

MARINE SCIENCES AND RESEARCH ACT

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Mr. MAGNUSON, from the Committee on Interstate and Foreign Commerce, submitted the following

REPORT

[To accompany S. 2692]

The Committee on Interstate and Foreign Commerce, to whom was referred the bill (S. 2692) to advance the marine sciences, establish a 10-year program of oceanographic research and surveys, promote commerce and navigation, secure the national defense, expand ocean resources, authorize the construction of research and survey ships and facilities, assure systematic studies of effects of radioactive materials in marine environments, enhance the general welfare and for other purposes, having considered the same, report favorably thereon, with amendments, and recommend that the bill as amended do pass.

INTRODUCTION

S. 2692 is designed to meet a pressing need.

That need is to unveil the secrets of inner space—the oceans.

Oceans cover 72 percent of earth's surface, an area nine times greater than that of the moon.

Their water volume is eight times that of the land above them.

The world's greatest mountain ranges and deepest canyons lie hidden in the oceans.

They control, in large measure, our weather and climate. They are a distinctive feature of our planet and it may be no other planet in the solar system has them.

They are the vast repository for wastes and sediments, organic and inorganic, of a billion years, and hold untold wealth in minerals and fossil fuels.

They are the last open range from which we will be able to amplify future protein food supplies.

Oceans no longer isolate nations but link them. The United States has ties, economic or military or both, with 58 other nations of the free world, physically separated from us only by the oceans,

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which carry 99.8 percent of the exchange of raw materials and finished products.

And the oceans are neutral.

An airplane flying 12 miles above the land surface of a foreign country creates an international sensation and the foreign nation responds to this distant overflight with raucous accusations of spying and aggression, the later, of course, obviously absurd.

But any unfriendly country can spy on us from only 3 miles off our ocean beaches. Submarines or noseey fishing vessels of a foreign power can cruise with impunity up to the 3-mile limit of the territorial seas. Beyond that invisible boundary the waters of the oceans are international. This, in time of peace, is as it should be.

Trade, commerce, and in a large measure the economy of free nations, are dependent on keeping the oceans open.

Oceans are now and will continue to be the highways for most of the world's international commerce. In 1959, free world exports totaled \$102 billion; free world imports \$105.8 billion. More than one-sixth of this commerce was to or from the United States, the world's greatest market and the preeminent supplier of foreign markets.

Freedom of the oceans is important to our economy and security, and the key to the free world alliance. To hold that key it is imperative that we know the oceans.

In the past that knowledge was two dimensional. It sufficed to know the winds, waves, and currents at the surface, fisheries resources near the surface, and the reefs and shoals imperiling surface ships. Even within these limited requirements our knowledge frequently has been and is inadequate.

Today knowledge of the oceans must be three dimensional, extending from the surface to the bottom, and to the crust below the bottom. Why?

Mr. Sumner Pike, former Commissioner of the Atomic Energy Commission, and a member of the Committee on Oceanography of the National Academy of Sciences, touched on the reason in his testimony at hearings on the bill before this committee. He said:

\* \* \* it has become suddenly apparent that the ocean is of the highest importance to national defense, indeed to our survival. It seems unnecessary to emphasize here the possible results of the development of nuclear submarines and guided missiles. My own personal reaction can be phrased briefly: Another nation caught us practically unawares upstairs; for heaven's sake don't let the same thing happen to us down cellar.

With this problem thrust upon us, we become unhappily aware of the abysmal extent of our ignorance of the ocean in areas where knowledge both wide and accurate seems essential.

To acquire this knowledge which appears so necessary requires marine research much more extensive than any this Nation has undertaken in the past or is undertaking now.

Soviet Russia, which has more submarines than all the nations of the free world combined, is conducting an unprecedented ocean research program, one that, in fact, surpasses that of the entire free world.

The Soviet oceanographic fleet, in numbers of ships, size, tonnage, diversity, and laboratory facilities, exceeds that of the Western nations. Her marine scientists far outnumber those of the United States, and Russia has launched a vast program to train more.

The United States has lagged in this vital scientific field, a lag that if continued could be enormously costly in time of peace; fatal in the event of war.

This lag was recognized in Senate Resolution 136, adopted by the Senate of the United States on July 15, 1959. It was the sense and purport of this resolution that the lag in our Nation's oceanographic research be overcome.

S. 2692 is the legislative approach to doing just that.

#### PURPOSE OF THE BILL

The primary purpose of the bill is to enhance the national economy, security, and welfare by increasing our knowledge of the oceans and the Great Lakes in all pertinent scientific fields. These include physics, biology, chemistry, meteorology and geology.

To speed this objective, the bill is designed to approximately double, within the next 10 years, the capabilities of the United States to conduct a balanced, comprehensive program of marine research and surveys.

Our capabilities in this program are dependent in large measure on—

1. A national policy of continuous and constructive scientific studies of the waters which form 13,428 miles of our 19,793-mile national boundary.

2. Education and training of additional marine scientists in numbers adequate to make these important studies.

3. Construction and operation of new and advanced research ships for scientists to work on, laboratories to work in, and tools, instruments, and equipment to work with.

4. Coordination of oceanographic and limnological activities of the various Federal departments and agencies participating in the program.

5. International and interdepartmental exchange of oceanographic data.

The bill, in the interest of maximum economy and efficiency, would meet these requirements by advancing the program in realistically progressive stages over a period of years. In this way the crash characteristics of the more extensive Soviet oceanographic effort will be avoided.

#### NEED FOR THE BILL

The need for a program of expanded marine research has been evident to scientists and scientific units of a number of Government agencies for the past 6 years, and was manifest when these agencies found it necessary or expedient in advance of several international conferences to call on the National Academy of Sciences for oceanographic information the agencies did not possess.

Examples of Federal dependence on the Academy, which is not a Government agency, were the Inter-American Conferences on Conservation of the Resources of the Continental Shelf and Marine Waters, held at Mexico City, Mexico, in July 1955, and at Ciudad Trujillo, Dominican Republic, in March 1956, and the International Conference



on Law of the Sea, held in Geneva, Switzerland, in March and April 1958, and relating particularly to pollution of offshore waters.

Attesting further to this need are three reports, two of them prepared by the National Academy at the request of Government agencies and the third prepared within the Defense Establishment by the Office of Naval Research and subsequently approved by the Chief of Naval Operations.

All three reports point to a drastic need for new ships, new facilities, more marine scientists, and greatly augmented oceanographic research and surveys.

S. 2692 gives legislative recognition to findings and conclusions contained in two of these reports and substantially confirmed with respect to four agencies by the third report, which was issued subsequent to introduction of the bill.

#### GENESIS OF THE THREE REPORTS

In 1957, several Government agencies, convinced of the need for an integrated oceanographic program, and aware that to achieve this would require an overall study conducted by an independent and completely objective scientific group, proposed that the National Academy of Sciences create a Committee on Oceanography to undertake this major project. This was done.

Formal support, financial and otherwise, was given to the undertaking by the following agencies:

Atomic Energy Commission.

Bureau of Commercial Fisheries.

National Science Foundation.

Office of Naval Research, Department of the Navy.

Subsequently the Coast and Geodetic Survey of the Department of Commerce, also participated in the sponsorship.

Dr. Harrison Brown, professor of geochemistry at the California Institute of Technology and formerly with Johns Hopkins University, Baltimore, and University of Chicago, was appointed Chairman.

Eminent marine scientists from seven universities and oceanographic institutions affiliated with universities were named to the Committee. New England, the Mid- and South Atlantic States, the Midwest and Pacific coast were each represented. A former Commissioner of Atomic Energy, Mr. Sumner Pike, of Lubec, Maine, also was appointed to the Committee.

All of the members of the Committee are civilians. None are employed by the Government. None were selected for membership on the Committee by any Government agency. The Committee and each of its members possessed complete freedom to make a comprehensive study and report.

Committee members are:

Dr. Maurice Ewing, Lamont Geological Observatory, Columbia University, Palisades, N.Y.; Dr. Columbus O'D. Iselin, Woods Hole Oceanographic Institution, Woods Hole, Mass.; Dr. Fritz Koczy, Marine Laboratory of the University of Miami, Miami, Fla.; Dr. Roger Revelle, Scripps Institution of Oceanography, La Jolla, Calif.; Dr. Dixy Lee Ray, University of Washington, Seattle, Wash.; Dr. Gordon Riley, Bingham Oceanographic Laboratory, Yale University,

New Haven, Conn.; Dr. Athelstan Spilhaus, University of Minnesota, Minneapolis, Minn.; Dr. Per Scholander, Scripps Institution of Oceanography; Mr. Sumner Pike, and Dr. Milner B. Schaefer, Inter-American Tropical Tuna Commission, La Jolla, Calif.

Each of the members has attained scientific distinction as a physicist, marine biologist, meteorologist or marine chemist.

Drs. Brown, Spilhaus, Iselin, Koczy, Riley, Ray, and Schaefer of the Committee testified before the Interstate and Foreign Commerce Committee at hearings on the bill held April 20, 21, and 22 of this year. Drs. Ewing and Revelle submitted prepared statements.

Testimony also was given by Dr. Allyn C. Vine, Woods Hole Oceanographic Institution and Chairman of the Committee on Oceanography's Panel on Engineering Needs for Ocean Exploration; Dr. Dayton E. Carritt, Johns Hopkins University, Baltimore, Md., representing the Committee's Panel on Radioactivity in the Oceans; Dr. J. Lamar Worzel, Columbia University authority on underwater sound transmission, earthquake seismology, ocean gravities, and submarine topography, and Mr. Pike.

The Committee on Oceanography held its first meeting in November 1957. During the following year it visited major oceanographic institutions in all sections of the United States, conferred with scientists and officials of all Government agencies having an interest in the oceans or the Great Lakes, and appointed eight panels of scientists to assist it in special studies. More than 60 scientists from private institutions and laboratories participated in these panels.

In January 1959 the Committee on Oceanography released its summary report and recommendations. It has since issued eight more reports detailing studies made in separate fields.

These reports have been the subject of an intensive study by the Committee on Interstate and Foreign Commerce and inspired Committee action on the program embodied in this bill.

Two conclusions of the Committee on Oceanography merit quotation at this point. They are:

1. From the point of view of military operations there is no comparison between the urgencies of the problems of the oceans and those of outer space. The submarine armed with long-range missiles is probably the most potent weapon system threatening our security today.

2. Our oceanographic research ships are inadequate for the job which must be done. Most of the ships are old and outdated. Many are obsolete and should be replaced by ships of modern design which will be more efficient to operate and from which a greater variety of scientific observations can be made.

Simultaneously with the study of overall marine scientific needs by the Committee on Oceanography, the Navy Department's Office of Naval Research prepared a survey and projection of the marine research needs and programs financed by the Navy in universities and oceanographic laboratories or institutions affiliated with universities.

Institutions with which the Navy has contracted for such research include:

- Woods Hole Oceanographic Institution.
- Scripps Institution of Oceanography.
- University of Miami.
- University of Washington.
- Texas Agricultural and Mechanical College.
- Lamont Geological Observatory of Columbia University.
- Hudson Laboratory of Columbia University.
- Chesapeake Bay Institute.
- Narragansett Marine Laboratory.
- Oregon State College.
- New York University.

The Navy report, designated Project TENOC (10 years in oceanography), was issued on January 1, 1959, with the endorsement of Adm. Arleigh Burke, Chief of Naval Operations. The report noted that the total budget for marine research financed by the Navy in institutions during fiscal year 1959 was \$7,600,000, and projected a graduated increase in funds for research ships, laboratories, and scientific personnel for these institutions over the subsequent 10 years.

Eighteen new ships were recommended, of which 4 would be large 2,000- to 3,000-ton vessels, 10 of approximately 1,200 to 1,400 tons, and the others small coastal boats. Delivery of one ship was sought in 1960, four in 1961, and four in 1962. One of the smallest ships recommended, an 80-foot boat, is now being built for Oregon State College. Contract was let last week for the first 1,350-ton ship which will require 18 to 24 months to complete.

Ten new laboratory buildings and two new piers also were proposed in the report. Construction has not begun on any of these although Navy scientists consider additional laboratory space one of the most pressing needs.

With reference to the ship construction program the report states:

This program is considered to be necessary to provide research needed to develop the ASW (antisubmarine warfare) capability required to combat the submarine menace. The program is expensive, but when it is considered that there has been no effort to improve research ships in this country for the last 15 years, and that we are proposing a 10-year building program, it becomes obvious that we have 25 years of shipbuilding to accomplish in 10 years.

In a further paragraph indicating the magnitude of the task ahead, the report states:

Since the oceans are the Navy's primary domain and since the Navy must move ships about, on, and in the oceans, and aircraft in the air above the oceans; it goes without saying that a complete understanding of the environment, including the ocean surface, the ocean bottom and the atmosphere above, must be obtained if the Navy is to compete successfully in a modern war. By understanding the environment we mean that the current systems in the ocean must be known from the surface to the bottom, the bottom topography must be known in detail, the temperature structure from day to day must be predicted, gravity and magnetic conditions must be known, sea and swell forecasting must be efficient,

the formation and breakup of arctic ice must be predicted, weather conditions must be predicted, beach conditions and the land areas around these seas must be known. Further, the Navy must understand this environment in the Mediterranean Sea, Sea of Okhotsk, Persian Gulf, Arabian Sea, Red Sea, and the Arctic Ocean. Our present understanding of these strategic areas is limited. In addition to these strategic areas, the Navy must have adequate knowledge of the broad reaches of the Atlantic and Pacific.

Admiral Burke, in commending the report, added this significant comment:

The numbers of oceanographers presently available in the United States are insufficient to meet the increasing military and civilian demands for their services.

Sections 13 and 14 of S. 2692, adopting the proposals of the TENOC report, is designed also to meet, through scholarships, the educational and training needs.

Admiral Burke supplemented this comment on June 16, 1959, with a letter to the chairman of the Committee on Interstate and Foreign Commerce, in which he stated in part:

The interest of the Congress in this vital area is timely since legislative assistance will be required if all the recommendations of the Harrison Brown Committee are to be implemented for a sustained 10-year effort.

Further, with reference to education and training of marine scientists and the Navy's participation in this program, present and projected, the Chief of Naval Operations stated:

The expansion of curriculum and enrollment at each of these institutions represents a major capital venture that can quickly become a serious fiscal loss to these research centers if Federal support vacillates from year to year.

The above quotations are pertinent in the light of comments on the bill received from some of the agencies which would participate in the program authorized.

The Department of Commerce was not an original sponsor of the study made by the Committee on Oceanography of the National Academy of Sciences. Nor were any of its agencies or bureaus.

However, the Secretary of Commerce, Hon. Sinclair Weeks, in 1958 requested that the Academy appoint a committee to undertake an evaluation of the Department's activities and responsibilities in the fields of science and technology.

Contracts were entered into and a committee of scientists and engineers appointed. The contracts were continued under Secretary Strauss and the present Secretary, Frederick H. Mueller.

The Academy Committee made its report on March 2 of this year.

Four of the seven agencies studied are designated in S. 2692 as having a significant role in the projected 10-year oceanographic program. They are:

- Coast and Geodetic Survey.
- Maritime Administration.
- Weather Bureau.
- National Bureau of Standards.

The bill would authorize appropriations for specified purposes to the Coast and Geodetic Survey, Maritime Administration, and the Weather Bureau and proposes cooperation with and by the Bureau of Standards.

The Academy Committee reported separately on each agency, commencing with the Coast and Geodetic Survey.

Commenting on the importance of this agency, the report states:

The nautical charts and allied publications supplied by the Survey enable waterborne commerce, estimated in excess of \$100 billion annually, to enter and depart from our coastal waters with complete confidence and assurance. \* \* \* The Coast and Geodetic Survey, during its 152 years of service, has made splendid contributions to knowledge and to the progress of our Nation and the world. It cannot exist on past accomplishments, but must steadily move forward in the fields of science and engineering essential to its activities. Because of the fundamental nature of its activities, the Survey must continue to play an important role in the destiny of the Nation and of the world.

Then follows a critical analysis of the present capabilities of the Survey to fulfill its responsibilities. Excerpts:

As a result of financial and staff limitations, the Survey, since World War II, has been forced into a production orientation. Its research and development activities have been severely neglected, with the danger of losses in its broad effectiveness to the Nation and in its stature as a dynamic scientific and engineering institution.

In interviews with key officer and civilian personnel and in the review of written material relating to Survey operations, a major concern was noted in all divisions about the inadequacy of data collection facilities. As an example, the Geophysics Division maintains eight geomagnetic observatories and a number of seismograph stations for the continuous recording of magnetic field fluctuations and of earthquakes. This chain of observatories is undoubtedly too sparse for providing data of sufficient accuracy on magnetic and seismic conditions throughout the world, and is less dense than that of other technologically advanced nations. (The Soviet Union has 22 magnetic stations.)

Appendix IV presents a sad picture of the condition of the Coast and Geodetic Survey fleet. Again, the personnel of the Survey have done a remarkable job in keeping outdated equipment operating effectively and producing quality products with such equipment. It is apparent that funds in adequate amounts should be provided for reconditioning the better vessels of the fleet, replacing the most antiquated, and commissioning new vessels as required by the expanding program of the Survey.

(App. IV lists the 15 ships of the Coast and Geodetic Survey, of which 5 are under 100 tons, 6 have a displacement between 100 and 300 tons, and 4 vary from 1,106 to 2,600 tons. Six are described as in good condition, 2 fair, 5 poor, and 2 very poor.)



It is a matter of much concern to the Panel that, because of fund limitations, the Survey cannot procure, through its civilian operations, enough information to satisfy the demands of the Defense agencies and that the Defense agencies must establish duplicate facilities to satisfy the needs, and through military operations. The Survey has an unchallenged record for economy. It seems clear to the Panel that it would be far more appropriate to allocate funds in proper amounts to permit an adequate civilian program by a civilian agency.

The space age is new. Its impact upon the Defense agencies is everyday knowledge to youngsters of preschool age. Yet the Coast and Geodetic Survey has been bypassed in the "tooling" for the new era—in spite of the fact that its products are an essential element in the planning, research and development which has made the space age possible and which will inevitably lead to further victories in space.

From the point of view of basic economy, if for no other reason, the future budgets of the Survey should be increased substantially—in the immediate future. Allocations of this magnitude represent only a small fraction of a major defense project of today and could have a major influence on both the defense and commerce of our country.

S. 2692 would authorize a substantial increase in funds for operation of Coast and Geodetic Survey ships, and construction of 10 ocean-going survey ships during the next 10 years.

The bill would authorize inauguration in the Weather Bureau of a comprehensive 10-year study of the interchange of energy between the oceans and the atmosphere, phenomenon which has a profound influence on storms, climate, and weather. Touching on this scientific problem, the Academy committee states:

Floods, hurricanes, tornadoes, droughts, frosts and air-pollution hazards have disastrous effects which, on occasion, have influenced the course of modern society. The economic losses accompanying some of these atmospheric catastrophes are staggering. Meteorologists do their best to predict and warn against these phenomena; they even hope in the future to be able to control them. But progress is impeded by lack of adequate knowledge concerning the processes that produce them. A close look at meteorology must inevitably point to the need for more research in order to reach the level of prediction and control that our society demands.

The Academy Committee report on the Maritime Administration is essentially limited to recommending a broader program of research and development. S. 2692 would place on the Administration the responsibility of constructing ships specifically designed for basic oceanographic research, giving due attention to quiet operation, efficient and economical scientist-crew ratios, space and power for winches and other scientific factors.

The Academy Committee panel deplors the fact that: "The Maritime Administration does not have specific legislation directed to the performance of research and development," and recommends

that the Department of Commerce seek such clear-cut legislative authority from the Congress.

S. 2692 would provide the authority necessary for the agency to carry out those segments of the oceanographic program assigned to it under the bill.

To sum up the preliminary steps toward an oceanographic program, the Department of Commerce, Department of the Interior, Navy Department, Atomic Energy Commission, and National Science Foundation sponsored and financed independent and extensive studies by outside committees of highly qualified and wholly objective scientists.

These studies were completed. Reports were prepared. The reports were furnished to the sponsors.

Strong emphasis is placed in these reports on the needs for greatly expanded and coordinated research in all marine scientific fields, and a program for such expansion and coordination is outlined. This program has been embodied in the bill.

The needs are established. They are known to the agencies, to the Congress, to scientific organizations and institutions, and, as evidenced by the large correspondence the bill has generated, to the general public.

Similar consideration must be given to the benefits.

#### BENEFITS TO BE ANTICIPATED FROM A NATIONAL OCEANOGRAPHIC RESEARCH POLICY AND PROGRAM

The benefits which would accrue from the program authorized in S. 2692 can be roughly classified as:

1. Military.
2. Economic.
3. Welfare.
4. International.

Some of the benefits in each of these categories previously have been touched on. But many remain, many of them brought out at hearings on the bill before your committee.

Military benefits would include:

Enhanced security from surprise attack by missile-launching enemy submarines. This will be achieved when we know more about underwater acoustics and have perfected our surveillance and detection systems. This will require extensive data on undersea water densities.

To quote a forthcoming report of the Committee on Oceanography titled "Oceanography Research for Defense Applications":

Density (temperature and salinity) is the fundamental parameter needed for an understanding and use of the propagation of acoustical energy. Applications of this information are particularly important in forecasting sonar ranges, in all types of submarine and antisubmarine warfare, in convoy routing, in mine warfare, and in the planning and development of all types of detection and communications systems which employ acoustic energy. Since sea water is virtually opaque to all other forms of radiated energy, underwater sound offers the only foreseeable means of long-range detection, communication, and monitoring.

"Today, there is no adequate defense against the nuclear, missile-launching submarine," states the official publication of the Navy

League, but this does not necessarily hold true for tomorrow, according to our foremost scientists in this field, if ample facilities are made available for continued research.

These scientists have a twofold problem.

They have the problem of perfecting ways in which our Navy can detect hostile submarines and keep them under surveillance.

They have the converse problem of perfecting ways that will enable our own submarines to escape detection.

We must be scientifically prepared for both undersea defense and offense, and this will require greatly intensified research and engineering.

We must be prepared also to counter any underwater mine warfare, in which the Soviet Union has long specialized. Today's mines are more diabolical than any previously used. Some are fired by the sound of a passing ship. Others are activated by a ship's magnetic field. Still others require only a change in water pressure, which also can be caused by passing ships. Some combine several or all of these "influences."

In antimine warfare we will need the councils of specialists in underwater acoustics (including knowledge of sounds made by fish and other forms of life in the sea), wave pressures and water density, magnetism, gravity, and bottom topography.

There are other military uses for three-dimensional knowledge of the oceans, some of them classified.

Economic benefits are incalculable.

Witnesses at hearings on the bill testified emphatically that eliminating all military factors, the economic benefits from the projected research program would far outweigh the costs of the program.

Economic benefits will be derived from the resources of the sea. These include food, liquid fuels, metallic minerals.

Food possibilities are tremendous. Population the world over is exploding. By the year 2000 it is expected to reach 6 billion, more than double the present total. That of the United States will be 200 million by 1970; 230 million by 1980, according to the lowest Census Bureau estimates.

As population soars the United States and other nations will seek to supplement their protein needs from the sea as do Japan and other heavily populated countries.

Russia, though not heavily populated, is making a massive effort to increase its protein food supply by harvesting the oceans. The Soviet Union has more than 100 fisheries research ships exploring the oceans and has invaded waters of the Bering Sea, the Grand Banks off Newfoundland, tuna fisheries in the central Atlantic and mid-Pacific, and other fisheries along the West Coast of Africa.

Red China is making desperate efforts to double its seafood production. Meanwhile the United States catch has steadily declined, our fisheries research fleet and its activities have diminished, and we are in grave danger of losing an industry that produces food in the value of a billion and a half dollars annually and gives employment to 500,000 citizens.

S. 2692 would authorize a scientific research program and economic studies designed to revive this industry and increase our food supplies from the oceans, their estuaries, and the Great Lakes.

Your committee has been told that 40 percent of the world's known reserves of liquid fuels lie offshore beneath the Continental Shelves.

As our terrestrial oilfields become depleted these reserves will become increasingly essential to our economy.

The committee was further told that the oceanic waters contain more minerals than have been mined by man in all history.

Vast deposits of manganese, cobalt, copper, iron, and nickel nodules lie on the deep ocean floor—one of these is off our South Atlantic coast—and Dr. Milner B. Schaefer testified that he expects techniques will be developed which will enable them to be mined commercially within 5 or 6 years.

Dr. Schaefer stated the mineral resources of the sea floor appear to warrant modest expenditures to assess their abundance and value, and for engineering studies of means of mining them, and added:

I note with great pleasure that the Senate bill, S. 2692, introduced by Senator Magnuson and others, contains authorization for various appropriate Government agencies to carry out the researches recommended by our Committee in the field of ocean resources, and also provides for means of coordinating the work of different agencies through a new office in the National Science Foundation.

Mankind will reap many benefits from marine research other than those derived from harvesting the ocean's riches. Among them will be added safeguards against the ocean's destructive forces, for the seas can be a friend as well as a mortal foe.

Earthquakes in Chile in the latter part of May caused tidal waves, or tsunamis as they are known to scientists, that sweeping up, down, and across the Pacific have brought death to thousands. In distant Japan these waves, traveling at speeds up to 440 miles per hour, cost at least 180 lives, in Hawaii 55, and in scattered islands throughout the South and Southwest Pacific possibly many others. The Philippines, Formosa, and Pitcairn Islands were among those struck. Property damage at Hilo, Hawaii, was estimated at \$60 million and the damage in Japan was many times greater.

Science cannot control earthquakes and it cannot prevent them from causing tsunamis, but science can convey warning which should reach those living on the edges of the ocean basins far in advance of any tidal wave. The speed of sound under water is about 4.8 times faster than sound waves traveling through the atmosphere.

Normal wave action also can be destructive and annually brings property losses to beach residents of the United States of more than \$15 million. The Beach Erosion Board of the Army Corps of Engineers, with extremely limited research funds, is making significant contributions toward mitigating this damage and the value of its scientific work is recognized in S. 2692 by authorizing its expansion.

Great damage also is caused annually by sea-born hurricanes, a combined oceanographic-meteorological problem of great magnitude.

From 1915 to 1955 hurricanes caused damage to coastal property of the United States totaling \$2.837 billion. During the 4-year period since then property losses have aggregated \$205 million despite improved warning systems. Scientists are now gleaning new clues about the relationship between water temperature and atmospheric circulation that may lead to hurricane forecasts before the hurricanes themselves have formed, enabling ships at sea to avoid them and shore dwellers ample time to prepare against them.

One of the most obvious benefits will be to commerce generally. Greater knowledge of currents, winds, and weather already enable our modern transocean carriers to clip a full day from the previous schedules. These are surface ships.

Merchant ships of the not too distant future may be nuclear-propelled submersibles that could cross the oceans far beneath the surface. They might move at approximately twice the speed of present-day craft, will seek out the favorable subterranean currents much as high altitude aircraft today take advantage of the jet stream, and avoid wind and wave resistance and be undisturbed by storms.

Sonar would take the place of vision, and this will be a gain because underwater acoustic ranges will be far longer than line of sight ranges. Fog will be a forgotten problem.

Underwater mariners will follow detailed charts of the bottom topography of the oceans much as motorists scan their roadmaps, and midocean automatic devices, many of them located on sea mounts, would substitute for lighthouses.

To plot these sea mounts and the ocean bottom will require extensive surveys by the Coast and Geodetic Survey and Hydrographic Office, and such surveys would be authorized in S. 2692.

Welfare benefits would accrue from climatological studies, from extensive investigation of the effects on the marine environment of atomic fallout and radioactive wastes, and from research into methods of counteracting pollution of estuarine and inshore coastal waters. Medical possibilities were hinted by Dr. Ray, who told the committee:

No marine invertebrate is known to suffer from cancer or any tumorous condition.

Perhaps the most important benefit that can result from a long-range, coordinated oceanographic research program was voiced by Dr. Spilhaus when he testified:

Like atoms for peace, we can use the oceans for peace.

To do this, continued Dr. Spilhaus:

We must have leadership on the oceans in the face of the threat of war and equally we must have leadership on the oceans in our hopes and our work toward peace.

#### EXPLANATION OF THE BILL

The bill would authorize a 10-year program of marine research, surveys, and education in which 5 departments of the Federal Government and 14 agencies would participate.

Three of the agencies are independent; the remainder are within departments.

The departments and agencies are:

Departments:

Commerce:

- Weather Bureau.
- Coast and Geodetic Survey.
- Maritime Administration.
- Bureau of Standards.

## Interior:

Bureau of Commercial Fisheries.  
 Bureau of Mines.  
 Geological Survey.

## Navy:

Office of Naval Research.  
 Hydrographic Office.

Health, Education, and Welfare: Office of Education.

Army: Beach Erosion Board:

## Independent agencies:

National Science Foundation.  
 Atomic Energy Commission.  
 Smithsonian Institution.

Following approval by your committee of the bill as amended, comments on the bill were received from the Department of Health, Education, and Welfare proposing that should the committee take favorable action on the bill appropriate sections of the bill should be amended to include the Public Health Service, which, according to the Department, engaged in a number of scientific activities in the marine environment.

The Department suggestion is meritorious and well grounded. However, as it was not made until after your committee had ordered the bill reported, as amended, the proposal can only be included by adoption by the Senate of an appropriate amendment offered from the floor.

The bill, as introduced on September 11, 1959, contained 15 sections. As amended in committee the bill has 19 sections. New sections were added to authorize participation in the 10-year program by the U.S. Army Corps of Engineers through its Beach Erosion Board, which was requested in comments received from the Department of Defense, and of the Smithsonian Institution, requested by a number of scientific institutions and concurred in by the Committee on Oceanography.

Remaining committee amendments are principally of a perfecting nature and a majority of these were suggested by departments and agencies in their comments on the bill. Others, designed to broaden the program in the interest of balance and efficiency, were proposed by scientific organizations or the Committee on Oceanography following a review of its summary report.

## ANALYSIS OF BILL BY SECTIONS

The title of the act, "Marine Sciences and Research Act of 1959," is given in section 1.

## DECLARATION OF POLICY

Section 2 declares the policy objectives of the Congress with relation to oceanographic and limnological research and surveys. It substantially restates the objectives detailed in Senate Resolution 136, adopted by the Senate in the 1st session of the 86th Congress; declares that to fulfill these objectives requires establishment of a Division of Marine Sciences in the National Science Foundation, and authorizes this Division to accept certain responsibilities and undertake certain duties.

A significant paragraph in this section states as follows:

The Congress further declares that sound policy requires that the United States not be excelled in the fields of oceanographic research, basic, military or applied, by any nation which may presently or in the future threaten our general welfare, maritime commerce, security, access to and utilization of ocean fisheries, or the contamination of adjacent seas by the dumping of radioactive wastes or other harmful agents.

Such a policy requires, the section amplifies, construction and modernization of research and survey ships and marine laboratories, development of new hydrographic research tools, recruitment of prospective oceanographers, collection and classification of biological marine data, establishment of a national oceanographic records center and development of formal international cooperation in the marine sciences and oceanographic surveys on a reciprocal basis subject to the approval of the President.

The Division of Marine Sciences would be authorized and directed to develop and encourage a continuing national policy and program for the promotion of oceanographic research, surveys, and education in the marine sciences; recommend contracts, grants, loans or other forms of assistance for the development and operation of this program; cooperate with and encourage the cooperation of agencies participating in the program; foster interchange of pertinent scientific information, and evaluate the scientific aspects of programs of marine research, surveys and taxonomy undertaken by agencies of the Federal Government for work in these scientific fields.

In other words the Division of Marine Sciences of the National Science Foundation would serve in a coordinating and evaluation capacity in addition to exercising certain planning and policy functions in connection with the 10-year oceanographic program and to giving direct assistance to that program through grants, loans, or contracts for research and education.

Your committee had two alternatives in placing responsibility for coordination and evaluation of the national program as it progresses.

It could create a separate agency, as was done with respect to the development of the nuclear and space sciences, or it could designate an appropriate unit within an existing agency to undertake these responsibilities and functions.

The latter was preferred. Establishment of an independent oceanographic agency, it was believed, might duplicate or disrupt marine activities of a number of existing Federal offices and bureaus, create conflicts of authority, and increase capital and operating costs.

For development of nuclear energy or the space sciences establishment of separate and independent agencies was appropriate because both were relatively new, as was the Government's interest in them. Nor were these programs widely dispersed among the various Federal departments and bureaus.

The marine sciences, on the other hand, are not new.

They merely have been neglected.

Work of the Coast and Geodetic Survey in this field, for example, dates back to 1807, and that of the Hydrographic Office to 1830. Both have, in times past, made significant contributions to our knowledge of the oceans, but their achievements often have been obscured

because both agencies are submerged in major departments of our Government with numerous projects and programs. This is true generally of all scientific agencies within the departments engaged in various programs of marine research. Other programs in the departments require larger expenditures and personnel and apparently receive priority in budget considerations.

The complaints of scientists, like those of small frogs in big ponds, too frequently have been only faintly heard.

Scientific effort in the oceanographic field has suffered generally from lack of coordinated planning, effort, and evaluation. Yet a hard core of splendid scientific talent, extensive background data, and modest technical facilities exist in all of these agencies, and all of them have had operational experience. Some also have research or survey fleets, however small and antiquated. These facts were well presented to your committee during hearings on the bill.

In view of these facts, it was thought appropriate to continue oceanographic operations in the existing agencies, but to provide these agencies with improved facilities for research and congressional assurance, in the form of a 10-year authorization, of continuity in their scientific efforts.

Likewise it was thought appropriate to place, through provisions of the bill, direct responsibility on the departmental Secretaries as well as on the agencies, for carrying out the activities authorized in the bill.

The importance of this was emphasized by Dr. Columbus O'D. Iselin, dean of U.S. oceanographers, in his testimony at hearings before the committee on the bill. Dr. Iselin was discussing a research operation now taking place in the Atlantic in which four small ships and approximately 45 scientists are participating, and which he described as—

both scientifically exciting and an important part of the problem of detecting and destroying enemy submarines equipped with ballistic missiles.

Dr. Iselin continued:

This operation has been made possible through the cooperation of several agencies, both governmental and private. The cooperation between the fellows who are working actually at sea today or in the air or beneath the seas—the cooperation is excellent. \* \* \* People are working around the clock, not for a day but for days on end.

From where I sit what bothers me is that the entire operation has had to be organized at the working level. The senior members of the cooperating agencies have really no time to understand what we are trying to do, or what it really means to them in terms of efficiency of their service.

In my opinion, Mr. Chairman, the most important thing that any bill that you can devise in support of marine science could do is to remind the heads of agencies (agencies which are in fact cooperating at the working level) that they, too, should take part in the planning of such future operations and that they should be cooperating as vigorously as the fellows who are struggling with seasickness and airsickness this morning.



There remained the problem of what instrument or group, responsive to Congress, should be given the responsibility of policy and program planning, coordination and evaluation of the national endeavor, during the 10-year period of expansion authorized in the bill. This was a problem that had perplexed the Committee on Oceanography throughout its studies and which was left unresolved in its report.

The question was raised again by Chairman Magnuson during hearings on the bill with Dr. Harrison Brown, Chairman of the Committee on Oceanography, appearing as a witness. Dr. Brown replied as follows:

We found in our survey of the oceanographic situation that this is perhaps one of the most difficult aspects of improving the status of oceanography, particularly within the Government. This is a field which, as you know, completely cuts across numerous Government agencies. Almost every agency in one way or another has oceanographic interests and the problem is how should this be coordinated.

Our own Committee discussed this at length. There were some of us who at one time felt that perhaps some kind of a central agency should be established. There were others who felt we ought to attempt to maintain independent development within individual agencies as much as possible and after thrashing this out we came to the conclusion that we favored a compromise between the central agency and the independent development approach.

Now I believe that the decision that your committee makes in this legislation far transcends oceanography itself. I believe that it will get at the core of the very basic fundamental problem of decision making, concerning science and technology in Government.

In selecting the National Science Foundation as the agency in which these responsibilities should be vested there were these considerations:

1. The National Science Foundation is concerned exclusively with science and with the education and training of scientists.

2. It operates under a broad mandate of the National Foundation Act of 1950 to "develop and encourage the pursuit of a national policy for the promotion of basic research and education in the sciences."

3. Its statutory duties include bringing about "the effective coordination of the various scientific information activities within the Federal Government," and fostering "the interchange of scientific information among scientists in the United States and foreign countries."

4. A major purpose under the act is to—

evaluate scientific research programs undertaken by agencies of the Federal Government, and to correlate the Foundation's scientific research programs with those undertaken by individuals and by public and private research groups.

5. It reports annually to Congress and to the President.

6. The National Science Foundation is administered by a Director and a Board of 24 members who must be eminent in fields of science,

engineering, agriculture, education or public affairs. Members of this Board are appointed by the President.

7. The act provides that there shall be divisions within the Foundation, each concerned with a special field or fields of science, and that for each division there shall be a divisional committee which can consist of either members or nonmembers of the Board.

Scientists from many universities and institutions serve on the Board and on the divisional committees, assuring broad expression of independent views.

The Division of Marine Sciences for which the bill would provide would include both scientists not connected with the Government and representatives of the major agency participants in the program.

This coincides partially with the British method of planning and conducting its oceanographic research with an enviable record of accomplishment.

Great Britain in 1949 established a National Oceanographic Council, consisting of Government officials and representatives of universities and scientific bodies, the latter having an equal voice in formulating policies. An Executive Committee consists of a high Government official from each of four Government agencies and representatives from four major universities. This committee supervises execution of policy by a National Institute of Oceanography, headed by a civilian director appointed by the Executive Committee, and by a secretary who is designated by a Government agency.

The principle of both governmental and nongovernmental participation in planning, coordinating, and evaluating is adopted in S. 2692, but not the centralized operational approach.

A Division of Marine Sciences in the National Science Foundation with authority to carry out the responsibilities delegated to it in the bill would consolidate activities now dispersed in the agency among three separate divisions and one office—the Division of Biological and Medical Sciences, the Division of Mathematical, Physical and Engineering Sciences, the Division of Scientific Personnel and Education, and the Office of Special International Studies.

The National Science Foundation, in its comments on S. 2692, takes the position that it prefers to keep marine biological activities separate from research in physical oceanography. In many countries and in many institutions of our own country, your committee is informed, biological, physical and chemical ocean research are carried on without discord by scientists and specialists in these fields associated and working together on the same ship. Section 2 presupposes that similar harmony could exist within the National Science Foundation.

No other agency in Government could perform a greater service to the Nation in this long-neglected scientific field than the National Science Foundation should it exercise the authority to be vested in it by section 2 of this bill.

#### *Committee amendments to section 2*

1. Page 3, line 4, insert "and marine surveys" immediately following the word "research". This amendment was suggested by the Navy and Defense Departments in their joint comments on the bill, and by the Committee on Oceanography.

2. Page 3, line 6: A period was placed after the word "Council."

3. Page 3, line 7, strike out "which requires but is not" and substitute "This program should include but not be" preceding the words

"limited to the". This language is suggested in the Navy-Defense Department comments.

4. Page 3, line 11, strike out "construction of" and substitute "modernization of existing and construction of new Government and civilian" preceding the phrase "laboratory and shore facilities". Suggested in Navy-Defense Department comments.

5. Page 3, lines 15 and 16, strike "including but not" and insert "which may include but not be". Suggested by Navy-Defense Departments.

6. Page 3, line 18, insert after "buoys" the words "instrumented marine towers, wave gages". Suggested by Navy-Defense Departments.

7. Page 3, line 25, and page 4, line 1, insert after the word "undergraduate" the words "and graduate", after the word "chemistry" the word "mathematics," and after the word "biology" the words "engineering, limnology, meteorology,". This increases the fields from which prospective oceanographers would be recruited for advanced education in the marine sciences, and was proposed by the Committee on Oceanography, the American Society of Limnology and Oceanography, and with respect to mathematics and engineering, by the Navy-Defense Departments.

8. Page 4, line 7: To the word "field" add the letter "s".

9. Page 4, line 8: Substitute the words "marine science" for the word "oceanography".

10. Page 4, line 9, insert the word "classification" after the word "behavior" ending line 8. Suggested by scientists in a number of universities and institutions.

11. Page 4, line 20, insert "and oceanographic surveys" after the word "sciences". This brings section 2, numbered paragraph 7, relating to international cooperation, into conformity with previously stated policy objectives.

12. Page 4, line 23, strike "oceanographic" and substitute "marine" after the word "of", and insert the words "and surveys" after "research".

13. Page 5, line 17, insert the words "marine research" after the word "of" and the word "surveys" after "oceanographic." These are clarifying changes.

14. Page 5, line 25, insert "the Smithsonian Institution," after "Survey," and on page 6, line 1, after "Standards," insert "the United States Army Corps of Engineers (including the Beach Erosion Board)," . The purpose of these amendments has been previously explained in the report.

15. Page 6, line 17, strike "oceanograph and fisheries research and surveys" and insert "marine research, surveys, and taxonomic programs". This deals with evaluation of programs by the National Science Foundation and is intended to make the language more specific.

16. Page 6, line 20, insert "in these scientific fields" after the word "Government". A perfecting amendment.

#### DIVISION OF MARINE SCIENCES

Sec<sup>n</sup> on 3 of S. 2692 would amend the National Science Foundation Act of 1950 to include a Division of Marine Sciences and a Divisional Committee of this Division. Six scientists selected on a basis of

competence from universities and non-Federal institutions would serve with representatives from designated Government agencies on the Divisional Committee.

*Committee amendments to section 3*

1. Page 7, line 8, insert after the last word of this line the words "divisional committee of the".

2. Page 7, line 13, insert after "Administration," the words "the Beach Erosion Board of the United States Army Corps of Engineers,". This was suggested in the joint comments submitted by the Navy and Defense Departments.

3. Page 7, line 14, insert after the word "scientists" the words "selected on a basis of competence"; after the word "and" the word "non-Federal", and strike after the word "institutions" the phrase "receiving assistance from the foregoing agencies." The purpose of the first amendment is to assure representatives chosen from non-Federal fields to serve on the divisional committee of the Division of Marine Sciences shall be highly qualified scientists. The final amendment in this section deletes what the committee considered to be an unnecessary restriction in this selection.

AUTHORIZATIONS FOR NATIONAL SCIENCE FOUNDATION

Section 4 adopts the recommendations of the Committee on Oceanography in authorizing appropriations to the National Science Foundation of funds for development of the marine sciences over a 10-year period beginning with July 1 of the first fiscal year following approval of the act by the President, and would provide that these appropriations be in addition to other appropriations provided the Foundation to carry out its statutory duties. Other sections of the bill authorizing appropriations contain similar language with reference to the effective date of the act and to appropriations authorized being supplementary to other appropriations.

Authorizations would include \$9,950,000 for construction of research ships, \$12,440,000 for their operation over a 10-year period, and \$8,250,000 for shore facilities for marine research. Under authority provided in section 3 of the National Science Foundation Act of 1950 the agency may conduct these and other activities specified in the bill through contracts, grants, loans, and other forms of assistance.

The bill would authorize \$37,200,000 for basic marine research operations with the proviso that expenditures in this category not exceed \$8 million in any year; \$3 million for fellowships to graduate students and postdoctoral fellows training to become professional oceanographers, annual costs not to exceed \$300,000, and such sums as may be adequate for special devices for ocean exploration and research.

The latter would include bathyscaphs and other manned submersibles, icebreakers and submarines converted for scientific use, acoustic telemetering devices, magnetometers and many other advanced instruments. Expenditures under this provision would be limited to not more than \$10 million in any one year. Total costs of this specialized equipment over the 10-year period have been estimated by the Committee on Oceanography at \$50.2 million.

For what the Committee on Oceanography recommends as the Foundation's portion of a minimal national oceanographic program,

the agency's requirements over a 10-year period would approximate \$121 million.

*Amendments to section 4*

1. Page 8, line 8, and page 8, line 9, prior to the word "research" the word "oceanographic" is stricken and the word "marine" substituted as a somewhat broader adjective. Suggested by several State fish and game departments.

2. Page 9, line 2, insert the words "and postdoctoral fellows" after the word "students" and the words "physical, biological, chemical, and geological" after the word "professional". The purpose of these amendments is to broaden opportunities for persons with specialized knowledge to qualify for fellowships to be used in training to become professional oceanographers. They were recommended to your committee by the Committee on Oceanography and other scientific groups and individuals.

DEPARTMENT OF THE INTERIOR

Section 5 of the bill would authorize and direct the Secretary of the Interior to undertake certain activities, studies, and research as part of the general 10-year program for development of the marine sciences.

The Department and its agencies have a primary responsibility to conserve and develop resources in order to meet the requirements of national security and an expanding economy.

Several agencies within the Department, notably the Bureau of Commercial Fisheries, the Bureau of Mines, and the Geological Survey have a direct interest in the resources, actual or potential, of and in the oceans and the Great Lakes.

These resources include marine fisheries, metallic minerals, and offshore deposits of liquid fuels. To realize increased benefits from these resources an expanded program of ocean and Great Lakes research is required, both basic and applied.

S. 2692 would authorize such a program, facilities to carry out such a program, and studies designed to augment the economic benefits of such a program to the Nation.

Specifically, the Secretary of the Interior would be authorized and directed to—

1. Make grants of funds to qualified scientists, research laboratories, institutions, or other non-Federal agencies in furtherance of the purposes of the act.

2. Replace, modernize, and enlarge the number of oceangoing ships being used for research, exploration, surveying, and the development of marine resources by the Department.

3. Construct and operate shore facilities and laboratories adequate to support the above ships.

4. Cooperate with other departments and agencies, including agencies of the several States, in the conduct of oceanwide surveys and of studies concerning the relation of marine life to radioactive elements.

5. Conduct studies of the economic and legal aspects of commercial fisheries and the utilization of marine products.

6. Cooperate with other governmental agencies, State agencies, educational institutions, and other public and private organiza-

tions or individuals devoted to marine sciences and fishery research.

7. Determine reserves of metals of industrial or commercial value in adjacent ocean waters and ascertain techniques and probable costs of recovery and extraction.

8. Assist in taxonomic studies of marine organisms and in providing facilities for their preservation and scientific classification.

Section 6 of the bill would authorize appropriations for the activities designated in section 5.

Such sums as may be necessary would be authorized for construction of new ships for fisheries exploration and research. The amount to cover the 10-year ship construction program is not specified, as your committee, which has legislative jurisdiction over the agency, will wish to review from time to time its progress in the program.

There can be little question that the Bureau of Commercial Fisheries, whatever the cause, has not kept pace with its responsibilities in recent years, although it still retains many dedicated officials and scientists.

The Committee on Oceanography, in its report on "Ocean Resources" filed with your committee, has this terse comment on the Bureau's ocean research activities:

The principal Government agency with primary responsibility of research and development of living ocean resources—the Bureau of Commercial Fisheries of the U.S. Fish and Wildlife Service—is retrogressing rather than progressing in its ability to engage in broader, basic programs involving ship operations.

Research ships of the Bureau are small and old and none in recent years have been replaced although many other nations, including the Soviet Union, Communist China, Japan, Canada, Great Britain, France, West Germany, and the Union of South Africa have augmented their fisheries research fleets with new and advanced vessels.

While these and other foreign nations have been enlarging their fleets, that of the Bureau of Commercial Fisheries actually has diminished.

The Bureau's principal research ship in the Atlantic, prior to its deactivation March 9, 1959, *Albatross III*, has not been replaced. At the time of its retirement it was 33 years old. Scientific duties assigned to the *Albatross III* were transferred to the 147-foot trawler *Delaware*, a 22-year-old vessel also engaged in fisheries studies. Likewise retired was a Great Lakes research boat, the *Musky*.

Largest ship of the Bureau's fleet, the 371-ton *Black Douglas* is 33 years old and capable of operating only light gear. The Bureau has been reduced to only six operating vessels over 40 feet in length.

Dr. Schaefer informed your committee during the course of the hearings that—

the Russians have been doing rather advanced work on marine biology and particularly oceanography in support of fisheries development for about as long as we have.

He continued:

In fact, they had a three-vessel expedition working in the Bering Sea in 1935 and 1936. They have made a thorough survey there of the fisheries and the currents and the types of bottom, and so on, and in the fisheries resource development their work is every bit as good as ours and in some cases it is advanced.

For example, one of their submarines, the *Severyanka*, has been converted into a machine with windows in it and sampling devices to study the upper reaches of the ocean, particularly in relation to the distribution of the herring and other fish in the North Atlantic. They have made some interesting discoveries with the submarine. This is one field where they are at least abreast of us.

Senator Lausche, who was presiding at the hearing during this portion of the testimony, asked:

From an applied standpoint, have they made advances in excess of ours, if at all?

Dr. Schaefer:

I would say equal to ours. One example of this is the use of the *Severyanka* in the herring fisheries in the Norwegian and Barents Seas. By using this submarine they were able to make observations on the behavior of the herring. On the basis of these observations they were able to design gear to greatly improve their catches. This is just one example. I wouldn't say they are ahead of us, but they are certainly abreast and they are certainly working at it very hard.

The Committee on Oceanography recommended that during the next 10 years the Bureau construct 14 research ships, 12 of 500 tons displacement and 2 of 1,200 to 1,500 tons displacement. It estimated the cost at \$27.4 million.

In the provision that would authorize appropriations for ship construction by the Bureau, the bill stipulates that the Bureau study the ships being built by other nations for exploration and research with a view to increasing the seaworthiness, range and efficiency of our own fisheries research fleet.

Appropriations for operation of the new U.S. ships to be constructed under this section of the bill would be authorized subject to a limitation of \$2 million per annum for operating costs.

It is also provided that in research operations by the Bureau full consideration shall be given to the needs for research in the Gulf of Mexico, Bering Sea, other areas of potential commercial importance in the oceans, and in the Great Lakes.

A similar stipulation is made in the authorization of such sums as may be deemed adequate by the department for capital expenditures in developing or expanding ocean resource studies with such devices as mesoscaphs for biological observations, automatic continuous plankton samplers, oceanaria, and instrumentation for studies of marine life behavior.

The major authorization in this section, however, is that of such sums as are necessary for operations, excluding ship operations, of fisheries resource studies including biological surveys, marine popula-

tion sampling, pond fish culture and brackish water farming, ecological mapping, taxonomy, estuary resources and potentials of nutrient increase. These would be limited to \$10 million per annum. The Committee on Oceanography, in its report, estimated that the total cost of these studies over a 10-year period would not exceed \$67,430,000, the costs beginning at a moderate level and approximately doubling after the first 5 years, and after facilities in the form of ships and laboratories had been constructed for the work.

Many of these studies, however, it is presumed by your committee, would be farmed out to non-Federal agencies, universities, or institutions through the program of grants authorized in section 5(a).

Final authorization in section 6 is that of \$11 million for continuing studies over a 10-year period of increased utilization of marine products, the development of new uses of these products, for legal and economic studies relating to commercial fisheries, and for investigation of the mineral resources of the seas. It is specifically stated that in directing these studies the Secretary of the Interior shall give full consideration to their being carried on in existing institutions, agencies, or laboratories through the issuance of grants.

A broad program would be assigned to agencies within the Department of the Interior. Execution of this program would require not only legislative authorizations and subsequent appropriations but a determination on the part of the Department and agencies to enhance utilization of the ocean's resources in the national interest and for the benefit of the American people.

Your committee, in reporting this bill, considers that the potential values of the resources of the oceans and of the Great Lakes merit the research facilities and studies authorized.

What these values may be was ably summarized for the committee at its hearings on the bill by Comdr. C. C. Wilbur, USN, in a 20-minute presentation. Commander Wilbur said in part:

**Fish:** The sea is presently supplying only a small percent of its potential food harvest. Although 35 million tons of fish in various forms are taken annually, this might well be increased 10 times or more.

**Minerals:** The sea is also rich in minerals—in fact, oceanic waters contain more minerals than have been mined by man in all history. Each cubic mile of sea water contains 18 million tons of dissolved salts of sodium, potassium, calcium, bromine, and phosphorous. There is enough gold in the sea to make every inhabitant of the world a millionaire. In addition, on the floor of the deep seas—in the form of nodules—lie deposits of cobalt, copper, nickel, iron, and manganese.

**Oil wells:** As each day passes our world requires more fuel to produce energy. Offshore—under the sea of the Continental Shelves—lies 40 percent of the world's known petroleum—20 million barrels of it. As commercial atomic power becomes a practical reality, the world's oceans offer a promising fuel source. Sea water is a source of both uranium for fission-produced power and deuterium for heavy hydrogen or thermonuclear power.

In the opinion of your committee, this country can ill afford to take second place in exploring and developing these potentials.



*Amendments to sections 5 and 6*

1. Page 9, line 5, insert "Geological Survey" after the word "Mines". This amends the heading over these two sections to read: "Bureau of Mines, Geological Survey, and Bureau of Commercial Fisheries, Department of the Interior." Representatives of the Geological Survey, at meetings of the Committee on Oceanography and of the Interagency Coordinating Committee on Oceanography, have supplied convincing evidence that they should participate in the overall oceanographic program.

As further evidence an outline of current research programs being conducted by the Geological Survey has been submitted to your Committee on Interstate and Foreign Commerce in connection with its considerations of S. 2692.

These programs include research into marine geology and mineral resources of the Continental Shelves and shallower oceanic waters; marine sedimentary diagenetic and mineral accretion processes; marine geochronology and the sedimentary record; paleoclimatology, paleobiogeography and paleocirculation; major crustal features of the western Atlantic, Gulf of Mexico, and California offshore basins; hydrodynamics of tidal and estuarine flow, and geochemical balance of the hydrosphere.

The Department of the Interior, in its comments on S. 2692, states that present expenditures of the Geological Survey aggregate "some \$600,000 annually," a relatively small amount considering the magnitude of the research it is attempting.

2. Page 9, line 16, insert after the word "institutions" the words "or non-Federal agencies". This amendment is designed to make specific the inclusion of State fisheries departments among those eligible to receive grants from the Federal department or agencies for basic and applied research programs, facilities or equipment.

3. Page 10, line 4, insert "including agencies of the several states" after the word "agencies". The purpose of this amendment is identical to that above except that it is applicable to the conduct of ocean-wide surveys from which data relative to ocean resources may be obtained.

4. Page 10, line 7, strike the first word "Conduct" and substitute "Cooperate with other departments and Agencies, including agencies of the several States in the conduct of". This relates to studies of the relation of marine life to radioactive elements, and has the same purpose as the two preceding amendments.

5. Page 10, line 16, insert the words "and cooperate with" after the word "from". This is a perfecting amendment suggested in comments received from the Navy and Defense Departments.

6. Page 10, line 18, insert "or their agencies, and with" after "States,". This is similar to numbered amendments 2, 3, and 4 above and relates to cooperation between Federal agencies and non-Federal agencies and institutions.

7. Page 10, line 19, insert "and the" after the word "research" and the letter "s" after "science".

8. Page 10, line 20, strike the word "oceanography".

9. Insert after line 25 the following paragraph:

(i) Encourage and assist in taxonomic studies of marine organisms and in providing facilities for the preservation of

specimens useful in scientific classification of marine organisms.

10. Page 11, line 1, strike "(i)" and insert in lieu thereof "(j)".

11. Page 11, line 12, strike the word "Bureau".

12. Page 11, line 13, strike the words "of Mines and the" and insert after the word "Fisheries," the phrase "Bureau of Mines and Geological Survey". The purpose of this is to include the Geological Survey among the agencies in the Department of the Interior for which sums are authorized to be appropriated in this section.

13. Page 12, line 13, insert after "Studies" the words "which may include but not be" and strike the words "including, but not". This is perfecting language which follows suggestions in the joint comments submitted by the Navy and Defense Departments.

14. Page 12, lines 23, 24, and 25, strike the word "north" ending line 23, all of line 24 reading "of 40 degrees north latitude, between 15 and 40 de-", and from line 25 the following: "gress north latitude," and in line 25 insert after the word "Sea," the words "the Great Lakes, and". The purpose of this amendment is to remove geographical specifications relative to providing facilities for, and conducting ocean resource studies, which at hearings on the bill were objected to by the Committee on Oceanography as being unduly restrictive.

15. Page 13, line 1, substitute the word "other" for the word "ocean" and strike "and the Great Lakes," the Great Lakes having been inserted in the previous line.

16. Page 13, line 9, strike "taxonomic development" and substitute "taxonomy." A perfecting amendment.

17. Strike the word "braking" and insert in lieu thereof "brackish." This corrects a misprint in the bill.

18. Page 13, line 15, strike "\$6,500,000" and substitute "\$11,000,000". This change is made as the result of a review of the sums recommended by the Committee on Oceanography of the amounts needed for a minimal program of studies over a 10-year period of marine product utilization, development of new uses, legal and economic problems affecting commercial fisheries, and utilization of mineral resources extracted from the marine environment.

19. Page 13, line 18, after the word "chemicals," strike the word "and" and insert the word "for."

20. Page 13, line 19, after the word "products" change the colon to a comma, and insert "for legal and economic studies relating to commercial fisheries, and for investigations of mineral resources of the seas:".

21. Page 13, lines 22, 23, and 24, before the word "through" in line 22 insert the words "agencies or laboratories", and after the word "institutions" in line 22 strike the remainder of the paragraph and insert the words "agencies, and laboratories." A perfecting amendment.

Although S. 2692 was introduced on September 11, 1959, and the Department of the Interior was repeatedly invited to submit comments on the bill, no comments were received until the afternoon of May 17, 1960, and after it had been announced that the bill was on the committee agenda for consideration on the following morning. Among other comments the Department suggested that the limitations placed in section 6(b) on authorizations for operation of new

ships be increased from \$2 million per annum to \$3,400,000 per annum. As no new ships are now being constructed by the Department for fisheries research and exploration and as none will be completed for several years when and if the Department constructs such ships, no need exists at this time for increasing the amount specified in the limitation.

DEPARTMENT OF COMMERCE

Section 7 would authorize and direct the Secretary of Commerce, with such funds as may be appropriated or otherwise made available to him, to undertake a 10-year program of study and research as part of the general program to advance the marine sciences in the United States and specifically to do the following:

1. Request and obtain cooperation from other Government agencies having an interest in the marine sciences and surveys, and to cooperate with educational institutions, laboratories, and public and private organizations which may be of assistance in the program.

2. Establish within the Department of Commerce a National Oceanographic Records Center to collect from other agencies and departments of the Federal Government, agencies of the several States, oceanographic institutions and laboratories and other sources, all oceanographic data, and prepare and disseminate such data for public use.

3. Replace, modernize, and enlarge in number the oceangoing ships for use in ocean and coastal surveys by the Coast and Geodetic Survey.

4. Construct and operate shore facilities for the Coast and Geodetic Survey and provide instruments and equipment essential for efficient use of these facilities and survey ships.

5. Inaugurate in the Weather Bureau a comprehensive 10-year study of the interchange of energy between the oceans and the atmosphere, and to prepare, based on such study, climatological maps illustrating the balance of incoming and outgoing radiation and heat exchange between the oceans and the atmosphere. These studies may be carried out by the Weather Bureau through contracts with public or private organizations, or by grants to scientific institutions.

6. Require the Maritime Administration to construct ships of approximately 500 tons and 1,200 to 1,500 tons displacement specifically designed for basic oceanographic research, and meeting the scientific requirements of quiet operation, sea keeping and handling qualities at low speeds, efficient and economical scientist-crew ratios, and suitable laboratory space and power for winches and other equipment. When completed these ships would be made available, at the discretion of the Secretary, to nonprofit oceanographic research centers, other agencies of the Federal Government, or State institutions.

The needs and problems of the Coast and Geodetic Survey, Weather Bureau, and Maritime Administration previously have been touched on in this report. The needs for a National Oceanographic Records Center have not.

The recommendation of the Committee on Oceanography follows:

A data center for all oceanographic research should be established for the storage, routine processing and "read-out"

of such information as sea surface temperatures, currents, and meteorological data.

This recommendation was greatly amplified in the Committee's subsequent report titled: "Ocean Resources." In states in part:

One of the Federal agencies already concerned with the collection, preparation and dissemination of scientific and technical data should be given the means and the responsibility of operating a center for preparing and disseminating all kinds of oceanographic and closely related data for public use.

For data already centrally located (such as the hydrographic station data and bathythermograms at the U.S. Navy Hydrographic Office, the sea level data at the U.S. Coast and Geodetic Survey and the sea temperature and related marine meteorological data at the U.S. Weather Bureau's National Weather Records Center), the task of the oceanographic records center would include only its further preparation and dissemination for oceanographic research and other public use; for data not now centrally located, it would also become the central depository. Dissemination should include periodical publication of summaries (such as mean monthly sea temperature charts, catalogs of data, etc.) and specially prepared data to order at cost.

The need for this service has become acute because a great volume of physical and biological oceanographic data which has continually been collected in various areas, by different groups for different purposes, remains unpublished, stored in the files of many institutions. Hence, much of it is inaccessible to any individual scientist or institution.

No provision in S. 2692 has received more favorable comment from individual scientists, scientific organizations, and industry than that looking toward the establishment of a National Oceanographic Records Center.

The center would be placed in the Department of Commerce for these reasons:

The center was authorized to be placed in the Department of Commerce for these reasons:

1. It is a civilian department.
2. Two agencies in the Department, the Coast and Geodetic Survey, and the Weather Bureau, already have extensive collections of oceanographic and related data.
3. It is centrally located.
4. The Maritime Administration, which has a direct interest in the seas, and the National Bureau of Standards, which has a close connection with many branches of science related to ocean research, are in the Department.
5. Those engaged in ocean commerce and navigation, and individuals and industries with a need for information and charts of coastal or estuarine waters, are accustomed to look for such data at the Department of Commerce.

The National Oceanographic Records Center should serve scientists in all hydrographic fields; those aspiring to become such scientists; those who use the oceans for navigation, sport, or means of livelihood; and those who are merely interested in their phenomena, and should do this in the broad and thorough manner that the Library of Congress serves students, scholars, and the general public.

Considered in this perspective the immediate establishment of such a center is of great importance.

Section 8 would authorize appropriations to carry out the purposes designated in section 7 including such sums as may be necessary for the Coast and Geodetic Survey to construct two survey ships of 500 tons displacement, six survey ships of from 1,200 to 1,500 tons displacement, and two survey ships of 2,000 tons displacement, and likewise such sums as are necessary to enable the Maritime Administration to construct the basic research ships authorized in the previous section. Section 8 would also authorize sums for capital outlay and operations of the National Oceanographic Records Center.

*Amendments to sections 7 and 8*

1. Page 15, line 5, following the word "item" change "(a)" to "(c)". A typographical correction.

2. Page 16, line 7, insert "agencies and" before the word "institutions". This is a broadening amendment relating to placement of basic research ships constructed under the program authorized in the bill to be undertaken by the Maritime Administration.

3. Page 16, line 8, after the word "Act." insert "The ships authorized by this subsection are in addition to ships authorized to be constructed by other sections of this Act." A perfecting amendment relating to construction of basic research ships by the Maritime Administration.

4. Page 16, line 23, for the sum "\$250,000" substitute the sum "\$500,000". This increase in authorized capital outlay for the National Oceanographic Records Center is in accord with views expressed to your committee by scientists, scientific organizations, and industry representatives that the amount stated in this subsection of the bill would be inadequate to provide the accommodations and facilities for the collection and dissemination of the data contemplated.

5. Page 17, line 21, after the word "period." substitute a semicolon for the period and add this proviso:

*Provided, however,* That operating costs for new survey ships placed in operation by the Coast and Geodetic Survey not exceed \$3,000,000 per annum; and

This is a perfecting amendment suggested in substance in comments received from the Comptroller General.

6. Page 17, following line 24 add a new subsection, likewise suggested in comments received from the Comptroller General, as follows:

(e) Such sums as are necessary to enable the Maritime Administration to design and construct the ships authorized in section 7(f).

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, OFFICE OF  
EDUCATION

Section 9 would authorize and direct the Secretary of Health, Education, and Welfare to undertake a 10-year program of obtaining new faculty in oceanography and marine sciences as part of the general program for developing the marine sciences in the United States, and to provide assistance through the Office of Education in the form of teachers' salaries and equipment.

Section 10 would authorize appropriations to carry out the duties specified in section 9.

*Amendment to section 10*

Page 18, line 19, strike that portion of the sentence following the word "States," which reads "Appropriations authorized in this section" and insert prior to the word "shall" at the beginning of line 20 the following: "Expenditures for this purpose shall not exceed \$500,000 per annum and appropriations for such expenditures." The remaining portion of the sentence reads "shall be in addition to other appropriations provided for such Department or Office to carry out its duties under law," and is unchanged. This is a perfecting amendment.

## ATOMIC ENERGY COMMISSION

Section 11 would authorize the Atomic Energy Commission to conduct an intensive 10-year program of control and monitoring of atomic waste disposal in the marine environment, including studies of circulation and mixing processes which affect distribution of contaminants in coastal and estuarine waters and the effects of radioactive elements on living organisms of the hydrosphere. The section would provide also that certain aspects of the program shall be carried on by the Public Health Service and the Coast and Geodetic Survey, or both, with funds made available by the Atomic Energy Commission.

Great emphasis was placed on the importance of this program by scientists who testified before the committee.

During the hearings the following colloquy took place between the chairman (Mr. Magnuson) and former Atomic Energy Commissioner Sumner Pike:

The CHAIRMAN. Have you any information on the problem of dumping atomic wastes from your experience on the Atomic Energy Commission?

Mr. PIKE. Yes, I feel, and Dr. Spilhaus does, that we ought to know what we are doing before we dump any amount of these wastes in the ocean. Once it is done, it is irreversible. It is like capital punishment. When you change your mind you can't get it back.

We ought to be very clear that if radioactive wastes are to be dumped in the ocean, they should be dumped in such places, at such times, and in such quantities only that we can prove to be completely harmless to the human race and indeed to other forms of life because, after all, the human race depends upon other forms of life for its own existence.

Later, Dr. Dayton E. Carritt, formerly a scientist with the Manhattan District at Los Alamos, N. Mex., and now with Johns Hopkins

University, Baltimore, and an authority on plutonium chemistry, atomic weights, and chemical properties of sea water, testified:

The information leading from these studies is essential to an accurate prediction of the fate of the wastes dumped, either intentionally or by accident, into many parts of the oceans, and consequently to our assessment of the hazard to man that might result from these actions.

There is no implication here that we are completely ignorant with regard to the behavior of the oceans. On the contrary, the oceanographers in this country are leaders in their respective fields, and it is due to their efforts that we are now able to recommend what are certainly safe but restrictive procedures, and to outline the framework within which detailed studies can provide the basis for safe and efficient uses of the marine resources.

Our present situation is one in which our inventory of trained oceanographers and oceanographic research facilities cannot keep pace with the demands for solutions to the problems caused by a rapidly expanding technology that either directly or indirectly becomes involved with the world's oceans.

The situation is urgent but not hopeless. There is time to make up our deficiencies, but no extra time. In my opinion we need a relatively long-term national policy that will (1) provide for the training of new oceanographers, primarily at the graduate and postgraduate levels, in a manner that will permit realistic competition with other science fields for the minds and talents of new scientists, and (2) provide the facilities, both land based and seagoing, that will permit present and future marine scientists to carry on efficiently their studies of the sea. Given these, I feel sure American oceanography can resume its place as a leader.

The CHAIRMAN. Well, Doctor, don't you think that we need to know this for another good reason? The world's oceans are the property of everyone. Other nations are embarking upon nuclear programs. It is obvious we are going to have to have some international agreements. How can we go to a conference and propose international agreements, or accept them, or to take any leadership in them if we don't know what we are talking about when we get there?

Dr. CARRITT. Precisely.

The CHAIRMAN. Or some other country at least assumes they know more of what they are talking about than we do. Technically we go in empty handed at some of these conferences.

Dr. CARRITT. That is correct.

Section 12 would authorize appropriations to the Atomic Energy Commission to carry out the studies designated in section 11, specifying such sums as are necessary for the various programs but with a limitation on the amount expended in any one year of the 10-year program.

For engineering studies in connection with control and monitoring radioactive contamination in the marine environment—not to exceed \$370,000 in any one year.

For participating in international meetings of scientists held to consider international control and monitoring—not to exceed \$30,000 in any one year.

For estuarine and coastal studies authorized in section 11—not to exceed \$2,800,000 per annum.

For research to determine circulation and mixing processes which control the dispersion of radioactive wastes in deep waters of the open ocean—not to exceed \$1,400,000 per annum.

For studies of the inorganic transfer of radioactive elements from sea water to the sediments—not to exceed \$484,000 in the first year of the program or \$299,000 in subsequent years of the 10-year program.

For studies of the effects of the biosphere on the distribution and circulation of radioisotopes in the oceans and adjacent seas—not to exceed \$938,000 per annum.

For studies of the genetic effects of atomic radiations on marine organisms—not to exceed \$100,000 per annum.

For field experiments in confined bodies of water using radioisotopes—not to exceed \$100,000 per annum.

For two major open-sea tests of radiological contamination at sea, its effects on marine life, and its potential effects on humanity—such sums as are necessary. The Committee on Oceanography estimates that the cost of these tests would not exceed \$2 million each, including ship time.

#### *Amendments to sections 11 and 12*

There are no amendments to these sections.

#### DEPARTMENT OF THE NAVY

Section 13 would authorize the Secretary of the Navy, with such funds as may be appropriated or otherwise made available to him, to carry out the following activities:

1. Undertake a 10-year program of expanded basic oceanographic research and hydrographic surveys as part of the general program for the development of the marine sciences in the United States.

2. Make grants of funds to scientists, research laboratories, or institutions for the above purposes.

3. Institute a 10-year program for the replacement, modernization, and enlargement in the number of ships for use in ocean research and surveys, retaining title to these ships when they are supplied to nonprofit scientific institutions for those purposes.

4. Construct and operate sufficient shore facilities and laboratories to support effectively the expanded research and survey programs.

5. Develop and construct or acquire new and improved vehicles for ocean research and exploration. These include bathyscaphs, icebreakers and submarines converted for scientific use. It also includes many scientific devices, among them seismic equipment, precision echo sounders, acoustic telemetering devices, and instruments for the study of the current structure of the ocean, oceanic temperatures, bottom topography, sound transmission and velocities, ambient noise, biological activity, and chemical or elemental components of the oceans.



6. Continue and expand the Navy's support of civilian oceanographic laboratories as proposed in Project TENOC, which is substantially similar to recommendations by the Committee on Oceanography.

7. Establish with the National Science Foundation or the National Academy of Sciences-National Research Council—a program of scholarships for selected students adapted to graduate training and research in the marine sciences.

8. Conduct a systematic and expanded program of three-dimensional ocean surveys including measurements or studies of depths, salinity, temperature, current velocity, wave motion, magnetism, and biological activity.

9. Continue a policy of expanding assistance and support to existing civilian laboratories and universities engaged in basic oceanographic research, and foster the establishment and growth of new civilian laboratories for applied oceanographic research needed by the Navy.

10. Request and obtain cooperation from other Government departments and agencies having an interest in the marine sciences, and to cooperate with the several States, educational institutions, laboratories, other public and private organizations, and with persons who can be of assistance.

Section 14 would authorize appropriations for the programs specified in section 13 in sums necessary for the following:

Construction of nine research ships of 1,200 to 1,500 tons displacement and four research ships of from 2,000 to 3,000 tons displacement. It was provided, however, that not more than one of the 2,000- to 3,000-ton ships should be built in any one year of the 10-year program, and that construction of the other research ships be spaced by years, with two each in the first and second years, one in the third year, two in the fourth year, and one in succeeding years of the program. This proviso followed the scheduling of ship construction in the TENOC report.

Construction of two survey ships of approximately 500 tons displacement, five survey ships of 1,200 to 1,500 tons displacement, and three of 2,000 tons displacement, with a proviso that not more than two of the 1,200 to 1,500 tons ships be built in 1 year.

Construction of one research ship of 300-ton displacement.

Operation of these basic research ships in excess of present operating costs for such ships, providing that this not exceed \$420,000 per annum for each of the new 1,200- to 1,500-ton ships, \$700,000 per annum for each of the 2,000- to 3,000-ton ships, and \$250,000 per annum for each of the 500-ton ships.

Construction of new shore facilities for basic research and for survey work.

Basic research other than ships.

Engineering needs for ocean exploration and research which may include bathyscaphs, manned and unmanned buoys, icebreakers and submarines modified or converted for scientific use (Soviet Russia has converted two 12,000-ton icebreakers into scientific research ships), telemetering devices, current meters, underwater television, seismic equipment, turbulence measuring devices, biological sampling devices, precision salinometers, precision echo sounders, towed temperature

recorders, magnetometers, and other instruments and laboratory equipment for oceanographic research.

Scholarships to selected students as authorized in section 13, with the proviso, however, that these scholarships not exceed \$300,000 per annum.

*Amendments to sections 13 and 14*

As a preface to listing these amendments it may be stated that with the exception of two amendments, to be hereafter noted, all of the amendments were suggested in comments received from the Department of the Navy, which also represented the views of the Department of Defense.

Many of the amendments are technical in nature, several broaden provisions of section 14, and one proposes the addition of new sections in order to include the Department of the Army, Corps of Engineers, Beach Erosion Board in the overall program, which has been done.

The amendments:

Section 13:

1. Page 22, line 20, strike the words "Make grants of funds" and after "(a)" insert "Provide funds by contract or otherwise," and also insert, after the word "scientists," and before the word "research" the words "Government and non-Government."

2. Page 22, line 22, substitute the word "funds" for the word "grants" and in the same line insert, after the word "for" the words "basic and applied research,". These and the amendments in the above paragraph broaden the language authorizing the Secretary of the Navy to assist scientists, laboratories, and institutions with funds in the furtherance of basic and applied research programs of interest to the Navy.

3. Page 23, line 3, insert the words "and applied" after the word "basic" and before the word "research". This is a similar broadening provision with relation to the purposes for which the Secretary is authorized to initiate and carry out a 10-year program of replacement, modernization and enlargement in numbers of the Navy's research ships.

4. Page 23, line 12, insert the words "and provide related instruments and equipment" following the word "laboratories." This is a well-considered amendment in connection with the construction and operation of shore facilities.

5. Page 23, line 13, insert "and applied" following the word "basic". The purpose is the same as that of the similar amendment in paragraph 3 above.

6. Page 23, line 17, strike the word "including" and substitute the words "which may include" and in line 18 below insert after the word "not" the word "be", so that the clause now reads "which may include but not be limited to". This language was preferred in the Navy-Defense Department comments.

7. Page 24, lines 3 and 4, strike the last word in line 3 ("civilian") and first three words in line 4 ("oceanographic laboratories as") and insert "marine studies substantially as", and after the word "TENOC" in line 4 insert "or the Navy's revised long-range oceanography program". As amended this subsection now reads:

(e) Continue and expand the Navy's support of marine studies substantially as proposed in project TENOC or the

Navy's revised long-range oceanography program approved by the Chief of Naval Operations, and substantially similar to the recommendations made in the report of the Committee on Oceanography of the National Academy of Sciences—National Research Council.

8. Page 25, line 7, insert "and cooperate with" after the word "from" and before the word "other". A perfecting amendment.

9. Page 25, following line 12, add the following new subsection:

(j) Section 7394, title 10, U.S.C., is hereby amended to read as follows: "The Secretary of the Navy is authorized to furnish maps, charts, and other publications and products of scientific value of the Hydrographic Office without charge to educational institutions, laboratories, and other public and private organizations and persons when it is determined that to furnish such information is in the national interest."

The above amendment broadens the usefulness and services of the Hydrographic Office and the Navy and Defense Departments are to be commended for recommending its inclusion in the bill. In an explanatory note in their comments it is stated:

Existing statutes are adequate to cover the furnishing of such information to commercial interests but they are construed as making impossible the free distribution of material of scientific value.

The new subsection will make such distribution permissive.

Section 14:

1. Page 26, line 1, after the word "construction" insert the words "research and survey ships which include but shall not be limited to", the remainder of the clause reading "nine one thousand two hundred to one thousand five hundred-ton displacement research ships:".

2. Page 26, line 3, after the word "ships" change the colon to a semicolon and delete the remainder of lines 3, all of lines 4, 5 and 6. This eliminates the provision adopted from the TENOC report which spaced the construction of these ships over a period of years. As the Navy has not commenced the construction of ships on the basis proposed in the TENOC report, and in fact had not, until a few days ago, issued contracts for any of these ships except the 80-foot boat previously noted, and has now issued contracts for only two ships, it will be necessary to accelerate the construction program if it is to meet the expectations of the Office of Naval Research or the Committee on Oceanography during the next 10 years. In deleting the proviso above, and elsewhere in this section, it is the hope of the committee that construction of these needed ships will be expedited and not further delayed.

3. Page 26, lines 7, 8, 9, and 10, in line 7 delete the words "for the construction", in line 8 after the word "ships" change the colon to a semicolon and strike the remainder of line 8 and all of lines 9 and 10. This is in line with the policy explained under numbered paragraph 2 above and has the further effect of consolidating the authorization for appropriations for construction of Navy research and survey ships.

4. Page 26, line 11, delete "for the construction".

5. Page 26, lines 13, 15, and 16, delete in line 13 "for the construction", and in line 15 after the word "displacement" change the colon to a semicolon and delete the remainder of that line and all of line 16.

6. Page 26, line 17, delete "for the construction".

7. Page 26, line 19, delete "for the construction".

With the above changes the bill authorizes to be appropriated to the Department of the Navy, during the 10-year period beginning with July 1 of the first fiscal year following approval of this act by the President, such sums as are necessary to construct the identical ships specified in the bill prior to amendment, but without a limitation of the number of ships in any category that may be constructed in any one year.

This portion of the bill now reads:

for the construction of research and survey ships which include but shall not be limited to nine one thousand two hundred to one thousand five hundred tons displacement research ships; of four two thousand to three thousand tons displacement research ships; two survey ships of approximately five hundred tons displacement; five survey ships of one thousand two hundred to one thousand five hundred tons displacement; three survey ships of two thousand tons displacement; one research ship of 300 tons displacement.

8. Page 27, line 5, insert after the word "for" and before the word "construction" the following words: "modernization, improvement, and expansion of existing shore facilities for basic research and for". This amendment is suggested in Navy-Defense Department comments "to permit flexibility in the utilization of existing facilities," and authorized the Navy Department to finance or assist in financing enlargement and improvement of existing facilities for basic research in addition to constructing new facilities for that purpose.

9. Page 27, line 8, is amended in a manner identical to the above and applies to shore facilities for survey work.

10. Page 27, lines 12, 13, 14, 15, 16, and 17, insert in line 12 after the word "research," the words "wave measuring equipment, systems engineering for reduction of data,"; in line 13 after the word "buoys" insert the words "for automatic continuous oceanographic recording"; in line 14 after the word "use" strike the word "acoustic" and insert the words "vessel positioning system acoustical equipment and measuring devices for direct density, turbulence and radioactivity, and"; in line 15 delete the words "cameras and", and in line 17 delete the words "turbulence measuring devices," and insert in lieu thereof the words "automatic continuous,". These amendments broaden the categories of vehicles, instruments, and devices which are designated as engineering needs for oceanographic research and surveys and for which such sums as may be necessary are authorized to be appropriated in section 14. The added instrumentation reflects not only some which are in current use but others which are in research or development stages.

11. Page 27, line 23, after the word "students" insert "post-doctoral fellowships". This amendment was recommended by the Committee on Oceanography and the American Society of Limnology and Oceanography to broaden the scholarship program.

12. Page 28, line 1, after the word "these" insert the words "scholarships and". Suggested by the groups designated above and with the same object.

## INSERTION OF ADDITIONAL SECTIONS TO BILL

Page 28, line 4, delete after "SEC." the numeral "15" and substitute the numeral "19". This section, headed "General" will then follow sections 15, 16, 17, and 18, to be inserted, as will follow.

## DEPARTMENT OF THE ARMY

On the recommendation contained in the comments received from the Department of the Navy and which expresses also the views of the Department of Defense, S. 2692 is amended by adding, under the heading "Department of the Army," section 15 and section 16, which would provide, in effect, for participation of the U.S. Army Corps of Engineers, through the Beach Erosion Board, in the 10-year comprehensive program for development of the marine sciences. The Board is now engaged in beach erosion work in many States.

The amendments, which are herewith printed in this report, indicate the broad scope of the activities of the Board in aquatic sciences in the near-shore areas of the Pacific and Atlantic Oceans, the Gulf of Mexico and the Great Lakes.

## DEPARTMENT OF THE ARMY

SEC. 15. The Secretary of the Army is authorized and directed, with such funds as may be appropriated or otherwise made available to him, to undertake a ten-year program of study and research by the United States Army Corps of Engineers, through the Beach Erosion Board, as part of the general program for the development of the marine sciences in the United States. In furtherance of the purposes of this Act, the Secretary is authorized and directed to carry out, in addition to programs now under way, the following activities relating to physical oceanography in the near-shore areas of the Atlantic and Pacific Oceans, the Gulf of Mexico, and the Great Lakes, which areas include the zone from the shore to the fifty-fathom depth contour in the oceans and lakes, and bays and tidewaters connected therewith:

a. Request and obtain cooperation from other Government agencies having an interest in the marine sciences and ocean surveys, and cooperate with educational institutions and laboratories devoted to the marine sciences and oceanography, and with other public and private organizations and persons who may be of assistance.

b. Contract with qualified scientists, research laboratories, research organizations, or educational institutions to undertake basic and applied research studies and experiments in the laboratories and in coastal waters, in furtherance of the purposes of this section.

c. Undertake in coastal waters studies of the action of waves, wave currents, tides, tidal currents, and large-scale ocean and littoral currents.

d. Study and evaluate the interaction of the atmosphere, the sea, and the land as they affect the waves, currents, tides, surges, hydrographic contours, and hydrographic changes in the coastal zone.

e. Establish observation stations in coastal waters to determine the short-term, seasonal, and yearly changes in waves, currents, and hydrography in the area surrounding the station.

f. Develop, construct, or acquire instruments and equipment for the furtherance of the program of studies authorized in this section.

g. Determine the sources of the bottom materials in the coastal area, the rates and methods of movement of these materials, and the effects on the coastal hydrography of changes in the rate at which these materials reach the coastal zone.

h. Study the mechanics and effects of density currents encountered in the coastal area on the current velocities, current patterns, hydrography, interchange of waters, and rates of sedimentation.

SEC. 16. In order to carry out the policies of this Act and of Senate Resolution Numbered 136, Eighty-sixth Congress, and to provide for the participation of the Department of the Army, including either or both military or civil functions activities, in the general program for the development of marine sciences in the United States, there is hereby authorized to be appropriated to the Department of the Army, during the ten-year period beginning July 1 of the first fiscal year following approval of this Act, the following sums, not to exceed \$2,000,000 per annum:

a. Such sums as are necessary for the investigations and activities described in section 15 relating to investigations in physical oceanography in the near-shore zone.

b. Such sums as are necessary to purchase, develop, or acquire and operate the scientific equipment required for investigations in physical oceanography in the near-shore zone, including but not limited to amphibious craft, floating craft, fixed platforms, buoys, current meters, wave meters, tide gages, sound equipment, direct density measuring equipment, turbulence meters, underwater cameras, and underwater television equipment, and other instruments and laboratory equipment for oceanographic research in the near-shore zone.

c. Such sums as are required for expansion and equipping of shore facilities as are necessary to support the program of investigations in physical oceanography in the near-shore zone.

d. Such sums as are necessary to provide funds for contracts with qualified scientists, research laboratories, research organizations, or educational institutions to make investigations into physical oceanography in the near-shore zone.

#### THE SMITHSONIAN INSTITUTION

S. 2692 is further amended by the addition of sections 17 and 18 for the purpose of including the Smithsonian Institution in the 10-year program of comprehensive expansion of the marine sciences authorized in the bill. The amendments follow:

## SMITHSONIAN INSTITUTION, MUSEUM OF NATURAL HISTORY

SEC. 17. In furtherance of the policies in S. Res. 136, Eighty-sixth Congress, and of this Act, and in order to preserve, study, and classify marine, coastal, and Great Lakes organisms collected during the ten-year program of expanded hydrobiological research, the Secretary of the Smithsonian Institution is authorized and directed, with such funds as may be appropriated or otherwise made available to him, to—

(a) construct additional facilities for the purposes authorized by this section;

(b) 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 during the ten-year program of expanded hydrobiological research;

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

(d) 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.

SEC. 18. It is necessary in order to carry out the policies of S. Res. No. 136, Eighty-sixth Congress, and of this Act to have the Smithsonian Institution carry out, under laws relating to such Institution, specified duties as part of the general program for the development of the marine sciences in the United States. Appropriations authorized in this section shall be in addition to other appropriations provided for such Institution to carry out its duties under law. There is hereby authorized to be appropriated to the Smithsonian Institution, during the ten-year period beginning with July 1 of the first fiscal year beginning after the date of enactment of this Act following approval of this Act by the President, the following sums:

(a) Such sums as may be necessary for the construction by the Institution of facilities necessary to preserve, study, and classify for taxonomic purposes marine, coastal and Great Lakes organisms collected by or for the Institution during the ten-year program of expanded hydrobiological research.

(b) Such sums as are necessary for establishment by the Institution of a program for the recruitment, training and placement of taxonomists required for the purposes of this section.

(c) Such sums as are necessary for use by the Institution under the authority conveyed in section 17(c).

(d) Such sums as are necessary for the preservation, study and classification by the Institution of fishes and

marine invertebrates collected or acquired by the Institution for taxonomic purposes.

The purpose of sections 17 and 18 is to assure, in the interest of a balanced program, that facilities and adequately trained personnel be provided, in the appropriate centralized Federal institution, for scientific study and classification of specimens of marine life to be collected or acquired during the 10-year program of biological research authorized in the act.

Present facilities and personnel for taxonomy in the marine biological field at the Smithsonian Institution and Museum of Natural History are inadequate not only for collections of specimens which would be acquired during the 10-year program of comprehensive ocean research, but for present collections at the Institution.

The amendments have been suggested by a number of scientific institutions, including the Academy of Natural Sciences in Philadelphia, the Hopkins Marine Station of Stanford University, and the Pacific Marine Station of the College of the Pacific, and have been concurred in by the Committee on Oceanography.

#### GENERAL

1. Page 28, line 3 retains the heading "General" over the final section of the bill.

2. Page 28, line 4, after "SEC." strike the numeral "15" and insert in lieu thereof the numeral "19".

3. Amend the section after line 18 by adding a new section to read as follows:

(c) All agreements for grants executed pursuant to the authority contained in this Act in excess of \$50,000 shall contain a provision that the Comptroller General of the United States or his duly authorized representatives shall have the right to examine any directly pertinent books, documents, papers, and records of the grantee relating to the purpose of the grant for a period of three years after the last payment to the grantee under the grant.

This provision is in accordance with other statutes relating to Federal grants.

Amend the title so as to read:

A bill 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 facilities, to assure systematic studies of effects of radioactive materials in marine environments, to enhance the general welfare, and for other purposes.

The words "coastal, and Great Lakes" have been added as making more specific the scope of the program and the inclusion of these waters and their contents in the research and surveys authorized.

Your committee urges enactment of this legislation, which will enable the United States to meet the challenge of Soviet Russia or any other foreign nation in the fields of marine science.



The complete text of the departmental reports on S. 2692 follow:

EXECUTIVE OFFICE OF THE PRESIDENT,  
BUREAU OF THE BUDGET,  
*Washington, D.C., April 13, 1960.*

HON. WARREN G. MAGNUSON,  
*Chairman, Committee on Interstate and Foreign Commerce,  
Washington, D.C.*

MY DEAR MR. CHAIRMAN: This is in response to an informal request by committee staff for the views on S. 2692, a bill to advance the marine sciences, to establish a comprehensive 10-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 materials in marine environments; to enhance the general welfare; and for other purposes.

While recognizing the merit of strengthening the marine sciences, the Bureau has serious reservations about the necessity and advisability of enacting S. 2692.

As far as we can determine the various agencies engaged in or supporting research in the marine sciences already have adequate legislative authority to continue or expand their work in this field. Accordingly, we believe that the enactment of S. 2692 to be unnecessary.

We are further concerned over the general approach which the bill takes in authorizing specific sums of money for various activities and programs of the Federal agencies engaged in the marine sciences. No field of science remains static. In this day and age there is a constant need for review of scientific requirements and redirection of research programs. It does not seem advisable, therefore, to earmark dollar amounts for specific agency activities or to delineate the composition of scientific activities in detail as S. 2692 undertakes to do.

We recognize the interest of the committee in seeking to strengthen the marine sciences. However, such strengthening not only can take place under existing authority but is already underway as reflected in the 1961 budget. In the budget message, the President specifically refers to the steps being taken to augment Federal support of the marine sciences since the report of the National Academy of Sciences on this subject. The budget provides for a substantial increase in Federal expenditures in this field, from \$38 million in 1960 to \$56 million in 1961, exclusive of certain military expenditures related to survey work in oceanography. We believe this gives appropriate recognition to the special needs of oceanography and the marine sciences for additional support from Federal agencies, and that together with increased aid from private sources, it should permit a significant expansion of research in these fields.

For the reasons given above, the Bureau would oppose enactment of S. 2692.

Sincerely yours,

PHILLIP S. HUGHES,  
*Assistant Director for Legislative Reference.*

THE SECRETARY OF COMMERCE,  
*Washington, D.C., May 23, 1960.*

HON. WARREN G. MAGNUSON,  
*Chairman, Committee on Interstate and Foreign Commerce,  
U.S. Senate, Washington, D.C.*

DEAR MR. CHAIRMAN: This letter is in reply to your request of September 17, 1959, for the views of this Department with respect to S. 2692, a bill to advance the marine sciences, to establish a comprehensive 10-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 materials in marine environments; to enhance the general welfare; and for other purposes.

The law when enacted would be cited as the "Marine Sciences and Research Act of 1959."

The bill would declare that systematic, scientific studies and surveys of the oceans and ocean floor and other data concerning the seas, and the education and training of oceanographic scientists are vital to defense and commerce, and that there must be a coordinated long-range program of oceanographic research. A Division of Marine Sciences would be established in the National Science Foundation which would include representation from Government agencies which have responsibilities related to oceanography, and oceanographic scientists associated with universities, laboratories, or foundations. The Division would be directed to (1) develop and encourage a continuing national policy and program for the promotion of oceanographic research, (2) recommend financial and other assistance for the program, (3) cooperate with and encourage the cooperation of other Government agencies dealing with problems related to the seas, (4) foster the interchange of information among marine scientists, and (5) evaluate the scientific aspects of programs of research and surveys of Federal agencies, universities, and institutions receiving assistance from the Federal Government for oceanographic and fisheries research and ocean surveys. Representatives of the Coast and Geodetic Survey and the Maritime Administration would be included among the membership of the Division of Marine Sciences.

The functions of various Federal agencies related to marine sciences and research would be directed to be utilized for the purposes of the bill and additional appropriations for specific purposes would be authorized.

The Department of Commerce supports the objectives of the bill and to the extent funds are made available is now carrying out certain phases of the program contemplated by the bill. However, the Department already has adequate legislative authority for programs in oceanography and therefore would not consider enactment of S. 2692 necessary to achieve these objectives insofar as the Department is concerned.

If, however, favorable consideration is given S. 2692 the Department of Commerce would have the following suggestions to offer regarding the provisions of the proposed bill.

A coordinating body already exists in the Federal Council for Science and Technology and its recently established subcommittee is known as the "Interagency Committee on Oceanography," conse-

quently, there appears to be no need to create a Division of Marine Sciences in the National Science Foundation.

Section 4 of the bill would authorize the appropriation of \$3 million to the National Science Foundation for the provision of fellowships to graduate students training to become professional oceanographers. This Department believes there are sufficient existing programs to train needed oceanographers and that the provision for fellowships in section 4 is therefore not necessary. The National Science Foundation provided 2,150 graduate fellowships to all sciences on a nationally competitive basis in fiscal 1960. In addition, the Foundation encourages students to enter the field of oceanography through their visiting scientists program, undergraduate research participation program, and summer training for secondary school students program. Universities and students can obtain funds for this type of training under the National Defense Education Act. Federal agencies can, in addition, provide training and education at the undergraduate and graduate level under the Government Employee Training Act.

In accordance with the recommendations of the Subcommittee on Oceanography, it is recommended that a National Oceanographic Records Center should be established at the Suitland offices of the Navy Hydrographic Office. This would be preferable to establishing such a center in the Department of Commerce, as is provided in section 7(b) of the bill. The Hydrographic Office already has such a center with data from approximately 300,000 oceanographic stations amounting to 4,800,000 lines of punched data. New data are being fed into this deck at a rate of about 61,500 items per year. Establishing a new center as proposed by the bill would duplicate existing personnel, data, and machines. It is suggested, in addition, that the center should be jointly funded and operated by the Navy, Coast and Geodetic Survey, Bureau of Commercial Fisheries, and the National Science Foundation.

It is also requested that the following proviso be inserted at the end of section 7(b): "*Provided:* That this Center shall not duplicate the work of the National Weather Records Center".

Line 9, page 15, of section 7(e) should be amended by adding the phrase "and matter" between the words "energy" and "between".

The Department believes that the provisions of section 7(f) should only require the Maritime Administration to construct ships when requested by other Government agencies. Consequently, the following provisions should be substituted for the matter in section 7(f), line 17, page 15, to line 8, page 16, inclusive.

"(f) Require that the Maritime Administration, when requested by other agencies of the Federal Government—

"(1) Construct, on a reimbursable basis, such oceanographic research ships as may be required by such agencies;

"(2) Design or arrange for the design, and supervise the construction of such ships; and

"(3) Undertake research and development for oceanographic research ships of unusual or novel design."

Deletion of section 8(a) and rewording of section 8(b) is recommended to authorize support of the records center by the Coast and Geodetic Survey in the amount of not more than \$80,000 per annum. This is in accordance with the recommendation made above and of the Subcommittee on Oceanography.

Section 8(c) should be amended to provide for at least six 2,000-ton ships with one each of the smaller types to conform with the opinion of the Subcommittee on Oceanography and this Department that ocean surveys of the type envisioned cannot be performed efficiently by the smaller ships.

The third function in section 8(d) lines 22 to 24, inclusive, page 17, should be denominated subsection (e) and amended to read as follows:

“(e) Such sums as are necessary for the establishment and operation by the Weather Bureau of a ten-year study of the interchange of energy and matter between the oceans and the atmosphere.”

An additional function should be added to section 8(d) reading as follows: “ \* \* \* for the conduct jointly with the Navy, of a systematic and expanded program of three-dimensional ocean surveys including measurements or studies of depths, salinity, temperatures, current velocity, wave motion, magnetism, and biological activity.”

Both this Department and the Navy believe the above amendment is necessary to assure joint effort on large projects and thus obviate military classification and military orientation.

The Department recommends that the proviso lines 20 to 25 inclusive, page 19 of section 11, should be amended by substitution of a comma for the period at the end of the sentence on line 25 and adding “but this proviso shall not authorize the Atomic Energy Commission to duplicate functions of the Coast and Geodetic Survey in the field of water circulation.”

It is recommended that the provisions of section 13(g), lines 18 to 21, inclusive, page 24, be amended to conform to the amendment recommended above in section 8(d) with respect to joint Navy-Coast and Geodetic Survey projects.

With the above recommended modifications it is estimated that the total program for this Department would approximate \$112 million over the 10-year program period.

The Bureau of the Budget advises there is no objection to the submission of this report to your committee.

Sincerely yours,

PHILIP A. RAY,  
*Under Secretary of Commerce.*

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DEPARTMENT OF THE NAVY,  
OFFICE OF THE SECRETARY,  
OFFICE OF LEGISLATIVE AFFAIRS,  
*Washington, D.C., April 19, 1960.*

HON. WARREN G. MAGNUSON,  
*Chairman, Committee on Interstate and Foreign Commerce,  
U.S. Senate, Washington, D.C.*

MY DEAR MR. CHAIRMAN: Your request for comments on S. 2692, a bill to advance the marine sciences, to establish a comprehensive 10-year program of oceanographic research and surveys; to promote commerce and navigation, to secure the national defense; to expand ocean resources; to authorized the construction of research and survey ships and facilities; to assure systematic studies of effects of radioactive materials in marine environments; 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 S. 2692 is as stated in the title.

While the Department of Defense concurs in the objectives of this bill, it does not consider enactment of S. 2692 necessary to achieve these objectives. In general, the agencies of the Department already have adequate legislative authority to continue and expand research in the marine sciences. In this connection it should be noted that the expenditures of the Navy for oceanography are expected to increase from \$17 million in 1960 to \$23 million in 1961. For the Government as a whole expenditures will increase from \$38 million in 1960 to \$56 million in 1961.

If, however, favorable consideration is given to S. 2692 the Department of Defense would have the following suggestions to offer regarding the provisions of such proposed enactment:

Sections 2 and 3 of the bill propose to establish a division of Marine Sciences in the National Science Foundation in which there is an interagency committee ostensibly to develop and encourage continuing national policy and program for the promotion of oceanography. The establishment of such a division should be based on the needs and desires of the Foundation. It does not seem appropriate, however, to extend the National Science Foundation's authority into applied research activities, the establishment of which the proposed Division might authorize. The National Science Foundation should continue to support basic research and programs to strengthen scientific research potential in all of the sciences including specialized fields such as oceanography which may from time to time require particular emphasis.

The Subcommittee on Oceanography of the Federal Council for Science and Technology has proposed that under the Federal Council a permanent interagency committee be established to exercise program control and coordination of the national oceanography program. The subcommittee, as a precedent for this form of management, has demonstrated its effectiveness in the 6 months of its existence.

Section 7 of the bill provides for the establishment within the Department of Commerce of a National Oceanographic Records Center. The Subcommittee on Oceanography has recommended, and it is generally accepted in the scientific community as being more appropriate, that the National Oceanographic Data Center be established at the Hydrographic Office with joint policy guidance and financial support to be provided by the Navy, the Coast and Geodetic Survey, the Bureau of Commercial Fisheries, the National Science Foundation, and the Atomic Energy Commission. This permits the utilization of existing facilities, equipment, and personnel. The expansion of the present physical plant can be more rapidly accomplished and at considerably less expense than the establishment of a second installation.

It is recommended that provision be made for such joint policy guidance and financial support as is necessary to insure that all of the Federal requirements are fulfilled. This can be accomplished by revision of section 6 to provide for participation and financial support of a National Oceanographic Records Center by the Bureau of Commercial Fisheries, and revision of sections 8(a) and 8(b) to provide for similar support and participation by the Coast and Geodetic Survey.

The Navy's research program, TENOC, for 10 years in oceanography, is recognized as the cornerstone of the national program. TENOC is now being revised to include all phases of oceanography such as research, development, surveys, and long-range requirements for ship and facility construction. It, therefore, appears appropriate that the portion of section 14 relating to ship construction should be worded in general terms similar to the provision calling for the construction of new shore facilities. The Navy oceanographic shipbuilding program should be developed within Navy and approved by Congress as a portion of the Navy's total shipbuilding program in accordance with established procedures.

It is noted that the Department of Health, Education, and Welfare is not included in S. 2692. This Department is contributing to oceanography with studies of radioactivity in the oceans and could also participate in an educational program which is essential to train the manpower required for an expansion of the national effort in oceanography. Further legislative authority is not needed by this Department, we understand.

Pursuant to sections 426-426h of title 33 of the United States Code, the Department of the Army, through the Chief of Engineers and the Beach Erosion Board, has a primary interest in near-shore oceanography and the interaction between the oceans and the land (shore and near-shore bottom). In order that this interest may be given recognition, it is recommended that the following revisions be made in S. 2692:

In the fourth line of the title, add "and coastal" after "ocean".

On page 3, line 17, and page 8, line 16, after "buoys," add "instrumented marine towers, wave gages,".

On page 6, line 1, after "Standards," add "the United States Army Corps of Engineers (including the Beach Erosion Board),".

On page 7, line 13, after "Administration," add "the Beach Erosion Board of the United States Army Corps of Engineers,".

On page 28, insert the following new heading and new sections 15 and 16 and renumber present general section 15 as section 17:

"DEPARTMENT OF THE ARMY

"SEC. 15. The Secretary of the Army is authorized and directed, with such funds as may be appropriated or otherwise made available to him, to undertake a ten-year program of study and research by the United States Army Corps of Engineers, through the Beach Erosion Board, as part of the general program for the development of the marine sciences in the United States. In furtherance of the purposes of this Act, the Secretary is authorized and directed to carry out, in addition to programs now under way, the following activities relating to physical oceanography in the near-shore areas of the Atlantic and Pacific Oceans, the Gulf of Mexico, and the Great Lakes, which areas include the zone from the shore to the 50-fathom depth contour in the oceans and lakes, and bays and tidewaters connected therewith:

"a. Request and obtain cooperation from other Government agencies having an interest in the marine sciences and ocean surveys, and cooperate with educational institutions and laboratories devoted to the marine sciences and oceanography, and with other public and private organizations and persons who may be of assistance.

"b. Contract with qualified scientists, research laboratories, research organizations, or educational institutions to undertake basic and applied research studies and experiments in the laboratories and in coastal waters, in furtherance of the purposes of this section.

"c. Undertake in coastal waters studies of the action of waves, wave currents, tides, tidal currents, and large-scale ocean and littoral currents.

"d. Study and evaluate the interaction of the atmosphere, the sea, and the land as they affect the waves, currents, tides, surges, hydrographic contours, and hydrographic changes in the coastal zone.

"e. Establish observation stations in coastal waters to determine the short-term, seasonal, and yearly changes in waves, currents, and hydrography in the area surrounding the station.

"f. Develop, construct, or acquire instruments and equipment for the furtherance of the program of studies authorized in this Section.

"g. Determine the sources of the bottom materials in the coastal area, the rates and methods of movement of these materials, and the effects on the coastal hydrography of changes in the rate at which these materials reach the coastal zone.

"h. Study the mechanics and effects of density currents encountered in the coastal area on the current velocities, current patterns, hydrography, interchange of waters, and rates of sedimentation.

"SEC. 16. In order to carry out the policies of this Act and of S. Res. 136, 86th Congress, and to provide for the participation of the Department of the Army, including either or both military or civil functions activities, in the general program for the development of marine sciences in the United States, there is hereby authorized to be appropriated to the Department of the Army, during the ten-year period beginning July 1 of the first fiscal year following approval of this Act, the following sums, not to exceed \$2,000,000 per annum:

"a. Such sums as are necessary for the investigations and activities described in section 15 relating to investigations in physical oceanography in the near-shore zone.

"b. Such sums as are necessary to purchase, develop, or acquire and operate the scientific equipment required for investigations in physical oceanography in the near-shore zone, including but not limited to amphibious craft, floating craft, fixed platforms, buoys, current meters, wave meters, tide gages, sound equipment, direct density measuring equipment, turbulence meters, underwater cameras, and underwater television equipment, and other instruments and laboratory equipment for oceanographic research in the near-shore zone.

"c. Such sums as are required for expansion and equipping of shore facilities as are necessary to support the program of investigations in physical oceanography in the near-shore zone.

"d. Such sums as are necessary to provide funds for contracts with qualified scientists, research laboratories, research organizations, or educational institutions to make investigations into physical oceanography in the near-shore zone."

In addition to the foregoing, it is recommended that the following specific changes be made in S. 2692:

Page 3, line 4, after the word "research" insert "and marine surveys". This is suggested as being more descriptive of the provisions of S. 2692.

Page 3, line 6, change lines 6 and 7 to read, "the National Academy of Sciences-National Research Council. This program should include, but not be limited to the—".

Page 3, lines 11-13, substitute: "modernization of existing and construction of new Government and civilian laboratory and shore facilities adequate to service and supplement the research and survey fleets;". This is suggested to permit flexibility in the utilization of existing facilities.

Page 3, lines 15 and 16, change to read: "research tools, devices, instruments, and techniques which may include but not be limited to bathyscaphs and other manned".

Page 3, line 25, change to read: "among undergraduate students of mathematics, physics, engineering, chemistry,".

Page 4, line 22: It is recommended that the Federal Council for Science and Technology establish the interagency mechanism for management of the national program in oceanography vice the establishment of a division within the National Science Foundation for this purpose. The functions of this management mechanism should be similar to the duties and responsibilities outlined for the Division of Marine Sciences in S. 2692.

Page 10, line 16, change to read:

"(g) Request and obtain cooperation from and cooperate with other gov-".

Page 12, line 13, change to read: "or procuring facilities for such studies which may include but not".

Page 14, paragraph (b): It is recommended that this paragraph be deleted and that formal recognition and support be given the Hydrographic Office as the National Oceanographic Records Center by revision of sections 13 and 14. It is further recommended that provisions be made for such joint policy guidance and financial support as is necessary to insure that all of the Federal requirements are fulfilled.

Page 16, line 6, change to read: "oceangoing scientific ships, with preference given to such agencies and".

Page 22, line 13, substitute "basic" for "basis".

Page 22, line 20: To provide greater flexibility and to be consistent with the general authority of the Office of Naval Research, the following is suggested as a substitute for lines 20-22: "Provide funds by contract or otherwise to scientists, Government and non-Government research laboratories or institutions in furtherance of the purposes of this Act, such funds to be used for basic and applied research, the purchase of equipment,".

Page 23, line 3, following "basic" insert "and applied". This suggestion is offered as being descriptive of existing authority.

Page 23, lines 12 and 13, following "laboratories" substitute "and provide related instruments and equipment to support effectively the expanded program of basic and applied oceanographic research and hydrographic". This suggestion is for completeness and accuracy.

Page 23, lines 17 and 18, change to read: "vehicles for ocean research and exploration, which may include but not be limited to bathyscaphs and other manned submersibles,".

Page 24, lines 3 and 4, change to read: "(e) Continue and expand the Navy's support of marine studies substantially as proposed in



project TENOC or the Navy's revised long-range oceanography program".

Pages 24 and 25, paragraphs (h) and (i). As a positive means of implementing the authority contained in these provisions, it is recommended that section 13 of S. 2692 include a provision to amend section 7394, title 10, United States Code, by adding: "The Secretary of the Navy is authorized to furnish maps, charts, and other publications and products of scientific value of the Hydrographic Office without charge to educational institutions, laboratories, and other public and private organizations and persons when it is determined that to furnish such information is in the national interest."

Existing statutes are adequate to cover the furnishing of such information to commercial interests but they are construed as making impossible the free distribution of material of scientific value.

Page 25, line 7, change to read: "(i) Request and obtain cooperation from and cooperate with other govern-".

Page 26, lines 1-20: It is recommended that the portion of this section relating to ship construction be worded in general terms similar to line 5, page 27, for the construction of new shore facilities.

Page 27, line 5: Change to read: "for modernization, improvement, and expansion of existing shore facilities for basic research and for construction of new shore facilities for basic".

Page 27, line 8: Change to read: "for modernization, improvement, and expansion of existing shore facilities for survey work and for construction of new shore facilities for survey".

Page 27, line 10: It is recommended that the following substitution be made for the present language beginning on line 10 and extending through line 21. The substitution is offered for consistency with authority granted elsewhere in S. 2692 and in some instances reflects instrumentation already in use or in research and development stages under the cognizance of the Department of the Navy: "for engineering needs for ocean exploration and research which may include bathyscaphs and other manned submersibles to be used for research, wave measuring equipment, systems engineering for reduction of data, manned and unmanned buoys for automatic continuous oceanographic recording, ice breakers and submarines modified or converted for scientific use, vessel positioning system, acoustical equipment and telemetering devices, current meters, measuring devices for direct density, turbulence and radioactivity, and underwater television, seismic equipment, automatic continuous biological sampling devices, precision salinometers, precision echo sounders, towed temperature recorders, magnetometers, and other instruments and laboratory equipment for oceanographic research; and".

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

The Department of the Navy has been advised by the Bureau of the Budget that there is no objection to the submission of this report on S. 2692 to the Congress.

Sincerely yours,

F. A. BANTZ,  
*Under Secretary of the Navy*  
(For the Secretary of the Navy).

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE,  
May 17, 1960.

HON. WARREN G. MAGNUSON,  
*Chairman, Committee on Interstate and Foreign Commerce,  
U.S. Senate, Washington, D.C.*

DEAR MR. CHAIRMAN: This letter is in response to your request for a report on S. 2692, a bill to advance the marine sciences, to establish a comprehensive 10-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 materials in marine environments; to enhance the general welfare; and for other purposes.

The bill seeks to carry out the policy expressed in Senate Resolution 136, agreed to on July 15, 1959, which, inter alia, commended to the President and to interested agencies the report of the Committee on Oceanography of the National Academy of Sciences-National Research Council, and concurred in a number of recommendations of that Committee which would result in the expansion of basic and applied oceanographic research (in part through the construction of shore facilities), the training of additional oceanographic scientists, the conduct of certain ocean surveys, a revamping and expansion of the Nation's oceanographic research fleet, an investigation of the effects of radioactivity in oceans, and numerous related programs.

With respect to the desirability of the bill as a whole, we defer to the views of the departments and agencies most closely affected by it. The following discussion concerns itself only with those portions of the bill that most closely affect the program interests of this Department.

Section 4(f) of the bill would authorize an appropriation of \$3 million to the National Science Foundation for a 10-year program of fellowships for graduate students training to become professional oceanographers.

It should be noted that, under title IV of the National Defense Education Act of 1958, the Commissioner of Education is authorized to award 1,000 fellowships during fiscal year 1959, and 1,500 during each of the 3 succeeding years. These fellowships can be awarded for graduate study in any field for periods of study not in excess of 3 academic years.

The National Science Foundation has at present two fellowship programs for graduate students—predoctoral fellowships and cooperative graduate fellowships. The program of predoctoral fellowships is designed to offer support to unusually able students to enable them to complete their graduate studies with the least possible delay. The cooperative graduate fellowship program differs from the predoctoral fellowship program in that institutions would, in effect, receive funds for fellowship support for individual graduate students of science, mathematics, and engineering whom they have recommended. The Foundation has offered from fiscal year 1959 funds, about 1,000 fellowships under each of these two programs.

The Foundation has broad authority to initiate and support basic scientific research and programs to strengthen scientific research potential. It can now award fellowships for oceanography as part of its broad programs for granting fellowships in a variety of fields to

individuals possessing the greatest scientific talent. Moreover, the Foundation can use its authority to make grants in support of basic scientific research to give additional impetus to the development of those sciences, such as oceanography, for which there is a critical need.

From the standpoint of our own program interests, we believe that it is generally more advisable to support graduate study on a broad base than to emphasize the support of a single field. We understand, however, that the National Science Foundation, in recognition of the need for increased attention to the support of research in oceanography, has added a full-time oceanographer to its program on earth sciences, and has taken other measures to foster oceanographic research and the training of research workers. However, with respect to the Foundation, the bill would not provide the Foundation with legislative authority beyond that which it already possesses.

Section 9 of the bill would direct the Secretary "to undertake a ten-year program of obtaining new faculty in oceanography and marine sciences \* \* \*," and in furtherance of the purposes of the bill would authorize him to "provide assistance through the Office of Education in the form of teacher salaries and equipment."

With respect to the fellowship program under title IV of the National Defense Education Act of 1958, mentioned previously, the award of a fellowship may be made only for study in a graduate program that, in the acceptance for persons for study, gives preference to students interested in teaching in institutions of higher education. As with graduate study, the role of this Department should be one of encouraging and assisting institutions of higher education to expand and improve their capacity for training teachers in all fields rather than one of promoting the teaching of a single specialty. However, teacher training in the sciences is supported by the National Science Foundation through grants to educational institutions to conduct institutes to assist elementary, secondary, and undergraduate teachers to improve their knowledge of science. We understand that, through this program, grant funds have been made available for institutes to train teachers in fields related to oceanography, as well as for other specialized institutes.

Section 2 of the bill, entitled "Declaration of Policy," declares that "a coordinated, long-range program of oceanographic research requires establishment of a Division of Marine Sciences in the National Science Foundation \* \* \* which Division shall \* \* \* cooperate with", inter alia, 11 named Federal agencies" and other Government agencies dealing with problems related to the seas". Section 3(b) would establish such a Division, providing that it "shall include among its membership a representative from the Office of Naval Research, the Hydrographic Office, the Coast and Geodetic Survey, the Bureau of Commercial Fisheries, the Atomic Energy Commission, [and] the Maritime Administration \* \* \*", 6 of the 11 Government agencies that are mentioned under section 2.

With respect to the desirability of creating such a Division, we defer to the National Science Foundation. However, if these sections are to be retained, we believe that section 3(b) should be amended to include the Public Health Service as a member of the Division, and that section 2 of the bill be amended to make specific reference to the Service.

The Public Health Service interest in oceanography is broadly fourfold:

1. The importance of the vast estuarine and inshore ocean waters and areas as a future major resource for municipal, industrial, and recreational water supplies.

2. The use of estuarine and inshore ocean waters as the final place of disposal for municipal and industrial wastes of rapidly increasing complexity and amounts, and the effects thereon.

3. The use of selected areas in the open ocean for the disposal of radioactive wastes, and the berthing of nuclear-powered ships in estuarine and inshore ocean waters.

4. The use of the ocean fishery resources as it relates to the health of the people of the United States, and the health of the populations in the underdeveloped countries of the world that this Nation is aiding.

The Public Health Service participates in oceanographic studies through the following mechanisms:

1. Consultation and technical services to the U.S. Army Corps of Engineers on a reimbursable basis on problems relating to pollution of inshore and estuarine waters from municipal and industrial wastes.

2. Consultation and technical services to the Atomic Energy Commission and the Maritime Administration on a reimbursable basis to develop optimized harbor and estuarine surveillance procedures for radioactive contamination and research on radioactivity in estuarine and marine waters.

3. Consultation to State water pollution control agencies on specific problems of potential radiation contamination and chemical pollution of estuarine and onshore ocean waters; also, problems involving disposal of municipal and industrial wastes.

4. Close working relationships with the Scripps Institution of Oceanography, Woods Hole Oceanographic Institution, Chesapeake Bay Institute, and other oceanographic research institutions on problems relating to pollution.

5. Membership on the interdepartmental coordinating Committee on Oceanography.

6. Research grants supporting oceanographic research in the amount of \$120,000 for the fiscal year 1960.

On August 22 the President directed that the Department of Health, Education, and Welfare "intensify its radiological health efforts and have primary responsibility within the executive branch for the collation, analysis, and interpretation of data on environmental radiation levels \* \* \* so that the Secretary \* \* \* may advise the President and the general public."

In order to carry out this directive, the Department has directed that Public Health Service assume responsibility, inter alia, for the operation of monitoring and sampling networks to determined the degree of radioactivity present in water, and for the development of recommendations pertaining to acceptable levels of exposure to radioactivity from water.

In view of these responsibilities, we believe that the Department, through the Public Health Service, is capable of making a considerable contribution to any expanded program of oceanographic research.

The Bureau of the Budget advises that it perceives no objection to the submission of this report to your committee.

Sincerely yours,

BERTHA S. ADKINS, *Acting Secretary.*

COMPTROLLER GENERAL OF THE UNITED STATES,  
*Washington, November 17, 1959.*

HON. WARREN G. MAGNUSON,  
*Chairman, Committee on Interstate and Foreign Commerce,  
U.S. Senate.*

DEAR MR. CHAIRMAN: Further reference is made to your letter dated September 17, 1959, acknowledged on September 21, requesting the comments of the General Accounting Office concerning S. 2692, 86th Congress, 1st session, entitled "A bill to advance the marine sciences, to establish a comprehensive 10-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 materials in marine environments; to enhance the general welfare; and for other purposes."

In the consideration of the bill, we recommend the following corrections and clarifications:

The reference in line 5, page 15, to "the preceding item (a)" apparently was intended to read "the preceding item (c)."

Section 7(f) directs the Maritime Administration to construct ships of designated tonnage. However, section 8 does not authorize any additional appropriation to the Administration for this purpose. If it is intended that other funds are to be used for this purpose, it is recommended that the bill so state. Also, it is not clear whether the ships required to be constructed by section 7(f) are in addition to ships authorized to be constructed by other sections of the bill.

Section 8(d) does not place any limitation on the cost of operating new Coast and Geodetic Survey ships, while an annual limitation is imposed on the Bureau of Commercial Fisheries by section 6(b) and on the Navy by section 14. We do not know whether this was an oversight or was intentional.

The last sentence of section 10 states "Appropriations authorized in this section shall be in addition to other appropriations provided for such Department or Office to carry out its duties under law." However, we are unable to ascertain where any appropriation has been authorized in such section.

We also recommend that a general provision be included in the bill to the effect that all agreements for grants in excess of a specified amount; e.g., \$50,000, contain a provision that the Comptroller General of the United States or his duly authorized representatives shall have the right to examine any directly pertinent books, documents, papers, and records, of the grantee relating to the purpose of the grant, for a period of 3 years after the last payment under the grant.

We recognize that the question whether legislation of this type is necessary is strictly a matter of policy for determination of the Congress, on which we express no opinion. However, we would suggest that the matters hereinabove set forth be given serious consideration by your committee in its deliberations on the bill.

Sincerely yours,

JOSEPH CAMPBELL,  
*Comptroller General of the United States.*

U.S. DEPARTMENT OF THE INTERIOR,  
OFFICE OF THE SECRETARY,  
*Washington, D.C., May 16, 1960.*

HON. WARREN G. MAGNUSON,  
*Chairman, Committee on Interstate and Foreign Commerce,  
U.S. Senate, Washington, D.C.*

DEAR SENATOR MAGNUSON: Your committee has requested a report on S. 2692, a bill to advance the marine sciences, to establish a comprehensive 10-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 materials in marine environments; to enhance the general welfare; and for other purposes.

We are now actively engaged in carrying out certain types of oceanographic research. Therefore, while the Department of the Interior concurs in the objectives of this bill, we now have authority to carry on oceanographic research and do not believe the enactment of S. 2692 is necessary at this time.

S. 2692 is designed to implement the recommendations of the National Academy of Sciences for increased research in oceanography, as defined in their report "Oceanography 1960 to 1970." That report outlines a proposed national program in this field.

A generally recognized need for more knowledge about the oceans and aquatic resources has received much attention within and outside the Government. The National Academy of Sciences in preparing its report, obtained the advice of the Nation's experts on the marine sciences. Their report indicates that the Nation would benefit if oceanographic research is expanded over the next 10 years. We concur in this opinion. In addition to the prospective benefits to navigation, national defense, and atomic energy development, improvements in the supply, quality, harvesting and use of seafoods and sea resources, improved sport fishing and recreational use of the ocean will result from such expanded research.

We believe it will be of interest to note that the program of research recommended by the National Academy of Sciences was submitted initially for examination and study to the Federal Council for Science and Technology that was established by the President. That Council appointed a special subcommittee to evaluate the proposal. This subcommittee recommended adoption of the program suggested by the National Academy of Sciences with certain modifications that were considered to be administratively and operationally feasible. The revised program has been adopted by the various governmental departments, as reflected by their individual programs and budgets for the fiscal year 1961.

This Department, as a result of the program recommended by the Federal Council for Science and Technology, now has an item of \$2,055,000 for the construction of an oceanographic research vessel in its fiscal year 1961 budget for the Bureau of Commercial Fisheries. That Bureau for some time has been actively engaged in research in the field of oceanography. Similarly, the Geological Survey of this Department is stepping up its activities in this field, as indicated by the fact that there has been a 50-percent increase, from \$400,000 to \$600,000 for this kind of research. The Bureau of Sport Fisheries

and Wildlife, and the Bureau of Mines of this Department also have important interests in this field. This Department has made significant contributions to the marine sciences and has a nucleus of scientific competence and facilities that forms a sound basis for further contributions that we expect to make to this important national program.

In our opinion, an important research program, in order to produce desirable results, should be as flexible and unrestricted as possible. This will permit such research to seek its logical conclusion and to be conducted without undue restrictions upon its operations and fiscal needs, which cannot be forecast accurately in advance.

If favorable consideration is given to enactment of this bill, this Department suggests the following amendments:

(1) Page 2, lines 10 and 11, strike out "rehabilitation of our commercial fisheries and utilization of", and insert in lieu thereof "conservation and utilization of fishery and".

This amendment is desirable, in our opinion, in order to permit consideration of marine sport fishery resources in connection with this program. The problems of managing the renewable resources, upon which both sport and commercial fisheries depend, are inseparable.

(2) Page 3, line 4, strike out "or identical".

(3) Page 5, line 22, after the word "Fisheries," insert "the Bureau of Sport Fisheries and Wildlife, the Bureau of Mines,".

This amendment would have the effect of including in this particular provision all of the Bureaus of this Department that are particularly interested in oceanography.

(4) Page 7, line 12, strike out the words "Bureau of Commercial Fisheries," and insert in lieu thereof "Department of the Interior,".

The foregoing amendment is desirable in order to give appropriate representation to all phases of our activities including those of the Bureau of Commercial Fisheries, the Bureau of Sport Fisheries and Wildlife, the Geological Survey, and the Bureau of Mines.

(5) Page 9, lines 5 and 6, strike out the words "Bureau of Mines and Bureau of Commercial Fisheries,".

This amendment is desirable in order to make clear that the appropriate agencies of this Department are within the scope of this authorization.

(6) Page 10, revise lines 22 and 23 to read as follows:

"(h) Determine, wherever necessary to carry out the purposes of this Act and without regard to previous statutory limitations, the reserves of metals of industrial, commercial or monetary value and".

This is a clarifying amendment designed to resolve any question that might arise concerning the extent of our research authority in this field.

(7) Page 11, lines 12 and 13, strike out the words "Bureau of Mines and the Bureau of Commercial Fisheries,".

This amendment is desirable for the reasons cited under our recommended amendment number 4.

(8) Page 11, beginning with the colon on line 25, strike out the proviso which begins on that line and which ends with "annum" on page 12, line 3.

We recommend this amendment because of the fact that funds needed to operate our research ships are requested and obtained in

accordance with established budgetary procedures. The proposed imposition by this bill of a fixed limitation for operating costs may very well prove to be unrealistic and unduly restrictive of the basic purpose of this proposed legislation in carrying out an effective research program. Two million dollars annually are needed at present for operation of our existing fishery research vessels. According to our present plans, some of these vessels will be replaced by new vessels. These new vessels will require approximately \$3.4 million per annum for operating expenses. Upon acquisition of the new vessels, our total annual operating costs of these vessels in the future probably will be no less than \$5,400,000.

(9) Page 12, line 23, beginning with the word "north" strike out the language of the bill up to and including the word "Lakes" on page 13, line 2.

This amendment is desirable, in our opinion, because the language in question, by referring to fisheries resources north of 15° north latitude, implies a restriction, which perhaps is not intended and which we believe is undesirable, concerning studies in the southern half of the Caribbean and in the Pacific south of Honduras.

(10) Page 13, line 10, strike out the word "braking" and substitute in lieu thereof the word "brackish".

(11) Page 13, line 11, strike out "transportations" and insert in lieu thereof "transplantation".

(12) Page 13, line 13, strike out "studies by the Bureau of Commercial Fisheries of the", and insert in lieu thereof "studies pursuant to this Act by the".

While this amendment is desirable for purposes of clarification as indicated under proposed amendment number 7, we feel that such expenditures should be governed by established budgetary procedures without specific monetary limitation in view of the impracticability of forecasting accurately future needs for expenditures of this kind.

(13) Page 13, line 19, strike out the colon after the word "products" and substitute in lieu thereof a period. Also, strike out the proviso that begins on line 19 and ends on line 2 of page 14, and substitute in lieu of such proviso the following new subsection:

"(f) In carrying out the provisions of this Act, the Secretary of the Interior may cooperate with existing institutions pursuant to agreements and by the issuance of grants to said institutions for continuing studies of matters relating to fisheries and for the investigation of mineral deposits on the ocean floor and mineral resources in the sea."

In view of the authority contained in subsection (a) of section 5, we believe the proviso that would be eliminated from the bill by this amendment is unnecessary. The proposed substitute language is desirable in the interest of clarification and in order to facilitate carrying out the prescribed functions by this Department.

Because this proposed program of oceanography necessarily must be a flexible program, as we have suggested previously, the probably future cost of such program will necessarily depend upon the progress and the direction taken by the program as it develops. In the case of the Geological Survey of this Department, our present expenditures for this work aggregate some \$600,000 annually. It is likely, of course, that these expenditures will be increased in an undetermined amount as the program develops. Similarly, we anticipate additional future expenditures for the work to be conducted by the Bureau of Mines in



this field; however, the probably extent of such expenditures also will depend upon future developments.

If authorized as contemplated by this bill the proposed 10-year program relating to commercial fisheries could result in costs as follows: Forty-four million dollars in capital expenditures, \$60 million in salaries, and \$45 million in operating expenses over the 10-year period. The \$60 million for salaries would provide an estimated 550 to 600 man-years of employment per year, or 5,500 to 6,000 man-years in 10 years. While our oceanography research, as it applies to marine species of sport fish, will be conducted in harmony with our oceanography research generally, it will be carried out pursuant to and with funds obtained in accordance with a previous enactment, the act of September 22, 1959 (73 Stat. 642).

We have been advised by the Bureau of the Budget that there is no objection to the submission of this report to your committee.

Sincerely yours,

ELMER F. BENNETT,  
*Under Secretary of the Interior.*

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NATIONAL SCIENCE FOUNDATION,  
OFFICE OF THE DIRECTOR,  
*Washington, D.C., March 8, 1960.*

HON. WARREN G. MAGNUSON,  
*Chairman, Committee on Interstate and Foreign Commerce*  
*U.S. Senate, Washington, D.C.*

MY DEAR SENATOR MAGNUSON: This is in response to your request for the comments of the National Science Foundation with respect to S. 2692, relating to oceanography and the marine sciences.

We consider the objectives of S. 2692 to be extremely worthwhile. The recommendations of the Committee on Oceanography of the National Academy of Sciences-National Research Council, referred to in the bill's declaration of policy, have been given careful consideration by the various Government agencies concerned, and, in general, the objectives of the committee's report are considered worthy of endorsement. Proposed future activities of the National Science Foundation with respect to support of oceanographic research and the provision of facilities for such research coincide closely in many respects to the committee's report.

We are pleased to see the interest of the Congress in these matters which, of course, are important to the progress of oceanographic research. It would appear, however, that much of the authority contained in this bill is already provided for in the basic legislation of the various Federal agencies concerned. With respect to the National Science Foundation, the bill would not provide any additional legislative authority. Furthermore, the Foundation is engaged in the support of significant activities aimed at improving research and training in oceanography. For these reasons, we do not favor enactment of S. 2692. We would like to point out, however, that, while we believe that additional legislation is not necessary it is important that certain areas of science which appear to require urgent assistance in the national interest, be supported more intensively. In recognition of the need for increased attention to the support of research in oceanography, we have added to our earth sciences program

a full-time oceanographer. We are also encouraging the submission of proposals to the Foundation which will provide not only for the carrying on of research in the field of oceanography, but which also have a strong emphasis on the training of research workers in the field. Furthermore, the Foundation will consider support for programs of basic research covering a broad area or subarea of science within which support may be provided for graduate thesis research in such areas or subareas. In the field of oceanography this type of research support would appear to be particularly appropriate. These and other methods being utilized by the Foundation in providing support for oceanographic research and training are discussed in greater detail in subsequent portions of the letter.

Our specific comments with respect to the bill are set forth below.

First, we note that subsection 4, appearing on pages 3 and 4 of the bill, proposes that the National Science Foundation, or other appropriate agency of the Federal Government, establish a long-term fellowship program for the recruitment of prospective oceanographers. Establishment of specialized fellowship programs for particular areas of science would tend to lessen the high-quality standards and the recognition which National Science Foundation fellowships now have. Furthermore, we believe that sufficient fellowship aid for high quality students is available through various sources so as to enable financial assistance to be provided to persons interested in entering the field of oceanography. The problem is not so much that of making more fellowships available as it is of stimulating students to take an interest in becoming oceanographers. While the various disciplines that go to make up oceanography are referred to in our fellowship literature, it is planned, in the announcement of fellowship programs to operate in fiscal year 1961, to also specifically mention oceanography and meteorology as examples of areas, among others, in which fellowship support from the Foundation will be available to qualified persons.

Let us assure you that the National Science Foundation realizes the importance and need of increased support of teaching and research requirements in the field of oceanography. We are studying possible additional measures for the support of faculty and graduate students in existing or new departments at universities, covering critical areas of science, including oceanography. The objective here would include support, extending into the future as far as possible, of the research of faculty members who are engaged in such fields. As we are sure you recognize, such forms of support must be worked out carefully in terms of Government-university relationships in general, and especially with respect to considerations of balance and judicial treatment as among university departments and as among the various fields of science as noted above.

S. 2692 further proposes that there be established in the National Science Foundation a Division of Marine Sciences to develop and encourage a continuing national policy and program for the promotion of oceanographic research, surveys, and education in the marine sciences, to recommend contracts, grants, loans, or other forms of assistance for the development and operation of a comprehensive national program of oceanographic research and education in the marine sciences and to engage in other activities in the field. Oceanography includes, or is related to, many fields of science and thrives best in intimate contact with various scientific disciplines. We believe it more appropriate that marine biology, for example, remain

associated with activities in the area of biological and medical sciences and that physical oceanography continue to be associated with the earth sciences. However, as we mentioned earlier, we have added a full-time oceanographer to our staff. We do not feel that the activities contemplated for the proposed Division of Marine Sciences necessitate the establishment of such a Division but can more appropriately be carried out within the framework of the Foundation's existing organizational structure.

Section 4 of the bill would authorize appropriations, in addition to those otherwise authorized for the activities of the National Science Foundation, to provide funds for use in connection with specified oceanographic research activities. It appears to us that considerable care must be exercised so as to avoid creation of a general view that the provision of substantial additional sums for particular areas of science will automatically greatly improve the research situation with respect to such areas. In the case of oceanography, while additional sums are being requested by various Federal agencies, the major problem is to obtain a sufficient number of well-qualified people able to utilize such additional funds in ways which will be of substantial benefit to oceanographic research. We believe that, in view of the particular interest which has been focused on the field of oceanography, more persons will become interested in entering the field. However, until a considerable number of additional persons are trained to do high-quality scientific research in oceanography the provision of large sums for the support of oceanographic research will not of itself improve the research situation in the field. This is not to say that additional sums are not desirable but merely to provide a word of caution as to the ability of available oceanographers to utilize greatly increased amounts of research money in a useful manner. The National Science Foundation and other Federal agencies are seeking funds of a magnitude which they believe can presently appropriately be utilized for oceanographic research taking into account, of course, needs in other areas of science.

Subsection (b) of section 7 of this bill would establish within the Department of Commerce a National Oceanographic Records Center which would collect data on oceanography and disseminate it for public use. The desirability of such a center, and its location, if one is to be established, are currently under study within the executive branch and we believe it advisable to await these recommendations before any action is taken in this regard.

In connection with subsection (c) of section 7, we would like to point out that for the Coast and Geodetic Survey to operate beyond the limits of the Continental Shelf a change in its basic authority will be necessary. H.R. 3450, introduced in the 1st session of the 86th Congress, would provide such authority to the Survey.

Subsection (f) of section 7 would require the Maritime Administration to construct oceanographic research vessels to be made available to nonprofit research centers, to other agencies of the Federal Government, or to State institutions engaged in oceanographic research requiring oceangoing ships. We feel that it would be preferable if the Federal agencies concerned with oceanographic research budgeted for such ships when and as they are needed, either for their own use or for use by private institutions. We believe that more appropriate roles for the Maritime Administration in this connection would be to (1) serve as adviser on design studies, (2) undertake construction on

the basis of a transfer of funds from the agency concerned or (3) finance and undertake research and development for oceanographic ships of unusual or novel design on request of user agencies. Such an approach, we believe, would provide greater flexibility and yet permit utilization of the valuable services of the Maritime Administration in connection with the ship construction.

Section 9 of the bill would authorize the Secretary of Health, Education, and Welfare, through the Office of Education, to provide assistance, in the form of teachers' salaries and equipment, designed to obtain new faculty in oceanography and the marine sciences. Title IV of the National Defense Education Act authorizes the provision of funds by the Department of Health, Education, and Welfare which may be used by colleges and universities for faculty and equipment related to new or expanded fellowship programs undertaken by such institutions. It would appear that the combined authority existing in the National Science Foundation Act of 1950 and in title IV of the National Defense Education Act is fully adequate for the undertaking by executive agencies of providing all of the forms of support contemplated by section 9 of the bill.

With respect to section 11 of the bill, authorizing the Atomic Energy Commission to conduct an intensive 10-year program of control and monitoring of radioactive waste disposal and studies relating to the effects of radioactivity on the marine environment, we understand that the Commission is presently engaged in activities in this area. In addition, we would like to point out that, on August 14, 1959, President Eisenhower issued Executive Order 10831, establishing the Federal Radiation Council to advise him with respect to radiation standards and the provision of guidance to executive agencies for their use in developing operating rules and regulations for radiological health protection. This Council was given a statutory base by Public Law 86-373, approved September 23, 1959. It appears, therefore, that enactment of section 11 of the bill may be unnecessary.

Finally section 13(f) of S. 2692 would authorize and direct the Secretary of the Navy to establish, with the National Science Foundation, or the National Academy of Sciences-National Research Council, a program of scholarships beginning at the senior level in undergraduate school and carrying through 4 years of graduate training and research in the marine sciences. Earlier in this letter we discussed the matter of providing special fellowships in the field of oceanography. With respect to undergraduate scholarships, it is our view that well qualified students in the various scientific fields are able to obtain financial assistance as needed and desired. We find substantial evidence that, with the scholarships presently available, students in at least the upper 10 percent of the classes graduating from the secondary schools, and planning to pursue studies in science, engineering, and mathematics, are generally able to obtain scholarship assistance if needed. Other financial assistance such as loans, is also available to them and to others with not so high an academic standing. Furthermore, it is our general view with respect to scholarship legislation, that, while science and engineering are exerting an increasing influence on our national life, a share of the highly talented youth should be available to other fields of endeavor. Therefore, if undergraduate scholarship legislation were enacted we firmly believe that such a program should not be limited to a particular field of science or even to science and engineering generally.

There are four programs of the National Science Foundation that are of special interest in connection with motivating more young persons to undertake scientific careers. One of these is the program that we refer to as the undergraduate research participation program. In this activity the National Science Foundation provides grants which enable participating universities to offer special research-oriented training opportunities for undergraduates during the summer months and in some cases throughout the academic year. These training programs may be carried out on a university campus, at a field station, or at some other appropriate location. This program provides research opportunities, including financial assistance, which make it possible for undergraduates to work in close contact with scientists who are doing significant research. As it applies to the problem of increasing the number of students studying oceanography, the undergraduate research participation program offers the possibility of presenting to highly selected undergraduate students some of the specific techniques of research in oceanography. It is certain that this type of program can have the effect of exciting the interest of undergraduate students and turning their minds in the direction of graduate study in oceanography and, therefore careers in this field. We are endeavoring to stimulate such activities in the field of oceanography during the coming year and stand ready to offer necessary support for them.

At a lower academic level, the National Science Foundation program of secondary school student training programs provides a variety of mechanisms by means of which carefully selected high school students can be shown the challenges of a particular scientific field and be given an explanation of the type of work that is actually carried out in that field. This past summer, for example, the American Meteorological Society sponsored a program along exactly these lines in an effort to arouse interest on the part of a selected group of high school students in possible careers in meteorology. Similar programs in oceanography could arouse the interest of a number of high school students and the Foundation is encouraging proposals for establishing and carrying out such programs.

College teachers in the various fields relevant to oceanography need to know more about oceanography so that they can broaden the outlook of their students. Summer institutes and conferences in oceanography, designed to meet the needs of these college teachers, could become an important phase of the effort to give oceanography a fuller degree of recognition, and college students a better idea of the rewards of careers in the field. We are presently attempting to stimulate interest in such activities in the field of oceanography and, here also, are prepared to provide necessary support.

The last of the National Science Foundation science education activities I shall mention is our program of visiting scientists. This program makes it possible for outstanding scientists to visit college campuses—and, to a limited extent, high schools, also—throughout the country, where they present to the students some of the latest findings in the visiting scientists fields. Thus far the Foundation has supported programs in a number of fields, and experience has shown that this program is a powerful mechanism for stimulating undergraduate students to take an interest in graduate study and to think in terms of graduate study in the field of the visiting scientist. As a mechanism for bringing additional students into oceanography,

therefore, this is a particularly useful possibility, and one of which we are encouraging oceanographers to make use.

The programs I have been discussing are all classified under the "Education in the Sciences" heading. The research-supporting operations of the National Science Foundation are also of major importance in connection with this problem. National Science Foundation research grants provide funds to enable individuals already trained in oceanography to carry out research in this field and in related areas of science. Grants made in support of oceanography (as in other fields) typically provide funds for the support of research assistants as do awards from other agencies supporting oceanographic research. The term "research assistants" is used to mean graduate students who are supported as a part of a research grant, either for a specific project or for a broad area of science. In many instances these students work on their dissertation problems in connection with a research grant which has been supported through the National Science Foundation's basic research program. With the additional funds being made available to the Foundation for the support of basic research in this area more support will go into projects related to oceanography and, therefore, additional support will be provided for the training of graduate students in oceanography.

Another mechanism to which I referred briefly earlier in this letter is that of broad research grants in the area of oceanography to institutions having highly competent staffs and programs in the field of oceanography. Funds thus provided can be used for young scientists who, entering as graduate students in oceanography, participate in the research of these groups. The caliber of the men carrying on the research would be a substantial factor in helping to secure the interest of first-rate students in careers in oceanography. As a further comment with respect to the role that research grants can play in attracting more able young scientists into careers in oceanography, I would also place high on the list the provision of adequate facilities. This includes, of course, suitable vessels for carrying on oceanographic research. Various Government agencies, including the National Science Foundation, have programs to assure the provision of more facilities of this nature.

The Foundation stands ready to assist in all of these ways discussed above, and I believe that an attack on the problem with the many devices at the command of the Government and universities should result in an important strengthening of work in this field.

In summary, the primary problems in the area of oceanographic research and training appear to be the following:

- (1) Motivation of more young persons to undertake careers in science and, at a later stage, to become interested in the field of oceanography. While financial assistance for highly capable persons interested in oceanography is, and should be, available, the problem is not primarily one of financial support, we believe, but more of encouraging oceanography as a career. As noted above, the National Science Foundation is undertaking efforts to achieve this objective.

- (2) Coordination of Federal and private activities with respect to stimulating research and training activities in oceanography. Federal agencies concerned with matters of oceanographic research and with the marine sciences are working closely with one

another and with non-Federal organizations to develop a comprehensive attack on the problem. In this connection, the Ford Foundation has recently announced the award of grants to several universities, designed to increase the number of advanced research scientists in the field of oceanography.

(3) Provision of funds to carry out needed programs in the field of oceanography and the marine sciences. The 1961 budget provides for substantial expansion of Federal support of oceanography through programs of the Foundation and a number of other agencies. We understand that total expenditures for oceanography exclusive of funds for certain military purposes will be \$56 million in 1961 as contrasted with \$38 million in 1960. As we mentioned earlier, care must be exercised, however, so as not to create too great an imbalance between oceanography and other areas of science. Another factor directly related to utilization of oceanographic research funds is that the number of oceanographers presently trained and capable of doing high quality research work is limited and until there is a significant increase in the number of such persons, additional funds alone will not achieve the desired result.

Thank you for giving us the opportunity to comment on the bill. The Bureau of the Budget has advised us it has no objection to the submission of this report.

Sincerely yours,

ALAN T. WATERMAN, *Director.*

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OFFICE OF THE SECRETARY OF THE TREASURY,  
*Washington, April 25, 1960.*

HON. WARREN G. MAGNUSON,  
*Chairman, Committee on Interstate and Foreign Commerce,  
U.S. Senate, Washington, D.C.*

MY DEAR MR. CHAIRMAN: Reference is made to your request for the views of this Department on S. 2692, to advance the marine sciences, to establish a comprehensive 10-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 materials in marine environments; to enhance the general welfare; and for other purposes.

The Department is not in a position to state whether new legislation is necessary to carry out the proposed program of oceanographic and marine research or whether it could be carried out by the departments and agencies specified in the bill under their existing authority. However, the Department would like to point out that the bill fails to recognize important interests that the Coast Guard has in many phases of the proposed research program. For example, the Coast Guard is charged with the enforcement of all applicable Federal laws upon the high seas and waters subject to the jurisdiction of the United States and the administration of a safety program upon these waters covering all matters not specifically delegated by law to another Federal agency (14 U.S.C. 2). The Coast Guard, in its management of the international ice patrol service, conducts oceanographic surveys of the ocean areas in the North Atlantic and collects

and disseminates ocean data (46 U.S.C. 738a(d)). Coast Guard vessels serving on ocean station duty collect and furnish limited oceanographic data to the U.S. Navy Hydrographic Office (14 U.S.C. 90). Icebreaking vessels are maintained and operated by the Coast Guard as one of its primary duties (14 U.S.C. 2, Executive Order No. 7521). The Coast Guard also has responsibility for regulating the carriage of explosives and other dangerous articles by vessels (46 U.S.C. 170).

Inasmuch as the Coast Guard already has authority to conduct programs in oceanography, it would not seek further authorization for these programs. However, should your committee take favorable action on this bill, the Department would suggest appropriate recognition of the oceanographic activities of the Coast Guard, along with those of other agencies.

The Department has been advised by the Bureau of the Budget that there is no objection to the submission of this report to your committee.

Very truly yours,

A. GILMORE FLUES,  
*Acting Secretary of the Treasury.*

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