

## OCEANOGRAPHIC SESSION

WEDNESDAY — NOVEMBER 15

*Chairman — J. FRANCES ALLEN, Associate Program Director for Systematic Biology, National Science Foundation, Washington, D. C.*

### **Federal Coordination of Oceanography**

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#### **Abstract**

Events leading to the development of the concept of a "National" Oceanographic Program are described. Multi-Federal Agency support of oceanography creates problems in planning, budgeting and coordination. A solution to these problems is of interest to Congress, Government administrators, oceanographers and friends of oceanographers. One solution evolving under continued attention from each of these groups is discussed as are two other solutions proposed by Congressional legislation. Many consider oceanography as a test case in Government involvement in the support of science in general. Thus, the success or failure of present attempts to solve oceanography's problems may affect other areas of Government-supported science.

#### **INTRODUCTION**

FOUR YEARS AGO only one committee in Washington had the word "oceanography" in its title—the informal "Government Coordinating Committee on Oceanography." Now there are three more.<sup>1</sup> In the same period the Government budget for oceanography has jumped from 12 to 97 million dollars. Thus, in four years the number of Washington committees on oceanography increased by a factor of four, while the Federal Budget for oceanography increased by a factor of eight—a remarkable accomplishment in view of Parkinson's universal laws of committees and government financing!

In the past several years our Nation has been mainly concerned with developing our land resources, our industry, our defense capabilities, and recently our space technology. Now many recognize the need to expand our knowledge and use of the oceans—the realm of your major interest. A significant increase in Federal funds for oceanography has already been achieved. More increases are planned for the future. This expanded effort is referred to as the "National" Oceanographic Program. It is based on fisheries needs as well as military needs for knowledge of the sea—on present and future uses of the ocean for resources, commerce, waste disposal and recreation.

Such an expanded program brings with it complex problems. How many

<sup>1</sup>They are: the Committee on Oceanography of the National Academy of Sciences, the Subcommittee on Oceanography of the House of Representatives Committee on Merchant Marine and Fisheries, and the Interagency Committee on Oceanography of the Federal Council for Science and Technology.

ships of what size and design must be built, and when? Where should the open ocean survey program begin? What things should be measured, how accurately and how frequently? Should we do more to train and recruit marine scientists and technicians? Must new laboratories be built, when, where and of what kind? How can we best cooperate in international expeditions and survey programs? In short, how can the national oceanographic program best be developed, financed and coordinated?

No one can provide the ultimate answers to these questions, but a way of making decisions on how to proceed is now being developed. It is a new method of multi-agency cooperation and coordination, that is, to some extent, an "experiment" in government—an experiment whose success or failure is linked for better or worse to the national program in oceanography.

### **A Brief Review**

To understand this experiment we need to review briefly the events leading up to the development of the concept of the "National" Oceanographic Program. In November of 1957 the first meeting of the National Academy of Sciences' Committee on Oceanography was held. Fifteen months later the Committee released Chapter 1 of its series of reports entitled "Oceanography 1960 to 1970." This chapter summarized a series of specific recommendations on needs for education and manpower, new ships, shore facilities for basic research, ocean-wide surveys, new devices, studies of radioactivity in the oceans, ocean resources studies and international cooperation. About the same time that the Academy Committee report was released, the Navy unveiled the first model of its ten-year plan for oceanography called "TENOC."

These two reports generated surprising interest within the scientific community, among Congressmen, budget makers, newspaper and magazine reporters, and the public. Feature articles on oceanography appeared in *Newsweek*, in *Time*, in *Fortune*, in the Sunday supplements, and even in high school study guides. Senator Humphrey made a major speech on oceanography in the Senate quoting frequently from the Academy Committee report. A Senate resolution was passed commending the Academy report to the President, the Bureau of the Budget and Government agencies involved with the marine sciences. Bills were introduced and hearings held by three Congressional committees. The published Congressional hearings and special reports on oceanography now total about 1,800 pages!<sup>2</sup>

All of these hearings stressed two major questions: Should the national effort in the marine sciences be significantly expanded? And, if so, how should this effort be organized and coordinated?

The answer to the first question was not long in doubt. Many eminent individuals and groups strongly endorsed the need for such a program and recently President Kennedy wrote in a supplemental budget request addressed to the Speaker of the House of Representatives that:

"Knowledge of the oceans is more than a matter of curiosity. Our very survival may hinge on it."

And again—

"The seas around us, as I pointed out in my message to Congress of February 23, represent one of our most important resources. If vigorously developed, this resource can be a source of great benefit to the Nation and to all mankind."

<sup>2</sup>A list of Congressional bills and reports on oceanography is appended to this report.

### ***Groups Concerned with Oceanography***

If it is agreed that our country should embark upon a "National" Oceanographic Program, there are divergent views concerning its management, coordination, and development. This divergency is more easily understood if we consider the variety of interests represented by some of the major groups concerned with oceanography.

Within the Federal Government, a dozen bureaus or agencies are directly concerned with oceanography, including: the Atomic Energy Commission, National Science Foundation, Bureau of Commercial Fisheries, Coast and Geodetic Survey, Office of Naval Research, Hydrographic Office, Bureau of Ships, Geological Survey, Smithsonian Institution, Coast Guard, Weather Bureau, and Bureau of Mines.

Congressional interest in the oceans is focused on two committees in the House (the Subcommittee on Oceanography of the Committee on Merchant Marine and Fisheries, and the Committee on Science and Astronautics) and one in the Senate (the Committee on Interstate and Foreign Commerce). Several other Congressional committees have a secondary interest in the sea.

In the National Academy of Sciences—a non-Governmental private institution—the major emphasis on oceanography is in the Academy's Committee on Oceanography. Many other Academy committees are also concerned with the sea including: Committees on Atmospheric Sciences, Undersea Warfare, Mine Warfare, International Cooperation, Geophysics, etc.

A list of national scientific, engineering and fisheries groups interested in one phase or another of the National Oceanographic program such as the American Society of Limnology and Oceanography, the American Meteorological Society, the American Geophysical Union, the Marine Sciences Division of the Instruments Society of America, the Gulf and Caribbean Fisheries Institute, and so on, would easily total two dozen.

Obviously, these many groups represent many diverse interests, many sources of support, many motivations, and many objectives which must be recognized in a truly effective national program.

### ***Coordinating the "National" Oceanographic Program***

One way of planning, budgeting and coordinating this program is now being tested, in an experiment in Government management that may have far reaching effects on other programs which demand such coordination in the future. One phase of this experiment is being conducted by the Interagency Committee on Oceanography (ICO) of the Federal Council for Science and Technology. The ICO is made up of top level scientific administrators from several Federal agencies.<sup>3</sup> The ICO has working groups and panels on ocean surveys, on research, on ships, on training and manpower, and on equipment and facilities. Great care is taken by the ICO to consider not only the objectives of a particular Government bureau but also the interests of the scientific community and the Nation as a whole. The ICO conducts a critical review of each Agency's program, stresses coordination and cooperation, and provides a forum for the planning and budgeting processes. Reports of the Interagency Committee are available to Congress (after being reviewed by the Executive Offices of the President.)

<sup>3</sup>Dr. James H. Wakelin, Jr. (Chairman), Dr. Donald L. McKernan, Radm. H. Arnold Karo, Radm. Joseph A. Kerrins, Dr. Randal M. Robertson, Dr. Homer D. Babbidge and Dr. John N. Wolfe.

Although quick to praise the work of the ICO, Congressmen are equally quick to point out that the existence of this Committee is based on a Presidential directive. The Federal Council for Science and Technology was created by a Presidential directive and, presumably, could be wiped out at the will of the Executive. Furthermore, although the Interagency Committee on Oceanography of the Federal Council eventually does make some of its findings available to the Congress, it is not technically obliged to do so.

Therefore, Congress is currently offering two alternative coordinating methods. Senator Magnuson's bill, S. 901, entitled the "Marine Sciences and Research Act of 1961" contains authorizations for expenditures of funds for each part of the national program by each agency involved. It also establishes a Division of Marine Sciences in the National Science Foundation, to coordinate the long-range program of marine research and surveys. The advisory committee for this new NSF division would have representation from Government agencies and non-government universities and laboratories. The proposed Division of Marine Sciences would be authorized and directed to develop and encourage a continuing national marine sciences program, to recommend grants, contracts, loans and other forms of assistance, to cooperate with other Government agencies, to foster exchange of information between scientists in the United States and other countries, and to evaluate the scientific aspects of research and survey programs undertaken by the Federal Government and institutions receiving Federal assistance. Thus the major burden for coordination and planning would be placed in a new division of an existing agency (the National Science Foundation) and the Congressional committees to which NSF reports would have a direct method of monitoring and influencing the program.

Congressman Miller's bill, H.R. 4276, entitled the "Oceanographic Act of 1961" would, on the other hand, establish a new National Oceanographic Council. The members of this new organization would be appointed by the President (with the advice and consent of the Senate) from the Departments of Treasury, Defense, Interior, Health, Education and Welfare, the Atomic Energy Commission, the National Science Foundation, and the Smithsonian Institution. The Council would establish a national program of oceanographic research on an integrated, coordinated basis, coordinate the efforts of various Government departments to implement the program effectively, and review budget requests for appropriations made by various agencies. To carry out special projects that a particular agency might be unable to support, the Council would have a "special aquatic research fund" that could be transferred to an operating agency to carry out programs in the national interest. This bill also establishes the position of "Oceanographer of the United States" to be filled by a distinguished oceanographer for a term of five years. The Oceanographer would perform such duties and exercise such powers as the Council would prescribe. The Council would have a staff, an advisory committee of three non-Government scientists, and would report annually to the President and to the Congress on the general status of aquatic science.

Another solution to the problem of coordinating a complex program is the creation of a new *operating* agency or department. The AEC, the NSF, and the National Aeronautics and Space Agency are examples of this approach in action. Early in its deliberations the Academy of Sciences' Committee on Oceanography discarded this solution for oceanography as being unwise and unworkable. The Committee felt that a new agency, (a "National Oceanogra-

phic Agency") would only interpose another layer of bureaucracy between the producers of oceanographic information—the laboratories and institutions—and the users; industry, the public and the Government agencies. The Academy Committee decided instead to encourage a parallel development in the support of oceanography by several Government agencies. With a reasonable amount of exchange of information, coordination and planning, the Committee felt that such a multi-agency development would not result in undue duplication of effort. The problems are so large and the area for study so vast that it would be hard to achieve duplication, even if this were the sole objective. The Inter-agency Committee on Oceanography under the Federal Council for Science and Technology is developing and coordinating just such a multi-agency program. Both Senator Magnuson's and Congressman Miller's bills would permit continuation of this concept but with the added feature of a permanent statutory base for operations.

Whether coordination is achieved through the assignment of this responsibility to an *existing* agency (as in Magnuson's bill), the establishment of a *new* oceanographic "Council" (as in Miller's bill), or an extension of the present use of the Federal Council's Interagency Committee on Oceanography, it is clear that Congress has expressed its intent that the program be "coordinated."

What will happen in the months ahead is anyone's guess.

Senator Magnuson's bill has passed the Senate and been referred to the House Merchant Marine and Fisheries Committee. Hearings on Mr. Miller's bill can be expected soon after the next Congress convenes. If Mr. Miller's bill is passed by the House these two bills may come together in conference and a compromise bill may emerge that will fulfill the coordinating objectives of both Senator Magnuson and Mr. Miller. If this is the case, I predict that the kernel of such a bill will involve the identification or creation of a responsible Government coordinating agency for oceanography.

#### ***Future Implications***

If coordination without central control can be made to work, if the experiment now underway, the multi-agency coordinated "National" Oceanographic Program, succeeds, other areas of endeavor that cut across many established lines of support and organization may follow the example of oceanography. Oceanography is leading the way with a new approach in Government management and support of a complex field of endeavor. I believe that this approach allows for a greater flexibility and a closer relationship between the *user* and the *producer* of scientific information. It also calls for an added degree of responsibility and concern for the national welfare by the Washington administrators, marine scientists and the many national organizations concerned with the sea.

The development of a truly national effort in oceanography is not an easy matter. There are many complicating features. Oceanography calls upon the talents of many different specialists from many different fields—physicists, chemists, mathematicians, biologists, geologists, and engineers. Its support by the Federal Government involves almost every major department and many agencies. The sea, the operating area of the oceanographer, is international territory.

Many groups in the Federal Government have viewed the problem of coordinating oceanography and the Federal Government involvement in its

support as a test case. It is a particularly difficult test case because of the many groups involved in its support, the many fields of endeavor that are concerned, and the need to develop our Country's support in a way that will be responsive to the national interests of today and in the years ahead.

Certainly there is no question concerning the need to greatly increase our Country's oceanographic effort, but legislators and administrators need the support and understanding of individuals and organizations such as the Gulf and Caribbean Fisheries Institute to achieve this objective. In return you may expect a steady advance in our understanding and use of the oceans, our deep frontier.

## APPENDIX

### ***Bills and Congressional Reports on Oceanography***

**H.R. 6298**—To amend the National Science Foundation Act of 1950 to provide financial assistance to educational institutions for the development of teaching facilities in the field of oceanography, and to provide fellowships for graduate study in each field.

Introduced April 13, 1959 by Mr. Overton Brooks and referred to the Committee on Science and Astronautics.

Hearings held August 18, 1959 (not published) and April 28-29, 1960, ("Frontiers in Oceanic Research" 76 p., NAS (Committee on Science and Astronautics, G.P.O., 1960).

**S.R. 136**—Senate Resolution commending Committee on Oceanography report to the President, the Bureau of the Budget, and heads of Government agencies.

Passed by unanimous consent July 13, 1959.

**S. 2482**—To remove geographic limitations on activities of the Coast and Geodetic Survey, and for other purposes.

Introduced August 4, 1959 by Mr. Warren Magnuson and referred to the Committee on Interstate and Foreign Commerce.

Reported out August 17, 1959. (Senate Calendar No. 731, Report No. 726, 9 p.) Passed Senate August 19, 1959.

**H.R. 8611**—(Identical to S. 2482.) Introduced August 11, 1959 by Mr. Herbert Bonner.

Hearings held January 22, 1960.

After passing both Houses, S. 2482 became Public Law 86-409, April 5, 1960.

**S. 2692**—To advance the marine sciences; to establish a comprehensive ten-year program of oceanographic research and surveys; to promote commerce and navigation, to secure the national defense; to expand ocean resources; to authorize the construction of research and survey ships and facilities; to assure systematic studies of effects of radioactive material in marine environments; to enhance the general welfare; and for other purposes.

Short title: "Marine Sciences and Research Act of 1959."

Introduced September 11, 1959 by Mr. Warren Magnuson (and 12 other Senators) and referred to the Committee on Interstate and Foreign Commerce.

Hearings held April 20, 21 and 22, 1960. ("Marine Sciences" 165 p., Committee on Interstate and Foreign Commerce, G.P.O., 1960.)

Committee report on bill printed June 7, 1960. Report No. 1525, Calendar No. 1588, 64 p. Senate debate on bill June 23, 1960, printed in Congressional Record, 19 p.

Passed unanimously by Senate, June 23, 1960.

**H.R. 9361**—(Identical to S. 2692.) Introduced by Mr. Thomas Pelley January 6, 1960 and referred to the Committee on Merchant Marine and Fisheries.

Hearings held May 20, 24 and 25, 1960. ("Oceanography," 217 p., Committee on Merchant Marine and Fisheries, G.P.O., 1960.)

**H.R. 10412**—To establish a public policy with respect to oceanographic surveys, and to provide for coordination of the efforts of Federal agencies with respect to oceanographic surveys.

Introduced by Mr. George Miller February 15, 1960 and referred to the Merchant Marine and Fisheries Committees.

Identical bills H.R. 10546 and 10581 introduced by Congressmen Oliver and Pelley respectively.

Hearings held May 17, 19, 20, 24 and 25, 1960. ("Oceanography," 217p.)

**H.R. 12018**—To establish within the United States Coast and Geodetic Survey a National Oceanographic Data Center and a National Instrumentation Test and Calibration Center.

Introduced May 2, 1960 by Mr. George Miller and referred to the Committee on Merchant Marine and Fisheries.

Hearings held May 17, 19, 20, 24 and 25, 1960. ("Oceanography" 217p.)

**H.R. 12700**—To amend the National Science Foundation Act of 1960 to create a Special Committee on Marine Sciences, to develop and encourage a national program for the promotion of research, surveys, and education in the marine sciences, to recommend contracts, grants, or other forms of assistance, to encourage cooperation of agencies and evaluate the programs of marine research undertaken by agencies of the Federal Government in these scientific fields.

Introduced by Mr. Overton Brooks, June 17, 1960 and referred to the Committee on Science and Astronautics.

**S. 901**—(Revision of S. 2692.) To advance the marine sciences, to establish a comprehensive ten-year program of oceanographic research and surveys, to promote commerce and navigation, to secure the national defense, to expand ocean, coastal, and Great Lakes resources, to authorize the construction of research and survey ships and laboratory facilities, to expedite oceanography instrumentation, to assure systematic studies of effects of radioactive materials in marine environments, to enhance the public health and general welfare, and for other purposes.

Introduced by Mr. Warren Magnuson February 9, 1961 and referred to the Committee on Interstate and Foreign Commerce.

Hearings held March 15, 16 and May 2, 1961. ("Marine Science," 204 p., Committee on Interstate and Foreign Commerce, G.P.O., 1961.)

(Committee Report No. 426, Calendar No. 399, 64 p., June 20, 1961.)

Debated and passed by Senate July 28, 1961.

**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.

Referred to as the "Oceanographic Act of 1961."

Introduced February 13, 1961 by Mr. George P. Miller and referred to the Committee on Merchant Marine and Fisheries.

Hearings held June 19-23 and July 14, 1961. ("Oceanography 1961 Phase 3," 375 p., Committee on Merchant Marine and Fisheries, G.P.O., 1961.)

Revised August 13, 1961.

**H.R. 4340**—To amend title 14 of the United States Code to provide for an expansion of the functions of the Coast Guard.

Introduced February 15, 1961 by Mr. George P. Miller and referred to the Committee on Merchant Marine and Fisheries.

Hearings held April 27, 1961. ("Oceanography 1961—Phase I," 100 p., Committee on Merchant Marine and Fisheries, G.P.O., 1961.)

**H.R. 6845**—A "clean bill" revision of H.R. 4340.

Introduced May 4, 1961 by Mr. George P. Miller.

Reported out by the Committee on Merchant Marine and Fisheries May 17, 1961. (House Report No. 403.)

Passed House June 5, 1961.

**S. 1189**—To amend title 14 of the United States Code in order to authorize the Coast Guard to carry on certain oceanographic research.

Introduced March 2, 1961 by Mr. Warren Magnuson and referred to the Committee on Interstate and Foreign Commerce.

Hearings held May 2, 1961.

Passed Senate June 12, 1961.

H.R. 6845 and S. 1189 were referred to House-Senate Conference. (Conference Report No. 1194 September 15, 1961.)

Senate agreed to conference changes September 19, 1961. House agreed to changes September 21, 1961. H.R. 6845 became Public Law 87-396, October 5, 1961.

**H.R. 8045**—To change name of Hydrographic Office to United States Naval Oceanographic Office.

Introduced July 10, 1961 by Mr. George P. Miller and referred to the Committee on Armed Services.

(Committee report No. 906, August 15, 1961, 4 p.)

Passed House August 21, 1961.

**Other Reports**—A series of general hearings on the oceanographic programs of the Government agencies was held by the Special Subcommittee on Oceanography of the Committee on Merchant Marine and Fisheries. They were: March 3, 10, 12, 17; April 21, 22, 24; June 1, 2, 23; July 13 and 14, 1959, ("Oceanography in the United States," 396 p., Committee on Merchant Marine and Fisheries, G.P.O., 1959); and February 9, 1960 ("Oceanography in the United States, Part II." 40 p., G.P.O., 1960).

The House Science and Astronautics Committee prepared a special report analyzing the national oceanographic program. ("Ocean Sciences and National Security," July 1, 1960, 180 p., Committee of the Whole House on the State of the Union, G.P.O., 1960.)

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## The Seasonal Cycle of Chlorophyll in the Florida Straits <sup>1</sup>

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SEASONAL STUDIES of primary productivity and associated features of the physical and chemical environment have been mainly carried out in regions well away from the tropics. The results of Menzel and Ryther (1960) from the Bermuda area most closely approximate the conditions found in more tropical waters. Bsharah (1957) reported on the distribution of zooplankton and nutrients in the Florida Straits from a station located at 25°33'N, 79°25'W, 40 miles east of Miami. During the years 1958 through 1960 a routine sampling program was continued at this station. Chlorophyll *a* measurements were added during the latter part of the program. This paper compares the seasonal cycle in the Florida Straits with those at the Fladen Ground in the North Sea (Steele, unpublished data) and at Bermuda (Menzel and Ryther, 1960<sup>3</sup>). A more complete report on the Florida Straits data will be presented elsewhere.

Figures 1, 2 and 3 depict the seasonal cycles of temperature, phosphate and chlorophyll *a* in the North Sea, the Sargasso Sea near Bermuda, and the Florida Straits respectively. Data from the North Sea indicate that during the production season the euphotic zone is 40-50 m deep. The nutrients required for the typical spring and autumn blooms in northern waters are provided by the complete mixing of the water column (140 m) from late fall to early spring. At Bermuda the euphotic zone is almost 100 m deep. For most of the year the mixed layer is 25-50 m thick but in winter the thermocline sinks down to a depth of 250-300 m and so permits some replenishment of nutrients in the upper waters. During this period the maximum chlorophyll *a* concentration of 0.5 to 1.0 mg/m<sup>3</sup> were found.

In the Florida Straits the data show that although there is a deepening of

<sup>1</sup>Contribution No. 351 from the Marine Laboratory of the University of Miami.

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<sup>3</sup>We are grateful to Drs. Menzel and Ryther for permission to quote their results.