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The University of Chicago

Department of Zoölogy

CHICAGO, ILLINOIS

March 26 1928

To the President and Members
of the General Education Board,
New York City.

Gentlemen:

For some years conversations and conferences have been undertaken by various scientific groups with reference to the situation in oceanographic research and instruction in America. Here is a broad field of interest touching on a great variety of human problems, scientific and economic, which is represented in only two of our universities, and which has remained in an unorganized state in our country, in spite of the existence of various agencies, both governmental and private, concerned with various phases of the subject. The conversations referred to led to a recommendation to the National Academy of Sciences for the appointment of a Committee on Oceanography from the Sections of the Academy concerned to consider the share of the United States of America in a world wide program of oceanographic research, and to report to the Academy. This recommendation was adopted unanimously by the Academy at its meeting held in Washington, April 27, 1927. The President of the Academy thereupon appointed the following committee: William Bowie (Chief, Division of Geodesy, of the U. S. Coast and Geodetic Survey), E. G. Conklin (Professor of Zoology, Princeton University and President of the Board of Trustees of the Bermuda Biological Station for Research, Inc.), B. M. Duggar, (Professor of Plant Physiology of the University of Wisconsin, and head of the Department of Botany of the Marine Biological Laboratory), John C. Merriam (President of the Carnegie Institution), T. Wayland Vaughan (Director, The Scripps Institution of Oceanography, of the University of California, La Jolla, Calif.), and Frank R. Lillie, Chairman (Chairman of the Department of Zoology, The University of Chicago, and President of the Marine Biological Laboratory, Woods Hole, Mass.).

The consideration given to the subject thus referred to it by the National Academy of Sciences has convinced the Committee that it faces a very large and complex situation, which can be treated in the form of a report only after prolonged and exhaustive study with the aid of expert assistants devoting their entire time for a period of perhaps two years to the subject. This conclusion may appear reasonable if we consider first the matters to be dealt with and second the agencies at present available throughout the world for their study.

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1. The subject of oceanography may be divided according to modes of approach and methods of investigation into physical and biological. The study of the latter division is dependent on the former as determining the various environments, and the limitations of growth and existence, of oceanic life (fisheries, etc.). Physical oceanography is also related to other fundamental human interests: thus the problem of submarine configuration, (which deals with the inequalities of the ocean floor, oceanic depths, etc.) is fundamental for many geological problems, and it also affects oceanic circulation, on which island and continental climates depend to a great extent. It is probable that a better understanding of oceanic circulation would be of great aid in long time weather prediction.

The biological problems are not of less interest and economic importance. It is certainly a challenge to scientific interest to realize when at sea that the least known part of the globe lies from a mile to five miles immediately beneath one's feet. Soundings and captures by net at various intermediate depths, have revealed the existence of life at practically all levels, but of the nature and quantity of these organisms and their means of subsistence very little is yet known. The life of the ocean may exceed in amount all other life besides. It is known to be dependent on a few microscopic plants (diatoms, etc.) which are made available for fishes and higher forms through a vast number of intermediate animals of relatively small size. The study of the food dependence of our various edible fish requires a knowledge of the life cycle of the ocean, variable according to locality and conditions, especially near the shores where the principal fisheries flourish, and varying also in important ways with the kind of fish concerned. How is this untimate food supply dependent on the physical and chemical conditions, especially the nitrogen and phosphorus contents of the sea? Fundamental studies in biological oceanography must form the future basis of intelligent cultivation of the sea, and so will be welcomed by our Bureau of Fisheries and other agencies concerned in increasing the economic yield of the ocean. Recent studies of the oil content of submarine deposits also bid fair to contribute in an important way to the solution of the problem of the origin of oil deposits.

2. The agencies concerned in the study of oceanography have arisen for the most part with reference to specific human needs. Some of these, like our Coast and Geodetic Survey, the Bureau of Fisheries, and certain marine laboratories are of relatively old origin dating back fifty or more years. But there has been relatively little attention given in America to fundamental oceanography the basis on which the various parts of the subject depend.

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In Europe the situation is somewhat better, for oceanography considered as a fundamental science took its origin there. While there are many institutions occurring in all parts of the world devoted to special tasks within the field of Oceanography, the number of institutions dealing with the subject in a comprehensive way is very small. Nevertheless, it would be necessary for the Committee to make a survey of the programs and resources of all dealing with the field in any way.

Oceanography is peculiarly an international subject interesting all maritime nations. While each maritime country has its particular problems in its own littoral, especially with reference to fisheries, the fundamental aspects of oceanography in general and the study of the high seas are of importance to all. It will therefore be necessary to consider with other maritime nations the best means of cooperating in general problems, as well as to consider how best to develop the problems of our own coast lines.

There are many agencies in America, Europe, Japan and the self governing Commonwealths and dominions of several nations on which a comprehensive plan for development of oceanography may depend for support. To a certain extent our problem will become one of interesting government departments both here and abroad in directing their investigations towards common ends. Thus naval vessels may well be used in the enormous task of mapping the ocean floor, an undertaking rendered possible by the invention of the sonic sounding apparatus. Similarly other government departments, such as the Bureau of Fisheries and the Coast and Geodetic Survey would undoubtedly cooperate in other problems. It would be important also to ascertain to what extent the Universities may be utilized for the educational needs of the subject, as well as for research.

In facing the organization and development of a subject of such great extent and importance the Committee feels that no specific projects should be entertained, until after an investigation of the kind above outlined has been made. Need can be seen for a central oceanographic institute in America, for strengthening marine laboratories of this country, for interesting research institutions and government departments, for an international journal of oceanography, and perhaps for aiding the development of agencies abroad. But no recommendations can be formulated without a comprehensive and fairly exhaustive study of the present status of the subject throughout the world.

In order to make such a study and prepare a report, which might furnish a basis for specific undertakings, the Committee be-

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believes that it should be assured of the services of at least two experts, with adequate financial provisions for travel and secretarial assistance for a period roughly estimated at two years; one of these men to be specially trained on the physical side and the other on the biological side. Provision should also be made for the occasional, or regular, employment of other experts as needed, e.g. on chemical problems, or special fisheries problems, etc. A central office should also be maintained during the progress of the inquiry; provision for expenses of committee meetings would be required; and a considerable proportional emergency fund should exist for unforeseen contingencies. It would be proposed that all disbursements of this undertaking should be made through the National Academy of Sciences.

Reduced to tabular form:

Services of two experts for two years @ \$7500.00 each per an.	\$30000.00
Additional expert services during two years	10000.00
All clerical assistance and office expense for two years	10000.00
Travel expense for two years	10000.00
Committee and emergency expense for two years	<u>15000.00</u>
	\$75000.00

This sum of money should be adequate for the purposes stated, and only that part of it would be used that could be well employed.

Members of this Committee have discussed the subject from time to time with officers of the General Education Board, and it is felt that in this way a more adequate understanding of the proposal has been conveyed than can be derived from the present brief abstract. The Council of the National Academy of Sciences has considered the proposals of the Committee and has authorized it to seek a sum of seventy-five thousand dollars for the promotion of its work. I beg therefore on behalf of the Committee to request the consideration of the General Education Board of our request for an appropriation of seventy-five thousand dollars to be made to the National Academy of Sciences for the purposes stated herein.

Respectfully submitted

Frank R. Lillie

F. R. Lillie,
Chairman, Comm. on Oceanography
of the National Academy of Sciences