I do feel that we have been consulted in this matter by the appropriate agency, though.

Mr. LENNON. This committee was organized a year ago last January and it was affirmed in March of 1961 and the list of those members of the committee publicized.

Here is a list of the committee members.

Dr. CARMICHAEL. Is our name there?

Mr. LENNON. It is not. You are not represented and that is the very thing that concerns us, the fact that this so-called Voluntary Inter-Agency Departmental Committee was bypassing, we thought, the Smithsonian Institution in its invitation to different departments or agencies who had a vital interest in this program and assigning some member at the top level of their staff as a permanent member of this committee.

Let me ask you this: If we should continue to project a program under a Voluntary Agency Committee, how could the Congress, which has the responsibility for determining the progress of the program, look to anyone for accountability? To whom should we look? Should we go to the Secretary of Commerce? Should we go to the Smithsonian Institution? Should we go to the Navy? Should we go to the Department of the Interior? Should we go to the U.S. Coast Guard? Should we go to the Coast and Geodetic Survey? Should we go to the Department of Health, Education, and Welfare? Should we go to the Atomic Energy Commission?

To whom should we look to determine if this independent agency is meeting its obligations on the terms of progress in the program for this purely voluntary agency?

Dr. CARMICHAEL. Mr. Lennon, it seems to me you have made a very clear and a very good point. It would be difficult for the Congress to have a single point of reference and I presume the committee would have a chairman. I presume the chairman would provide a report and he would be subject to any questions and report to the Congress.

I must say that as you present it, I see very clearly the other side of the picture.

Mr. LENNON. We have been privileged since early last year to hear from the agencies and departments I referred to. All of them have an interest in oceanography but their interest is secondary to their principal or primary objective.

It differs with every other agency as to whatever its interest in oceanography may be.

How can we coordinate that? How can we get out of the interdepartmental jealousy even in a fixed agency by statute?

We refer to our armed services as being an integrated armed service but that is fiction and not fact. We know that even though, by statute, we told them to do it 14 years ago, that is not so. If we had it on a purely voluntary basis such as this agency is now constituted, I do not know to whom we could look. For instance, we ought to have a data center, we believe, and there ought to be an exchange of information. Testimony just this week has been that there are many organizations which are interested, even colleges and universities which have departments of oceanography. They are making tests and doing research but they do not say, in the information they gather, they can send it to a central agency where it can be disseminated.

You do not do that, I do not imagine?

Dr. CARMICHAEL. There is——

Mr. LENNON. There is no reason why you should. You are autonomous. You are within yourself.

Dr. CARMICHAEL. May I answer?

Mr. LENNON. Yes, sir.

Dr. CARMICHAEL. I think we are just that in the biological sciences. In fact, one thing that I had written to present in coming up here was that we are a data center for the biological sciences in oceanography and we have been so recognized for a great many years. It is to us that the universities come. I have no doubt that if you went to the Smithsonian today, not where the visitors are but in our great study collections, I have no doubt you would find dozens of people from other Government bureaus, from universities, from oceanographic research centers, who are at work in our laboratories. There really is no similar place for them and we, therefore, do fill that need.

Let us take the question of fish. We are the place where all kinds of fish, both salt and fresh water, are organized. There are other collections of fish in other parts of the world, but I think I can say that we have the greatest collection and data center.

Information does come in to us in regard to such matters but this is just one specialized part. It does not bear upon your very clear, and I think, your very effectively stated point. There should be an overall data center for other aspects of oceanography than the biological. If a new data center were developed, we in the biological sciences, of course, would cooperate with it. These collections occupy vast spaces and the data is often not in the written word but is in a jar full of alcohol or water which contains fish collected from a particular place in the Pacific, for example.

I agree with you on the importance——

Mr. LENNON. How close is your working relationship with the marine and biological laboratories of the Department of Interior?

Dr. CARMICHAEL. Very close.

Mr. LENNON. Research?

Dr. CARMICHAEL. In research in the areas I mentioned, it is very close. In fact, some of their people are in our building, necessarily, virtually all of the time.

Mr. LENNON. On the program accountability, you diffuse this varied interest of the various departments and agencies. You know what the Navy's primary interest is in oceanography; you know what the

primary interest is of the U.S. Coast and Geodetic Survey and the Coast Guard and others down the line, as well as the Atomic Energy Commission. If the legislative committees have to bring in the person assigned to this voluntary committee and hear from every one of these people—and the natural feeling is that they must project their point of view perhaps a little bit ahead of other agencies—that is where we run into difficulty, Doctor.

Dr. CARMICHAEL. Sir, if I may take off my hat as head of the Smithsonian and put on my hat as a member of the National Academy of Sciences, which is a civilian organization, on Constitution Avenue, which has done a good deal of work in this field and has issued a series of important reports, I cannot resist saying that I see very clearly the point you have just made.

The statement that I have presented to you is influenced, to a certain degree, as most statements are that come to the Congress, by our consultations with those who are concerned with the administration's program. And so I feel that I must make the statement in the formal sense in which I made it in my letter.

Mr. LENNON. Even though this Interagency Committee was established in January of last year and, according to their statement, they have had frequent meetings and its status was affirmed in March of this year, in view of that several persons this week have already asked to be let in, so to speak?

Mr. CARMICHAEL. Yes.

Mr. LENNON. You see the scope of this thing?

Mr. CARMICHAEL. Yes.

Mr. LENNON. Very few departments or agencies of the Federal Government do not have some interest in this program.

Dr. CARMICHAEL. We are keenly interested in it.

Mr. LENNON. We do not intend, by statute, to fix it so rigidly it could not be broadened to let in other interested agencies where they could demonstrate their right to come into this program.

Thank you very much.

Dr. CARMICHAEL. Thank you very much indeed.

Mr. DINGELL. I would like to commend my distinguished friend for his very useful questioning and exposition.

Doctor, I am sure Mr. Bauer has some questions he would like to ask.

The Chair will recognize Mr. Bauer at this time.

Mr. BAUER. Doctor, I have a few questions.

In the Smithsonian setup, is it not true you occupy a unique situation in the Government as a corporate entity? In other words, your Board of Trustees are composed of representatives of the executive department, the judiciary, and the legislative, as well as the general public?

Dr. CARMICHAEL. Yes, sir, the Board of Regents is so composed.

Mr. BAUER. I think that is a unique organization.

Dr. CARMICHAEL. Yes, sir.

Mr. BAUER. Bearing that in mind, I think it is true that you are the only Government agency which is not only a Government agency but a private institution, so you really cover the entire spectrum of all interests, do you not?

Dr. CARMICHAEL. We are certainly represented on a broad front, sir.

Mr. BAUER. As far as your operational function is concerned, you do operate the Baro Colorado installation as a field station?

Dr. CARMICHAEL. Yes, sir.

Mr. BAUER. You also have the Smithsonian Astrophysical Laboratory?

Dr. CARMICHAEL Yes, sir.

Mr. BAUER. Do you have any other field station connections? For example, I am thinking of organizations like the American Museum of Natural History which has probably half a dozen field stations, like the Lerner Marine Laboratory, and so on.

Are those the only two you operate?

Dr. CARMICHAEL. Those are the two principal ones; the astrophysical observatory does maintain, somewhat on a temporary basis, a number of observatories around the globe concerned with optical satellite tracking.

We also participate every year in many expeditions that go out to different places and I may say a good many of them are paid for by private foundations or by other governmental agencies. It has been the custom of the Smithsonian since the earliest years to participate in, and provide scientific advice for, expeditions that are mainly paid for by some other organization. I think this thrifty custom has certain advantages.

Mr. PELLY. Would you yield?

Mr. BAUER. Yes.

Mr. PELLY. I can testify as to that because, in my own family, my grandfather, who was a Dr. Minor, after the Civil War at the instance of the Smithsonian, was attached to the Coast and Geodetic Survey boat that went up to Alaska and he collected material at very little cost to your organization, and was able to contribute to the scientific gathering of material for the Smithsonian Institution.

Dr. CARMICHAEL. May I make a comment?

Mr. PELLY. Yes.

Dr. CARMICHAEL. I think the record shows that probably if Smithsonian scientists had not gone on expeditions in accompanying the telegraph company going to Alaska, then called Russia-America, the Congress would not have considered that the resources of that strange part of this continent were worth acquiring.

This has been said in more than one book, and I think it is one of the great stars in the crown of the Smithsonian, the fact that we have Alaska, which is due in no small measure to the very elaborate testimony on the natural resources of Alaska brought back by Smithsonian scientists.

Mr. PELLY. I might say that I employed one of the stenographers at the Institution at very little cost to make copies of all of the letters in those early days. They make a fascinating record on collecting of material and data, and I certainly know from my own experience that there has been a very interesting scientific way of gathering material at little cost.

Dr. CARMICHAEL. Thank you.

Mr. PELLY. That is all.

Mr. BAUER. Would it be of any assistance to enlarge your field capability, or do you think you have enough authorization to enlarge it, if you saw fit?

Dr. CARMICHAEL. I think we have enough authorization to enlarge it if funds were available. It is true, as I suggested in the letter I have just read, if legislation is to be provided, that it might be helpful to reinforce our authority by mentioning the disposition of collected materials in the legislation.

Mr. DINGELL. Would you yield?

Mr. BAUER. Yes.

Mr. DINGELL. Would that have to do, perhaps, with making the Smithsonian the repository of collected material? Would that be helpful to your institution?

Dr. CARMICHAEL. Mr. Chairman, we believe that, by law, we are that now, but as I have just said, I think if this were reinforced in later legislation, it might help to keep people cognizant of this fact.

It is true now that the Geological Survey and the Fish and Wildlife Service, and so on, after they are through with the immediate work on specimens, by law, and if we need these specimens for our collections, they are transferred to us.

Mr. DINGELL. Doctor, would you ask some of your staff people to draft us an amendment appropriate to carry out the intent of what you mentioned?

Dr. CARMICHAEL. Yes; we will.

Mr. DINGELL. Submit that to the committee.

Dr. CARMICHAEL. Yes, sir.

(In response to the committee's request for language the following is suggested as an additional subparagraph of section 9(a):)

(5) to serve as the depository of all collections of marine and aquatic organisms made pursuant to this Act when such collections are no longer needed for investigations in progress and are accepted by the Secretary.

Mr. BAUER. In the collection of specimens, I refer to the specimens collected, before the Bikini explosion—this is a priceless collection of before-atomic radiation change—are those specimens being actively worked, and de we have specimens after the Bikini explosion to compare what changes, if any, occurred?

Dr. CARMICHAEL. Mr. Bauer, subject to correction, my answer to your question in both cases is "Yes."

(NOTE.—This answer was subsequently verified.)

Mr. BAUER. When you get collections of this type, do you encourage graduate student participation in the study of these specimens in your Institution, or do you send the specimens to various universities? In other words, do you have any facility to take care of graduate study at the Smithsonian?

Dr. CARMICHAEL. Yes, Mr. Bauer. We cannot ordinarily send specimens very effectively to other places for study. In the case of some paleontological specimen, a unified thing put in a crate, for example, which somebody studying at the University of Wisconsin could be furnished, sometimes such things are sent. In general, when a man is doing a piece of graduate work and when he is working for his Ph. D. degree at California, Chicago, Minnesota, Harvard, or any other university, if his work requires—as it often does in these fields—specific study in organized collections, that man then comes to our Institution where his professor has already written to our curators. Our people are research scientists and ordinarily friends of the professors in these various fields.

This young man then will come and he may work for a few weeks, if the problem is a simple one, or a few months. There have been occasions when people have come for a few years. And this is not only true in regard to our universities, but it is true, for example, of the British Museum.

People have come over from the British Museum and have spent months, or even longer. So, with the other great museums of the country, this is the kind of scientific interchange that takes place. There is a great amount of knowledge on the part of scientists in these highly specialized fields, about which other people really do not know enough to be competent. Therefore, the experts interchange their students and interchange the knowledge that is developing in these fields.

I feel that we do help in this way. We do not, ourselves, however, provide graduate training in the sense of giving graduate credit, to use the technical university term, that would be given by the university from which the man came, say the University of California at Los Angeles, or from some other research institution.

Mr. BAUER. In conjunction with this very valuable program, do you need any more facilities?

Dr. CARMICHAEL. The Congress has been——

Mr. DINGELL. Rather penurious in giving sufficient funds?

Dr. CARMICHAEL. I wanted to say that the Congress has given us funds to add a wing, which is now going up, to our Natural History Building. This is primarily to meet these needs.

Mr. DINGELL. When you get that wing up, you will have it full of specimens you already have, and then have enough for another three wings?

Dr. CARMICHAEL. Mr. Chairman, I think your statement is a very wise statement but I hope this will not come immediately.

Mr. DINGELL. I think it should have come a few years ago.

Dr. CARMICHAEL. The Congress decided that the Natural History Building was overcrowded a great many years ago, but it was——

Mr. DINGELL. Grossly inadequate is my term.

Dr. CARMICHAEL. I do feel that at the present time, to answer the question specifically, we are so grateful for what the Congress has done in connection with the building of the east wing, and in connection with the legislation for the building of the west wing for the Natural History Building, that I feel reluctant to say we are in immediate need of additional facilities at this time.

However, the chairman is certainly correct when he says that any great growing program of this sort never permanently can exist without development of facilities.

Mr. DINGELL. I would like to point out your aircraft building as being a splendid case in point. You have some of the great national treasures in this field and yet it looks like you are housing them, to me, in a quonset hut. You have them wedged in one great big building and it does not look to me like a national treasure house but a sort of an attic.

I want to say that I think you folks should have enough money to do what you need in an appropriate way, that a great national institute of the kind you have should receive the funds from this Congress to carry out its purposes.

My remarks are not critical of you or the Smithsonian. They are critical of the way we have given you money to carry on the very high responsibility you have.

Dr. CARMICHAEL. Thank you, Mr. Chairman. I am deeply grateful for your statement.

Mr. PELLY. Mr. Chairman, would you yield?

Mr. DINGELL. Yes.

Mr. PELLY. Maybe we could have diverted some of the money going to this new office building to the advantage of the Nation.

Mr. DINGELL. Maybe we still might convert it.

Mr. BAUER. I have another question.

Dr. Carmichael, are you funded in your operations by the National Science Foundation?

Dr. CARMICHAEL. Activities conducted by the Smithsonian Institution, according to law, including the activities of the U.S. National Museum, particularly the Department of Zoology, which concerns itself with fish, mollusks, and so on, are appropriated for annually by the U.S. Congress under the heading, "Salaries and expenses of the Smithsonian Institution." However, it is true that the Smithsonian Institution does receive from the National Science Foundation, and from private foundations as well, money for specific—I think they call them ad hoc scientific research programs—projects that have to be done now that will not go on indefinitely. Funds for these studies do come to us from the National Science Foundation, from the Navy, from the Atomic Energy Commission, as well as from the Guggenheim and other Foundations and from private donors.

Mr. BAUER. With respect to other museums in the country, do you have a cooperative program with them for the exchange of specimens, study, and so on? I am thinking of the American Museum of Natural History and organizations of that kind.

Dr. CARMICHAEL. We do have.

Mr. BAUER. Do you have any publications in which you disseminate the information that you produce?

Dr. CARMICHAEL. Yes, sir; we have a publication program. It is one of the great publication programs in science. A direct result of this program is the fact that since the Smithsonian started its publication 115 years ago, it has published much important research. These publications go to universities, to scientific research centers all over the world, and back come exchange copies.

These go first into the Smithsonian Library and then are transferred to the Library of Congress. This country of ours is enriched certainly, I would say, by a million titles that have come as a direct result of the scientific publication program of the Smithsonian established by my distinguished predecessor, Joseph Henry, when he came from Princeton to start the scientific work of the Smithsonian more than a century ago.

This was when science was indeed at a low ebb in this country.

I am only the seventh Secretary of the Smithsonian Institution in 115 years.

Mr. BAUER. I hope you live 115 years.

Dr. CARMICHAEL. Thank you, sir.

Mr. BAUER. Dr. Carmichael, would you supply to the committee an organizational chart of the Smithsonian?

Dr. CARMICHAEL. Certainly.

Mr. BAUER. That is all I have to ask, Mr. Chairman.

(The material requested is included in the additional information furnished in letter dated July 11, 1961, printed below.)

Mr. DINGELL. Mr. Pelly?

Mr. PELLY. I have no questions but I would like to ask which official of the Smithsonian would be the appropriate one if a representative were added to the Council, such as the Director of the National Science Foundation included in this bill? Who would be the appropriate one?

Dr. CARMICHAEL. I think I would be the appropriate person and my title is Secretary. It is an ancient title and I think when the Smithsonian was founded, it was the title used for the principal administrative officer in this city.

It is still used by the Secretaries of the Cabinet departments.

That would make it possible for me, or for my successors, to designate the person most appropriate to go with him, or to attend in his place when he could not attend meetings.

Therefore, I think the principal administrative officer is the proper person.

Mr. DINGELL. Doctor, you are then the principal administrative officer of the Smithsonian?

Dr. CARMICHAEL. That is true, sir.

Mr. DINGELL. Apropos of that, I was wondering if you would scrutinize H.R. 4276 and give us other comments you feel might perfect the bill with regard to protecting and preserving the interests and importance of your great Institution? Would you do that for us?

Dr. CARMICHAEL. Yes, Mr. Chairman.

The letter I have prepared is in answer to this.

Mr. Chairman, I do not know whether I should make reference to this or not, but you realize that as we administer these Bureaus, which are part of the Federal establishment, we must clear statements we send formally in reply to questions from the Congress with the Bureau of the Budget.

Mr. DINGELL. I am aware of that.

I would like to receive this at the earliest possible moment. I would also like to have you so advise the Bureau of the Budget and I want your honest recommendations and not the recommendations of the Bureau of the Budget.

I think this would be most helpful to this committee.

Dr. CARMICHAEL. Yes, Mr. Chairman. We will submit that.

(The information follows:)

JULY 11, 1961.

Hon. JOHN D. DINGELL,
Committee on Merchant Marine and Fisheries, U.S. House of Representatives, Washington, D.C.

DEAR MR. DINGELL: This responds to your request for answers to specific questions raised at the committee's hearing on June 23, 1961, on H.R. 4276, a bill to expand and develop the aquatic resources of the United States including the oceans, estuaries, and rivers, the Great Lakes and other inland waters, to enhance the general welfare, and for other purposes.

The Smithsonian Institution is greatly interested in the field of oceanography and welcomes the opportunity to share in the expansion of research now going on in this important area of scientific knowledge. For more than a century, since its inception in 1846, the Smithsonian Institution has fostered and encouraged the increase and diffusion of knowledge in the realm of the natural

sciences. Its sustained interest in oceanography has been evidenced by the many oceanographic expeditions in which it has participated and in the continuing related taxonomic activities of its highly specialized staff of scientists.

Several of the divisions of the Department of Zoology in the Smithsonian's Natural History Museum are particularly active in this field.

The Division of Marine Invertebrates is concerned with the protozoans or single-celled animals, sponges, hydroids, jellyfishes, sea fans, sea anemones, flatworms, rotifers, hair worms, round worms, bryozoans or moss animals, feather stars, starfishes, brittle stars, sea urchine, sea cucumbers, segmented marine worms, earthworms, leaches, horseshoe crabs, sea spiders, fairy shrimps, copepods, barnacles, wood lice, shrimps, lobsters, crabs, sea squirts, and related forms. Most of these animals live in the sea, but many are found in fresh water.

A few of the invertebrates that live in the sea, such as the shrimps, lobsters, and crabs, are food resources known to everyone. Numerous less familiar forms, however, play an even more important role in the general economy of the seas, lakes, ponds, and streams. They form the basic food of fishes and other animals which, in turn, are utilized by man in various ways. They are the scavengers that help keep the aquatic environment unpolluted. Several are parasites of animals useful to man or act as intermediate hosts of other parasites that may be harmful to man. Others are of great economic importance as fouling organisms on ships hulls and as boring animals destructive to marine structures. Some contribute substantially to the noise level beneath the sea surface and thereby seriously interfere with underwater sound equipment that is becoming increasingly important in naval warfare. A knowledge of the somewhat simplified biochemical and physiological processes of invertebrates is often necessary to an understanding of the more complex processes of the higher animals, including man.

Basic information on the kinds and distribution of these animals, which the Division of Marine Invertebrates attempts to provide, is therefore often a prerequisite to successful attacks on problems that have a direct bearing on man's welfare and survival. Because of the wide scope of its interests and its extensive and comprehensive collections (one of the three largest collections of its kind in the world), the Division acts as an identification center and a clearinghouse for marine biological information. The Division has 1,735,501 specimens in its reference collection. These collections must be used in the identification and proper classification of materials brought in as a result of oceanographic research.

The scientific work of the Division, both field work and the preparation of reports and monographs for publication, is necessarily restricted in scope because the limited staff cannot cover all of the diverse groups under its jurisdiction. Frequently the published research of the Division results from requests for information of a specific character from other Government and private agencies and institutions. Only occasionally are time and personnel available for the revisions and monographs that have much more far-reaching importance. Considerable time of the professional staff is also devoted to the evaluation and preliminary editing of manuscripts prepared by collaborating specialists in other institutions and by other persons working on the national collections of marine invertebrates.

The Division of Fishes deals with the origin, distribution, classification, nomenclature, and relationships of the fishes of the world and with the peculiarities that characterize them. It is concerned with the habits, ecology, variation, developmental history, hybridization, and evolution of both fresh-water and marine fishes and indirectly with the conservation, economic utilization, and fisheries management of commercially valuable, rare and vanishing species. Having the custody of the largest research collection of fishes in the world, the scientific staff identifies and classifies fishes. There are about 40,000 different species of living fishes in the world classified among 47 orders; these are divided into 638 families. Some of the more important orders are: Branchiostomoidae (lancelets); Petromyzonoidae (lampreys); Myinoidae (hagfishes); Selachoidae (sharks); Lamnoidae (mackerel sharks); Squaloidae (dogfish sharks); Batoidae (rays); Chimacroidae (ratfishes); Acipenseroidae (sturgeons); Isospendyloidae (salmon and herring); Ostariophysoidae (minnows and carp); Apodoidae (eels); Cyprinodontoidae (toothed carps); Anacanthoidae (codfishes); Percomorphoidae (perch and bass); Pleurenecoidae (soles and flounders); Plactognathoidae (triggerfishes); and Pediculatiformae (anglerfishes).

Of the 40,000 known kinds of fishes in the world, the National Museum has examples of about half. These natural-history collections accompanied by accurate records, form the basis of the science of ichthyology, just as cataloged books in the Library of Congress preserve the recorded knowledge and history of mankind. In connection with comparative studies on species, subspecies, and races, the research workers in this Division study the principal morphological characteristics of specimens and establish, on the basis of morphology, standards of classification. The Division has 1,704,654 specimens in its reference collections. The use of these collections is basic in many research problems in oceanography.

Much of the scientific work of the staff is carried on in cooperation with other Government departments or foreign governments, as well as through contracts with individuals and various organizations. The performance of scientific work required a background of highly technical knowledge and experience gained through years of intensive study and familiarity with the fishes of the world. With the fundamental knowledge, ability, and initiative to do creative investigations, the staff increases and diffuses ichthyological knowledge to mankind. This work is made possible by having at our fingertips a large divisional library and many drawings and photographs of fishes. As a result, the Division (1) publishes revisions of families, genera, and species; (2) prepares reports on the fish fauna of certain areas; (3) initiates studies with institutions and private individuals; (4) develops techniques and methods of studying fishes; and (5) prepares manuscripts of life history, habits, ecology, distribution, anatomy, physiology, and conservation of fishes.

The Division of Mollusks is charged with the study of the mollusks of the world. These are found almost everywhere on this globe, from the depths of the oceans to the reefs, rocks, and sands that fringe the continents, on the land from the lush tropical jungles to the desert wastes and high barren mountain peaks, and in almost all fresh-water rivers, streams, and ponds. In the oceans are found representatives of all the five classes into which the molluscan phylum is divided: the Crepipoda (or Amphineura), including the chitons or coat-of-mail shells; the Scaphopoda or tooth and tusk shells; the Pelecypoda, including the edible oysters, scallops, pearl oysters, and claims; the Gastropoda, which include many different groups, such as the limpets, periwinkles, conchs, cowries, and whelks; and finally the Cephalopoda, the most highly developed group of mollusks, including the squid and octopus. In the fresh water we have the river and pond snails among the Gastropoda, and the fresh-water mussels and fingernail clams among the Pelecypoda. The Division deals with the identification, classification, relationships, nomenclature, and geographic distribution of the mollusks and studies their structure, life habits, ecology, variation, and evolution, as well as their economic importance.

Many mollusks are closely connected with man's life. Oysters, clams, and scallops, for instance, are important food items. *Teredo*, the shipworm, is a great destroyer of pilings and other wooden structures along our coasts. Many fresh-water mollusks are directly implicated in severe diseases of man and livestock by acting as intermediate hosts to larval stages of parasitic worms. It is estimated that probably 100 million persons in China alone suffer from schistosomiasis induced by the oriental blood fluke.

The Division has 9,677,070 specimens in its reference collections. The Division undertakes the identification of the mollusks in the collection, probably the largest in the world, with a view to arranging them properly in a natural classification. This is done by comparing them with specimens already authentically named (including types) and by consulting the books and publications in the sectional library, the finest collection of books and articles on mollusks in the country. This may result in the preparation of brief articles or extended monographs on the mollusks of a certain region (such as "A Manual of the Recent and Fossil Marine Pelecypod Mollusks of the Hawaiian Islands"), or the known species included in a certain genus or family or larger unit (as "A Monograph of the American Shipworms"). It likewise involves the preparation of card indices of species of mollusks of certain areas, or those included in certain groups. The preparation of bibliographies of molluscan literature is also a necessary adjunct.

A project that has been carried on for a number of years in a study of the marine mollusks of the western and central Pacific, in cooperation with other institutions and with the aid of other Government agencies. It reflects the increasing interest in the marine life of the Pacific and is directly related to

the atomic bomb testing carried out in the Pacific area, and its possible effect on the life of the ocean.

In addition, the Division carried on investigations at the request of or in conjunction with other Government agencies or outside institutions, collects mollusks while taking part in expeditions or explorations of regions of which the mollusks are little or imperfectly known, and evaluate manuscripts on mollusks submitted for review and criticism.

The present Smithsonian staff in the Divisions of Marine Invertebrates, Mollusks, and Fishes comprises approximately 25 positions with an annual budgetary allotment of approximately $200,000. Subject to budgetary limitations and to the availability of professionals skilled in these fields, substantial increases in the staff are indicated in the future, particularly in view of the current expansion of oceanographic research on a broad front.

In the field of plant science, it must be kept in mind that all animal life in the sea ultimately depends upon plants-diatoms, microscopic and small algae, seaweeds, and sea grasses and their relatives. The composition of plankton, an important element in the food chain of the sea, cannot be understood without a knowledge of the identity of its plant components. At present the Smithsonian staff includes only one diatomist: expansion of the staff to provide for adequate coverage of the taxonomy of algae and other marine plants is urgent.

In addition to research in the area of biological oceanography, it should be added that our Department of Geology is also concerned, since these scientists study marine fossils as well as terrestrial. As examples, studies of the fossil record and evolutionary history of such marine groups as brachiopods, bryozoa, and echinoids are now in progress. A study of foraminifera impinges upon the living forms, and a current staff member has made several trips with logistic support from the Woods Hole Oceanographic Institute. The physical geologists on the Museum of Natural History staff are not at present studying marine deposits or the physical properties of the oceans, but expansions in this direction is a distinct possibility.

The provisions of section 9 of H.R. 4276 relate specifically to the activities of the Smithsonian Institution. In our letter of June 23, 1961, we advised that statutory authority already exists for the Smithsonian Institution generally to engage in the natural history phases of oceanographic activities. This authority is embodied in the act of August 10, 1846, and in the act of March 3, 1879.

In response to your direction the following additional comments are furnished. Regarding section 2 which provides for the establishment of a National Oceanographic Council, we reiterate our earlier suggestion that if such a Council were to be created, the Secretary of the Smithsonian Institution be named to membership in view of his responsibilities in this field. Smithsonian is not a member of the Interagency Committee on Oceanography although we are generally informed of its transactions. In this connection it should be noted that I serve as chairman of the standing committee of the Federal Council for Science and Technology, as an associated inter-agency body.

In reference to section 9(a)(1), which would authorize the construction of additional taxonomic facilities, we believe that such authorization may well be needed in the future as this program advances and collections of acquatic and marine organisms accumulate. The construction of the authorized additions to our Museum of Natural History which is now underway, however, should provide the necessary expanded work room and laboratory space for our needs in the immediate future.

In reference to section 9(a)(2), we advised earlier that the Institution is not currently staffed to recruit, train, and place taxonomists in such number as may be required to classify fishes and marine invertebrates collected in carrying out the purposes of the bill. We recognize the need to develop specialists in this field, however, and should the Congress establish such a program the Smithsonian Institution would of course be pleased to cooperate in every way consistent with the terms of such an authorization.

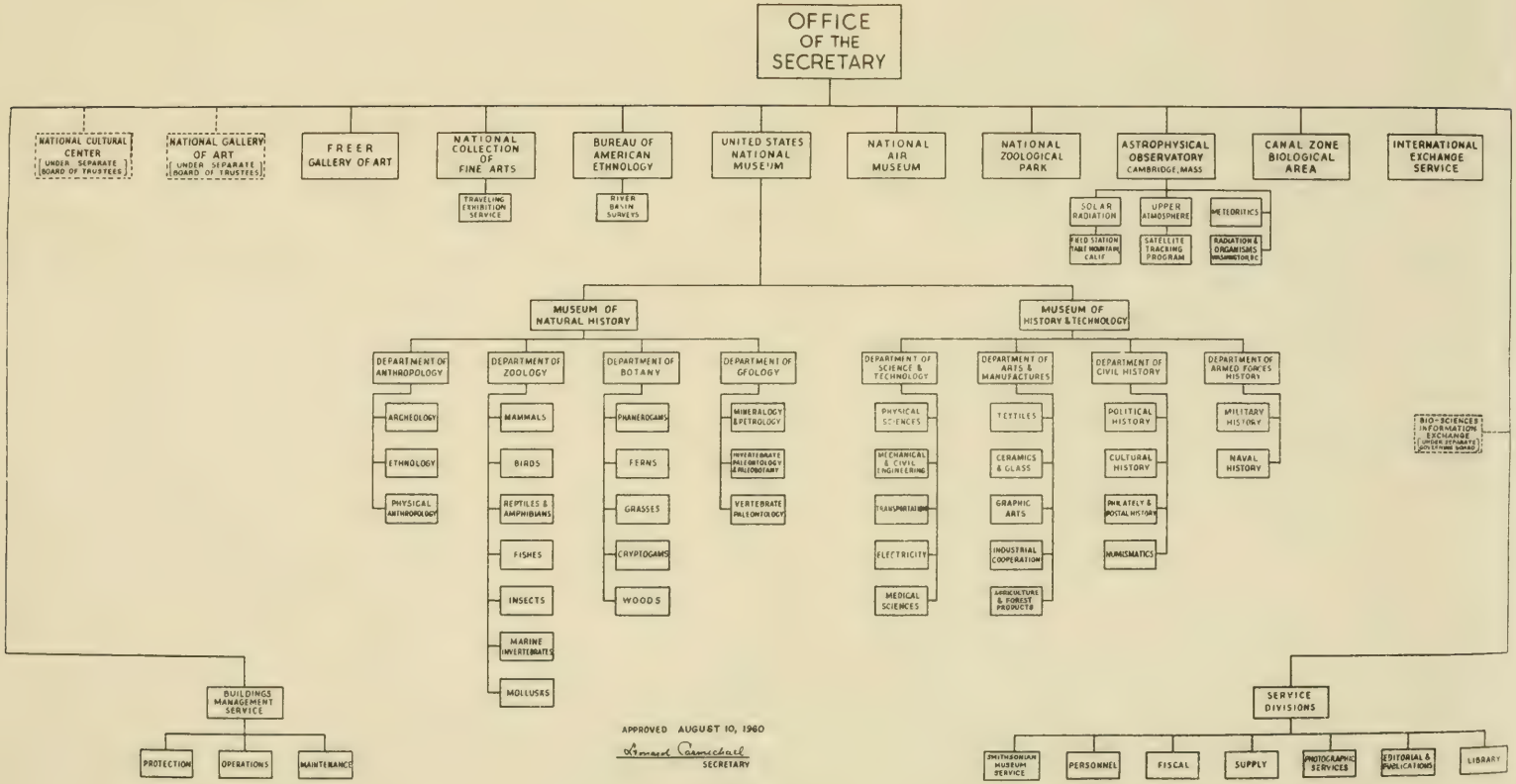
One effective means of encouragement would be the provision of fellowship or grant opportunities for graduate study and research in connection with the programs of the Institution.

In reference to section 9(a)(3), the Institution does not now have authority to make grants of funds or fellowships to qualified scientists, institutions, laboratories, or museums for taxonomy relating to marine organisms.

In reference to section 9(a)(4), the Institution does cooperate with other governmental agencies and with other public and private organizations in this

SMITHSONIAN INSTITUTION

ORGANIZATION CHART



APPROVED AUGUST 10, 1960

Leonard Carmichael
SECRETARY

field of marine science. If the Congress should adopt comprehensive legislation as envisioned in H.R. 4276, it would be well to emphasize cooperative endeavor among all concerned in this field of marine science.

By provision of the act of March 3, 1879, the Smithsonian Institution is designated as the official depository for governmental collections of "rocks, minerals, soils, fossils, and objects of natural history, archaeology and ethnology, when no longer needed for investigations in progress." We believe that the depository responsibility of the Institution is being discharged satisfactorily and that it can be strengthened by further interagency action. If the Congress should adopt the comprehensive legislation expressed in H.R. 4276, however, it would be useful to redefine our depository responsibility in order to assure that the collection, preservation and documentation of marine organisms is given proper emphasis in the expansion of oceanographic activities.

In response to the committee's request for language the following is suggested as an additional subparagraph of section 9(a):

"(5) to serve as the depository of all collections of marine and aquatic organisms made pursuant to this act when such collections are no longer needed for investigations in progress and are accepted by the Secretary."

There is enclosed in further response to your request an organization chart of the Smithsonian Institution.

Sincerely yours,

LEONARD CARMICHAEL, *Secretary.*

Mr. DINGELL. You may advise the Bureau of the Budget and if they are reluctant to cooperate, I would appreciate being notified.

You mentioned that it was your feeling that this is being done by Executive order, or at least the provisions of H.R. 4276 are being substantially carried out by Executive order.

Is it your feeling we do not exactly need this bill to make it a part of the oceanographic arts and sciences?

Dr. CARMICHAEL. Mr. Chairman, I think my answer is that it is the belief of the Smithsonian Institution that if the present arrangement for oceanography is facilitated and carried forward in the most effective way possible, it would be possible for us to perform the functions that are necessary under the existing regulations.

However, as an andividual, and in view of the discussion I have heard here this morning, I do not feel I am competent to say that this legislation is not needed.

Mr. DINGELL. Doctor, I want to thank you very much.

Mr. LENNON. One more word, Mr. Chairman.

Mr. PELLY. Mr. Chairman?

Mr. DINGELL. I would be glad to yield to either one of you.

Mr. LENNON. Dr. Carmichael, you have seen the bill?

Dr. CARMICHAEL. Yes, sir.

Mr. LENNON. You have studied the language in section 9 on page 5 of the bill with reference to the Smithsonian Institution?

Dr. CARMICHAEL. Yes, sir.

Mr. LENNON. Mr. Chairman, I overlooked this the other day, but Prof. Edwin J. Lewis of the George Washington University School of Business and International Affairs, in his testimony specifically recommended, speaking of the part that you would play under section 9 of the bill, concludes in his testimony with reference to the Smithsonian by saying:

> There would be considerable merit, therefore, in adding both of these agencies to Council membership.

He means there the Smithsonian and Health, Education, and Welfare. I am reminded that someone else is thinking of you.

Dr. CARMICHAEL. Thank you very much. We do feel that that is very true.

Mr. DINGELL. Doctor, I certainly want to thank you for a very splendid and helpful statement, and we hope that you will understand some of the remarks of the Chair were not intended by way of criticism either of yourself or the great institution you represent, but rather by way of criticism of the state of affairs which has permitted the Smithsonian to fail to have the funds to operate in the public interest.

Dr. CARMICHAEL. Thank you very much, Mr. Chairman.

Mr. DINGELL. The Chair will recognize next Dr. Hiden Cox, director of the American Institute of Biological Sciences.

Doctor, we are privileged to have you with us this morning, and you are certainly welcome.

Do you have anyone with you this morning you would like to have sit beside you at the witness table?

Mr. COX. Yes, Mr. Chairman.

I have with me my deputy, Dr. John R. Olive, and ask if he might sit with me.

Mr. DINGELL. Proceed.

STATEMENT OF DR. HIDEN COX, DIRECTOR, AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES; ACCOMPANIED BY DR. JOHN R. OLIVE, DEPUTY EXECUTIVE DIRECTOR, AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES

Mr. COX. I am Hiden Cox, and I am the executive director of the American Institute of Biological Sciences, although I hasten to add I am not testifying in behalf of the institute this morning.

I find always in situations of this sort that I am placed at a disadvantage personally, since I always seem to follow such distinguished people as Dr. Carmichael.

Secondly, I must say I am not even a marine biologist, and yet I have been asked to testify upon a bill involving that aspect of biology.

However, proceeding from the assumption that whatever helps that segment of biology helps all biology, then I do welcome the opportunity of submitting my comments on this bill.

This bill, in my opinion, is quite an excellent bill and I believe that all science will benefit by its passage.

As a biologist, I am understandably gratified that there is especial emphasis upon the development of biological aspects of oceanography. It is becoming increasingly apparent, I think, that most major scientific breakthroughs of the next several years will be biological and I commend the sponsors of this bill for their vision and foresight.

I am in favor of the establishment of a National Oceanographic Council which would be charged with responsibility to develop the aquatic resources of the United States along the lines stated in this bill.

Any group of this sort, if it were to have representation from all involved sciences, would obviously be unmanageable and I have every reason to be confident that the distinguished persons who will constitute this Council will seek advice from practicing scientists in the many fields of biology which contribute to marine biology.

I personally approve heartily the provision for a national oceanographic data center or centers.

I take it from the wording of this portion of the bill that the sponsors feel that several centers may be needed. I am inclined to agree and am hopeful that these centers may be truly international and not all necessarily located in the United States.

In connection with data centers, I am sure you gentlemen are fully aware that there are fundamental differences in operation and purpose between a data center and an information center. An information center is quite a different and more difficult operation than a data center.

Both are urgently needed in marine biology as well as in all fields of biology.

The information exchange problem is more acute among biologists probably than among scientists of any other field. In primary publications alone, it has been conservatively estimated—and I am restricting this to serial publications, those that come out regularly one or more times per year—that there are between 30,000 and 50,000 journals in the world publishing original biological research. These journals contribute perhaps as many as 2 million new research articles per year to our already overburdened information exchange system.

New journals are arising at an annual rate of about 4,000 and, unfortunately, the journal death rate is only about 2,000 per year. The situation will get worse before it gets better. Biologists are aware of the magnitude of their problem and through the AIBS, with support of the National Science Foundation, they are actively pursuing solutions to their information problems. It is essential that development of oceanographic data centers and/or information centers be coordinated with the efforts biologists already are making to solve the chaotic state of their information exchange system.

The provision in section 5 for establishment of a National Instrumentation Test and Calibration Center is undoubtedly worthwhile and should be done. Probably an unnecessary word of caution is that biological instrumentation has not yet reached the level of sophistication of instrumentation in other scientific fields. Bioinstrumentation as a field or as a technique is in its infancy and I am told by my colleagues that there is wide disagreement on the proper ways of using instrumentation in biological ecological systems. I should hope that the setting of standards would be done in such a way that the development of instrumentation for biology is not inhibited.

In section 6 the Council is quite rightly directed to develop long-range plans for research development studies and surveys of aquatic environments. I am sure that the sponsors of the bill had in mind that these studies and surveys should be of a continuing nature and not just single one-shot surveys. Not entirely germane to this point is the fact that many of us feel that we as a nation are not utilizing to the maximum our potential for making such continuing, frequent, periodical collections of biological materials from the oceans. As an example, our merchant marine and in particular our regularly scheduled ocean liners could make plankton hauls periodically. The addition of a trained technician and equipment to these ships would be a relatively inexpensive way of collecting samples at regular, periodical, intervals over extended periods of time.

I especially wish to commend the sponsors of the bill for their wisdom in including section 8 in the bill. There is no doubt in my mind but that this provision can permit maximum utilization of vessels which will be built for oceanographic research. The retention of title by the United States will permit the assignment of these vessels to be used to their maximum capability. This is an extremely farsighted attitude.

It is superfluous to say that the Smithsonian Institution is one of the great taxonomic research centers of the world. I can only commend the bill's emphasis upon development of taxonomic research facilities in the Smithsonian and for the emphasis upon recruitment and training of taxonomists. I would under no circumstances recommend that this part of the act be changed. As the committee is aware, however, marine biology is a considerably broader field than just taxonomy. Our effort in marine biology, which is, of course, a substantial part of oceanography, must be strengthened in all fields of biology which have anything to do with the aquatic environment. Attention should be given to the development of facilities, and the identification, training, and research support for all other fields which can contribute to our knowledge of our aquatic resources and their utilization. Such fields as ecology, biophysics, biochemistry, physiology, animal behavioral studies and cytology are but a few. In a very real sense, it seems to me, all of biology is, or should be, affected by increased support of marine biology.

There is one provision which I would like to see stated in the bill. This would be thought of as contributing to the mobility of biologists. A great deal can be gained by encouraging biologists of one research institution to spend time at others. Any such support of the exchange of people in marine biology with the resultant exchange of ideas and information is a good scientific investment.

I hope, and I am sure the bill's sponsors agree, that the very worthwhile end products of this bill will benefit biology internationally. Political boundaries are nonexistent in science and particularly so in biology. I would strongly advise that all things which come out of this increased effort in aquatic science will be available equally to biologists of the world. It might not be inappropriate to point out here that many biologists feel that an international biological project is desirable and there are preliminary plans now being made to propose such a project. Groups of biologists operating within the framework of the National Academy of Sciences, the American Institute of Biological Sciences, and other organizations are discussing advantages that might accrue to the world from such an IBP. There is no sentiment that I can detect that biology should mimic the highly successful IGY but we feel that there are many efforts that should be undertaken on an international cooperation basis. Many of our most pressing world problems, population control, food production, and living standards, the conquest of cancer and other diseases, the effects of radiation, all are biological. Far beyond these programs are many others which can be pursued effectively by concerted simultaneous international biological researches, simultaneous observations of animal migrations, for example; a coordinated effort to determine the extent of trichinellosis throughout the world; international expeditions into as yet biologically unexplored parts of the world.

We must learn to husband the biology of abundance—the tropics, and the biology of paucity—the arid lands. On the other hand, even if no major biological problems are solved directly by such an international effort, the money and energy will not have been spent in vain. I am convinced that one of the ways by which world tensions may be lessened is by increased international contact among scientists. Also, the resulting improved communication among biologists will have been worth the effort itself. Any major effort to bolster our research in and development of aquatic resources should be considered within the framework of an international biological project.

It has been a privilege for me to direct these remarks to your committee, and I commend this entire group for its thoughtful attention to the problems of marine science which are facing us.

Mr. DINGELL. Mr. Lennon?

Mr. LENNON. No questions.

Mr. DINGELL. Mr. Pelly?

Mr. PELLY. No questions.

Mr. DINGELL. Mr. Bauer?

Mr. BAUER. Mr. Cox, several witnesses have expressed the opinion that in a study of the aquatic environment there should be a division between fresh water and salt water. Does this apply to thinking in respect to studies of biological inhabitants of the environment? In other words, should there be a distinction between the study of fresh water and a study of salt water?

Mr. COX. I would cover myself by saying I am not a marine biologist, I am a botanist by training. In the field of plants, in which I would have some competence, I should not think there is a clear-cut distinction between salt water and fresh water. I do not think there is a clear-cut distinction between salt water researchers and fresh water researchers.

Mr. BAUER. Could Dr. Olive perhaps talk to the distinction with respect to the zoological inhabitants?

Mr. COX. He could.

Mr. OLIVE. I think I would state that I, too, see no clear distinctions. Actually, I would look at fresh waters as being models perhaps that could apply very nicely to the oceans. It is entirely feasible that we should look at these more carefully in terms of the size of the body of water. It becomes much more tenable for us to carry out investigations, long range, take those findings and apply them to the oceans. Actually, if you go back in history, you will find the great majority of oceanographers have been trained as fresh water biologists. At least, they had their roots in fresh water habitats.

Mr. DINGELL. Is it not also true that back in the beginning of the earth the oceans were not salt but have become salt by reason of the leeching from the earth?

Mr. OLIVE. You are precisely right, sir.

Mr. DINGELL. So this may be still more further illustrative that they actually are models in how close is the biology of salt water and fresh water.

Mr. OLIVE. I would agree, Mr. Chairman.

Mr. BAUER. In other words, it is the opinion of both Dr. Olive and Dr. Cox that there would be no advantage in the study of basic biology to split the national program into fresh water and salt water?

Mr. Cox. I see no advantage, Mr. Bauer.

Mr. BAUER. With respect to the question of sampling at sea in synoptic fashion of biology, referring to plankton, is it not true the development of high speed samplers that can be used with a ship of opportunity, as it has been called—a merchant ship traversing a certain course—would that not be a highly desirable development?

Mr. COX. Again I would ask Dr. Olive to speak on that. You are getting two witnesses here for the price of one. He is a zoologist, I am a botanist.

Mr. OLIVE. I came along for the ride.

Mr. COX. You are getting one.

Mr. OLIVE. Certainly the techniques being developed, referring to such things as use of the Hardy plankton sampler, is extremely efficient. The Toronto sampler is another that has been explored. It would seem the potential has not been tapped, that as Dr. Cox mentioned, ships traversing the same route over and over approximately, could give us much in terms of zoogeographic information that is lacking. There are great gaps. We collect only sporadically. Somebody said it is like taking a plant grab from a jet aircraft as you speed over the desert. This is about where our state of knowledge is at this time.

Mr. BAUER. Dr. Cox, you mentioned strengthening section 9. Would you be willing to give the committee the benefit of your thinking as to possibly how it could be strengthened?

Mr. COX. Which section is that?

Mr. BAUER. The one on the Smithsonian. You are familiar with the cooperative program of the Scandinavian countries Dr. Thorson is interested in—Sweden, Finland, Norway, and Denmark.

Mr. OLIVE. I am aware of that.

Mr. BAUER. Do you think his approach is a good one?

Mr. OLIVE. I am not sure I completely understand which portion of the approach.

Mr. BAUER. Where they exchange students to study the various areas between the countries.

Mr. OLIVE. That is the one I hoped you were talking about.

Mr. BAUER. Mr. Chairman, I have a personal letter from Dr. Thorson in Copenhagen, which he has given me permission to insert in the record.

Mr. DINGELL. Without objection, it is so ordered.

(Dr. Thorson's letter follows:)

MARINBIOLOGISK LABORATORIUM,
KØBENHAVNS UNIVETSITET,
Grønnehave, Helsingør, November 23, 1960.

Mr. PAUL S. BAUER,
Consultant to S.P.E.C. Subcommittee on Oceanography,
House of Representatives, Washington, D.C.

DEAR PAUL S. BAUER: Thank you so very much for your letter, too long ago, and for your two kind telephone calls from Washington. It often happens to me, that letters and questions, which I feel I have to answer especially thoroughly, are postponed and postponed, because I never find time to do it well enough.

Today, however, I have finally managed to "take a day out of my life" to give you a detailed answer on your questions, and here it is.

In Denmark we have two main institutes of marine biology: The Practical Fishery Investigations (address: Charlottenlund Slot, Charlottenlund. Director Dr. Erik Bertelsen) under the Ministery of Fisheries. A part of this institute

also comprises the Fishery Board for Greenland. Then we have my institute: The Marine Biological Laboratory belonging to the Copenhagen University under the Ministery of Education.

The practical fisheries investigations started as a most important scientific institution with such famous research workers as C. G. Johs. Petersen, Johannes Schmidt, and Martin Knudsen. Now, however, this institution is strictly focusing on practical studies and only that, and much of its time is devoted to routine work: following the growth and migrations of fish populations without adding too many new ideas. Among the people working there are, however, several good scientists who should want to do basic research, but their routine program is so comprehensive and the Ministery of Fisheries is keeping them so busy on practical problems, that they may hardly get any time for basic research.

My institute under the Copenhagen University is exclusively focusing on basic science, but since our basic research work is concentrated on the planktonic larvae, on life cycles, on the upgrowth of the invertebrates of the sea bottom, the balance between predators and their prey animals, et cetera, our results nevertheless are of much practical significance. We also have a very narrow collaboration with the Zoological Museum of the Copenhagen University, where I have been a curator during 23 years. Several of the zoologists from the museum are working in our laboratory on living material, and the specialists of the museum help us identify animals, which we wish to study in detail. It only takes 1 hour by train from Copenhagen to Elsinore, and since we have got a guesthouse where people may sleep at night, we may offer our colleagues from Copenhagen good facilities during their stay here, and we have a very good collaboration.

As you probably know, our institute is only a "baby": 2½ years old, while the other Scandinavian countries: Sweden, Norway, and Finland have had such marine stations for 40 to 70 years already. On the other hand our station, being fully new, has been able to exploit all the modern technical stuffs and apparatus to make it fully modern. Our station, however, is a very small one only (too small already), but extremely well situated at the very border of the sound and just at the harbor. We have an excellent 33 t cutter: "*Ophelia*" (8.3 knots, 6 cylinders, 100 horsepower Rolls Royce diesel motor) which brings in fresh material everyday, and all animals, even those from deep water in the Skagerak, seem to live well in our aquaria, which are based on a system of recirculating water, 60 m^3 in all.

Our staff, so far, consists of four permanent scientists and six nonscientific assistants and technicians, among them our mate and our fisher on the boat. We also have managed to build up a very good library already (18,000 reprints fully filed, several of the most important periodicals). Much and good research work is already done, and several young Danish zoologists are being trained.

Besides our research work, we also give courses (classes) during the 3 summer months, and here is a most important thing: We give classes as well for the Danish students of the Copenhagen University as also the Swedish students of the Lund University. They all are taught by Danish teachers, and every year in August we, furthermore, have an Interscandinavian specialist course, comprising about 15 trained young marine biologists from Finland, Norway, Sweden, and Denmark.

I am going to tell you more about this, but first I shall have to add, that outside the two institutions mentioned (Charlottenlund and Elsinore) we also have good marine biologists associated with other institutions. Dr. Anton F. Bruun is in the Copenhagen Zoological Museum. Professor E. Steemann Nielsen is in the pharmaceutical high school, but we all keep in close contact and are working eagerly together. So, in Denmark there is no distinct line between the systematic zoologists in the museum and the biologists and ecologists at Elsinore or Charlottenlund. We have very good relations, and our students are trained equally well in systematics as in ecology. Also the University of Lund stresses systematical knowledge as most important but are doing a bit less ecology than are the Danish students.

The most important of all, which I have to tell you about, is the fairly new Interscandinavian collaboration-programme in marine biology. Encouraged by the great success of the Scandinavian Airlines System, the Scandinavian Governments finally realized that as soon as all four countries put their efforts together as a unit, they might exploit their forces much better. This led to the start of a "Nordic Council" (prime ministers and ministers of foreign affairs) and a

"Nordic Culture Commission" (Ministers of Education and University rectors) to coordinate the efforts inside Scandinavia. The Culture Commission set down an expert committee for marine biology, which made a detailed proposal for Interscandinavian collaboration. On the basis of this proposal the "Nordic Council for Marine Biology" was erected some 3 years ago. The Council consists of 4 members, one from each county: Prof. Hans Brattström (Norway), Prof. John Runnström (Sweden). Dr. S. G. Segerstråle (Finland), and myself (Denmark, President). We get equally large amounts of money, viz 50,000 Danish crowns from each country each year, making a total of 200,000 Danish crowns. For these funds we manage to carry out the following programme of collaboration: In each of the four marine laboratories: Espegrend, Kristineberg, Tvärminne and Elsinore we permanently have an exchange stipendiate from another Northern country. His salary is paid by the government in the country, where he is a guest, and this means that on an average a young marine biologist from each country will get 1 year's training in a laboratory of another Scandinavian country, combining during this year research work and staff work. Furthermore, each of the four laboratories mentioned above each year gives a specialist course. Fifteen selected young students in marine biology participate in this course every year with an equal share to Finnish, Norwegian, Swedish, and Danish students. Since other specialist courses are taking place the same time at the other three Scandinavian stations, this will mean that 60 young marine biologists every year will get an opportunity to see other marine faunas and floras than their own and to be taught by other professors than they are accustomed to. This gives them a much wider knowledge, and perspective and has proved to be a great success. Any expenses for travel and food and lodgment during the courses and going to and fro are paid by the Council.

As part of this collaboration-programme, we also take up repetition courses for high school teachers in marine biology. Also here, all expenses are paid by the Council, and the teachers are extremely eager to participate. It has already been demonstrated that, when returning from these courses, the teachers are capable of stimulating their pupils to specialize in marine biology. So also this has been most successful.

The money we get will also allow us to start a comprehensive scientific collaboration besides the educational and training programme. When all Scandinavia is regarded as a unit, it actually is a fairly large and most varied area, also from an ecological point of view. The four countries may start studies on the organisms as related to a salinity-gradient starting in the brackish water off Finland via the two distinct water masses in the Sound near Helsingør to the fairly saline Swedish fjords and to the open ocean off Bergen. Or we may study the animals as influenced by a temperature gradient from Arctic Tromsø to temperate Esbjerg, and so on.

This scientific collaboration also comprises efforts of educating and training inside Scandinavia specialists on all animal groups in our seas. Here the Council coordinates their programme. At present Denmark educates specialists on Nemerteans, Ascidians, Turbellarians, Bryozoans, Amphipods, and Ciliates. Norway trains specialists in Foraminifera, in all pelagic larvae. Sweden specialists in Acanthocephalids and in microfauna, and so on. We hope to send these specialists by-and-by to all Scandinavian stations to work up the faunas there, so that, before a too long time, we may publish comprehensive lists of the marine fauna and flora in the areas round all our four stations.

Another part of this scientific collaboration is, that all four stations are at present coordinating their faunistic notes. We are printing cards so to use just the same type of files. Actually, it is not files, but large solid, white envelopes. On the front of the envelope is printed heads for all references of literature to the animal species in question. On the back cover of the envelope is printed a map of the area covered by the station's boat, and inside the envelope are placed all new notes, photos or observations on the animal in question. We have found this a very good way to keep all information, and it seems to function well.

So, you will see, that this fairly small amount at disposal for Nordic collaboration, less than $30,000 a year in your currency, allows us to make an impressive progress in our collaboration and training programme, which has significantly stimulated the interest for marine biology among the young students and carries several of them to our "camp."

I think this has given you a fairly good idea about, how things are getting on in our country. Probably, I shall have to add, that the governmental funds

to run this laboratory inclusive of the cutter are only some $6,000 a year. To this may, however, be added heating, electricity, gardening and cleaning plus the salaries for all staff. I think that the whole amount: salaries and any funds to run the laboratory will comprise some $30,000 a year, all in all.

This amount, however, is already too small. We have a daily "headache" in applying for new grants. More than 100 students have their classes here every summer. We permanently have some three to four UNESCO fellows to be trained here, 1 year each, and research workers from Lund and Copenhagen and actually from the whole world come here to work for shorter or longer periods. We just got a grant of $15,000 from the Rockefeller Foundation for a radio-telephone for our boat, for microscopes, and for buying periodicals for our library. Nevertheless, we still urgently need more microscopes, but our urgent problem is space. As you probably know, the Rockefeller Foundation will not give money for buildings. Here we are, dependent on the Danish Government, and since we are only 2½ years old, the Government will hardly feel it justified to give us money for new buildings during the first 5 years. As I told you, we are already up to 70 years later in having a marine station than, for instance Sweden, and the number of scientists and students working here, since the station was established, is increasing nearly "like an explosion." Our whole laboratory, comprising two floors only, is only 9 by 25 feet long, and already now our students are crowding so densely that it is a real problem for us.

We need a new building. All our needs for the first 5–6 years may be covered by a sum of $150,000, but we are fully sure that, could we only manage to get a grant of some $50,000 from outside to start the new building, we might be able to get the rest from enthusiastic Scandinavian industries and factories. In this country, it plays an enormous part, when we can start a new program with some help from outside.

Knowing that you are in a most important position in the center of planning for oceanographical research in your country, I should like to call your attention to this point and ask for your advice, if you know of any funds or institutions which might give grants for scientific buildings in Scandinavia.

As you will see from our collaboration program sketched above, we do our very best to exploit any amount in the most economical way. Dr. Pomerat from the Rockefeller Foundation was deeply impressed when he saw how large and well equipped a boat we had managed to build for the $30,000 he gave us, and our economical exploitation of these funds was directly causing the new Rockefeller grant, we have just received.

It is curious, after having sketched for you our very successful inter-Scandinavian collaboration and the great interest which our four governments have taken in this program, to have to admit, that, as soon as new buildings are concerned we have to fight a bitter fight with the Ministry. So, this lack of space which very soon will force us to reduce our research and training program, may easily be a serious "bottleneck" for our most successful program.

I forgot to mention that our "Nordic Council" is working closely together with the Marine Laboratory in Miami, Fla., to have started regular exchange of two Scandinavian and two American fellows in marine biology each year. A foundation is already established (see the enclosed letterhead with the flags of the five nations), and the first Scandinavian fellow is already working in Florida. Also, a permanent grant for a Scandinavian fellow at Napoli will start very soon, and we hope to get two more fellowships for Scandinavian marine biologists to go to Bimini, Bahamas, each year.

In Europe our program of collaboration inside Scandinavia has been received with the greatest interest. Actually, we have in all four countries a group of most enthusiasitic marine biologists at present, and a new group of young students is coming up. So we have to exploit this opportunity to build up an efficient program. I do not have any printed material on my station and the collaboration program but hope this will give you the information you want. If not, please let me know, and I will do my very best to add new facts to the above.

With kindest personal regards,

Sincerely,

GUNNAR THORSON.

Mr. OLIVE. I feel this is a must, the exchange of personnel Dr. Cox touched upon in his remarks. There is no substitute for this, as I see it. You can search the literature, you can read and be knowledgeable in literature and literature techniques, but the matter of eye-to-

eye contact, to use a term of the psychologists, the actual feel for being in a laboratory and working side by side with these scientists, I think certainly is strongly indicated and we must have it.

Mr. BAUER. In our national effort, would it be your opinion that we should actively support those field stations which happen to be located where the biota exists although they are not within the continental limits of the United States, referring to the Bermuda Biological Station, the Lerner Marine Laboratory in Bimini of the American Museum of Natural History and others?

Mr. COX. I would strongly recommend it personally.

Mr. BAUER. Thank you.

Mr. DINGELL. You support H.R. 4276 and the purposes included therein?

Mr. COX. Yes, sir.

Mr. DINGELL. Doctor, the committee is very grateful to you for your courtesy and your kindness, and I would like to thank both of you distinguished gentlemen for the honor you have shown us this morning by coming and testifying.

Mr. COX. It was a privilege.

Mr. DINGELL. The next witness is an old friend of the Chair, a distinguished biologist and conservationist, the Honorable Robert M. Paul, special assistant to Assistant Secretary of Interior for Fish and Wildlife.

STATEMENT OF ROBERT M. PAUL, SPECIAL ASSISTANT TO ASSISTANT SECRETARY OF INTERIOR FOR FISH AND WILDLIFE, FRANK P. BRIGGS

Mr. PAUL. All of you know Dr. McHugh, Director of Research for the Bureau of Commercial Fisheries. He came to Commercial Fisheries by way of the Scripps Institute of Oceanography in California and most recently director of the Virginia State Fisheries Laboratory. He came in about a year ago.

Also with me is Mr. Al Swartz. Mr. Al Swartz is even newer than Dr. McHugh, just recently assumed direction for the salt water sport fish research program set up by Mr. Lennon's bill of 2 years ago. I suspect it is the first time Mr. Swartz has had a chance to see the committee. If you have any questions or desire any information, I think he might be a very good witness.

Mr. LENNON. I am glad to see him.

Mr. PAUL. I knew you would be.

Mr. DINGELL. You gentlemen are very welcome. Having had some interest in the bill, I am delighted to see the Department is moving, and I know Mr. Lennon is.

Mr. PAUL. Mr. Chairman, I appreciate your invitation to appear to discuss the biological implications of an oceanographic program. This is the first time I have had an opportunity to appear before your committee as a representative of the Department of Interior and I am very grateful to meet with you again.

Last year your subcommittee held a very fruitful series of hearings on our national needs in oceanography and all of us are pleased that you have again decided to secure the ideas of many outstanding scientists in this field—both in and out of Government. If anybody ques-

tions the fact that you do not get results, I think you can point with pride to the establishment of the National Oceanographic Data Center which resulted from last year's hearings.

The Interagency Committee on Oceanography has already testified on the bills under consideration and rather than repeat our official comments on the details of proposed legislation I will discuss in general terms the biological aspects of the national oceanographic program—particularly as they relate to inshore and estuary areas and what is being done to meet these needs in the Department of Interior.

I believe we can all agree that the necessity for expanding the national oceanographic research effort has been established beyond any doubt. Our problem now is to plan and carry out a program that will truly meet our national interest in the oceans of the world.

Last year in testimony to your subcommittee when I was wearing a different hat I stressed the need for—

(1) Recognizing that the primary Federal responsibility is for basic research particularly in the biological phases of the national oceanographic program.

(2) Broadening the scope of the projected fishery studies to make sure that species important to sport as well as commercial fishing are included.

(3) Encouraging more emphasis on basic ecological studies on the inshore and estaurine areas that are the most important economically and will be most affected by man's activities.

I have been genuinely pleased at the progress made toward these objectives since last year. In particular, there has been substantial progress in the salt water sport fish research program established by Mr. Lennon's bill in 1959 that may be of particular interest to your committee.

To bring you up to date. I think you will be interested in the progress that has been made. Salt water sport fishing has a tremendous recreational potential, as we know. The 1960 hunting and fishing survey, which has not been published, has shown a growth in 5 years from 58 million man-days to more than 80 million man-days of salt water sport fishing annually. This represents an increase of more than 35 percent or 7 percent a year, much more than is the case in fresh water. It is estimated that marine anglers caught nearly one-half billion pounds of fish and spent more than that in dollars for the privilege. The preliminary data indicates that last year for the first time the salt water sport fish catch exceeded the total fresh water sport fish catch in pounds of fish.

The oceans are our last frontier and our new frontier for recreational fishing. Projections of our population's growth show that we will have 330 million people in the United States by the year 2000 and that from 90 to 95 percent of this will be concentrated in urban areas, to a large extent along our coastlines. Inland waters will simply not be able to absorb the fishing demand and it is abundantly clear that the oceans, the bays, sounds, and tidal areas must take on an increasing share. At the same time it is equally clear that the marine fishes are not an inexhaustible resource.

Increasing pressures from commercial and recreational fishing are already threatening the supply. Even more important, most of our favored species are tied to the coast and its environs in some stages of

their life history. These are the areas which are undergoing rapid change by agricultural, industrial, and economic development. These changes have already made serious inroads on our anadromous fishes. The Atlantic salmon, the Pacific salmon, the shad, the steelhead, the striped bass, the alewives, sturgeon and sea trout have all been severely depleted. These are the marine fishes which depend upon fresh water for spawning. I think your question about the futility of trying to separate fresh water from ocean phases of this program Mr. Bauer, is very pertinent when we consider the tremendous problems of salmon conservation. There is no way to separate the two phases, at least from a fisheries standpoint.

Mr. DINGELL. Has not pollution been a factor in the destruction of these fish that live in salt water and spawn in fresh water?

Mr. PAUL. It is certainly a most serious factor.

Not quite so vulnerable are many other valuable marine species such as the flounder, fluke, croaker, weakfish, sea trout, red drum, kelp bass, rockfish, tarpon and snook. Nevertheless these fishes are characterized by a limited range, inshore-offshore migrations and a dependence on estuaries during some stages of their life cycles. Because of this they are subject to the same adverse influences as the anadromous species—pollution, sedimentation, channeling, dredging, ditching diking and spraying, the effects of which are insidious and difficult to detect until it is too late. Yet we know virtually nothing about these species and their relationships to their environments. Marine biology is following far behind physical, chemical and geological oceanography. Unless we make a substantial effort in this field soon we may be in a position of knowing all about a house empty of inhabitants.

In this connection your attention is called to Resolution 5 "Encouragement of Biological Aspects of Oceanographic Research" adopted by the American Fisheries Society at its annual meeting, September 1959, as follows:

RESOLUTION 5—ENCOURAGEMENT OF BIOLOGICAL ASPECTS OF OCEANOGRAPHIC RESEARCH

Whereas the American Fisheries Society has constantly encouraged biological research in marine and inland waters since 1870; and

Whereas the National Academy of Science-National Research Council has recently published reports pointing out the Nation's critical need for an expanded oceanographic research program; and

Whereas the U.S. Senate and the House of Representatives have each created a special committee to study oceanographic problems and recommended new legislation and programs to implement the National Academy of Science-National Research Council reports; and

Whereas a careful study of these reports and publications indicated that the biological aspects of the proposed program are subordinated to other disciplines: Now, therefore, be it

Resolved, That the society (1) commends the administration and the Congress for the interest they have expressed in expanding the national effort in oceanographic research; (2) expresses its concern that the vitally important biological aspects of the oceanographic research program be given more adequate recognition in the development and implementation of plans; and be it further

Resolved, That copies of this resolution be sent to Dr. George Kistiakowsky, chairman of the Federal Council for Science and Technology, to the president of the National Academy of Science-National Research Council, to the House Merchant Marine and Fisheries Subcommittee on Oceanography, and to the Senate Interstate and Foreign Commerce Committee.

The Department of the Interior's Advisory Committee on Fish and Wildlife made the following recommendation to the Secretary of the Interior on October 20, 1959:

> The 10-year oceanographic research program of the National Academy of Sciences is a vitally important undertaking which the committee supports. The committee is hopeful that greater emphasis will be given to the basic biological aspects, especially of the fishes. A preponderance of effort is now proposed on physical oceanography. We believe that added emphasis on biological research would strengthen the program and greatly increase its overall value.

In an attempt to meet some of these pressing problems, the Bureau of Sport Fisheries and Wildlife commenced in 1960 a modest program of research on marine game fishes. This program includes the following:

1. A pilot study of the Shrewsbury River estuary. This will be expanded as funds permit to include larger geographical areas.
2. A compendium of marine game fish knowledge. This will point out the gaps and direct future research.
3. A national survey to determine the game fish catch, and species of importance by regions. This will provide essential economic information and also guide future research.
4. We have begun a program of grants and fellowships to students just within the last few weeks.

I am attaching a copy of a recent paper for the use of the committee. I would like to emphasize that an important part of the marine game fish research activity will be graduate studies sponsored and financed by the Bureau. This program has two purposes: one, to stimulate the recruitment of marine biologists to the field of fishery research, and two, to fill in the gaps on marine game fish problems. Students will be encouraged to undertake problems which may be integrated with larger investigational programs of the Bureau. Selection of students will be by the university rather than by the Bureau. At present this program is underway on a very modest scale with two student assistants. One is engaged in a study of the life history of channel bass at the University of Miami, the other is engaged in an analysis of temperature, salinity and other features of the physical environment of the Caribbean Sea. He is working under the direction of Dr. Wust at Columbia University. This study promises to result in an important contribution to understanding the Gulf Stream.

This is the new program of the Bureau of Sport Fisheries and Wildlife. As you are well aware, the major portion of the oceanographic work is carried on by the Bureau of Commercial Fisheries. Without going into detail this Bureau's plans for 1962 include the following new oceanographic projects:

African expedition	$300,000
Data center	100,000
Graduate fellowships and trainees	200,000
Estuarine research	200,000
Taxonomic research	25,000
Eastern Pacific oceanography	175,000
Total	1,000,000

The Department of the Interior is probably more directly concerned with the biological phases of the oceanographic program than any other department of the Federal Government. Secretary Udall is

personally concerned and one of the principal reasons he wants to add a science adviser to his personal staff is to intensify and coordinate the Department's efforts in this field.

Secretary Udall wishes me to express to your committee that we will be happy to help you in anyway we can. Thank you very much.

(The attachment to Mr. Paul's statement follows:)

NORTHEAST SECTION OF THE AMERICAN FISHERIES SOCIETY, HALIFAX, NOVA SCOTIA, JUNE 1961

BUREAU OF SPORT FISHERIES AND WILDLIFE PROGRAM FOR MARINE GAME FISH RESEARCH

(By Albert H. Swartz, Assistant Chief, Branch of Fishery Research, Division of Sport Fisheries, Bureau of Sport Fisheries and Wildlife)

A marine game fish research bill was passed in 1959 known as Public Law 86–359. This new legislation recognizes the fast-moving trend toward the excitement and satisfaction of salt-water fishing and the need to know more about the resource on which it depends. Pertinent sections of this act read as follows:

"An Act authorizing and directing the Secretary of the Interior to undertake continuing research on the biology, fluctuations, status and statistics of the migratory marine species of game fish of the United States and contiguous waters.

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That the Secretary of the Interior is hereby directed to undertake a comprehensive continuing study of the migratory marine fish of interest to recreational fishermen of the United States, including species inhabiting the offshore waters of the United States and species which migrate through or spend a part of their lives in the inshore waters of the United States. The study shall include, but not be limited to research on migrations, identity of stocks, growth rates, mortality rates, variations in survival, environmental influences, both natural and artificial, including pollution, and effects of fishing on the species for the purpose of developing wise conservation policies and constructive management activities."

Why is game fish research important? There are a number of good reasons which may be divided into the spheres of conservation, economic values, and social values.

Conservation

Americans should know all they can possibly learn about their natural resources.

Knowledge is the key to solution of conservation problems now unforeseeable but sure to arise in the future.

Research can accumulate knowledge in advance of need. The crisis research and "crash programs" which have characterized studies of the commercial fisheries after failure of a fishery or after massive changes in the environment can be largely avoided.

The myth of inexhaustibility of renewable resources has been exploded during this century. Population pressures and shrinking fishing opportunities inland encourage people to go to the coasts for recreation and relaxation. Fishing pressures are going up, especially in easily accessible fishing spots. With more knowledge about the fish, fishermen will have more freedom to move around, sample new areas, try different species.

Americans need to know how marine game fish will be affected by agricultural chemical applications along the coasts, other forms of pollution of coastal waters, including radioactive waste disposal, and large-scale industrial and navigation and other developments in the estuaries and coastal marshes.

Research findings can lead to improved recreational opportunities by defining good fishing grounds, explaining and predicting fluctuations in abundance, by preventing unwise or uniformed restrictions, by increasing abundance through scientific habitat improvement or enlargement.

Economic values

Marine sport fishing has been called a growing giant, and it is certainly that from the standpoint of all its supporting industries—boats and motors, fuel,

food, tackle, maintenance and repairs, equipment replacement, housing accommodations, rentals, charters, bait sales, and myriad shore services.

We know from our fishing and hunting survey that close to 5 million people fished off our coasts in 1955, spending about half a billion dollars on some 60 million fisherman days. Late this year we should know whether these figures will double by 1965 as has been predicted.

In Delaware it was estimated that 340,000 marine anglers caught more than 2½ million fish in 1954.

A survey in Texas showed that three-quarters of a million Texans fished in coastal waters from September 1957 to August 1958. They caught 28 million fish weighing 37 million pounds.

In 1958, a similar survey in California revealed that deep sea anglers alone caught 25 million fishes. More than one-half million anglers participated in this catch. From 1946 to 1953, 1,380,000 to 1,750,000 pounds of striped bass were taken annually by 113,000 to 116,000 anglers. This fishery is valued at $18 million annually.

Salt water anglers caught more than 3 million fish in just one bay of Long Island in 1959.

The value of Florida's recreational fishing in salt water to the economy of the State has been estimated to be approximately equal to the combined value of the citrus and cattle industries.

Social values

It is clearly in the national interest to foster wholesome use of leisure time by all citizens; fishing is widely recognized as one of the most wholesome forms of recreation. This is so because fishing is a personal participation sport and can lead to the development of real and satisfying skills. It is a form of recreation available to everyone at a wide range of cost. The bridge and pier fisherman, the surf caster and the rowboat angler may find satisfaction as real as the yachtsman or charter boat fisherman.

Scientific interest and satisfying the curiosity of the layman fishermen are entirely valid reasons for marine game fish research.

THE FEDERAL FUNCTION IN MARINE GAME FISH RESEARCH

Geographical

The marine game fishes may be classified reasonably in any of several ways. A sort of zoogeographical classification describes habitat and migrations to illustrate the interstate, interregional, and international nature of many of them.

The inshore-estuarine species such as winter flounder and white perch are more or less nonmigratory, local populations, susceptible of local study and management.

The inshore-offshore species spend part of their lives in the bays, streams, and estuaries and part of their lives offshore, at sea in deep water. The inshore part of their lives is of great importance for spawning, early life stages, and feeding. Croakers, scup, flukes, and weakfish are examples.

The coastal migratory species make long migrations along the coasts; some like the striped bass travel from Chesapeake Bay to southern Maine.

The pelagic-oceanic species such as bluefish feed close to the surface much of the time, make long seasonal migrations, sometimes moving far offshore, sometimes close inshore.

The transoceanic fish are truly international species, as demonstrated by recoveries in Europe and Asia of tags from fish originally caught in the United States. Tuna, swordfish, and marlins are examples.

Federal responsibility

Apart from the congressional authorization mentioned earlier, there is a unique responsibility to the public to see that Federal civil works, military installations, and other Federal activities do as little harm as possible (or no harm at all) to resources which might be adversely affected.

The Coordination Act of 1956 gives the U.S. Fish and Wildlife Service a strong voice in the review of Federal construction proposals (and also private proposals when the construction comes under Federal permit) involving impoundment, diversion or other control of any stream or other body of water, for the purpose of recommending methods for preventing loss and damage to fish and wildlife resources. Dredging, filling, canalizing, dammning and diverting and diking can so alter the inshore and estuarine environment of marine game fishes as to reduce or endanger some species.

Size

A list of important marine game fish will total between 50 and 200 species. Research involving mixed species, boundless water areas, and wide ranging habits make for as large-scale fishery research as has ever been undertaken. Fortunately, this research, like any other, may be divided into its component parts and developed along several different lines by species, by ecological areas, or by different subject matter disciplines, but to be ultimately useful it must be coherent, coordinated, and finally put together to make a useful product.

ESTABLISHMENT OF THE ATLANTIC MARINE LABORATORY

The program actually got underway late in 1960 with the establishment of a laboratory at Sandy Hook, N.J., under the direction of Dr. Lionel Walford, an internationally famous marine biologist, well known to most of you. It is well located and adaptable to the requirements of marine research. It is the former Army Hospital at Fort Hancock. In the past few months it has been remodeled to provide offices, library, laboratories, study collections, aquaria, and shop to accommodate not only the resident staff but also visiting biologists and graduate students. Ample docking facilities are available at Army and Coast Guard piers. The laboratory is on the shore of Sandy Hook Bay, into which several rivers empty, and is also close to the open Atlantic. Thus it is within easy reach of a remarkable variety of ecological situations—oceanic, coastal, bay, estuarine. It is near principal transportation facilities and several universities that are engaged in oceanographic studies. Finally, Sandy Hook is near the center of one of the greatest concentrations of sport fishing in the world, which draws from species of boreal, transitional, and tropical life zones.

A modest program is now underway with the following activities:

National survey of marine game fishing

We have arranged, by contract with the U.S. Bureau of the Census, a national poll to collect catch statistics of marine game fishing, which will form an essential background for policies in directing future research. John Clark, Assistant Laboratory Director, has collaborated with statisticians of the Bureau of the Census in designing the questionnaires to be used, and will analyze the data resulting from the survey. The poll, which consists of a sampling by States, will include the methods of fishing which salt water anglers used during 1960 and the principal species and quantities caught by regions. This project is a supplement to the Bureau's 1960 National Survey of Hunting and Fishing.

Inventory of game fishing facilities

A first step in defining the National Marine Sport Fishery is to take inventory of its facilities—the boats, liveries, and landing ramps; the jetties, piers, and beaches; the fishing bottoms, bays, reefs, and wrecks. To provide this description, Irwin Alperin and John Casey on the Atlantic and James Squire on the Pacific have commenced an intensive review of published and unpublished records available from State and Federal agencies, coastal laboratories, sportsmen's clubs and associations, outdoor writers, boat captains, boat stations and operators, and chambers of commerce. Field surveys will be carried out to verify and supplement presently available records. A catalog of facilities will be developed and maintained currently. It will be plotted on charts which will gradually form a national marine game fishing atlas. Methodology for the collection and compilation of current catch statistics are being developed as an outgrowth of the inventory project.

Compendium of game fishes

A continuing function of the program will be to compile and systematize existing knowledge on marine game fishes and their environments. This activity will result in an organized collection of published and unpublished reports and data, including an inventory of past and present research projects. The result will be a compendium of research materials which should be useful to scientists, administrators and the general public. The compendium will be published at intervals in sections according to subject. Subjects under preparation are the dolphins, weakfishes, bluefish, striped bass, and coastal hydrography. The entire staff participates in this project.

Estuarine research

One of the most serious gaps in our knowledge of the biology of most migratory fishes concern the period between the end of the larval stage and the time when

the young fish begin to occupy habitats characteristic of the adult. During this juvenile stage of development survival evidently depends on finding nursery conditions that satisfy specific physiological requirements, food supply and safety from enemies.

Fishes occupy a variety of nursery habitats. Many coastal fishes, including some of the most important migratory game species, find their nursery grounds in the protected and nourishing waters of estuaries, bays, and rivers.

With increasing knowledge of the natural history of nurseries, we should eventually have a scientific basis for environmental protection and improvement.

Estuaries are particularly amenable to such modifications; unfortunately, they are also particularly subject to gradual destruction as a habitat for aquatic life, thanks to human activities. Consequently, we hope to give special attention to the estuarine environment. In our first year, Robert Croker is carrying out a pilot study consisting of a systematic sampling of plankton at the mouth of the Shrewsbury estuary. This will determine the species of young fishes, their sizes, relative abundance, and the times of their arrival and departure. The material collected is exchanged with the Menhaden Investigations of the Bureau of Commercial Fisheries, which is conducting a similar program at the entrance to the Indian River in Delaware. We hope to extend such studies to other estuaries by collaboration with State and private marine laboratories. Meanwhile, as the installation of the sea water system, aquaria, and ponds at Sandy Hook Laboratory becomes completed, we shall begin experimental studies to determine the factors affecting survival and well-being of juvenile game fishes.

Graduate training

An important part of the marine game fish research activity will be graduate studies sponsored and financed by the Bureau. This program has two purposes: one, to stimulate the recruitment of marine biologists to the field of fishery research, and two, to fill in the gaps on marine game fish problems. Students will be encouraged to undertake problems which may be integrated with larger investigational programs of the Bureau. Selection of students will be by the university rather than by the Bureau. At present this program is underway on a modest scale with two student assistants. One in engaged in a study of the life history of channel bass at the University of Miami; the other is engaged in an analysis of temperature, salinity, and other features of the physical environment of the Caribbean Sea. He is working under the direction of Dr. Wüst of Columbia University. This study promises to result in an important contribution to understanding the Gulf Stream.

Finally, I would like to take a moment to outline a most important cooperative endeavor which Dr. Walford and his staff are attempting to foster. This is the Atlantic Shelf environmental campaign.

Marine biologists are constantly troubled by the overwhelming problem of how to cover the entire ranges of species which they study.

To understand the variations in the occurrence, distribution, and abundance of fishes, it is essential to have synoptic and systematic pictures of the physical and biological features of their environments throughout their ranges. This is possible only by cooperation among all marine laboratories in making necessary observations. Dr. Walford has presented to biologists in three regional meetings of the Atlantic States Marine Fisheries Commission Research Committee, a proposal to conduct periodic multiple-ship surveys in a program to be called the Atlantic Shelf environmental campaign. This would take place in 1963 or 1964. The proposal has been unanimously recommended for formal presentation to the forthcoming annual meeting of the whole Commission. If the Commission approves, detailed plans will be developed by representatives of the agencies, institutions, and laboratories who will participate in this cooperative endeavor.

To sum up, it is clear that the oceans are both our new frontier and our last frontier from the standpoint of recreational fishing. The pace of development in this country is rapid. By the year 2000 there may well be 330 million people, an increased concentration in metropolitan areas, more money to spend, more leisure and better travel facilities. All of this points to a tremendous increase in the demands upon our natural resources including marine fishes and the waters in which they live. Often these demands are of a conflicting or competing nature. There can be no doubt, however, that outdoor recreation, including fishing, has become one of the large industries of the country and will continue to outstrip our population growth.

The advancement of science and conservation in the field of marine fishes will be needed to keep pace with this demand. The task is so large that there is far more than all of us can do. Duplication of effort would be wasteful and we should be seeking every means to cooperate and coordinate our activities, especially in research.

Our program is conceived to accomplish this. It will focus upon basic, long-term research in an effort to provide new knowledge and better understanding of marine fishes for those who are responsible for the management of this resource. In addition, we believe that the Federal role in this field carries additional responsibilities for defining the national dimensions of this resource and for developing methods to assess it periodically; to stimulate the recruitment and training of marine fishery biologists; to assist in the problem of scientific communication which threatens to inundate us.

Mr. DINGELL. Mr. Lennon.

Mr. LENNON. Mr. Chairman, I am sure you and Mr. Pelly in particular were members of the Subcommittee on Wildlife and Fisheries and share my satisfaction in hearing the emphasis placed on what has developed as a result of what you, Mr. Pelly, and you, Mr. Dingell, did and your great help to me in making this program possible. I am happy to know this and envision it as one of the great programs for the reason you mentioned.

Our great centers of population by the year 2000 will be largely along the coasts of our country—the gulf, the west, the east, the Great Lakes. It is a great program and is so tied in inexorably to this program of the study of oceanography. On your comment upon Mr. Bauer's query of the former witness to the effect that you cannot disassociate fresh water, particularly tidal waters, from salt waters when so many of our game fish, and others as well, spawn, even some commercial fish spawn to some extent, so I am advised, in estuaries—all species of shad and all species of rockfish, stripers of all species. I think there are others that come in brackish waters such as croakers, what we call popeye mullet, where they spawn nobody seems to know, but they catch them from that size on up in our brackish and even fresh waters of North Carolina. I am glad you gentlemen helped so much on it.

Mr. DINGELL. Mr. Pelly.

Mr. PELLY. I think it is interesting to get a review on a program you have seen started. I join with you in saying that I am glad to hear from the witness and get a firsthand report.

Mr. LENNON. I think the red drum is our fish and I think a study ought to be made a little further up the coast than the University of Miami.

Mr. PAUL. I assure you most of the work will be done where the red drum are, and I think this happens to be along the coast of North Carolina.

Mr. LENNON. Right significantly, up until 5 or 6 years ago it was not known that blue and white marlin were present in any degree along the North Carolina coast. I never pick up a paper from day to day that I do not see what is being caught off Hatteras and off Nags Head in the marlin contest. The Secretary of Commerce was there a few days ago, as he goes every year, for the marlin contest. I think they had five caught down there 2 or 3 days ago.

The thing I was concerned about is if you make a study of the movement of our sport fish—I know people who come to North Carolina and tell me they start fishing, people who can afford it, they start

fishing off the New England coast and as the fish move south in the fall of the year they fish all the way down to Florida. Then when the fish move back, they fish all the way up and down the coast from Florida right up to New England following the sport fish—king mackerel, cobia, bluefish, all the other game fish we have along our entire gulf and South Atlantic coasts. They can tell the folks where to go to catch them. That tourist trade is a wonderful thing we have Thank you very much.

Mr. DINGELL. The Chair would like to pay appropriate tribute to the distinguished conservationists on this committee, Mr. Pelly and Mr. Lennon, and point out for the record that if it were not for the efforts of these two distinguished members of this subcommittee, the Subcommittee on Fisheries and Wildlife, not only would Mr. Lennon's bill, the salt water fishing bill, not have come about, but many other good pieces of conservation legislation would not have seen the light of day.

I think it is interesting to observe that we practically sit this morning as a Subcommittee on Fish and Wildlife in the Oceanography Committee.

Mr. LENNON. I want to use this opportunity to tell the gentleman I was disappointed last year when we did not get our pesticide bill through. I took a rather hard stand even against my State commissioner of agriculture, who got the wrong slant on this thing.

I want to ask this of the gentleman now. Is the Department of the Interior, particularly the Bureau of Fish and Wildlife, getting the cooperation it ought to have and to which it is entitled from the Department of Agriculture in this question of notifying you people when they ought to start a movement to broadcast insecticides and pesticides in the areas of our Fish and Wildlife Service?

Mr. PAUL. At this point I would like to pay particular tribute to the present chairman of this committee. Thanks to Mr. Dingell, I feel we have made a substantial amount of progress in the last 2 months. He can give you a better report than I. I would say things are better than they ever have been in our relations with Agriculture.

Mr. LENNON. You will recall last year that neither the Department of Agriculture nor your Department wanted the bill. You said you could do it without the bill. My information was that you folks were not getting the cooperation you were entitled to from the Department of Agriculture. That was the only thing we had in mind.

You mentioned a few minutes ago when you said pollution of the waters, particularly in tidal areas, through insecticides and pesticides was damaging our marine life—and I am sure it is—if you do not get the cooperation, I wish you would let some of us know so we can start with our bill again.

Mr. PAUL. Mr. Dingell has taken a personal interest in this, and even more important, Secretaries Udall and Freeman have agreed between themselves and have told staff members like myself that we are going to work this out, and at the present time we are formalizing an agreement between the Departments of Government concerned—Agriculture, Interior, HEW, and Defense—to set up a formal committee at the policy level to review these programs with the power to modify them, cut them off, or change them in any way to get better and more complete protection to fish and wildlife. I am personally very optimistic.

Mr. LENNON. Thank you very much for that statement. I am sure it will be a workable program if there is such cooperation among the Departments.

Mr. PAUL. Secretaries Udall and Freeman, you will be interested to know, listed the points of conflict between the two Departments, and pesticides was No. 1 on the list. Through the active help of Secretary Freeman, who is personally interested in it, I feel we can really make some progress this year.

Mr. LENNON. I am delighted to hear it. Thank you very much.

Mr. DINGELL. I think Mr. Bauer has a question he would like to ask.

Mr. BAUER. I have only one thought, which is you have the Bureau of Sport Fisheries, whose motivation is sport fishing; you have the Bureau of Commercial Fisheries, whose motivation is the sale and utilization of products of the sea.

Do you contemplate in the Department of the Interior any organizational setup that would have as a motivation the study of basic biology, per se, without either of those motivations? I agree you cannot separate them, but would Interior would be the spot to put an active program in basic biology?

Mr. PAUL. This is a very interesting question and one that, as you probably know, is being actively studied by Secretary Udall. The whole future role of science and research in the Department of the Interior is being actively considered now. As you are probably aware, the Secretary requested several months ago, shortly after he took office, that he be allowed to add a science adviser, a top-level man, to his personal staff to coordinate and help the Department do a better job in this field.

There have been no studies of direct organization to deal only with pure biology. At present this function falls more into the good hands of Dr. Carmichael of the Smithsonian and the National Science Foundation, although as I mentioned briefly, we are definitely extending and expanding our basic biology work, particularly through fellowships and grants. We look on this as a logical function, perhaps limited by funds, but one we are quite interested in and active in. It would be hard for me to give a definite answer as to the desirability of a new organization within the Department strictly for biology research.

I am, like most people, inclined to think the great pool of knowledge in this field is in the academic institutions outside of Government perhaps, and that to get the best results we should tap this pool in the best way we can.

Mr. BAUER. That is all, Mr. Chairman.

Mr. LENNON. Who testified for the Department of the Interior this year before this particular Subcommittee on Oceanography? Do you recall? I am talking about this calendar year.

Mr. PAUL. Perhaps Dr. McHugh knows. Have we testified directly before the committee?

Mr. MCHUGH. We have not testified before the committee yet.

Mr. LENNON. Since no one has testified, and we have a few minutes, the Chairman of this Interagency Committee on Oceanography testified that in his opinion—he was not too strong on it—in his opinion the establishment by statute of this particular National Oceanographic Council was not necessary and that we could continue to operate

under what would be termed in essence a "voluntary interagency committee."

Would you care to comment on that or would you rather someone else would do it?

Mr. PAUL. I am rather certain that was probably Dr. Wakelin from the Navy, the Chairman of the Interagency Oceanography Committee, who testified. He was expressing the administration's view. I think their feeling has been the present degree of coordination has been relatively good and that the total oceanographic program needs to be strengthened.

As a strictly personal viewpoint, as I testified the last couple of years before your committee, I feel quite strongly that an expression of intent and an expression of interest by the Congress in this whole field would be very helpful.

Mr. LENNON. I want to say to you there is no intent on the part of this committee or of the Congress to invade any executive responsibility in this field. It seems to me that the coordination of the two through an expression of Congress in putting its stamp of approval legislativewise on a program which has been recommended at the executive level certainly could do nothing in the world but strengthen the program, as I see it.

The difficulty, if you have a voluntary interagency committee, is that of the Congress or the legislative committee of Congress in calling in a witness from one of the several agencies represented and getting a short, quick statement from him. If you had a person who could speak authoritatively for this National Oceanography Council, he could come here and in 2 hours' time cover the field, so to speak, as to the progress being made by the various departments that were allied with this national council. You know what happens if you bring before us here a person representing the Navy. He is going to take an hour and a half, if necessary, to point out what they are doing.

It looks like if this bill passes, there would be at least 8 and perhaps 10 of our departments or agencies on this Council, all at top level, even at secretarial level. That is one reason I think it is imperative that we have some central agency representative or spokesman who can speak authoritatively so we can determine what progress the program is making rather than have to call in every one of the agencies involved in this so-called voluntary interagency committee.

I think the point is well taken, it is true the administration has indicated they thought this was sufficient, but I do not believe there is any serious opposition on the part of anyone connected with the administration in what we are trying to do, to give congressional legislative approval to what the administration has recommended. That is what we are doing.

We are not running counter to their purposes but are going down the line with them, trying to strengthen their position. At the present time if we authorize the appropriation, which is subsequently appropriated, then we have a right to look to some central agency to tell us what progress is being made because we have to answer to the taxpayers and you folks do not. That is the difference. They are right important people these days, you know. Thank you.

Mr. DINGELL. Mr. Paul, I notice you said you had Mr. Swartz here, who is in charge of the program of salt water sport fisheries research in your Department.

Mr. PAUL. I would like very much to have him come up an answer any questions.

Mr. DINGELL. I think Mr. Lennon would like to know how that program is coming. I know I would. Come up and tell us briefly what you are dong, what your budget is, and how you are progressing.

Mr. PAUL. This is Mr. Swartz, a New Englander, who has only been really assigned in charge of this program since last February. I inserted for the use of the committee a copy of a paper Mr. Swartz has just prepared on this program. I think you will find it very interesting.

Mr. DINGELL. Would you like to tell us briefly, Mr. Swartz, what has happened in the program, your budget, your plans, some programs you have in mind?

STATEMENT OF ALBERT H. SWARTZ, ASSISTANT CHIEF, BRANCH OF FISHERY RESEARCH, DIVISION OF SPORT FISHERIES, BUREAU OF SPORT FISHERIES AND WILDLIFE

Mr. SWARTZ. Late in August last year we acquired an Army hospital at Fort Hancock, N.J. We have been in the process of converting it in the past few months to make office space, laboratory space, shop, and so on, as a center for marine game fish research on the Atlantic coast. Even though we have been operating for less than a year, we have several small programs underway already.

Two of the most important, in our opinion, are: the national survey of marine game fishing, which is being done under contract with the Bureau of the Census in connection with the national survey of hunting and fishing to give us a national picture of the salt water catch in six broad geographical regions in the United States. These are the north Atlantic area, north of Cape Cod, the middle Atlantic area from Cape Cod to Cape Hatteras, the south Atlantic from Cape Hatteras down and including Florida, the gulf coast area, the south Pacific area, south of Point Conception, and the north Pacific area. When this is completed, we will have a picture of the important species that are caught and their frequency in the fisherman's creel.

We also have some good estimates, I believe, of the total effort. We have some preliminary data already. Mr. Paul mentioned it. That is, that for 1960 there were 80 million man-days of fishing in salt water. This represents an increase of about 35 percent since 1955.

Another undertaking that we have engaged in now is the survey of facilities. We think that this sort of thing in combination with the survey of catch and effort will help to define this marine game fish resource. It will involve cataloging and describing the facilities along all of the coasts for marine game fishing—the piers, the jetties, the banks, the marinas, the number of boats, that sort of thing. We hope to prepare a national atlas containing this information when it is completed.

In connection with this activity, we hope to develop a methodology for estimating the sport fishing catch, periodically. We think a terrible gap exists now in the amount of fish that are caught by recreational fishermen. For some species and in some places this catch exceeds the commercial catch. For example, in Great South Bay on Long Island 3 million flukes are taken in 3 months in the summer just by anglers.

This occurs in many places around the coast. We think we need a system for collecting statistics like this to supplement the commercial catch statistics which are now made available by the Bureau of Commercial Fisheries to give us, the public, the State, agencies that are responsible for the management of these resources, a total picture of what the catch is and what the drain is on some of the important species that exist in salt water.

Mr. Paul mentioned another activity, which is really a pilot study now, but which we hope will grow into one of our more important endeavors, and that is the estuarine study. Presently we are occupied with an estuary right near our new laboratory at Sandy Hook on the Shrewsbury River. We are trying to get a picture of the abundance, distribution, migration of young fishes, time of their movements in and out of the estaury, and to develop techniques for doing this sort of thing on a periodic and synoptic basis along the coasts.

We do not pretend we are going to be doing this all by ourselves. We hope to coordinate this activity with the Bureau of Commercial Fisheries, with the university laboratories, and with State agencies. There is more than all of us can do together. There is no problem of duplication of effort at all.

Mr. Paul mentioned the program for recruiting marine biologists through sponsoring and financing their graduate studies. This, too, is a very small program at the present but we are confident that it is an important activity for us to become engaged in and we hope it will grow.

A final activity ties in with something Dr. Cox brought out before. That is this matter of scientific communication. We feel that the amount of this information is threatening to inundate all of us, and we feel it is a Federal responsibility to attempt to do something about the problems of scientific communication.

What we are doing is to take the important marine game fish species like bluefish, dolphin fish, striped bass, croakers, marlins, many others——

Mr. Dingell. Channel bass?

Mr. Swartz. Channel bass, and to assign them among the staff at our laboratory, have these people compile all the information that is available, both published and unpublished, and to put this information in a form where it can be used. In other words, this is the difference between data and information that Dr. Cox brought out. We hope that once the back data are assembled and collated, that we will be able to keep up to date for each species. This is important to us for directing our own research, it is going to be important to university people and to State people who are engaged in research and who are administering these resources.

I think there is one more thing you might be interested in. We recently have taken steps to secure a laboratory site on the west coast. This is at Tiburon, Calif., on San Francisco Bay. The Navy is presently engaged in drawing up a license to permit us to use some of the certain buildings at this base, which is a deactivated submarine net base, I believe.

We have one man stationed on the west coast now and hope when funding permits to build up a staff there and undertake a program similar to what we are doing at Sandy Hook.

Mr. PAUL. I might say, Mr. Chairman, Mr. Swartz and the people in this program have been quite successful in finding free facilities. They managed to find a surplus Army hospital well suited to their needs on the east coast, and now this is a surplus naval installation on the west coast. These are secured at no cost to the program, I might add.

Mr. LENNON. The gentleman's statement has demonstrated his experience, his knowledge, and his training. For my own information would you care to state that for the record, your training prior to your coming into this field 2 months ago? I know it was adequate or you would not be where you are, but for the record I would like to have it.

Mr. SWARTZ. I must say I am not a marine biologist. My training and experience have been largely in fresh water. I am a graduate of Williams College in Massachusetts. I have a master's degree from Cornell University in aquatic biology and fisheries. I was the chief aquatic biologist for the State of Massachusetts Conservation Department from 1940 until 1948, less 3 years' service in the Navy.

In 1948, I joined the Fish and Wildlife Service, attached to the regional office in Boston, engaged in river basin work and the Dingell-Johnson program, which was one of the finest experiences of my life.

In 1960, I transferred to the Washington office and was Chief of the Section of Research in the Federal-aid program, better known as the Dingell-Johnson program. In February 1961, I transferred to the Branch of Fishery Research as Assistant Branch Chief.

Mr. LENNON. I am sure the gentleman found his new experience in salt water fishing interesting.

Mr. SWARTZ. In the Dingell-Johnson program, both in the Northeast and nationally, we are concerned with marine resources and particularly with research.

At the present time I believe there are 17 States that have marine projects, 22 in all, that are supported by the Dingell-Johnson funds, concerned with the restoration of marine game fishes.

Mr. LENNON. I recall in 1958 when this legislation was being considered that we developed the amount of money being generated annually at the retail level, gross dollars per year being generated by salt water sport fishing. It was astounding even then, the figures we were able to obtain for the record up to that time. I would say it was on the basis of increase in days spent, 80 millions I believe you said.

Mr. SWARTZ. Yes.

Mr. LENNON. You have that same increase in total dollars spent at retail level generated by salt water fishing.

Mr. SWARTZ. I expect it is much higher now.

Mr. LENNON. It is bound to be if the man-days go up. When a man has a fishing boat for salt water fishing, there is no way to stop him from buying reels, rods, outboard motors, plugs, bait; there is no end to the expenditure in connection with salt water fishing. I hope this program will grow. I think it is a great thing for the people who are seeking recreation along our coasts and across the country.

There is nothing in the world quite as relaxing as standing in the ocean surf watching the sun come up out of the ocean. Certainly there is no thrill like having 100 yards or so of line in the water with a

3-pound bluefish at the end of it. It does things for people and I believe everyone should have this experience.

Mr. DINGELL. Mr. Swartz, I would like to commend you for a fine presentation. I know my old Dad would be proud to hear the good remarks you said about his bill. He was very proud of it. It was one of the things I believe he worked the hardest for here in Congress. He had to get a Presidential veto withdrawn and had a lot of other difficulties. He took a great deal of pride in that bill.

I would like to commend you and Mr. Paul for your fine presentation this morning and tell you how happy we are with the vigor we see displayed in the Department.

With that, I express my thanks to you and the thank of my colleagues. Mr. Bauer is recognized for the purpose of inserting in the record certain communications.

Mr. BAUER. I would like to insert certain communications we received with respect to H.R. 4276: One from Professor Banner of the University of Hawaii, now in Thailand; one from Dr. Neushul of the University of Washington; and one from Dr. Wiggins, the director of the natural history museum at Stanford University.

Mr. DINGELL. Without objection, it is so ordered.

(The letters follow:)

CHULALONGKORN LABORATORY,
Ang Sila, Cholburi, Thailand, March 24, 1961.

Mr. GEORGE P. MILLER,
Chairman, Subcommittee on Oceanography, Committee on Merchant Marine and Fisheries, House of Representatives, Washington, D.C.

DEAR MR. MILLER: As a marine biologist and biological oceanographer for 20 years, and as a systematist working on marine animals for an even longer time, I was most interested in your H.R. 4276, especially in section 9 which deals with taxonomy of marine forms.

The whole bill appears to be excellent and well conceived. If it is passed it will undoubtedly be of great stimulus to all of the marine sciences.

However, I should like to discuss section 9 in particular. All of the biological sciences rest firmly upon a foundation of taxonomy. No studies in physiology, ecology, genetics, in applied fisheries, or in biological oceanography are valid unless identification of the animals studied is exact. Yet today, the fields of taxonomy and systematics are becoming more and more overlooked; few national grants are offered for taxonomic studies, few students are being trained in the intricate and exacting disciplines, and even the journals cannot afford to print papers of the lengths necessary in taxonomy. As a consequence, with this basis growing weaker, all of biology grows weaker.

May I cite one example of this neglect: The Mysidacea are a group of shrimp-like planktonic and bottom-living organisms which I studied for about 10 years. They are of great importance in the seas, for they are food intermediates, and their dense swarms are fed upon by many commercially important fish like the salmon, the halibut, and the cod. It is likely that they could be also used as "indicator organisms" to mark the origin, distribution, and fate of water masses within the oceans, although that has never been studied. Yet, to my knowledge, there are only several persons now living in the world who can identify these organisms, and none in the United States.

Your bill would remedy this situation and therefore it has my support.

Yours sincerely,

ALBERT H. BANNER, Ph.D.,
Professor of Zoology and Director of Hawaii Marine Laboratory, University of Hawaii; on Leave.

UNIVERSITY OF WASHINGTON,
DEPARTMENT OF BOTANY,
Seattle, Wash., March 11, 1961.

Representative GEORGE P. MILLER,
Chairman, Subcommittee on Oceanograpy, House Office Building, Washington, D.C.

DEAR REPRESENTATIVE MILLER: Thank you for the opportunity to comment on your recently introduced bill H.R. 4276.

As a marine botanist I am very much aware of the great deficiencies in marine studies at the present time and am encouraged to see that action is being taken to stimulate and provide support for further activity in this field.

I find, however, in the bill presented there is very little mention of the role to be played by the universities. The Smithsonian Institution, I feel, should not be burdened with the task of making grants for taxonomic studies when an existing governmental agency, National Science Foundation, has a special section experienced in this field.

I take strongest issue with the expressed intent to have the Smithsonian Institution establish a program for the recruitment and training of taxonomists. Also the limiting of taxonomic efforts to fishes and marine invertebrates ignores the plants which contribute well over three-fourths of the worlds total photosynthetic effort. The Smithsonian is not a training institution; the training of scientists should be done within the university system.

These comments, although presented in a way suggestive of criticism, are offered with the hope that they can be constructively used. I feel that the bill, even if unamended, would be a very good thing indeed.

Yours sincerely,

MICHAEL NEUSHUL, Ph. D.

STANFORD UNIVERSITY,
Stanford, Calif., March 20, 1961.

Hon. GEORGE P. MILLER,
Chairman, Subcommittee on Oceanography, House Office Building, Washington, D.C.

DEAR CONGRESSMAN MILLER: Thank you very much for the copy of House of Representatives bill No. 4276 pertaining to the support of the study of oceanography and related subjects under the auspices of the U.S. Congress. It is my understanding that this bill, called Oceanographic Act of 1961, is companion bill to one introduced into the Senate and which also is aimed at improving the situation with regard to support for oceanographic studies.

I am particularly interested in the phase of this work which will involve identification of marine organisms, both the vertebrates and inverterbrates. I believe that this bill and its company in the Senate should do much to improve the situation with regard to our knowledge of marine resources, both those which are renewable and those which can be completely exploited and disappear.

I hope, however, that placing the prime responsibility for encouarging work in the systematics of marine organisms under the control of the Smithsonian Instituion will not hamper the work that may well be carried on at other institions. I understand that the other agencies and universities in the United States who may be working on oceanographic subjects can work directly with and under the sponsorship of the Smithsonian Institution and still be within the framework of this bill. I hope that this will not just add another step in the administrative machinery which can slow up the active work that this bill is designed to promote.

Again, please let me thank you and the members of your committee for the support that you are giving to oceanographic study and the position of the United States in that field.

Very sincerely,

IRA L. WIGGINS,
Director, Natural History Museum.

Mr. DINGELL. The committee will adjourn, subject to the call of the Chair, for receipt of further data and for further hearings, hearing the National Science Foundation.

(Whereupon, at 12 o'clock noon, the subcommittee adjourned, subject to the call of the Chair.)

OCEANOGRAPHY 1961—PHASE 3

FRIDAY, JULY 14, 1961

House of Representatives,
Subcommittee on Oceanography of the
Committee on Merchant Marine and Fisheries,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to adjournment, Hon. George P. Miller (chairman of the committee) presiding.

Present: Representatives Miller, Lennon, Casey, and Morse.

Also present: Representative Gross.

Staff members present: John M. Drewry, chief counsel, and Paul S. Bauer, staff consultant.

Mr. Miller. The subcommittee will be in order.

Today we will resume the hearings on H.R. 4276 with respect to the testimony of the National Science Foundation, represented so ably by Dr. Randal M. Robertson. His testimony, interrupted by the congressional call bell, was of such importance that we have requested him to return.

His incompleted testimony raised the problem of the financial management of grants, or essentially gifts, to nonprofit institutions, of public funds. It should be manifiest that any increase in the working assets of nonprofit institutions will by itself increase the general and administrative costs of the institution. This could reflect in an increased allowable cost of the Defense Department cost-type contracts. There are many more problems of a technical accounting nature which will be explored by the subcommittee with the aid of qualified experts and the assistance of those granting agencies of the executive department.

We further shall concern ourselves with that portion of the bill which requires title to vessels constructed by grant or contract to rest with the Federal Government and as an ancillary problem the question of grants or gifts of shore facilities from public funds.

It gives me a great deal of pleasure to recall as a witness Dr. Randal M. Robertson of the National Science Foundation whose interesting testimony was unfortunately cut short by the summons to the House floor.

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STATEMENTS OF DR. RICHARD H. BOLT, ASSOCIATE DIRECTOR (RESEARCH); DR. RANDAL M. ROBERTSON, ASSISTANT DIRECTOR FOR MATHEMATICAL, PHYSICAL, AND ENGINEERING SCIENCES; CHARLES RUTTENBERG, DEPUTY GENERAL COUNSEL; DR. JOHN T. WILSON, ASSISTANT DIRECTOR FOR BIOLOGICAL AND MEDICAL SCIENCES; DR. WILLIAM E. BENSON, PROGRAM DIRECTOR FOR EARTH SCIENCES; AND DR. JOHN LYMAN, ASSOCIATE PROGRAM DIRECTOR FOR EARTH SCIENCES, NATIONAL SCIENCE FOUNDATION

Dr. ROBERTSON. Good morning, Mr. Chairman.

The CHAIRMAN. Have you anyone with you, Doctor, that you want us to hear?

Dr. ROBERTSON. Yes, sir. Dr. Bolt, our Associate Director for Research, is here. I believe Dr. Waterman wants him to answer questions regarding general policies of the National Science Foundation. We also have Dr. William E. Benson, our Program Director for Earth Sciences, Dr. John T. Wilson, Assistant Director for Biological and Medical Sciences, Dr. John Lyman, Associate Program Director for Earth Sciences in charge of our oceanography program, and Mr. Charles B. Ruttenberg, our Deputy General Counsel.

Mr. MILLER. Fine. Of course, the phase of this we are interested in is that which pertains to oceanography. We realize that the National Science Foundation covers a wide range of activities but, other than oceanography, they do not come within the jurisdiction of this committee, so we will confine ourselves to oceanography, or the things which are relevant to it.

Do you want to proceed, Doctor? Suppose you pick up the questioning, Mr. Bauer.

Mr. BAUER. Thank you, Mr. Chairman.

At the last session, it was brought out, if I may review it for the moment because I do not think Dr. Bolt was here, on the method of giving grants that the decision was apparently left in the hands of an advisory group of scientists that also were recipients of grants.

I wonder if Dr. Bolt would care to talk to the subject of the granting process and as to whether or not there is any question that can arise from the grantees being the deciding body as to the issuance of grants.

Dr. BOLT. May I make a general comment about this kind of problem first and then tie it in specifically with the oceanographic question.

Mr. BAUER. Please do.

Dr. BOLT. There are two aspects here that are important to recognize. The first is that we certainly want to support the very best in science. We want to support the outstanding scientific investigators. At the same time, we want our advisory body to be of the very highest possible caliber because only by having top quality scientific judgment in our advisory groups and panels are we able to insure that we are supporting first-rate research. Every so often our advisory body is going to contain one of these top scientists who also is the sort of

person that should be receiving support because he is doing outstanding work.

Now, we believe that the possible conflict of interest that is implied by this situation can be handled completely and is handled by insuring that when a case arises in which a recipient or potential recipient is also in an advisory group, he simply absents himself completely from the discussions and has no part whatsoever in the decisionmaking process.

Let me make one other comment also. As you know, our advisory panels themselves do not make the final decisions regarding our grants. This decision responsibility is vested in our National Science Board and delegated to the Director and decisions down the line as to which grants should be recommended for consideration by the Director and the Board are made by our program directors and the assistant directors for research, so in any case, this adviser has not been involved in making a decision. I would like to ask if Dr. Robertson would make some comments about the particular review situation in which the ship for Woods Hole was being considered.

Mr. BAUER. Please do, Dr. Robertson.

Dr. ROBERTSON. The oceanographic ship which we gave to Woods Hole resulted from a proposal received from Woods Hole and reviewed by our Earth Sciences Program Office.

Mr. BAUER. Who were the members of the advisory panel at the time this was decided?

Dr. ROBERTSON. I have Dr. Benson here, who is the Program Director for Earth Sciences and who was present during the consideration by the panel. I would like to ask him to go into any detail he would like regarding that process.

Mr. BAUER. I was wondering who the membership was.

Dr. ROBERTSON. I believe we submitted for the record the fiscal 1961 membership of the panel. Dr. Benson can tell you who the membership was at the time that this proposal was reviewed.

Mr. BAUER. That was fiscal 1958, was it not?

Dr. ROBERTSON. It was fiscal 1959, I believe. The grant was made in fiscal 1960.

Mr. BAUER. When was the Woods Hole proposal received?

Dr. ROBERTSON. In February 1959, and the grant was made in the fall of 1959, using fiscal year 1960 funds.

Mr. BAUER. If Doctor would give us the names of those on the advisory group that were concerned with the question, I think it would be helpful.

Dr. BENSON. With your permission, Mr. Bauer, I would like to give you two advisory groups because there are different dates involved in here.

Mr. BAUER. Please do.

Dr. BENSON. I know you are interested in this information. The actual proposal was received from Woods Hole in February 1958, as Dr. Robertson has said. I have a list of the panel members for that year here. I can read them or we can simply have them for the record.

Mr. MILLER. You can submit them for the record.

Dr. BENSON. All right.

(List referred to follows:)

Past and present membership of Advisory Panel for Earth Sciences

Area	State	Appointed	Expired
GEOCHEMISTRY			
Goldsmith, Julian R., University of Chicago	Illinois	July 1, 1958	June 30, 1961
Osborn, E. F., Pennsylvania State University.	Pennsylvania	Apr. 9, 1953	June 30, 1955
Pecora, William T., U.S. Geological Survey	District of Columbia	Apr. 24, 1953	June 30, 1957
Roedder, Edwin W., U.S. Geological Survey	do	July 1, 1961	June 30, 1964
Urey, H. C., University of Chicago	Illinois	July 1, 1955	June 30, 1958
Verhoogen, John, University of California	California	July 1, 1960	June 30, 1963
GEOLOGY			
Behre, Charles H. J., Columbia University	New York	July 1, 1955	June 30, 1958
Gilluly, James, U.S. Geological Survey	Colorado	July 24, 1954	June 30, 1955
Hunt, Charles B., U.S. Geological Survey	do	July 1, 1960	June 30, 1963
Pettijohn, Francis J., Johns Hopkins University.	Maryland	July 1, 1959	June 30, 1962
Russell, Richard J., Louisiana State University.	Louisiana	Apr. 2, 1953	June 30, 1957
Sharp, R. P., California Institute of Technology.	California	July 1, 1957	June 30, 1960
Shenon, Philip J., Consulting Geologist	Utah	Apr. 16, 1953	June 30, 1956
Shrock, Robert R., Massachusetts Institute of Technology.	Massachusetts	July 1, 1958	June 30, 1961
Van Houten, F. B., Princeton University	New Jersey	July 1, 1961	June 30, 1964
GEOPHYSICS			
Balsley, J. R., Jr., U.S. Geological Survey	District of Columbia	July 1, 1957	June 30, 1960
Benioff, H., Seismological Laboratory	California	Apr. 13, 1953	June 30, 1957
Birch, A. F., Harvard University	Massachusetts	July 1, 1960	[1] June 30, 1961
Haskell, N. A., Air Force Cambridge Research Center.	do	July 1, 1961	June 30, 1963
Heroy, W. B., Sr., Geotechnical Corporation	Texas	July 1, 1957	June 30, 1960
Hess, H. H., Princeton University	New Jersey	July 1, 1956	June 30, 1959
Hubbert, M. King, Shell Oil Co	Texas	Apr. 13, 1953	June 30, 1957
Knopoff, Leon, University of California	California	July 1, 1959	June 30, 1962
HYDROLOGY			
Leopold, Luna, U.S. Geological Survey	District of Columbia	Apr. 24, 1953	June 30, 1955
METEOROLOGY AND CLIMATOLOGY			
Landsberg, H. E., U.S. Weather Bureau	do	July 1, 1956	June 30, 1959
Petterssen, Sverre, University of Chicago	Illinois	May 5, 1953	June 30, 1956
Thornthwaite, C. W., Johns Hopkins Laboratory of Climatology.	New Jersey	July 2, 1953	June 30, 1955
OCEANOGRAPHY			
Koczy, F. F., University of Miami	Florida	July 1, 1961	June 30, 1964
Menard, Henry W., Jr., Scripps Institution of Oceanography.	California	July 1, 1959	June 30, 1962
Munk, Walter H., Scripps Institution of Oceanography.	do	Apr. 1, 1953	June 30, 1957
Von Arx, W. S., Woods Hole Oceanographic Institution.	Massachusetts	July 1, 1957	June 30, 1961
PALEONTOLOGY			
Patterson, Bryan, Harvard University	do	July 1, 1956	June 30, 1959
Simpson, George G., American Museum of Natural History.	New York	Mar. 30, 1953	Dec. 16, 1954

[1] Appointed for 3 years but resigned after serving 1 year. N. A. Haskell appointed to finish Birch's term.

Summary by State, university, and geographic area

Universities represented	States represented	Area
University of California (2)	California	West.
California Institute of Technology	do	Do.
Seismological Laboratory	do	Do.
Scripps Institution of Oceanography (2)	do	Do.
U.S. Geological Survey (2)	Colorado	Do.
U.S. Geological Survey (4)	District of Columbia	South.
U.S. Weather Bureau	do	Do.
University of Florida	Florida	Southeast.
University of Chicago (3)	Illinois	North Central.
Louisiana State University	Louisiana	South.
Johns Hopkins University	Maryland	Do.
Woods Hole Oceanographic Institution	Massachusetts	Northeast.
Harvard University (2)	do	Do.
Massachusetts Institute of Technology	do	Do.
Air Force Cambridge Research Center	do	Do.
Johns Hopkins Laboratory of Climatology	New Jersey	Do.
Princeton University (2)	do	Do.
American Museum of Natural History	New York	Do.
Columbia University	do	Do.
Pennsylvania State University	Pennsylvania	Do.
Geotechnical Corp	Texas	South.
Shell Oil Co	do	Do.
Consulting geologist	Utah	West.

Dr. BENSON. Actually, this proposal was received, in effect, after the decision had been reached. We first started talking about the need for oceanographic vessels when I first joined the Science Foundation early in 1956 and, in May 1956, I prepared a staff study in which I had cited consultations with the personnel of ONR, and with oceanographers in the country about the growing need for new oceanographic vessels, both to replace a fleet that was being worn out and to start building up oceanography. This was even before the Academy Committee was formed. This study was considered by the Earth Science Panel of that year, and I have the names of those people also.

Mr. BAUER. Will you supply it for the record?

Dr. BENSON. Yes, I will supply that for the record.

(Material referred to follows:)

MEMORANDUM FOR THE RECORD, OCTOBER 15, 1956

In connection with its studies of needs in oceanography, the earth sciences program, through the MPE Division, requested and received aid of the American University in calling a special meeting of the directors of seven oceanographic institutions to discuss the need for new research vessels. The meeting was held in the board room of the National Science Foundation, September 29, 1956, and was attended by the following people:

Participants:

Dr. Columbus Iselin, Woods Hole Oceanographic Institution.
Dr. Maurice Ewing, Lamont Geological Observatory.
Dr. Donald Pritchard, Chesapeake Bay Institute, John Hopkins University.
Dr. F. G. Walton Smith, Marine Laboratory, University of Miami.
Dr. Dale Leipper, Texas A. & M. Research Foundation.
Dr. Richard Fleming, University of Washington.
Dr. Roger Revelle, Scripps Institution of Oceanography.
Dr. William E. Benson, National Science Foundation.

Present as observers:

Dr. M. King Hubbert, Chairman, Advisory Panel for Earth Sciences.
Paul Kratz, National Science Foundation.
Gordon Lill, Office of Naval Research.
Arthur Maxwell, Office of Naval Research.
Carl Alexis, Office of Naval Research.
John Lyman, Hydrographic Office.

After a considerable discussion, it was agreed by the various directors that there are three distinct and pressing needs in oceanography: (1) The gradual replacement of the present fleet by new vessels, preferably those which are designed as research vessels rather than conversions. (2) Two larger vessels that would be capable of long-range or all-weather cruises so that the United States can start a program of deep-sea oceanography in stormy latitudes and winter weather. (3) Financial support for operation of the existing fleet but especially for any new vessels. At present the various institutions are able to keep their ships afloat only through extensive contract operations and their scientific programs are therefore hampered.

In the case of new, larger vessels, additional operating funds are essential; otherwise, no existing institution could afford to accept the new vessel. It was recommended that an annual grant equal to about two-thirds of the annual operating costs should be provided with any larger vessel that is built. It was also recommended that in providing one of the smaller vessels to an institution, one-third of the annual operating costs should be given with the vessel. In summing up the opinions of the various participants, a subcommittee consisting of Revelle, Fleming, and Pritchard, drafted a report that was discussed and adopted unanimously. Copy of this report is attached.

The group passed also the following resolution: "In view of the condition of the *Atlantis*, first priority should be given to the construction of a larger vessel of about 1,000 tons." Such a vessel would act as a proving ground for the desirability of another large vessel to operate in the Pacific Ocean.

WILLIAM E. BENSON.

U.S. NEEDS FOR OCEANOGRAPHIC VESSELS

The following represents a summary of opinions at a meeting of directors of U.S. oceanographic institutions held at the National Science Foundation, September 29, 1956, concerning U.S. needs for scientific research vessels.

1. What are the needs for new oceanographic vessels?

Two kinds of new oceanographic research ships are needed in the United States: (1) Vessels of moderate size (80 to 150 feet) for experimental work at sea usually within a thousand miles of coastal stations; (2) large ships capable of deep-sea exploration over the entire expanse of the oceans, particularly in high latitudes and at all seasons of the year. The latter should be large enough and should have other characteristics to enable them to handle heavy gear in all-weather operations. Unlike existing U.S. scientific research vessels, they should have ample laboratory and deck working space and comfortable living quarters.

2. Why are these two sizes of ships needed?

Smaller vessels are needed not only to replace existing vessels but also to increase the size of the U.S. scientific research fleet. Specially designed ships would allow more efficient operation and would enable U.S. marine scientists to advance more rapidly in increasing our understanding of the oceans and the animals and plants that live in them.

The larger vessels are needed to enable American scientists to work in those parts of the ocean and at those times of the year that are now inaccessible to them because of the inadequacy of existing vessels. The largest nongovernmental oceanographic ships operated in the United States have a displacement of about 750 tons. In contrast, one of the principal Russian research vessels displaces about 5,000 tons and has ample working and living space for four times the number of scientists that can be accommodated on any American vessel.

3. How can the provision of new research ships aid the earth and biological sciences as a whole?

In all aspects of the earth sciences, more knowledge is needed about that part of the earth covered by the ocean. Similarly, in the biological sciences, comparative studies of marine organisms are essential to the solution of many fundamental biological problems. The needs in both cases, however, are not for

accumulation of data but rather for the application of the most advanced ideas and techniques of modern science to problems of the oceans. It is essential to enlist the interest of imaginative and outstanding scientists in these problems. For this purpose, the provision of adequate primary research tools, particularly livable and efficient oceanographic ships, is a prime requisite.

4. Why do we need to replace existing vessels?

Because many are nearly worn out and others are obsolescent and do not meet the needs of modern oceanography. It is characteristic of all American oceanographic institutions that all available funds have been used for operation and no reserve for replacement or depreciation has been accumulated.

5. Why cannot Navy and other Government vessels be used for research?

Basically, because Navy vessels are designed to operate for other purposes; namely, to maintain a fleet in readiness for the defense of the United States. This means that training and military operations must take priority over scientific work. In our opinion, it is both ineffective and uneconomical to use Navy vessels for free research, although they can be very effectively used for surveys and developed tests. Similar considerations apply to other governmental vessels which in almost every case have primary tasks that inhibit free research.

6. What size, type, and number of vessels are needed and when should they be built?

During the next two decades at least 10 ships, 80 to 150 feet long, capable of 15-knot speed, cruising radius of 1,000 to 5,000 miles, capable of staying several weeks at sea with a scientific party of 10 to 20, will be needed. These should be provided at the rate of one every 2 years.

In addition, two ships are needed, one for the Atlantic and one for the Pacific, of 1,000 to 1,500 tons, capable of all-weather exploration of the entire ocean, with laboratory and living accommodations for effective scientific work by 20 to 30 in the scientific party. These should be built as soon as possible to enable the United States to assume its proper role in modern scientific investigations of geophysics, geochemistry, and marine biology.

7. Is it sufficient merely to build these vessels?

No. On the contrary, operating funds are desperately needed. These would allow more free scientific work at sea for existing oceanographic ships. The need for operating funds would be even greater for the proposed large new vessels, since they would be more expensive, probably twice as expensive as any existing nongovernmental American oceanographic ship. Experience shows that for every dollar spent on ship operation, about $3 must be spent in the shore establishment, for the support of scientists and technicians, the operations of laboratories, and the provision of equipment. Unless a substantial part of the required operating funds for the large vessels are provided, then it would not be advisable to have them built. Because of the necessity for coordination of the scientific work, funds for ship operations should be made available to the institution responsible for the ships, rather than grants to individual scientists. Because of the necessity of long-term planning, funds should be made available for a period of at least 5 years.

8. Who should operate the proposed new ships?

As in the past, smaller vessels should be operated by the various oceanographic institutions. Some other arrangement might be necessary for the proposed two large vessels; but, in general, such arrangement should also involve existing oceanographic institutions with the basic prerequisite that every attempt be made to enlist the interest and active participation in the work at sea of scientists throughout the country.

Dr. Benson. It was recognized at that time that the most pressing need was the replacement of the *Atlantis* at Woods Hole. We did not state, "This is what we are going to do." We wanted to explore it further, but we had this in the back of our minds.

In September of 1956, with the concurrence and advice of the Earth Sciences Panel, we called together the directors of seven oceanographic institutions of the country that would be most concerned for an advisory meeting on the need for ships, on what type of ships we needed,

and various matters such as that. The minutes and the report of that meeting can be entered in the record. The report includes a resolution in which the seven directors said: "In view of the condition of the *Atlantis*, first priority should be given to the construction of a larger vessel about 1,000 tons."

So that as early as September then of 1956, we were really heading for a replacement for the *Atlantis*, although in order to keep our own plans flexible enough, it was not so stated and was not so planned. In other words, it was a possibility that by the time we requested and got funds the *Atlantis* might not still be the first priority problem, but we were pretty sure that it would be.

Mr. BAUER. You were also cognizant, were you not, that the Navy was contemplating supplying an AGOR to Woods Hole?

Dr. BENSON. The meetings that I speak of here were before the AGOR was really on the drawing boards. We were in close contact with the ONR people and we knew we were both requesting oceanographic vessels; we had decided that this many vessels were definitely needed in the country, and that there would be really no conflict or duplication when and if we received authority to construct these vessels. We felt we would have no trouble in finding proper places for them. This is why we did not specify where each one was going. It was more or less an informal and off-the-record agreement between ourselves and ONR that, whichever agency was able to get a vessel, Woods Hole had a strong case for receiving it.

We did not make the final decision until later.

Mr. BAUER. After the conception of supplying vessels in 1956, then, if I understand your testimony correctly, there was a parallelism of who could supply the first vessel to replace the *Atlantis;* is that correct, between the Office of Naval Research and the National Science Foundation?

Dr. BENSON. I cannot speak directly for ONR. Maybe Dr. Robertson can. As I recollect it, probably imperfectly, there was some question of how soon they were going to be able to get their oceanographic vessel approved, and we sought for and received authorization, I think, in time so that it was decided then that we would probably take Woods Hole.

Mr. BAUER. When did ONR receive the advice that the National Science Foundation was going to supply a ship to replace the *Atlantis* and that AGOR that was contemplated to go to Woods Hole would not go to Woods Hole? Do you have any recollection of that?

Dr. BENSON. I believe it was some time in 1958.

Mr. BAUER. That is the time that Dr. Robertson came with the National Science Foundation from the Office of Naval Research?

Dr. ROBERTSON. I came to the National Science Foundation from the Office of Naval Research in early July 1958.

Mr. BAUER. Were you, Dr. Robertson, involved with the question of the parallelism of supplying the ship that was needed by Woods Hole?

Dr. ROBERTSON. We had been——

Mr. BAUER. I mean when you were with the Office of Naval Research?

Dr. ROBERTSON. Yes. We had been in constant discussion with the National Science Foundation concerning the problem of obtaining

more oceanographic ships. The Navy, of course, had been supplying converted ships for oceanographic purposes, Navy types for this purpose, and had not, at that time, obtained final approval for a design for a new oceanographic ship. This came later in the form of the AGOR. It was recognized generally that support for oceanography, including support for provision of oceanographic ships, should be diversified. ONR felt and made informal representations that the total burden of supporting oceanography should be spread, and that the NSF should enter in a strong way into the support of basic research in oceanography, both supporting the ongoing research programs and attempting to provide some of the needed new ships.

This was a mutual understanding that developed between the two agencies.

Mr. BAUER. Of course, you are familiar, are you not, with the difference in approach with respect to the National Science Foundation and the Office of Naval Research whereby the Office of Naval Research maintains title and contract for the use of the ship and the National Science Foundation makes an outright grant or gift?

Dr. ROBERTSON. That is correct. The Navy, of course, keeps title to its ships. It is an agency that has a long experience with taking care of ships. The National Science Foundation policy is to give title to the facilities that it provides for research purposes to the nonprofit institutions that receive its grants.

Mr. BAUER. Let us suppose, looking into the future, that there are more ships needed, which undoubtedly there are, which policy should we pursue? That of the National Science Foundation of giving title, or that of the Office of Naval Research of retaining title?

Dr. ROBERTSON. My own feeling is that there is a lot of value in having both policies. In other words, we need to build up the scientific assets of our nonprofit research institutions. We can do this by making grants for ships and other major facilities.

At the same time, the Navy with its history of taking care of ships and providing them, might well continue to give ships on loan.

Mr. BAUER. If you were in the situation of a recipient, which would you prefer from a point of view of the scientific merit of either having a ship on a bailment, as the Navy does, or a ship given to you as the National Science Foundation does? If you were the recipient which would you prefer?

Dr. ROBERTSON. If I were the director of an oceanographic institution, I would like to have a reasonable number of ships which belong to the institution. I might also accept the care of certain Navy ships because of the Navy's interest in the institution. To me an oceanographic institution with nothing but shore facilities is unthinkable. Such an institution needs to have both its shore laboratories and its ships.

Mr. BAUER. In your hearing before the House Appropriations Committee in 1960, the justification of your budget proposal as I remember it, was that you were going to spend $3 million for ships; is that correct?

Dr. ROBERTSON. $3 million was the amount of our original grant to Woods Hole.

Mr. BAUER. But, I mean in your budget justification, you were just talking about ships.

Dr. ROBERTSON. Yes.

Mr. BAUER. Now, in 1961 in the hearings before the subcommittee on appropriations of the House you implied that "If you give us a ship, you must also give shore facilities to take care of the operation of the operation of the ship." Is that putting it succinctly?

Dr. ROBERTSON. Yes.

Mr. BAUER. Then, Mr. Thomas, the chairman of the other committee of the House raised the question: "Now that you have given them the ship, you must give them the shore facilities. Therefore, you must, of course, give them a substantial sum of money to keep the ship in operation." It that correct?

In other words, in your future plans, now that you have the ship and the shore facilities, are you going to fund the operation of the ship?

Dr. ROBERTSON. Our understanding at Woods Hole is that they will fund the operation of the ship in their normal way, that is, through the inclusion in research grants and contracts which they have with Government agencies of ship operating costs.

Mr. BAUER. In other words, the Office of Naval Research?

Dr. ROBERTSON. We feel that in the long run it is likely that support for Woods Hole will be equally shared between the Office of Naval Research and the National Science Foundation, and that, looking into the future and projecting our budget which we hope will continue to increase, probably about half of the operating cost of this ship will come from the National Science Foundation. This is an estimate.

Mr. BAUER. That presents somewhat of an accounting problem for Woods Hole, does it not, because the Office of Naval Research spells out in their contract with Woods Hole what they shall do and maintains financial management of their operations, whereas you give them the money and maintain no financial management of the operation.

Dr. ROBERTSON. We require them to keep a record of their expenditures and file financial statements, and they are subject to inspection.

Mr. BAUER. Is that statement audited by GAO?

Dr. ROBERTSON. I believe it is.

Mr. BAUER. I do not mean to belabor the point, but GAO advises us that they have no audit authority for grants.

Dr. ROBERTSON. We have an internal audit group which audits the expenditures under our grants, and we require that adequate records be kept so that we will know at all times where the money has gone.

Mr. BAUER. There will be no hardship then if the General Accounting Office had their authority enlarged as far as the National Science Foundation is concerned, to explore all grants given by you? It would be no hardship to you because you have the internal audit facilities, you say?

Dr. ROBERTSON. That is right.

Mr. BAUER. Do you care to comment, Dr. Bolt?

Mr. RUTTENBERG. I think our position would be on this, that we would not object. We have our own audit program, too, which is just getting underway. It is in the early stages so that not too many institutions have been audited. I am sure, however, that at least 6 or 8 have been audited by our own auditors to date where they go in and check the financial records of the institutions as far as Foundation

grants are concerned and report to us. Even if GAO does not do it, the National Science Foundation at some point will, I am certain.

Mr. BAUER. When did this start?

Mr. RUTTENBERG. I believe they actually began to go out to the institutions within the past year. I know that there are at least six or eight where audits have been made beginning in a circle with Washington as the center. They started in the Washington area with Maryland, George Washington, and so on. They have been at Rutgers, the University of Pennsylvania, or they may be there now, and one or two other institutions. This circle is going to expand as they get more experience and more people.

Mr. BAUER. I am very much interested, and I think the committee is, in how do you maintain financial management that the Navy has been doing for years very successfully, if the program of financial management of your grants has just started this year, and you have granted in excess, since you started, of some $500 million.

Mr. RUTTENBERG. If I may speak to that, Mr. Bauer, your statement is not quite accurate. What I was referring to is actual on-the-site audits. We have had auditors on our staff all along and they go over these financial statements on a regular basis. What I am speaking of now is the actual on-the-site audits.

Mr. BAUER. That is what I am referring to.

Mr. RUTTENBERG. Yes.

Mr. BAUER. What is your policy with respect to depreciation of capital assets created by your gift?

Dr. ROBERTSON. I do not believe we have a policy which we impose on the institution in that respect.

Mr. BAUER. In other words, if an institution receives a $10 million ship or a $7 million ship, is it going to depreciate it, or carry it forever as a capital asset at cost?

Dr. ROBERTSON. As far as I know, and this is not a field in which I am qualified, the individual institutions have their own standard bookkeeping systems, including depreciation formulas, and we permit them to apply those procedures to the property which we give them.

Mr. BAUER. If they do not depreciate the ship and carry it at the cost, then when the ship is no longer useful, they would have no reserve for replacement of the ship, and that means then that you will have to buy them a new ship, is that it?

Dr. ROBERTSON. Any proposal for a new ship would be considered on its own merits. I think your implication that there should be depreciation on ships included in the financial statements of these institutions is correct.

Mr. BAUER. In other words, you favor the depreciation of the ship after the gift to the institution?

Dr. ROBERTSON. That would seem to me a proper procedure, but I am not skilled in the art of accountancy.

Mr. BAUER. Do you not think it is important that the National Science Foundation have a policy as to whether depreciation is concerned, because you will remember Mr. Fye's testimony. He was undecided as to whether he should depreciate the ship or not.

Mr. RUTTENBERG. Mr. Bauer, we have been discussing this problem and the matter is not settled as to how this should be handled.

Normally, with respect to grants to institutions of higher education or other nonprofit institutions, we follow their accounting practices and procedures, if we consider those appropriate. In this case, this is a special situation and the matter of how it should be handled is still under discussion, so that it is not settled, and your point, I think, is a good one.

Mr. MILLER. While this committee is concerned with the matter of what you do with respect to ships that you make grants of, I know that there is some concern in another committee on which I sit as to what is going to happen to the apparent plan that you are going to use for making grants to scientific or learned institutions or universities. This is one of those mundane things that you get into. You ought to keep your heads well in the clouds where you do the work that you are supposed to do. This is one of the practical sides of the operation; what is going to happen to the money that the Federal Government appropriates to the National Science Foundation and are the products of that money going to be well handled, or going to be preserved to the Government. We are probing this matter because I am certain if the committee can be shown that outright grants are the best, we will not get in your way on these grants. The committee is also concerned with its responsibility for this money and just making outright grants in the case of this ship. We have no desire to pick on Woods Hole because this just happens to be the case in point. Perhaps title to the ship should be retained in the U.S. Government. The National Science Foundation, I realize, does not want to burden itself by having title to and maintaining a lot of ships but certainly if the time comes when any institution no longer needs the ship and you withdraw your support of the ships, then such a ship may be a burden.

Could you not retain title of it and, if necessary, turn it over to the GSA to dispose of?

Mr. RUTTENBERG. We have certain restrictions in the grant to Woods Hole on the ship which I think would take care of the problem you raise. One of the clauses, and we can read the specific ones, as we have the grant with us, is to the effect that if the vessel is no longer being used primarily for basic scientific research, title must be returned to us at our request, and then we can do with the ship what we wish.

Mr. MILLER. Why should we give title in the first place, if we are going to put that string on it, because they may say, "Well, we can use this someplace." This is an important piece of property that the Government owns. Why can we not hold title to it and let them use it as long as they want it, rather than to say, "When, in your opinion, you no longer need it, we are going to take it back," or they start using it for some objective other than for which it was constructed, and we then say, "Well, in this case, we are going to demand the ship back," and then have to argue with them whether or not the ship belongs to the United States.

Mr. RUTTENBERG. I think the decision would be the Foundation's in that respect. One of the reasons, of course, that we have felt that giving title is desirable, is that while they have the ship it gives them a freedom of action with respect to where they use and how they use the ship, and so on.

Of course, let me say there are certainly opposite views which have some merit and we recognize these, and it is a question of having to make a decision one way or the other. We have felt that the restrictions we have put on the grant will protect the Government. If we could, I think, it might be useful to read into the record the restrictive clauses that we have in the grant.

Mr. MILLER. I think we would be very happy to have that.

Mr. RUTTENBERG. Shall I proceed?

Mr. LENNON (presiding). Will the gentleman proceed to read into the record the restrictions and commitments with respect to the use of these vessels?

Mr. RUTTENBERG. These clauses I am about to read may not appear in the grant in this order, but they are in. This is a summary of the ones that are pertinent. First:

The grantee will, within the reasonable limits of its funds, operate and properly maintain the completed vessel.

The next clause that is involved is as follows:

During a period of national emergency declared by the President or the Congress, the grantee will, should the cognizant Federal Government executive agency decide that the interests of national defense require it, convey to the Government, title and ownership of the vessel without further cost to the Government except for such equipment and improvements as may have been added by the grantee and such other costs as may, in the judgment of the cognizant agency, be deemed equitable.

The next clause involved is:

The grantee shall use the ship primarily for the conduct of basic scientific research. In the event that the ship does not continue to be so used, title to the ship will be transferred to the U.S. Government upon the request of the National Science Foundation.

Finally:

In the event that the grantee wishes to dispose of the ship, such disposal shall not take place without the prior approval of the Foundation.

Those are, I think, the relevant clauses.

Mr. LENNON. In Dr. Fye's testimony heretofore given before the committee, he listed some restrictions and commitments that were tied to the transfer of these vessels to such a private institution as the Woods Hole Institution and I read this language from the transcript of the testimony and ask your comment on it. You just touched on it.

This is quoting Dr. Fye:

It is required that the ship be used for basic research, and if this use ceases the title returns to the United States * * *.

You just mentioned that.

Reading further—

* * * If there is no privilege to use this as an asset of a research institution in terms of sale, without approval and complete acquiescence on the part of the Science Foundation.

Would you explain that?

Mr. RUTTENBERG. I think the clause he referred to there was the one I read which says that—

In the event that the grantee wishes to dispose of the ship, such disposal shall not take place without prior approval of the Foundation.

I think that is what we had reference to in the statement that he made. In other words, they cannot sell the ship or get rid of it, without our prior approval.

Mr. LENNON. I think that is entitled to some further explanation. Does the National Science Foundation have a right to make a contract with a private institute such as the Woods Hole Institution that will permit the Woods Hole Institution to dispose of that vessel?

Mr. RUTTENBERG. We have the legal right, if we had done so, to give them full title without any strings at all under our basic statutory authority. In other words, there is no requirement that we put the restrictions in that we have, but we felt that in the national interest it was desirable.

Mr. LENNON. But they are always included?

Mr. RUTTENBERG. With respect to ships, we have done so; yes, sir.

Mr. LENNON. I am not familiar with the basic act establishing the Science Foundation, but I am a little bit surprised to know that you could convey or transfer a vessel to a private enterprise and just let it go at that, because that is all taxpayers' money, is it not?

Mr. RUTTENBERG. The whole philosophy behind the Foundation Act, which was enacted in 1950, was that the Foundation should be able to make grants and it was given much more liberal authority than any Federal agency had at that time.

Mr. LENNON. When you say grants, you mean actually capital assets of the Federal Government?

Mr. RUTTENBERG. That is correct. Generally speaking, we do it through funds, though, not capital assets. On occasion, we have gotten something from surplus and granted it, but in most cases, it is money to either buy things for their use, or to construct things for their use.

Mr. LENNON. Reading further from the testimony given by the head of the Woods Hole Institution, he said that in the three decades, 30 years, they had operated 17 other major research vessels at one time or another, "all of which have been owned outright."

Do you happen to recollect how they acquired and from what source they acquired the greater number of those 17 vessels?

Mr. RUTTENBERG. I am sure we can answer that.

Mr. LENNON. They do not own anything outright from the Navy, do they?

Mr. RUTTENBERG. No, they do not.

Mr. LENNON. The 17 could not be from the Navy, then?

Mr. RUTTENBERG. I think he said where they did not own them outright.

Mr. LENNON. He said where they did.

In the course of over three decades of oceanographic research, we have operated 17 major research vessels at one time or another, all of which we have owned outright.

Dr. BOLT. I would like to ask Dr. Lyman to comment on that.

Dr. LYMAN. I believe I can give you an idea of this, Mr. Lennon.

The first ship they owned was the *Atlantis*.

Mr. LENNON. I think we can get to this quicker. Was the major part of them acquired from the National Science Foundation?

Dr. LYMAN. No. The ship under discussion this morning is the first ship the Science Foundation has granted to anybody.

Mr. LENNON. Proceed, please, Mr. Bauer.

Mr. BAUER. Thank you, sir.

Now, with respect to these ships how many ships do you have in your budget in fiscal 1962?

Dr. ROBERTSON. In fiscal 1962, we included funds to complete a second large oceanographic ship. That was the only specified ship, I believe. The funds are available for oceanographic facilities and the actual grants would depend on the proposals received.

Dr. BOLT. Dr. Wilson would also like to comment on another ship for biological oceanography, a smaller vessel.

Dr. WILSON. In our fiscal 1962 budget for biological and medical sciences, we have made provision for the possibility of a vessel at Scripps Institution, a biological vessel in the amount of approximately a half million dollars. It is a small ship.

Mr. BAUER. That brings up a rather interesting point. In your testimony before the House Appropriations Subcommittee on your fiscal 1962 budget, Dr. Robertson testified as follows:

> We looked very hard at the problem of converting existing ships for use as oceanographic research vessels and they are just not satisfactory. The major difficulty is that the ones that have the necessary space are so expensive to operate that in the long run it is better and cheaper to build your own ships and have exactly the facility you want.

How do you reconcile the fact that you have granted Stanford University $400,000-odd to convert a ship for oceanographic purposes with that philosophy?

Dr. ROBERTSON. We look at each case on its merit.

Mr. BAUER. I am talking about the ship.

Dr. WILSON. I think probably, Mr. Bauer, that the issue here is a fundamental difference between ships that are primarily used for biological work and ships which are used either exclusively for physical oceanography or for general purposes. The kind of ship I was talking about for biological and medical sciences is 100 feet long and when he was making that statement, I think he had in mind vessels of much larger magnitude. The vessel at Stanford that you are referring to is a schooner that originally was owned and is still owned, as a matter of fact, by the Vanderbilt Foundation. The Vanderbilt Foundation is an institution that is located on the Stanford campus and does ichthyological research. Commodore Vanderbilt, prior to his death, wished to give the schooner, the *Pioneer*, to Stanford as a gift. Stanford was willing to accept it under the condition that they could raise funds to modify the vessel for primarily biological oceanography training and research. This vessel is not of a size that Woods Hole is interested in for general oceanographic research. It is satisfactory from the point of view of graduate training, doctoral research, and staff research in biological oceanography. I think it would not be considered satisfactory by physical oceanographers whose equipment is much heavier.

Mr. BAUER. On the question of size of the ship, and whether it would be satisfactory or not, is it not correct that the schooner in question is 172 feet long?

Dr. WILSON. That is right.

Mr. BAUER. And your Woods Hole vessel started at $3 million and now is up to $5 million and no one knows what it will actually cost.

It started at 170 feet. Then it went to 175 feet. Then it went to 195 feet with steam. I do not see essentially what the difference is. In other words, the question is, if you can convert an existing vessel, why should you have to build a new one? That is the question.

Dr. WILSON. The question in the case of the Vanderbilt vessel is it was available to Stanford University on the basis of a gift. Woods Hole had no one to give them a 172-foot vessel so they had to get a new one.

Mr. BAUER. Dr. Robertson testified:

> We looked very hard at the problem of converting existing ships.

How hard did you look, Dr. Robertson? Did you survey the available ships that are mothballed with the Maritime Administration, we will say, the Navy, and so on? What is wrong with the AGOR's that have been converted as far as oceanographic vessels?

Dr. ROBERTSON. This whole matter has been examined by our advisers, by the National Academy Committee.

Mr. BAUER. Would you mind telling us who the advisers are?

Dr. ROBERTSON. This has been discussed with the directors of the oceanographic institutions, with the National Academy of Sciences Committee on Oceanography, and with the Navy people, and the general consensus is that for the large general-purpose oceanographic ship of the type that Woods Hole is building, it is better and cheaper to design your floating laboratory from the keel up. You get a better, more effective, and more efficient ship, and this is the reason, as I understand it, that the Navy has created a special class of oceanographic research ships called the AGOR's, which will replace the conversions which they have been using and which are less efficient for the purpose than these specially designed ships.

Dr. BOLT. If I could add further to this, the business of looking closely at the design of the vessel really means looking very closely at the exact uses for which the vessel will be put. In the case of the biological oceanography ship, by and large, this is simply a platform from which to gather specimens to make certain relevant measurements about the environment from which the specimen came, and perhaps to do something in the way of preserving or analyzing these specimens. Some of the physical oceanography studies, measurements, types of investigations, involve really very different things, and these research needs have to be reflected in the design of the vessel.

If I could give just one example so you will see how this ties down, you mentioned that the Woods Hole ship increased in length and went over to a steam plant. One of the very important physical tools in oceanography is using sound waves for depth measurement and long-distance communication, and a very important feature of a ship is that it should be very quiet if you are going to use it to pick up weak sound signals under the seas. When you look very carefully at the problem of making an oceanographic vessel that is going to be really useful for all types of physical underwater acoustic studies, you find that the type of powerplant, such as steam, can be a critical matter in the design in giving you the quietness that you need. I just mention this as one of the kinds of ways in which some of the physical oceanography uses can actually affect the basic hull design, the materials, shape, and powerplant, and everything to do with the vessel,

and this is quite different from having a ship satisfactory just to go out as a platform to gather samples and make simple measurements.

Mr. BAUER. In other words, you contemplate the Woods Hole ship will be used for underwater acoustics primarily?

Dr. BOLT. This would be one of the several things that it would do. If you would like more details on the kind of programs there are, there are many other uses of that ship contemplated.

Mr. BAUER. I would like to find out why you went from diesel to steam and increased the yearly operational cost estimated from $410,000 a year to $432,000 a year using steam.

Dr. BOLT. Perhaps the most important single consideration going to steam was the quietness of the vessel, the ability to give it a low enough noise so that it can detect very weak signals coming from long distances.

Mr. BAUER. You are familiar with the geophysical industry that has been in the business of making seismic studies of the bottom of the ocean. They are down to depths of 20,000 feet below the bottom of the ocean by both seismic reflection and seismic refraction and they have no difficulty with diesel ships.

Dr. BOLT. This is a question of degree and a question of just what they are doing. In general, the seismic measurements to which you refer are restricted to certain frequency ranges and also they have relatively high levels of acoustic energy available. In a general underwater acoustics research program, one is interested in frequencies over a very wide range, from very low to very high frequencies, and you are dealing with extremely weak signals if you are looking for sound waves coming from a great distance away. There is a significant difference between steam and diesel in the ability to design a quiet ship.

Mr. BAUER. You know, of course, that the tongue of the ocean is being investigated from the point of view of underwater sound, quantity of noise, the background noise, by a commercial company under contract with the Navy, and they use diesels in their explorations.

Dr. BOLT. That is right and they can come to a full stop to make certain measurements, also.

Mr. BAUER. Is that bad?

Dr. BOLT. In certain cases you would like to make continuous runs to have something that is quiet enough to be able to be underway while you are making your survey.

Mr. BAUER. Let us look at the other ship that you have here. You have the USNS *Eltanin*, I believe in your Antarctic program.

An ice-strengthened cargo ship will become a seagoing scientific laboratory. This ship will be fitted to accommodate numerous disciplines, including meteorology, upper air atmosphere studies, marine and terrestrial biology, physicial oceanography, submarine geology, and geomagnetic studies.

This ship is a conversion, is it not?

Dr. BOLT. Yes.

Mr. BAUER. Of a C–1 hull.

Dr. LYMAN. It is not a C–1 hull. It was a specifically ice-strengthened vessel that was built for MSTS several years ago.

Mr. BAUER. And the amount that you have in the budget for fiscal 1962 and 1963 in the expenditure of the antarctic phase of your operations is $1,700,000 on that ship? Is that right?

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Dr. LYMAN. If it is in the budget.

Mr. BAUER. The point I am trying to get at is why should we build new ships when we apparently find that conversions work very well. That is what I am getting at.

Dr. ROBERTSON. Of course, the antarctic ship is not a general-purpose oceanographic ship. It is a floating laboratory for antarctic use and it required an ice-strengthened hull. I feel that that is rather a special case and does not bear too closely on the problem of what is the best way of obtaining the kind of oceanographic research ships that we have to have if we are going to get ahead with this important field of science.

Mr. MILLER. Who will operate this ship, incidentally?

Dr. ROBERTSON. Which ship?

Mr. MILLER. This antarctic ship. Will that be operated by one of the foundations, or will it be operated by the Federal Government? I am speaking of that specially designed ship to take up the stresses in the antarctic.

Dr. ROBERTSON. MSTS provides the operation for that ship, which forms a part of our antarctic research program.

Mr. MILLER. That ship is retained entirely as the property of the Federal Government at all times?

Dr. ROBERTSON. That is a Government ship.

Mr. MILLER. There is no grant involved here.

Dr. ROBERTSON. That is correct.

Mr. MILLER. Of course, the point that Mr. Bauer makes is that this ship is available and by converting it you just turn it into the type of laboratory that you want.

Mr. BAUER. With respect to the operation of the Woods Hole ship, I hate to belabor the point, but you have testified, Dr. Robertson, that half of the operational cost would come from the Office of Naval Research by contract, and half will come by grant from the National Science Foundation; is that correct?

Dr. ROBERTSON. That is my estimate.

Mr. BAUER. Will the Office of Naval Research in its contract spell out what the ship shall be used for?

Dr. ROBERTSON. Oceanographic research in certain broad areas.

Mr. BAUER. No more than that?

Dr. ROBERTSON. The Office of Naval Research, as I recall it—this may have changed since my day—had several contract tasks at the Woods Hole Oceanographic Institution, one of which was for a broad program of basic background, oceanographic research. In addition to this, they had others which called for rather specialized programs in fields of special interest to the Navy.

Mr. BAUER. The theory by which you have given Woods Hole the ship is that they can do anything they want to with it. Yet half of the operational cost will be by contract spelling out the tasks; is that correct?

Dr. ROBERTSON. As I said, the basic research contract tasks written by the Office of Naval Research provide for a broad program of oceanographic research, and we assume that this ship will be used for such programs in connection with Navy work perhaps at the same time that other people on the ship are working under NSF grants.

Mr. BAUER. In the event that this committee and the House enacts Congressman Miller's bill requiring title of ships constructed with

Federal funds to be in the Government, do you have any preference as to where the title should rest? Would it be with the National Science Foundation, or the Maritime Administration, or the Navy, or the Coast and Geodetic Survey?

Dr. ROBERTSON. Under these circumstances, I would think for these basic research ships it should remain with the National Science Foundation.

Mr. BAUER. That is all I have, Mr. Chairman.

Mr. MILLER. Mr. Lennon, have you any questions?

Mr. LENNON. No, sir.

Mr. MILLER. Mr. Gross?

Mr. GROSS. No, sir.

Mr. MILLER. Mr. Drewry.

Mr. DREWRY. Mr. Ruttenberg, I came in late so maybe this has already been covered. Stop me if it has been.

In your discussion of the restrictions on this particular ship that we are talking about of Woods Hole, do you make the money available to Woods Hole by grant?

Mr. RUTTENBERG. Yes.

Mr. DREWRY. Is it on a progress basis?

Mr. RUTTENBERG. Yes. I do not know the specific details, but it is on a progress basis, I am sure. In other words, the whole sum is not given at one time. Dr. Benson would know specifically how that works.

Mr. DREWRY. So at no point do you ever have any title of any kind in the product of your grant. Is that right?

Mr. RUTTENBERG. That is correct.

Mr. DREWRY. On these so-called restrictions, in the event of a national emergency the institution that has agreed with you in connection with the grant of whatever product of the grant is, in this case a ship, the ship would be available to the United States. Does that mean that you would grant it back to the United States, or sell it back for a dollar, or would they get just compensation?

Mr. RUTTENBERG. I do not think they would get any compensation, no. I think it would be transferred to the United States without compensation, except for what they have put into it of their own money. There would be an equitable adjustment on that, but insofar as the U.S. portion is concerned, there would be no further compensation to them upon return of the ship.

Mr. DREWRY. Actually, since the title is vested in the institution, while they will agree to do this, they do not have to. They have the ship. They have full, free, and clear title, have they not?

Mr. RUTTENBERG. Well, I suppose that in an extreme case, and I do not visualize this ever happening, there could be a case where we would have to proceed against the organization to get it, but we do not anticipate that.

Mr. DREWRY. No. I am just talking about the legal aspects.

Mr. RUTTENBERG. They have accepted the grant subject to the conditions that have been placed on it.

Mr. DREWRY. However, legally, the full title is in the institution?

Mr. RUTTENBERG. That is correct.

Mr. DREWRY. So for the Government to get it back, then there would have to be a——

Mr. RUTTENBERG. Reconveyance.

Mr. DREWRY. Not a reconveyance, but a conveyance. You never had it.

Mr. RUTTENBERG. That is true. We have just given them the money.

Mr. DREWRY. Then you said they would be reimbursed for costs which they themselves have put into it. I suppose if they had financed certain changes or improvements they would be reimbursed for that, or if they had special equipment that had become essentially part of the vessel, then they would be reimbursed for that. Then, I believe you said, "And such other compensation that might be agreed upon."

Mr. RUTTENBERG. Such other costs as may in the judgment of the agency be deemed equitable. In other words, that is to cover unanticipated things which, in our judgment, we feel we should pay. This does not mean we have to pay anything at all.

Mr. DREWRY. Could they not claim that "since you are taking our ship, we think it is equitable that we be reimbursed for the value of it because we no longer have it"?

Mr. RUTTENBERG. They could say that, but under the terms of the grant, we decide, and I am sure we would decide against that point of view.

Mr. DREWRY. This is a question that has come up several times recently, as to what the present individuals may fully intend and would carry out, if they were still around and what the picture might be when a new crowd comes in.

Mr. RUTTENBERG. Of course, the wording of this is "in the judgment of the agency," so I am clear that it would be our judgment that there would be no compensation for the ship as such other than the things we mentioned.

Mr. DREWRY. They could dispose of it.

Mr. RUTTENBERG. They cannot dispose of this ship without our permission.

Mr. DREWRY. Without your permission?

Mr. RUTTENBERG. That is correct.

Mr. DREWRY. But you can give them permission to dispose of it?

Mr. RUTTENBERG. Yes, we could.

Mr. DREWRY. Since you have no further strings on it if they disposed of it then the proceeds of the sale of the ship, for instance, would go to the institution?

Mr. RUTTENBERG. You mean if they did that without following the conditions of the grant?

Mr. DREWRY. No; they come to you and say, "We no longer need this ship. The developments in oceanography are such that this is not quite the right type. We would like to sell it." I do not imagine that you would insist that they keep something that they do not need, would you?

Mr. RUTTENBERG. No. We might wish, however, to give it to someone else rather than allow them to sell it. It would depend on the circumstances.

Mr. DREWRY. How could you enforce that?

Mr. RUTTENBERG. We have a clause that says that if it ceases to be used primarily for basic research then we can get it back.

Mr. DREWRY. Without cost?

Mr. RUTTENBERG. Without cost.

Mr. DREWRY. But, you could give them permission to dispose of it in any way that they wanted to?

Mr. RUTTENBERG. We could give them permission; yes, sir.

Mr. DREWY. Having dealt quite a lot with contract matters concerning Government participation in commercial ship transactions, this seems to me to be a little bit on the way of being shockingly loose from a legal standpoint.

Mr. RUTTENBERG. It is loose depending on the frame of reference. For example, we did not have to put any restrictions at all on it except those which we felt would be appropriate. Under our authority, I believe quite clearly we could give the ship away without any strings at all, or give them the money.

Mr. DREWRY. There is no doubt about that in my mind.

That is all, Mr. Chairman.

Mr. MILLER. I have only one question.

Why could not the National Science Foundation build and retain title to this ship, consulting Woods Hole for construction of the ship and the type of ship that it wants, and facilities, and then contract with Woods Hole to operate the ship and do the research necessary?

Mr. RUTTENBERG. Well, legally, we could, of course. I think it is a matter of judgment of our scientific people as to whether this is a desirable approach from the point of view of Foundation policy, but legally, of course, we could.

Mr. MILLER. What, Doctor, would be some of the immediate objections to this from a scientific point of view?

Dr. ROBERTSON. From a scientific point of view, it seems to me that you have to go back to our basic objectives, which are to strengthen the research program in the United States. It is the judgment of the National Science Board and the Director, that an important way to do this is by providing the research institutions, the universities and nonprofit institutions such as Woods Hole, with the tools to do the research that they want to do, and that the best and simplest way of doing this is to give them these facilities. This enables them to design their own ship, to take full responsibility for planning it exactly as they need it, to introduce variations that apply to their local circumstances. We feel that this method not only strengthens the institutions which we are trying to strengthen, but also provides them with the best and most efficient tools for their own use.

Mr. MILLER. Well, now, the Coast and Geodetic Survey recently took delivery of a specially designed ship, and I do not think that you want to charge that the work that the Coast and Geodetic Survey is going to do with the ship is not going to be of the highest caliber.

Dr. ROBERTSON. Not at all. I feel that the Coast and Geodetic Survey is entirely competent.

Mr. MILLER. Mr. Ellsworth and I had the privilege recently of visiting the *San Pablo* that was here in Washington on display; she is pretty well equipped with all of the heavy equipment that is needed for physical oceanographic work. We are not going to question the value of the program that it is doing for the Hydrographic Office, and the Government is going to operate these ships.

Dr. ROBERTSON. I am not questioning the ability of the Government to operate its own ships.

Mr. MILLER. Or even in the field of science.

Dr. ROBERTSON. Our position is that the facilities for research to be done by universities and nonprofit institutions can best be done by their having their own facilities.

Mr. MILLER. I believe that they can do it, but I question and have some reservation whether, in order to get the universities or the scientific institutions to do this work, we have to make large grants of physical equipment or to make them outright grants of this equipment.

Suppose we build this ship for Woods Hole. They may use it for the next 4 or 5 years and then a situation comes about where we want some work done in the Pacific Ocean not too far south and Scripps is in a very fine position. Will we be able to say then, "Well, now, we are going to take this ship, turn it over to Scripps and do the work," or is Woods Hole going to say, "No; we still have some work." It might be minor. Is Woods Hole going to cooperate and say, "We will let go of this"? I should not use Woods Hole. I will say institution A, and institution B needs it. Is institution A going to give it up or is it going to be the usual thing that takes place in all institutions or any agency of government from county up to the National Government; once you get your hands on something you fight to retain it and never let go of it?

Dr. BOLT. Mr. Miller, if I may comment on this, I believe this gets to the heart of the basic philosophy of the Science Foundation and why the Government established it.

First, I would like to mention, of course, that any given ship can be used by and large to do almost any given measurement on any given day. We are talking about a broader, long-range kind of thing here. The Navy has a certain ultimate mission. It does many things to feed and support this mission, but when the chips are down, it has a certain responsibility.

The Coast and Geodetic Survey has another kind of responsibility. Each agency has a certain ultimate responsibility. The Foundation has been set up with an ultimate responsibility not of these other mission types, but of insuring that our fundamental science research and science education is strong. If we really mean this, we must assure that our educational institutions, including the ones that give education and training in oceanography and the biological oceanographic sciences, and so on, are strong and have the maximum ability to do their basic mission properly over the long haul, and it is really in keeping with this broader philosophy that we come to the conclusion we do.

This is not to say that it is not wise for the Navy to do it one way, because in the last analysis, they need to insure that they can fulfill their Navy mission, and having title to their ships gives them an added protection, and similarly for Coast and Geodetic Survey. But we feel that given these safeguards, such that in time of emergency the Government can get the ship back, short of a national emergency, we should do all we can to give the academic institutions the utmost opportunity to plan long-range programs, educational and research programs, using their equipment and facilities of all kinds, including vessels, and we do not see vessels as any different from a linear accelerator or a cyclotron, or a darkroom in this connection.

Mr. MILLER. That is true. You cannot have a cyclotron or a linear accelerator—we are having a little trouble determining where that is going to go now—as you can a ship.

On the other hand, in the field of oceanography and the very fine work done by the Academy of Sciences pointing it up, it has also pointed up the necessity for some coordinating body, so we now have an interagency committee voluntarily established by Executive order to do this work. Of course, the real objective of this bill is to make this an agency or an interagency committee, a more stable statutory agency.

Of course, my own feeling is that we have not done enough in the biology of the ocean, so we have something in common. I would like to see more done in this field than has been done, but I still think that we must accept some very definite fiscal responsibility though it is desirable to do this for educational institutions—you heard some rumblings in another committee on this very subject of making unlimited grants to universities. You will hear more of it, I can assure you, because this committee is becoming conscious of what has been proposed.

We just want to explore this and make sure that it is necessary to get the job done.

Mr. Casey, have you any questions?

Mr. CASEY. No questions.

Mr. LENNON. Mr. Chairman.

Mr. MILLER. Oh, yes. Excuse me.

Mr. LENNON. The *Atlantis* was specially designed for oceanography, was it not?

Dr. ROBERTSON. Yes.

Mr. LENNON. Who holds the title now to the *Atlantis*?

Dr. ROBERTSON. I believe Woods Hole Oceanographic Institution holds title to the *Atlantis*.

Mr. LENNON. Was that constructed through grants by the National Science Foundation?

Dr. ROBERTSON. No; that was constructed long before the National Science Foundation existed.

Mr. LENNON. Was that done through Federal funds, or private funds?

Dr. ROBERTSON. Private funds.

Dr. BOLT. Rockefeller Foundation funds.

Mr. LENNON. The reason I ask, actually section 8 of Congressman Miller's bill would have no practical effect at all in the light of the proposed plan now to award grants to Woods Hole and other private institutions interested in oceanography, would it? Look at section 8. It would have no practical value?

Mr. RUTTENBERG. Section 8 says:

> Whenever any vessel is supplied by the United States * * *.

Mr. LENNON. But you do not do it that way.

Mr. RUTTENBERG. That is right.

Mr. LENNON. You do it through a series of grants and allow them to construct their own vessel and the title, of course, is in the person.

Mr. RUTTENBERG. We never had the title, that is correct.

Mr. LENNON. So as long as you continue the program that the National Science Foundation has in mind in making a series of grants

to educational and private institutions engaged in oceanography, section 8 would have no practical effect, would it?

Mr. RUTTENBERG. Technically, it does not appear to have any effect, that is correct.

Mr. LENNON. To what extent is private industry participating in the activities of these institutions such as Scripps and Woods Hole and colleges and universities? Do they make any contribution to operation and maintenance funds, or is that all done by Government contract?

Dr. ROBERTSON. I believe that Woods Hole and the other nonprofit private institutions receive some help from industry in the form of money and equipment. I do not know the extent of that help.

Mr. LENNON. The testimony reflects that so far as Woods Hole is concerned, 90 percent of their operating funds come from Government contracts, so we find ourselves in a position of the Federal Government putting up the money for your capital assets to an appreciable degree so far as ship construction is concerned, and then the taxpayers also pick up 90 percent of the tab for operation and maintenance of those private institutions. Is that not what the record reflects?

Dr. ROBERTSON. I think it might be commented——

Mr. LENNON. Just answer the question and then explain it, please. Is that not what the record reflects?

Dr. BOLT. Yes, of course.

Mr. LENNON. Now make any explanation you wish.

Dr. ROBERTSON. I was simply going to comment that if we did not have Woods Hole, a major institution of oceanography on the east coast, it is very likely that the Government would have set up a national center for oceanography research. I think it is fortunate that we have a private group that is able to do this work.

Mr. LENNON. I am not singling that out. I am just trying to get in the record, generally speaking, the taxpayers, indirectly through contract, furnish approximately 90 percent of the operating expenses of these private institutions which engage in something that we are also interested in, oceanography, and in addition, the Federal Government puts up the largest amount of the funds that are capital assets in the construction of these ships which are going to be needed.

I am just seeking information.

Dr. BOLT. Mr. Lennon, that is right, but the fraction of support by the Federal Government varies considerably among the different fields of science. If you will look at all types of basic research being done in universities today, the Federal Government is putting in about 60 percent of this, and in some fields industry is contributing quite sizably.

Also, in many institutions, the State legislatures are contributing to the support of basic research. It just happens that oceanography is one which is very largely supported by Federal funds.

Mr. LENNON. Private institutions can still do it and a whole lot cheaper than perhaps the Federal Government could, if it was in the whole way.

Mr. MILLER. I was going to say any contributions made to Woods Hole or most any of these institutions are contributions made by people who are interested in the advancement of science, not that they hope to obtain any immediate reward from it.

We know that in the steel industry, and the textile industry, and many of these others, contributions are made to universities and to

scientific institutions purely for the purpose of developing new techniques where the person who makes the contribution hopes to receive monetary gain from it. That is not the case in oceanography except perhaps in the fisheries end of it, and the fisheries people, from time to time, have made some contributions.

Mr. GROSS. Mr. Chairman, may I ask a question if Mr. Lennon is through?

Mr. LENNON. Yes, I yield the floor.

Mr. GROSS. What is the status of this proposed ship? Is it on the drawing boards? Is it under construction?

Dr. ROBERTSON. No. At the moment, the bids are being studied. It has been completely designed and bids have been obtained.

Mr. GROSS. Who designed it?

Dr. ROBERTSON. The design was done by the Bethlehem Shipyard at Quincy, Mass., based on preliminary design studies made by M. Rosenblatt & Son and the Woods Hole staff.

Mr. GROSS. Your organization does not have the know-how to design and supervise the construction of a ship?

Dr. ROBERTSON. That is correct.

Mr. GROSS. What did you do? Go out and hire somebody?

Dr. ROBERTSON. This is being done by the institution. You will recall that we made a grant to Woods Hole to build a ship of a certain class which they had presented to us. We require, under the grant, that at certain stages they submit their plans and procedures to us. We have a committee under Dr. Lyman to review these, consisting of representatives from the Navy Bureau of Ships, the Maritime Administration, and I believe, the Fish and Wildlife Service, the Bureau of Commercial Fisheries.

We review the plan submitted by Woods Hole, but Woods Hole has the responsibility for the several stages in the design and construction. We approve it and we use this committee to review and approve at certain check points.

Mr. GROSS. I am surprised to hear that your organization is in this shipbuilding business. In fact, I am astounded to hear that you are in that kind of business.

Dr. ROBERTSON. Of course, the oceanographic ship is a research tool and one of our jobs is to see to it that the scientists have the tools they need.

Mr. GROSS. What other organizations are in the shipbuilding business? Obviously, there are none exactly similar to your organization. Do you know of any others in Government where this sort of thing is going on?

Mr. MILLER. Coast and Geodetic Survey and ONR.

Dr. LYMAN. Fish and Wildlife Service.

Mr. MILLER. One of the things that we have talked about was making the Maritime Administration the designer of all ships of scientific and other purposes in the country so that we have it centered in one place.

Mr. GROSS. I would hope so. I would think this is getting out of hand, Mr. Chairman.

Mr. MILLER. We will get them out. Mr. Casey, do you have any questions?

Mr. CASEY. No questions.

Dr. BOLT. If I may make a comment on that, as long as it is an electron microscope we are buying for a research group, or a computer, or other such things, this kind of question does not come up. If the only way they can do their research is to use a ship and we buy them a ship, then naturally, one can ask this question: Are we going in the shipbuilding business?

But one can also ask the question: Are we in the business of building computers or building electron microscopes?

Mr. MILLER. Doctor, if you are going to build a computer for the University of California, or an electron microscope for the University of Texas, the building you are going to house these in is not part of the job that you are doing and the type of building has been pretty well established; but we also know that when we get into the shipbuilding business, particularly with people who want to be a bit exotic occasionally, and want this or that on a ship, the ships are a little bit different. I am not entirely without some experience in this field because for 4 years I was executive officer of the California Division of Fish and Game at a time when we had the best biological ship, the *N.B. Schofield*, that had ever been designed.

I know at that time, we could have gone far beyond what we did, if we had not had some practical people assisting us in the design of the ship. She was good enough that at the outbreak of the war, the Navy immediately commandeered her. We fought the commandeering on the grounds that the Navy could seize your ship or my ship, but it could not seize the property of the sovereign State, and the Navy agreed with this.

Then we made a charter party entirely different from other charter parties, revocable on 30-day notice by either side, and the Navy took her. Instead of using her for the things which they indicated they were going to use her for, they were going to turn her over to the Fish and Wildlife Service, because they wanted to do certain work. We served notice on the Navy and took the ship back, but we wrote another charter party of a different type. It is perhaps the only time that the Government sat down with a State agency and determined the type of charter party ships would be operated under, so they are a little different from building houses to put in the cyclotrons or linear accelerators. As a matter of fact, we have a very good place in my district we would like to sell you for the accelerator.

We have a series of hills you can build it through, but this is another story.

Mr. Morse.

Mr. MORSE. Thank you, Mr. Chairman.

I have just a couple of questions I would like to pose. First, with regard to the question that Mr. Gross just asked, I apologize for not being here throughout the testimony, Dr. Bolt, but I infer that what you have been talking about is the grant of funds to Woods Hole and then Woods Hole has accumulated a sufficient amount of money that they are in the business of going out and procuring an oceanographic vessel and title to the vessel in Woods Hole with 100 percent of Government funds, I infer.

Dr. BOLT. Yes, and they would have the vessel designed and built with these funds.

Mr. MORSE. Such a contract would be entirely free from any restrictions of ordinary Government procurement; is that correct?

Mr. RUTTENBERG. Legally, that is correct.

Mr. MORSE. If there is an antidiscrimination provision, let us assume, in the Government contracts, this would be one way of avoiding that sort of provisions?

Mr. RUTTENBERG. It would not be legally required, that is true.

Mr. MORSE. This amazes me. Whatever the reasons for it, it seems to be rather loose to just through this device grant Woods Hole, with no restrictions, Government money for procurement.

One further question, Doctor. It relates to the testimony that Dr. Fye, who is not here today, I understand, made at an earlier date. I had some administrative responsibility as a layman and as a common lawyer for a research program, a multimillion dollar research program, and I was astonished to see this statement which was just brought to my attention, and I quote Dr. Fye:

> Creativity is essentially a personal and private process. The innovative research worker is keenly sensitive to his environment. Even though he has a firm conviction that research will pay big dividends, he can be diverted quickly to areas of low risk and small thinking if management shows more interest in quick-fix improvements, rather than in free-wheeling endeavors which may add greatly to the storehouse of human knowledge. This becomes increasingly worse as management control is removed further and further from the researcher's immediate domain.
>
> This, I speak with conviction when I urge you to eliminate section 8 from this bill. This is a conviction shared, I believe, by all directors of oceanographic establishments, and endorsed essentially universally by oceanographers. Whereas, we know both systems can do work, we strongly support placing the responsibility for research planning and the control by ownership within the hands of the research workers themselves.

I just do not see the relationship of that last clause. It is magnificent non sequitur and in all of my discussions with the National Academy of Science and National Research Council, that particular kind of statement I have never heard or seen before.

Mr. GROSS. Will the gentleman yield?

Mr. MORSE. I will, indeed.

Mr. GROSS. The chairman used the word "exotic" a little while ago. It seems to me that is an exotic statement.

Mr. MORSE. I might say it was esoteric, Mr. Gross. It astounded me that this was something that the scientific community thought was essential to creativity in research. The ownership of the instruments of research.

Is that an attitude that is held commonly by the scientific community engaged in creative research?

Dr. ROBERTSON. I think broadly speaking what he probably is referring to is the feeling that you have control over the tools of your trade. For example, you can imagine a case where restrictions would be put on. I am doing an experiment. I want to make a change in the equipment. Suddenly, it occurs to me that this belongs to the Government, and I cannot modify it until I get in touch with someone, say, in Washington, who might be off on leave, to make it an extreme case. This has kind of a shattering effect on his enthusiasm for getting on with that particular job. It is better if he can use this thing and modify it as necessary to do his job. I think that is what he is referring to here.

Mr. GROSS. Would the gentleman yield?

Mr. MORSE. I would, indeed.

Mr. GROSS. There is one sentence that intrigues me very much.

Even though he—

and I assume he refers to a scientist—

has a firm conviction that research will pay big dividends, he can be diverted quickly to areas of low risk and small thinking if management shows more interest in quick-fix improvement rather than in freewheeling endeavors which may add greatly to the storehouse of human knowledge.

Someday when the snow is falling heavily, I would like somebody to sit down and explain that sentence because I am not able to absorb it.

Mr. MILLER. If there are no other questions, then I want to thank you.

I do not want you to feel now that you are before people who are unfriendly to you. We are going to try and do a job for you. It is going to be very hard to get some of these bills through Congress.

Mr. RUTTENBERG. May I make this one observation?

Mr. MILLER. Yes.

Mr. RUTTENBERG. Mr. Morse was speaking of the antidiscrimination clause. What I said was correct. I have been advised by Dr. Lyman, though, that that clause is in the contract.

Mr. MORSE. The principle still has application.

Mr. RUTTENBERG. That is correct.

Mr. MILLER. Thank you very much.

Dr. BENSON. May I supplement the record when I said I will give you the names of the advisory panels? I have it here and I am going to insert the complete list of all of the composition of the panels since the time of the Earth Sciences program.

Mr. MILLER. Fine.

Dr. BENSON. And also on the question of panel members receiving grants, it was decided very early within the composition of this panel that unless exceptional circumstances came up, the panel would prefer that its own members not submit proposals and there have only been two that have actually been processed since 1953, when the program started, and those were proposals that were received by the Foundation before that man was a member of the panel.

Mr. MILLER. Fine.

I want to say we will keep the record open for further insertions as long as we can.

Thank you very much, gentlemen.

The committee stands adjourned subject to the call of the Chair.

(Whereupon, at 12:10 p.m., the subcommittee recessed, to reconvene subject to the call of the Chair.)

APPENDIX

SOVIET OCEANOGRAPHIC FLEET

The Soviet oceanographic fleet has an estimated strength of approximately 150 ships (Table 1), as compared with less than 75 ships for the United States. About thirty Soviet ships are assigned to the Academy of Sciences alone, about another 40 are assigned to the All-Union Scientific Research Institute for Marine Fisheries and Oceanography (VNIRO) and its regional affiliates for support to the Soviet fishing industry, and more than 20 ships are assigned to conduct hydrographic surveys along the Northern Sea Route. These and other ships in the fleet range in size from small coastal types used for supporting the work of coastal laboratories to deep-sea research ships of several thousand tons displacements. They include among their number the only non-magnetic research ship in the world, the Zarya, and a research submarine, the Severyanka.

The present size of the fleet is the result of a tremendous expansion of a program begun in the mid-1950's for participation in the International Geophysical Year. Many of the fisheries research ships, five of the basic research ships of more than 3500 tons displacements, and the research submarine were added to the fleet in this expansion period. In order to acquire the needed number of ships in a relatively short period of time, conventional cargo ships and fishing vessels were modified and converted for oceanographic research. These ships lack many of the desired characteristics for an ideal research ship; however, they do meet the current needs of the survey type of operations dominating the Soviet oceanography program.

The largest, most modern ships are being assigned to basic research. The Academy of Sciences has received three of the last five commissioned since 1957. The other oceanographic organizations subordinate to the ministries are now also beginning to receive new, modern ships. (Table 2) The Hydrometeorological Service (GUGMS) obtained the Voyeykov (3600 tons) in 1959 and the Shokal'skiy (3600 tons) in 1960. The fishing industry obtained the converted submarine, Severyanka in 1958 and apparently has a 3950 tons Mayakovskiy under construction.

The capabilities of the existing Soviet oceanographic fleet are adequate for collecting data from any oceanic area in the world as was aptly demonstrated during the International Geophysical Year and present operations. There are now sufficient numbers and types of ships to enable the USSR to be a leading participant in any international cooperative oceanographic studies. With seven large basic research ships of more than 3500 tons displacements, the USSR can conduct large simultaneous expeditions in various parts of the world. In 1960, the USSR participated in two international studies--the Atlantic Ocean Polar

Front Program and the International Indian Ocean Expedition. The Soviets also conducted independent studies in the Atlantic and Pacific Oceans and in its bordering seas. A seven-ship survey of the Gulf Stream off the east coast of North America in 1960 demonstrated the Soviet ability to coordinate an operation of research ships from fisheries, military and academic organizations, and to conduct such an operation remote from the USSR.

TABLE 1

Estimated Size and Composition of Soviet Oceanographic Fleet

Basic Research	30
Applied Research	20
Survey	55
Fisheries	40

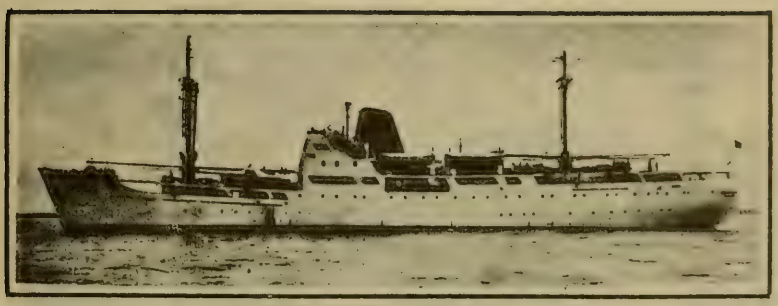
TABLE 2

Significant Additions to the Soviet Oceanographic Fleet

SHIP	YEAR COMMISSIONED	TONNAGE	ORGANIZATION
Mikhail Lomonosov	1957	5960	Academy of Sciences
Severyanka	1958	1200 (submarine)	VNIRO
Voyeykov	1959	3600	GUGMS
Shokal'sky	1960	3600	GUGMS
Petr Lebedev	1960	5000	Academy of Sciences
Sergey Vavilov	1960	5000	Academy of Sciences
Mayakovskiy	1961-62	3950	VNIRO (?)

Vityaz
(5500 tons displacement)

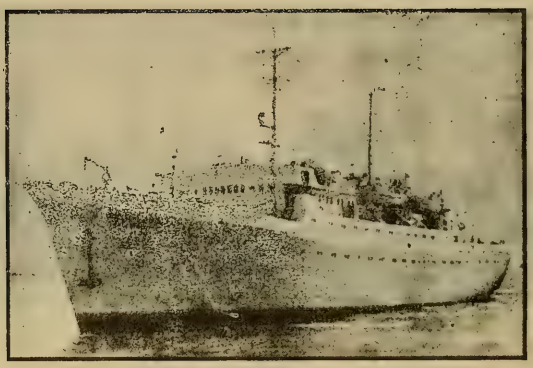
Year Constructed	1939
Length	359 feet
Beam	47 feet
Speed	14 knots
Range	18,600 miles
Scientific Complement	65
Laboratories	12



Mikhail Lomonosov
(5960 Tons displacement)

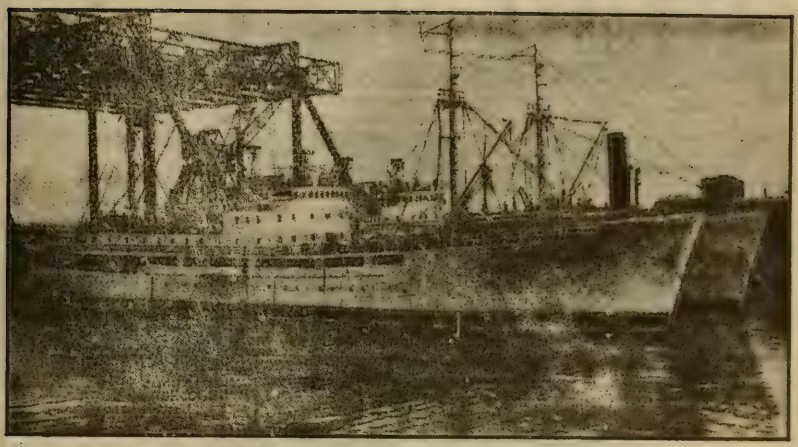
Year Constructed	1957
Length	336 feet
Beam	46 feet
Speed	13 knots
Range	11,000 miles
Scientific Complement	60
Laboratories	16

68965 O—61——15



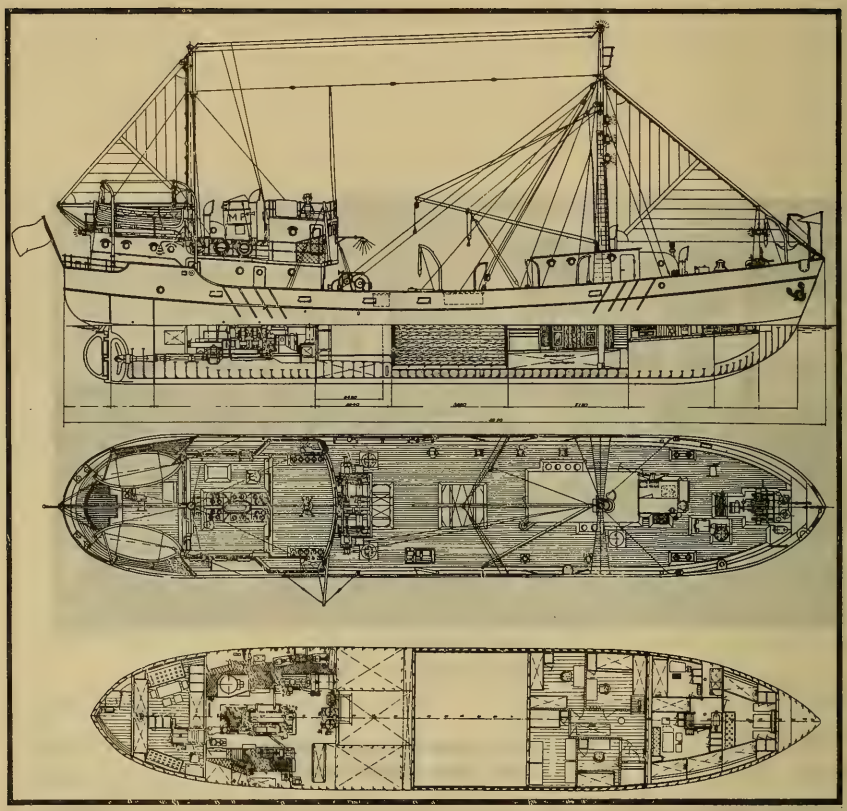
Voyeykov/Shokal'skiy
(3600 tons displacement)

Years Constructed	1959/1960
Length	(84.6 meters)
Beam	(14.0 meters)
Draft	(5.5 meters)
Speed	13 knots
Range	15,000 miles
Scientific Complement	45
Laboratories	16
Scientific Gear	
Winches	6
Research Meteorological Rockets	



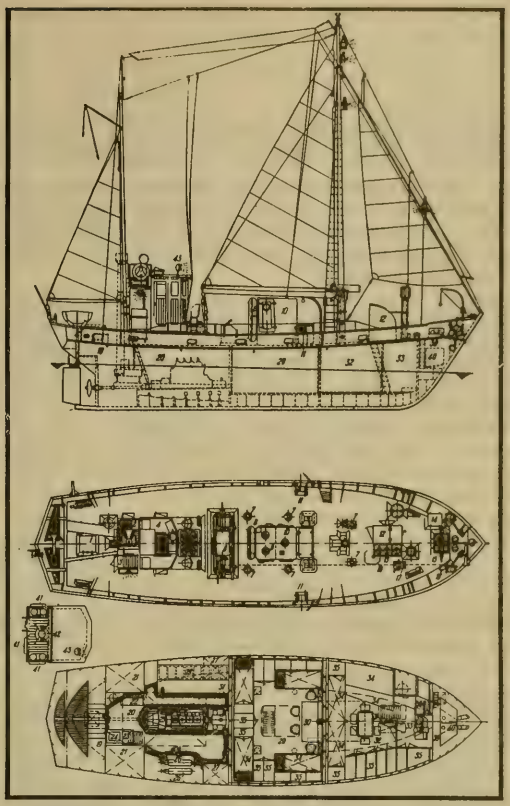
Petr Lebedev/Sergey Vavilov
(5000 tons displacement)

Year Constructed	1960
Length	100 m.
Beam	14.3 m.
Draft	6.0 m.
Speed	14 knots
Scientific Complement	50



Converted Medium Class Trawlers
(488 tons displacement)

Length	126 feet
Beam	24 feet
Draft	9 feet
Speed	10 knots max./8.5 knots aver.
Laboratories	3



The attached diagrams show upper deck, bridge, and interior arrangement. The quarters and equipment identified are as follows:

1. Hatch of the afterpeak
2. Washroom
3. Hatch to engine room
4. Wheel house
5. Skylights for engine room
6. Trawling winch
7. Deck flood lights
8. Life raft
9. Hatch to quarters for scientific workers
10. Radio shack
11. Oceanographic hand winch
12. Hatch to crew quarters
13. Skylight for crew quarters
14. Hatch of forepeak
15. Windlass
16. Cable of deapsea anchoring installation
17. Locking device for 16.
18. "Kipp" deepwater anchoring installation
19. Afterpeak
20. Engine room
21. Fuel tanks
22. Auxiliary motor genesator
23. Oil tank
24. Kerosene tank
25. Main engine
26. Compressed air cyclinders
27. Fresh water tanks
28. Storage batteries
29. Quarters for scientific compliment
30. Laboratory table
31. Water heating system
32. Hold
33. Galley
34. Bunks
35. Storage
36. Coal bunker
37. Water heating boiler
38. Galley stove
39. Forepeak
40. Gable bin
41. Lifebelts
42. Compass
43. Search light

Converted STB Trawlers
(78.6 tons displacement)

Length	60 feet
Beam	17 feet
Draft	7 feet
Speed	8 knots

68965 O—61——16

STATEMENT OF RICHARD H. STROUD, EXECUTIVE VICE PRESIDENT, SPORT FISHING INSTITUTE, ON H.R. 4276, TO ENACT AN "OCEANOGRAPHIC ACT OF 1961"

Mr. Chairman, I am Richard H. Stroud, executive vice president, Sport Fishing Institute, Washington, D.C. I am addressing your committee in my official capacity as SFI's chief executive officer in order to add my organization's support to that of other witnesses urging early creation of a comprehensive national oceanographic research program.

Extensive hearings were held during the last Congress on several proposals (H.R. 9361 by Mr. Pelley, S. 2692 by Senator Magnuson, H.R. 10412 by Mr. George Miller, and similar House bills) to authorize a 10-year $600 million program of intensified oceanography studies recommended by a Joint Committee on Oceanography of the National Academy of Sciences and the National Research Council. This is a complex issue because various segments of the work would be done by several Government agencies under a number of administrative heads, in several departments. The hearings were directed toward developing a balanced and substantial plan of action, with appropriations to be secured for various aspects through regular departmental budgetary channels. Effective coordination becomes an extremely important aspect of need in such a program.

Sport Fishing Institute was among the organizations which testified at the hearings last year. Mr. Robert M. Paul, then a member of my staff in the capacity of executive secretary, presented the institute's testimony at that time. That statement was carefully prepared by the SFI staff and represents this organization's considered views on the general proposal at hand, and on key elements which we believe must be built into any program under any authorizing legislation. With your permission, Mr. Chairman, I should like to attach a copy of that testimony as a supplement to my present statement, to summarize briefly the key points made last year and to add one further recommendation.

Last year's hearings revealed a number of weaknesses in the proposed program which need to be accounted for under H.R. 4276. As I read the bill, but noting that I have no professional legal skills, the language would appear reasonably adequate to do the job. As we see it, the overall program objective is highly commendable. There needs only to be certain that these weaknesses revealed in previous testimony are overcome in implementing actions, viz:

1. Lack of an equitable balance between the biological and physical aspects of the program, the former being relatively neglected.
2. An overemphasis on applied research as distinct from basic research, with a need to emphasize the ecological aspects.
3. A preoccupation in fishery aspects with trade-oriented research on commercially important species to the exclusion of species equally or more important for other interests.
4. Limitation of some types of research to laboratory studies excluding field studies necessary for adequate knowledge.
5. Inadequate attention to inshore and estuarine areas through preoccupation with deep sea situations.

It should be noted, too, that both the American Fisheries Society and the U.S. Department of the Interior Fish and Wildlife Advisory Committee expressed concern last year with these deficiencies. Each body adopted resolutions which, while commednatory of the general proposal for intensified oceanographic research, urged that added emphasis be placed on biological research in order to strengthen the program and increase its overall value.

Further, Mr. Chairman, a conference of North Atlantic State and university marine biologists, convened in January 1961, at the New Jersey State Fishery Laboratory (at Lebanon, N.J.), recognized the need to overcome these deficiencies. The suggestion was advanced there that what is needed is a coastal biological oceanographic "year," similar in concept to the recent IGY and its subsequent continuation in substance. It was conceived to embrace the coastal salt waters from the heads of estuaries to the outer edge of the Continental Shelf

bordering the United States. It was also proposed in this same group that the new Federal marine game fish research program (Public Law 86–359) should serve as the logical medium for coordination and stimulation of such a venture.

My organization considers that this proposal has much merit. Addition of the sums Sport Fishing Institute has already recommended for inclusion in the 1962 budget for the Department of the Interior, under the authorization of Public Law 86–359—totaling $850,000—though nominal in the scale of oceanographic planning, would go far toward helping to overcome a serious problem by getting a start on such a program. It would provide effectively for the initial coordination and stimulation needed to bring together the available talent of coastal State governments and numerous independent small coastal biological laboratories in a concerted joint effort having tremendous potential both for developing the marine sport fisheries and filling a vital gap in oceanographic planning. It would undoubtedly also generate the expenditure by the State agencies of similar sums in this important endeavor.

Therefore, Mr. Chairman, we hope that your committee can give this worthy proposal your serious consideration and then find it possible to throw its full weight of influence behind it in order to get a positive program going. In closing, let me state again that we consider H.R. 4276 to be a highly significant measure, and urge your favorable consideration of it, with such modification, if any, that you may deem necessary to assure that the possible program weaknesses under its provision are reduced to a minimum.

Thank you for the opportunity to submit these views.

(Supplement to statement of Richard H. Stroud, Sport Fishing Institute, on H.R. 4276:)

STATEMENT OF ROBERT M. PAUL, EXECUTIVE SECRETARY, SPORT FISHING INSTITUTE, ON H.R. 10412, AND H.R. 9361

Mr. Chairman, I am Robert M. Paul, executive secretary of the Sport Fishing Institute, located in Washington, D.C. I am appearing before your committee on behalf of Sport Fishing Institute in order to join other witnesses in urging the early creation of an adequate national oceanographic research program. In addition, we would like to discuss briefly the implications of an expanded ocean research program for sport fishing and the need to emphasize the biological phases of the program, particularly as they relate to inshore and estuary areas.

The Sport Fishing Institute strongly supports the efforts to strengthen oceanographic research represented by the bills under consideration. H.R. 10412 to formalize coordination among the various Federal agencies concerned with oceanography seems to be the logical first step particularly when it is combined with the establishment of the National Oceanographic Data Center proposed by H.R. 12018. The major points of discussion, in our opinion, relate to specific details of the broad oceanographic program proposed in H.R. 9361.

The witnesses that you have invited to appear before your committee, the establishment of your Subcommittee on Oceanography, the various reports you have secured from committees of scientists, are all effective testimony to your committee's awareness of the need for expanding the Nation's oceanographic research program. We believe the need has been documented beyond question. The problem now is to plan and initiate a program that will adequately meet the national requirements.

Much of the initial interest and action on this problem was due to reports on oceanographic needs prepared by the Committee on Oceanography of the National Academy of Sciences-National Research Council. As you know, their recommendations have been largely incorporated onto H.R. 9361, which is one of the bills under consideration. We believe that the NAS–NRC Committee did an excellent job. The aggressive, thorough approach they took in attacking a most complex national problem is commendable.

A few months ago Dr. Harrison Brown, the chairman of the NAS–NRC Committee, asked the Sport Fishing Institute for comments on the completed chapters of the report. The Institute's comments were transmitted to Dr. Brown in a letter by our execuive vice president, Richard H. Stroud. Those observations form the basis for discussing the bills under consideration. Dr. Brown asked

six specific questions about chapter 1 (the Introduction and Summary of Recommendations):

1. Do you agree with the general recommendations contained in the report?
2. Do you agree with the need for an increased national program in the marine sciences?
3. Do you feel that the rate of increase outlined in the report is realistic?
4. What comments do you have concerning the detailed recommendations?
5. Do you feel that adequate attention has been given to a balance between the various aspects of the marine sciences?
6. What comments would you care to make concerning those aspects of the report which pertain to your particular interests?

On the first three questions we answered yes with no qualifications whatsoever. Question 4 (the detailed recommendations in the report) had to be answered with some serious reservations about the proposals outlined for ocean resource research (sec. III, G, p. 22 of ch. 1 of the report).

We are extremely concerned about the apparent overemphasis on applied as opposed to basic research. We feel this is more than another argument over definitions. The wording and apparently the intent of the specific recommendations for ocean resources seems to contrast markedly with much of the committee's chapter on basic research. The general recommendations of the committee properly emphasize the accepted responsiblity of the Federal Government for basic research. In our opinion, however, the details of the ocean resources recommendation of the report don't reflect this obligation.

The specific recommendations for ocean resources seem to reflect an overt, almost exclusive emphasis on commercially important fish stocks and on trade-oriented problem areas of the moment. We wonder if this is not an overly narrow, almost self-defeating focus on applied research which fails to recognize the long-range problems and potential of the marine resources.

What are some of the specific areas where the scope of proposed studies needed to be broadened?

Specifically, three major recommendations (Nos. 2, 11, and 14) propose to limit research to commercial or food fish. These recommendations overlook other species that are often more important, particularly the species used by sport fishermen. Moreover, this limitation to specific fishes might overlook the importance of other species as competing organisms or as important elements in food chains. The limiting of estuarine research to "food fish and shellfish" is clearly not justified.

Another recommendation (No. 3) would apparently limit behavior studies to the laboratory and exclude vitally important field studies. It is a well known phenomenon that responses in the laboratory may differ decidely from actions in nature. Both phases should be utilized; they are often mutually complementary aspects of research, both necessary to full understanding.

Recommendation 7 on the nature of the aggregation of organisms would be improved by expanding its scope in order to recognize and include broad-scale ecological studies and research on population dynamics of marine organisms. These are woefully weak areas of knowledge and hold vast potential to benefit mankind. Detailed life history studies are also badly needed. Among fishes alone, for example, less than 1 percent of the world's known total of about 25,000 species are biologically well known.

The promise for eventual deliberate farming of the sea depends on these particular areas of research. To omit these phases of the program is perhaps to deny the future. It seems to us that failure to include these phases is evidence of an unfavorable preponderance of emphasis on relatively narrow trade-oriented commercial fishery thinking. The result, in our view, is too much emphasis on applied as distinct from basic research. A greatly strengthened ecological approach needs to be injected to give better balance to this very important program.

The committee's question No. 5 dealing with the balance between the various aspects of marine science brings up another point which we feel should be called to the attention of your committee.

There have been a number of expressions of concern about the relative lack of emphasis on the biological sciences in the NAS–NRC report. The American Fisheries Society, for instance, adopted the following resolution in September 1959:

"Whereas the National Academy of Sciences-National Research Council has recently published reports pointing out the Nation's critical need for an expanded oceanographic research program, and

"Whereas the U.S. Senate and the House of Representatives have each created a special committee to study oceanographic problems and recommend new legislation and programs to implement the National Academy of Sciences-National Research Council reports, and

"Whereas a careful study of these reports and publications indicated that the biological aspects of the proposed program are subordinated to other disciplines: Now, therefore, be it

"*Resolved*, That the society (1) commends the administration and the Congress for the interest they have expressed in expanding the national effort in oceanographic research; (2) expresses its concern that the vitally important biological aspects of the oceanographic research program be given more adequate recognition in the development and implementation of plans * * *."

This rather obvious neglect of the biological aspects of oceanography has been noted by other groups. For instance, the Department of Interior's Advisory Committee on Fish and Wildlife made the following recommendation to the Secretary of Interior on October 20, 1959:

"The 10-year oceanographic research program of the National Academy of Sciences is a vitally important undertaking which the committee supports. The committee is hopeful that greater emphasis will be given to the basic biological aspects, especially of the fishes. A preponderance of effort is now proposed on physical oceanography. We believe that added emphasis on biological research would strengthen the program and greatly increase its overall value."

To sum up our views, we question whether the proposed national oceanographic research program adequately meets the accepted Federal responsibility for basic research. We appreciate that the long-range national security benefits are implicit in efforts to increase food supplies—but this is not the entire problem. There should certainly be a more equitable balance between the biological and physical aspects of the program to enhance what are perhaps equally important long- and short-range social and economic benefits to our Nation realizable from sport fishing. There should also be a better balance between inshore and estuary research and the deep-sea research that has been most emphasized in previous testimony.

Obviously, we are concerned more with the details rather than with the basic structure of the report. This is because the implementing recommendations made thus far for detailed ocean resource studies that would follow seem to us to be somewhat more narrowly conceived and shortsighted than desirable for the overall public interest. Basic research is accorded secondary importance when it should be primary. There is an obvious lack of balance, not only in the overall report as between physical and biological research, but in the section on ocean resources as between basic biology and trade-oriented developmental research as well. There is an evident lack of appreciation for the underlying long-range importance of detailed life history and ecology studies, behavior in nature, and population dynamics of marine organisms, especially fishes.

We are concerned, too, as you might expect, over the overt restriction of research attention to "commercial" or "food" fishes. This indicates inadequate appreciation of the vast social and economic significance of marine fishery resources and the sport fishing industry. For example, in 1955, a detailed study of the State's marine sport fishery was made by the New Jersey Department of Conservation and Economic Development. It was discovered that 27 marine species were exploited jointly by sport and commercial fishermen. Of the total catch, 44 percent were harvested by sport fishermen. The five most important species to both groups were the same. This relationship is not much different in other areas of the country.

Economically, the marine sport fisheries are already at least one-half as valuable in terms of retail business generated as marine commercial products at retail level. All told, about 5.4 million Americans seek needed relaxation by going fishing in the ocean. Marine fish provide a total of some 70 million recreational days annually, a rapidly growing figure.

Last year, Congress officially recognized the importance of salt water sport fishing for the first time. The bill directing the Secretary of the Interior to initiate a salt water sport fish research program was introduced by a member of this very committee. The hearings held by your committee on Mr. Lennon's bill clearly showed that salt water sport fishing is an important and growing segment of the Nation's business and recreation. The number of salt water anglers is growing at a rapid rate. To ignore the importance of sport fishing in the devel-

opment of the oceanographic program would seem to be neglectful of responsibilities. We strongly urge that the Department of the Interior's participation in the program be broadened to include the Bureau of Sport Fisheries—not confined to the Bureau of Commercial Fisheries.

For your information, we estimate the current number of salt water anglers in the coastal States to be as follows:

	Total number of salt water anglers [1]		*Total number of salt water anglers* [1]
Alabama	70,000	New Jersey	293,000
California	775,000	New York	608,000
Connecticut	103,000	North Carolina	328,000
Delaware	29,000	Oregon	190,000
Florida	487,000	Rhode Island	31,000
Georgia	239,000	South Carolina	180,000
Louisiana	209,000	Texas	748,000
Maine	70,000	Virginia	304,000
Maryland	148,000	Washington	198,000
Massachusetts	200,000		
Mississippi	126,000	Total	5,391,000
New Hampshire	46,000		

[1] Includes many anglers who also fish in fresh water.

We trust that our comments have been constructive. They are not intended as representing opposition to the objectives of the legislation under consideration. We urge the development of an adequate oceanographic research program as quickly as possible. For example, we strongly favor the part of H.R. 9361 that calls for the immediate strengthening of the marine biological research effort of the National Science Foundation. Implementation of the National Science Foundation program is probably the best way to get an early start on basic research problems and take advantage of the pool of talent available outside the Government agencies. There should be early emphasis on contractual and/or grant research because these are excellent ways to meet the need for more trained personnel in this field.

We appreciate the opportunity to present our views to your committee. Please be assured that we will be glad to assist further in any possible way.

STATEMENT OF THE NATIONAL CANNERS ASSOCIATION TO THE SUBCOMMITTEE ON OCEANOGRAPHY, COMMITTEE ON MERCHANT MARINE AND FISHERIES, U.S. HOUSE OF REPRESENTATIVES ON H.R. 4276, THE OCEANOGRAPHIC ACT OF 1961, JULY 20, 1961

The National Canners Association is a nonprofit trade association representing approximately 650 members located in 48 of the 50 States as well as in the territories. The membership of the association, which includes both independent canning companies and cooperative canning enterprises, packs more than 75 percent of the entire national production of canned fruits, vegetables, specialities, and seafood.

NCA members pack more than 80 percent of the entire national production of canned seafood. The fishermen who provide the raw material to these fish canners work out of ports in the States of Alaska, Hawaii, Washington, Oregon, California, the Gulf Coast States, the Atlantic Coast States, the Commonwealth of Puerto Rico, Peru, Ecuador, Colombia, and Mexico.

Fish canning plays a significant role in our national economy. Retail sales of all canned seafood products in the United States during 1959 totaled more than $550 million. In 1958, there were 12,600 persons employed in the seafood canning industry, with a total annual payroll of $38.2 million.

Since its organization in 1907, the National Canners Association has placed strong emphasis on research. Today it maintains three full-time laboratories in the United States. This association recognizes the importance of fundamental

research in adding to man's basic storehouse of knowledge concerning his environment. In this respect it is unquestionably true that our knowledge of the seas, which comprise approximately three-fourths of the earth's surface, has lagged far behind our knowledge and exploration of land and sky.

It is ironic, in a sense, that we are beginning to explore the frontiers of outer space before we have explored fully the aquatic resources of our own planet. Eventually we may be compelled, by the sheer weight of our rapidly expanding world population, to investigate the ocean depths for possible new sources of high-protein foods with which to replenish our limited food supplies, as well as those of other nations. Before that time comes, it would be desirable to expand our basic knowledge of marine resources and the factors which control their distribution and affect their abundance.

Foreign countries, including both those considered friendly to our way of life and those which are not, are increasing their exploitation of fishery resources in all areas of the world, including waters adjacent to our own coasts. Some of these countries appear to be far ahead of the United States in their study of the oceanographic sciences. The United States, for reasons of its own prestige and self-preservation, cannot afford to be left behind in this worldwide race.

If it is to survive economically, the American fish canning industry must be able to compete successfully with those of other nations where the costs of production are significantly lower. At present, the fishing fleets which supply the NCA's fish canners are required to spend long hours in search of their prospective catches. If we can learn more about the effects of various natural phenomena upon fish movements, we can reduce the time required for the catch and, thereby, lower the costs of production significantly.

In conclusion, the National Canners Association supports the objectives of H.R. 4276 and urges its enactment by the Congress.

EDGERTON, GERMESHAUSEN & GRIER, INC.,
Boston, Mass., March 9, 1961.

Mr. GEORGE P. MILLER,
Chairman, Subcommittee on Oceanography,
U.S. House of Representatives, House Office Building.

DEAR MR. MILLER: We have just read your bill on the establishment of the National Oceanographic Council.

The National Oceanographic Data Center sounds like a wonderful idea.

Tens of thousands of photographs of the ocean floor have been taken using our cameras all over the world. We hope that some day these pictures will be on file in the data center. Some sample pictures are enclosed. They were taken last fall by Dr. Richard Pratt of WHOI in about 3,000 feet of water 200 miles east of New York.

Users of our cameras are:

Woods Hole Oceanographic Institution.
Scripps Institution of Oceanography.
Comdr. J. Cousteau and National Geographic Society.
French bathyscaph.
U.S. Naval Ordnance Laboratory.
Bell Telephone Laboratories.
Advanced Systems Development.
Life magazine.
Naval Electronics Laboratory.
Westinghouse Research Laboratory.
U.S. Navy Hydrographic Office.
Global Marine Exploration Co.
U.S. Navy, Newport, R.I.
Department of Defense Production.
Department of Mines and Technical Survey.

Yours truly,

SAMUEL O. RAYMOND, *Senior Engineer.*

THE BINGHAM OCEANOGRAPHIC LABORATORY,
YALE UNIVERSITY,
New Haven, Conn., March 13, 1961.

Hon. GEORGE P. MILLER,
Chairman, Subcommittee on Oceanography,
Committee on Merchant Marine and Fisheries,
House Office Building, U.S. House of Representatives, Washington, D.C.

DEAR MR. MILLER: Thank you for the copy of H.R. 4276 that you sent me. I am deeply gratified, as are the other members of the National Academy of Sciences Committee on Oceanography, that you have taken so much interest in this field which we regard as important both scientifically and for the future welfare of the Nation.

Your bill will accomplish much of what is needed in the way of legislative action to strengthen this field. It has my heartiest personal endorsement. I note, however, in comparing your bill with the one that has been introduced into the Senate, that although there is agreement on major aims, there are many differences in minor details. I sincerely hope it will be possible in the course of time to reconcile these differences of opinion and find a course of action that will be agreeable to all concerned.

With best wishes.

Sincerely yours,

GORDON A. RILEY.

U.S. ARMY CHEMICAL CORPS RESEARCH AND DEVELOPMENT COMMAND,
U.S. ARMY CHEMICAL RESEARCH AND DEVELOPMENT LABORATORIES,
Army Chemical Center, Md., March 14, 1961.

Hon. GEORGE P. MILLER,
Chairman, Subcommittee on Oceanography of the Committee on Merchant Marine and Fisheries, House Office Building, Washington, D.C.

DEAR REPRESENTATIVE MILLER: Thank you very much for your recent communication concerning the Oceanographic Act of 1961 with the enclosed copy of H.R. 4276. You ask for my comments on this proposed legislation.

I am extremely interested in having such a bill passed with all due speed. I think that the time is overdue for the United States to insure adequate development of the aquatic and marine resources of this Nation. The general point of view of the bill is mind sound. It resembles very much the Senate bill 901 entitled "Marine Sciences and Research Act of 1961." The Senate bill is expressed in greater detail than is your bill but essentially they both intend to do the same thing.

In any such legislation it is important that the biological aspects of the matter be properly considered. The Great Lakes and our surrounding oceans will be, in the future, an important if not essential source of food and raw materials. These vital resources will be wasted if we do not plan now for their exploitation in a scientific manner. The biological aspects of the problem are critical; I am pleased to note that your bill specifically insures that adequate support will be forthcoming for biological studies.

I assure you that I am thoroughly sympathetic with the aims and methods proposed in this bill. I would be glad to exert any effort which I could to aid its passage. So I hope that you will feel free to call on me in any capacity in which I can serve to facilitate the early passage of this legislation.

For your information, on May 1, 1961, I will be leaving these laboratories to take up a new position as dean of the graduate school and professor of biology in Kent State University, Kent, Ohio. Consequently you can see how I am vitally interested in the educational and research support aspects of this bill. Will you please keep me informed concerning the progress which this legislation makes.

Again assuring you of my continued interest and my sincere offer of support, I am,

Cordially yours,

CHARLES G. WILBER, Ph. D.,
Chief, Experimental Zoology, Branch,
Directorate of Medical Research.

GENERAL ELECTRIC CO.,
ADVANCED ELECTRONICS CENTER,
Ithaca, N.Y., March 17, 1961.

HON. GEORGE P. MILLER,
U.S. House of Representatives, Washington, D.C.

MY DEAR CONGRESSMAN MILLER: Thank you very much for the copy of H.R. 4276, and let me congratulate you on the excellent work you and your committee have done.

Since you are inviting comments and suggestions, I would like to make a recommendation. I believe that the bill would be greatly enhanced if the Congress would authorize the establishment of a central interagency clearinghouse for oceanographic instrumentation.

One of the great problems connected with oceanographic instrumentation is that most equipment is built at institutional laboratories, works only for the individual who has built it, and does not lend itself to production. However, there is a great deal of development and production know-how in private industry, and also a willingness to contribute to this great oceanic development program. At the present time there is no central place in the Government where industry can go to get information on what is needed; nor where to offer an instrument that has been designed; nor where to submit a proposal. It is very time-consuming and therefore costly to make the rounds from agency to agency, bureau to bureau, department to department, ad infinitum, only to learn later that one has missed the unit that has an urgent need for a certain piece of equipment.

Much time and money could be saved and duplication avoided by having this clearinghouse, which should be abreast of the needs of the 16 Federal agencies mentioned on page 6 of S. 901, and should be aware of who is doing what. In other words, those in private industry who are willing to contribute their engineering resources and know-how cannot only be informed of the needs, but also be directed to the appropriate person in case he wishes to offer specific instruments, systems, etc.

My recommendation is based on over 10 years' experience as an oceanographer with the Woods Hole Oceanographic Institution, the Navy Hydrographic Office, and the General Electric Co.

Sincerely,

Francis E. Elliott,
Dr. F. E. ELLIOTT.

BEAUFORT, N.C., *March 21, 1961.*

HON. GEORGE P. MILLER,
The U.S. House of Representatives, Washington, D.C.

DEAR SIR: Thank you for sending me a copy of your bill H.R. 4276. As a marine biologist, I have been following developments of the so-called oceanography Act during the past 2 years. I wish to commend you on your efforts in the House of Representatives to get action on this bill. I hope this year passage can be achieved in both the Senate and the House for such a marine science program. Research of this type is long overdue and is necessary for the general welfare and defense of the country. Your work on making this possible is greatly appreciated.

Very truly yours,

G. B. TALBOT.

STATE OF NEW YORK,
CONSERVATION DEPARTMENT,
DIVISION OF FISH AND GAME,
SHELLFISHERIES MANAGEMENT UNIT,
Freeport, Long Island, N.Y., March 21, 1961.

HON. GEORGE P. MILLER,
Chairman, Subcommittee on Oceanography,
House Office Building, Washington, D.C.

SIR: Thank you very much for your letter of February 19, 1961. I read over the proposed legislation and agree wholeheartedly on it. However, I would

like to see the word "chemical" added to line 17, page 2. Also, I hope that the publications of the scientific center will be well advertised in various journals so the smaller labs and individuals can be aware of them.

I certainly hope that this bill will be passed.

Sincerely,

J. FOEHRENBACH, *Sanitary Chemist.*

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS,
DEPARTMENT OF OCEANOGRAPHY AND METEOROLOGY,
College Station, Tex., March 23, 1961.

Hon. GEORGE P. MILLER,
House of Representatives, Committee on Merchant Marine and Fisheries,
House Office Building, Washington, D.C.

MY DEAR MR. MILLER: Thank you for your recent invitation to comment upon the bill which you recently introduced in the House of Representatives, H.R. 4276.

It is difficult for me to visualize just how the proposals made in Congress will work out in relation to each other. However, I can make some general comments.

The attention which you have brought to our science will be of great benefit no matter what the future of the bill itself may be. We appreciate your efforts in our behalf. Of course, those of us in oceanography fully believe in its importance to the Nation and support your increasing emphasis on it.

To me it seems strange that an act called an oceanographic act should include the fresh waters. I believe that I would favor a separate bill for these waters. Although the problems in the two environments have much in common it seems that most scientists are interested in one or the other but seldom both. Also, each has so many unique features that the interest in it comes from quite a different source than the interest in the other. In Russia, the Hydrometeorological Agency covers oceanography and limnology both, but its institutions are devoted to one or to the other, not to both.

The council you propose would certainly place oceanography in higher circles of consideration which should be to its benefit.

It was my understanding that a National Oceanographic Data Center has already been established. If this is the case I am not sure what section 3 of H.R. 4276 implies.

I believe that passage of your bill would do much to further our efforts to learn about the oceans. I hope that you are successful in obtaining full support for it.

Yours very truly,

DALE F. LEIPPER, *Head of the Department.*

INTERNATIONAL LONGSHOREMEN'S &
WAREHOUSEMEN'S UNION, LOCAL 3,
Seattle, Wash., March 23, 1961.

GEORGE P. MILLER,
Chairman, Subcommittee on Oceanography,
House Office Building, Washington, D.C.

DEAR GEORGE: It is nice to hear from you again and to know that you are interested in fishery problems. Our organization is in support of the subject matter contained in H.R. 4276. The extreme need is for fast work in this field especially where we are involved, on the west coast, in international treaties. This calls for as much work to be done in the shortest possible time. It is my firm belief that a serious shortcoming in your bill is that you won't have enough money to do the job required.

Your truly,

JOE JURICH, *Secretary-Treasurer.*

INTERNATIONAL PACIFIC HALIBUT COMMISSION,
Seattle, Wash., March 27, 1961.

Hon. GEORGE P. MILLER,
Chairman, Subcommittee on Oceanography, Committee on Merchant Marine and Fisheries, House of Representatives, Washington, D.C.

DEAR SIR: We have received your form letter of February 17, 1961, enclosing copy of H.R. 4276, Oceanographic Act of 1961, and asking for comments.

In common with other agencies responsible for research upon and the management of marine fisheries resources, we have long recognized an urgent need for intensive oceanographic work.

We heartily approve the objectives of your bill and the proposed composition of the National Oceanographic Council which will be given the responsibility of implementing them.

Sincerely yours,

H. A. DUNLOP,
Director of Investigations and Secretary.

ATLANTIC RESEARCH CORP.,
Alexandria, Va., March 29, 1961.

Hon. GEORGE P. MILLER,
Chairman, Subcommittee on Oceanography, U.S. House of Representatives, Committee on Merchant Marine and Fisheries, House Office Building, Washington, D.C.

DEAR MR. MILLER: Thank you for your letter of February 17 which enclosed a copy of the bill cited the Oceanography Act of 1961. In general, we must give our wholehearted support to federally initiated and supported oceanography programs. This is one domain where the Federal Government has a right. Over the past few years, private capital has spent millions of dollars building up a capability in the expectation of Government support. Once the program has uncovered and publicized the tremendous potential in our oceans, leadership can be returned to the private, competitive sector of our society.

Thank you for this opportunity to comment.

Very truly yours,

C. M. GRAY.

WESTERN GEOPHYSICAL CO. OF AMERICA,
Los Angeles, Calif., March 31, 1961.

Hon. GEORGE P. MILLER,
Chairman, Special Subcommittee on Oceanography, Committee on Merchant Marine and Fisheries, House of Representatives, Washington, D.C.

DEAR MR. MILLER: It has recently come to my attention that you are preparing or have prepared a national oceanographic research policies bill and that your committee may be holding hearings on the subject in the near future.

We are indeed pleased that an alternative approach to that offered by Senate bill No. 901 will be presented. As we have previously indicated, we have certain strong objections to that bill as presently written. Your well-organized and well-balanced staff approach to oceanographic exploration leads us to expect that the House bill will take a realistic and practical approach to the massive oceanographic program.

An opportunity to testify before your committee on any legislation affecting oceanographic survey will be most welcome. If there is any material information or assistance that we can furnish to your committee or your staff, please feel free to call upon us.

I am looking forward to meeting with you in Oklahoma City during the Geophysical Society meeting.

Yours very truly,

CARL H. SAVIT,
Director of Systems Research.

University of Miami,
The Marine Laboratory,
Miami, Fla., April 5, 1961.

Hon. George P. Miller,
Committee on Merchant Marine and Fisheries, House of Representatives, House Office Building, Washington, D.C.

Dear Mr. Miller: In answer to your request for comments on bill H.R. 4276, which you have introduced in the House of Representatives, I am glad to comply by outlining a few of my thoughts. My general opinion is that the complex structure of the organization of oceanography in the United States makes it necessary that the funding be guided by a unified point of view. As a member of the Committee on Oceanography, I was very much concerned about the way such unification could be achieved. One of the proposed solutions to this problem was the establishment of a National Institute for Oceanography, which is a similar idea to the National Oceanographic Council. Another possibility was the enactment of detailed legislation on general procedures for funding, giving all agencies a guideline, but avoiding a centralization. Each of these points of view has many pros and cons. Experience in other large countries, however, has demonstrated that a national institute can become a heavy and difficult to organize body; therefore, the Committee on Oceanography has decided not to propound this step. I want to emphasize that I was one of the few in favor of a national institute, but I became convinced of the difficulties involved. The Interdepartment Committee on Oceanography (ICO), on the other hand, was acting in some respects as the centralizing agency and has, in my opinion, done an excellent job. It may, therefore, be logical that this committee may be established as the National Oceanographic Council.

There are a few points that I would like to bring to your attention. I believe, in addition to the six mentioned Departments and Agencies, there should be a representative of the State Department and the Department of Public Health, Education, and Welfare. The first one because of the international nature of oceanography and the second one because of the importance of the ocean to public health and welfare.

Furthermore, I believe that, in effect, the Council will not be represented by the Secretaries of the Department and the Directors of the Agencies, but that each one will delegate one of his administrative assistants to represent him. For this reason, I would prefer that the responsible scientific administrators in the different Agencies should constitute the Council.

As a representative of a university institution, I was interested in the fact that the bill contained no acknowledgement of nor provision for the research and engineering work developed and carried out by universities in the field of oceanography. Up to now the universities have carried out the principal part of the research, and I am of the opinion that they should continue to do so in the future, since the basic research must be the backbone of all advancement in science. In addition, the university is the place where young scientists are educated. I do not see, at the present time, how the proper position of the universities' participation in the nationwide oceanographic program can be outlined in this bill. I would have liked it to be emphasized that the universities and institutions are the best source of new scientists interested in the ocean.

Further, I hope that the Smithsonian Institution will be willing to carry out the direction given in the bill. I completely agree that the Smithsonian Institution must get better facilities, and especially a larger staff, in order to serve as the central disposition place and the center for taxonomic work in marine biology.

Please be assured that all efforts made by the House of Representatives are appreciated, as long as these measures guarantee a continuous support of marine sciences and contribute to the coordination of diversified programs.

Very truly yours,

F. F. Koczy,
Chairman, Physical Science Division.

MURRAY & TREGURTHA, INC.,
Quincy, Mass., April 12, 1961.

Mr. GEORGE P. MILLER,
Chairman, Committee on Merchant Marine and Fisheries, House of Representatives, House Office Building, Washington, D.C.

DEAR MR. MILLER: The writer was very pleased to have the opportunity of reviewing the bill now being proposed as regards the development of aquatic resources of the United States.

The writer has just returned from an extended visit to the Mohole project now under operation by the National Science Foundation. We have in a small way contributed to the success of this venture in that we are positioning the boat with our outboard propelling units which in turn are making this project possible.

We are in full accord with the bill as presented and would like you to push this through to a final conclusion.

Very truly yours,

A. W. WANZER, *Chief Engineer.*

NATIONAL BERYLLIA CORP.,
North Bergen, N.J., April 17, 1961.

Hon. GEORGE P. MILLER,
Chairman, Committee on Merchant Marine and Fisheries, House of Representatives, House Office Building, Washington, D.C.

DEAR SIR: I wish to apologize for this late response of the letter addressed to the writer February 17. Our company has been in the process of a rather extensive plant expansion and tooling up program with the related increase in staff and organization which accompanies such a program, consequently this delay in my response.

I have read your bill H.R. 4276 and was impressed with the complete coverage provided the general needs in the area of marine mineral resources. I feel there is a great need for a bill such as this and with its scope broad enough at the outset to provide for specific concentration in areas of importance, as they become apparent. This broadness means provision for augmenting the expected findings with the proper action that would be required to properly exploit the vast mineral resources that are available in apparent abundance along our ocean frontiers.

I shall be looking forward to learning of the progress made by your committee in this very interesting area.

With kindest regards.

Sincerely,

C. E. NELSON, *President.*

GREAT LAKES COMMISSION,
Ann Arbor, Mich., June 23, 1961.

Hon. GEORGE P. MILLER,
Chairman, Subcommittee on Oceanography, Committee on Merchant Marine and Fisheries, U.S. House of Representatives, Washington, D.C.

DEAR CONGRESSMAN MILLER: Your attention is respectfully directed, in connection with the present hearings on H.R. 4276 relating to the proposed new Federal oceanography program in the enclosed statement submitted by this agency to the Senate Select Committee on National Water Resources at hearings in Detroit, Mich., in October 1959.

You will note that the Commission, which is a joint statutory agency of seven Great Lakes States, urges inclusion of the Great Lakes in the waters to be studied by such a program. This recommendation is based on the similarities in many respects between the oceans and the Great Lakes, the excellent opportunities provided by the Great Lakes for certain oceanographic studies, and the laboratory which the Great Lakes provides for the training of oceanographers. Additionally and very important to the States bordering the Great Lakes, of course, inclusion of these waters would provide knowledge most urgently needed for their wise use and further development.

As additional support for including the Great Lakes in the proposed oceanography program, we respectfully direct your attention to a recent report by a committee of the American Society of Limnology and Oceanography. This report, published as a supplement to volume 6 of "Limnology and Oceanography," states as follows:

"Special opportunity for the expansion of education for oceanography exists in the universities of the Great Lakes area. A number of these have been active for many years in the fields of aquatic biology and limnology and are already teaching and conducting research in many aspects of oceanography. Ohio State University has supported a productive research laboratory on Lake Erie and at the University of Michigan the Great Lakes Research Institute provides a center from which a broad program of investigation of the larger lakes is being conducted. Many of the concepts and techniques employed in the study of the Great Lakes are identical with those of oceanography. Small lakes, in which conditions may be controlled and experimentally modified, are advantageous for giving students experience in the study of many special problems in aquatic science. Many men trained in the Great Lakes area are contributing effectively to oceanography.

"Adequate ships are badly needed for research which should be done in the Great Lakes. Until they are available the opportunities for providing students with practical experience in the techniques of oceanographic investigation in this area will be limited."

In the Commission's view both the contributions which studies of the Great Lakes can make to oceanographic research generally and the contribution which such studies can make to improved management of the water resources of the Great Lakes thus indicate the importance of including the Great Lakes in any new Federal oceanography program.

We understand that H.R. 4276 would include the Great Lakes and the expanded program in marine sciences which the bill proposed and on that basis herewith indicate our support for the enactment of the bill.

Sincerely yours,

MARVIN FAST, *Executive Director.*

THE UNIVERSITY OF MICHIGAN,
INSTITUTE OF SCIENCE AND TECHNOLOGY,
GREAT LAKES RESEARCH DIVISION,
Ann Arbor, Mich., July 14, 1961.

Hon. GEORGE P. MILLER,
Chairman, Subcommittee on Oceanography, Committee on Merchant Marine and Fisheries, U.S. House of Representatives, Washington, D.C.

DEAR CONGRESSMAN MILLER: My concern for the development of the aquatic sciences of the United States stems from professional interests as well as considerations of national economy; therefore, I submit the following comments in support of your committee's commendable legislative efforts as expressed in H.R. 4276.

(1) In order to effectively expand and develop the aquatic resources of this country, a thorough knowledge of our rivers, lakes, and oceans is requisite.

(2) It is essential, in the effort to solve problems related to our aquatic resources, that the major emphasis be placed on basic problems rather than on specific waters or geographical areas. The goal should be to use the waters best suited to solve a particular problem; in one instance it may be the oceans, and in another, lakes or streams.

(3) Basic problems such as biological productivity, water quality, disposal of radioactive wastes, air-water interface phenomena, underwater acoustics, etc., need to be studied concurrently in waters of different salinities and sizes. Small lakes, in contrast to oceans, afford opportunities for experimental research of a more definitive nature, and because of their small size and ready accessibility offer the advantage of economy of time and money. On the other hand, oceans are better suited for the large-scale study of basic problems and the phenomena peculiar to large bodies of water.

(4) Scientific personnel qualified to carry out the proposed program in aquatic sciences must be drawn both from the fields of oceanography and limnology. The objectives, methods, and the equipment of limnology and oceanography are basically the same, and in many instances a person trained in one field eventually works in the other.

(5) The role of our Great Lakes in advancing the aquatic sciences is noteworthy, and I am pleased with the recognition they have received in your bill. In several respects these large lakes are intermediate in characteristics between the small inland lakes and the oceans, and therefore lend themselves uniquely to certain kinds of investigations. Their evident lacustrine features are (1) possession of both inlets and outlets, (2) typical lake thermal characteristics, and (3) low salt content. Their oceanic characteristics are (1) visible effects of Coriolis force (the apparent tendency of wind-driven surface water to move to the right of the wind direction), (2) distribution of upwellings and sinking according to the relationship of current streamlines and the shore, and (3) the presence of distinct water masses.

The Great Lakes afford the following advantages in the conduct of aquatic research: (1) Their size and ready accessibility make investigations economical in respect to time and outlay of equipment; (2) most oceanographic phenomena exist in the Great Lakes and in such scale that the lakes may be considered as laboratory-sized oceans; (3) lack of pronounced tides and high salinities makes many research problems simpler and more readily solvable in these lakes than in oceans; (4) low electrical conductivity of fresh water and its much less corrosiveness make possible a rapid and economical testing and development of instrumentation; and (5) the existence of scientific research and training centers in the Great Lakes States, such as the Universities of Michigan, Wisconsin, Minnesota, and Ohio State, which contribute to the national effort in aquatic sciences and are a source of trained personnel.

I will follow the progress of this proposed legislation with great interest.

Sincerely yours,

DAVID C. CHANDLER,
Director, Great Lakes Research Division.

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