Careers in Oceanography

by

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Sea Grant College Program
Texas A&M University
College Station, Texas  77843

TAMU-SG-79-608

March 1979

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Dr. Robert B. Abel
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This discussion is intended as a "do-all" response to the many young people who each year request advice concerning the possibilities of a future in oceanography. It will not help the desperate high school student whose "term paper is due tomorrow", nor will it be much help for the business firm which has decided to incorporate as an oceanographic venture. It is a brochure to answer questions and provide resources for information about the field. At the end of the booklet, the names and addresses of agencies, organizations and reference books mentioned in the text have been listed for people who would like additional information.

What Is An Oceanographer?

Ocean scientists study the physical, chemical, biological and geological properties of the sea. Working in, on, and near the water, they use their expertise to study the nature and processes of the ocean, the air-sea interface, the ocean bottom, and the interrelationships among the creatures that live in the ocean. Although they have a broad and thorough understanding of the total ocean picture, oceanographers usually have trained in or specialize in a single aspect of the marine environment.

Ocean engineers are people who make the ocean work and make things that work in the ocean. They may have specialties in civil, mechanical, chemical, industrial or agricultural engineering, and they contribute to the field by developing and constructing the equipment needed for every level of oceanographic work and study.

Being a chemist, physicist, geologist, biologist or engineer is not the only way a person can participate in oceanographic endeavors. Mathematicians have a place in many fields related to oceanography. Ocean technicians, who have skills and know techniques, assist the scientists and engineers. Ocean social scientists are concerned with the law-of-the-sea, economics of resource recovery, and the social and psychological factors concerning work around and under the water. The management, distribution, usage and protection of marine resources involve people whose backgrounds are in business, administration and marketing.
Collectively, these people contribute to the general welfare of society by discovering and improving ways to use the ocean as a source of food, drugs, minerals, transportation, waste disposal, defense, recreation and enjoyment.

A brochure, "Opportunities in Oceanography," which explains the kinds of work that oceanographers do, is available for $1.00 from the Smithsonian Institution. A more comprehensive package of materials may be obtained from the Marine Technology Society. There also are many text books which describe the information, tools and techniques which oceanographers use.

Where Does One Study Oceanography?

Thirty years ago when this was a nascent discipline, it was almost impossible to obtain a degree in oceanography or to study the subject anywhere. Now, more than 150 universities and colleges offer courses in this or closely allied fields, and about 20 universities offer advanced degrees specifically in oceanography. It does differ from other curricula, however, in that very few schools teach oceanography at the undergraduate level; exceptions include the University of Washington at Seattle and
Moody College at Galveston. The institutions which have programs in the field are listed in *University Curricula in the Marine Sciences and Related Fields*, which may be obtained from the U.S. Government Printing Office.

A student seriously interested in pursuing an ocean career must attend a college that is right for him or her, and the selection of a school depends on many factors pertinent to the student's interests, goals and intended education. These considerations might include: a university's emphasis on the various specialties within oceanography, such as fish taxonomy, marine geophysics, chemical analysis of sea water; special professors or other staff members at a given university; aspects relating to the location of the institution — geography, climate, proximity to the sea; facilities available at the school; and cost and financial support. It is wise to solicit opinions and information from a variety of sources before applying to favored schools. Personal or written contact with oceanographers at the institution or in the field usually will aid the prospective student in selecting a university conducive to his educational intentions.

Because it has become almost mandatory to have at least a master's degree, preferably a doctorate, most oceanographers enter the field after two to six years of graduate level study in oceanography or one of the related basic sciences. Ocean engineers traditionally have sought and found employment with only a bachelor's degree; however, more now are finding advanced degrees beneficial. Business administration students usually can enter commercial fields with a bachelor's degree.

Ocean technicians normally attain a bachelor's degree, although some are the products of two-year colleges where they have earned an associate degree in ocean technology. Technicians play important roles in all fields of oceanography, and some of their diverse job opportunities include operations at sea, instrument maintenance and repair, and data processing. The American Association of Junior Colleges has published a good reference booklet, "The Education and Training of Marine Technicians", which provides specific program information.
An obvious prerequisite to becoming an oceanographer is a basic enjoyment of science and the sea. A student should not consider the field simply because the work looks exciting or because he or she believes the employment opportunities will be abundant. For every student enrolled in oceanography or closely-related subjects in 1960, nearly 20 are enrolled today. Much of the work in oceanography is conducted or supported directly or indirectly by the United States government and therefore is dependent on fluctuations in the federal budget. The current trend does not foretell a strong upsurge in employment demand in the near future, except perhaps in the areas of energy and environmental protection.

On the other hand, students of oceanography may find many prospects for financial support of their education. The National Science Foundation annually publishes a list of scholarships and fellowships available from national sources, and universities often have their own program of awards. Some of these awards are competitive, and some are based on need. Graduate assistantships normally are available from the individual departments in which students are enrolled, however, one traditional means of graduate support, teaching undergraduate students, may be limited to those schools with undergraduate courses in oceanography. Once ensconced in a program, an advanced student may receive assistance through a research grant, by working with a professor on a particular scientific problem.

Marine science studies at pre-college levels have an important role, not in providing education in oceanography but in educating people to oceanography, since an early awareness of marine phenomena promotes a respectful attitude toward the ocean throughout life, regardless of profession. Many high schools have introduced occasional units of marine science within the general science curriculum, and a few advanced and energetic high school departments have obtained ships, equipment and laboratory facilities. Some elementary and secondary teachers have found creative and innovative ways to introduce marine concepts by using art, film, folklore and literature, as well as life science studies.
Who Hires Oceanographers?

About 40 percent of persons involved in marine science are employed by the U.S. government. An equal number teach and conduct research at academic institutions, and the remainder work in industry. Most government oceanographers are employed by the Departments of Commerce, Interior, and Defense; additional employment opportunities are offered through the National Science Foundation, Environmental Protection Agency, National Aeronautics and Space Administration, Smithsonian Institution, and the Departments of Transportation, Energy, and Health, Education and Welfare. The comprehensive report, "Federal Ocean Program", which is issued periodically by the Committee on Atmosphere and Oceans, describes programs and projects conducted or sponsored by each of the federal
agencies. It may be obtained free of charge from the National Oceanic and Atmospheric Administration.

Some universities retain their most promising graduate students to teach and to do research, although most encourage their students to transfer to industries, federal agencies or other institutions in order to spread ideas and techniques. The academic institutions which employ oceanographers are listed in *University Curricula in the Marine Sciences and Related Fields*, and an approximate idea of their staff sizes may be gained from the publication.

Very few private companies in the United States are concerned entirely with ocean development. Most oceanographers working in industry are employed in relatively small branches of corporations, involved in some aspect of oceanic development incidental to the principal corporate mission. The *Sea Technology Handbook*, published by Compass Publications, lists industrial firms concerned with ocean research and development. However, of the nearly 1,000 organizations included in this volume, no more than one or two hundred are considered active in ocean development.

There is no central employment clearinghouse in this country for prospective employees in ocean science and technology. Most of the major periodicals carry some form of "opportunities" section; these, however, are a limited resource. As in any field, business contacts often provide excellent leads, and job-seekers also can rely on the conventional methods of letter-writing and personal contact, often arranged by or through one's professors.

When a field is expanding as fast as oceanography, literature that glamorizes or sells the work may be more optimistic about employment prospects than is warranted by its growth or future potential. Students considering oceanography should be wary of exaggerated claims about career opportunities, particularly in books written for popular consumption, and enthusiasm for a field should be tempered liberally with caution and discretion. In fact, while employment possibilities have risen steadily over the past two decades, the current employment outlook is only fair due to the recent and continuing flood of students into oceanography. In several categories, biological
oceanography for example, supply seems about to exceed demand. In some others, the prospects are more positive; there currently appears to be a good future for engineers and technicians.

Who Supports Oceanographers?

A number of associations and societies exist in support of oceanography and oceanographers. Among the largest in the United States are the National Ocean Industries Association (primarily industrial), the Marine Technology Society (primarily professional and trade), and the American Geophysical Union and the American Society of Limnology and Oceanography (primarily scientific). About 20 other societies relate to oceanography, although most of these are sections of larger organizations. Recently, a National Marine Education Association has been formed, to focus on education-related problems and opportunities in marine science and technology. The National Ocean Education Foundation, which emphasizes the incorporation of marine science instruction into high school curricula, helps high school teachers become prepared to teach the related subjects. Although none of these organizations has a large staff, all try to answer persons who write to them for information and assistance.
Specialized information of various kinds also may be obtained from these sources: the Office of Sea Grant, the Office of Coastal Zone Management, and the National Marine Fisheries Service, all of which are part of the Department of Commerce; the Office of the Oceanographer of the Navy; the National Science Foundation; and three National Research Council Boards, the Ocean Sciences, Ocean Policy, and Marine Boards.

Many societies, business interests and even entire governments sponsor trade fairs in oceanography which combine scientific papers and exhibits of instruments and other ware. These are held approximately triennially in Germany, Japan, France and England. American societies hold several meetings each year; the Offshore Technology Conference, held in Houston in May, is by far the largest of these. Information about these conferences may be obtained from the sponsor societies and from professional publications.

The oceanographer can expect to make a salary comparable to that of a scientist or engineer working outside the marine field. Of course, every institution or company employing oceanographers may have pay scales which vary according to experience and education of the prospective employee. He who aspires to this profession for financial reasons, however, should remember Mary's advice to her son:

"If you stop to find out what your wages will be and how they will clothe and feed you, Willie, my son, don't go on the sea. The sea will never need you."

—Rudyard Kipling

Where Does One Obtain Information?

Brochures and information mentioned in this publication can be obtained from the following sources. Unless otherwise stated, listings are in Washington D.C.
American Association of Junior Colleges
1 Dupont Circle, N.W., Suite 410 (20036)
American Society of Limnology and Oceanography  
c/o Dr. Claire Scheltzke  
Great Lakes Research Division  
University of Michigan  
Ann Arbor, Michigan 48109  

Compass Publications  
1117 North 19th Street  
Arlington, Virginia 22209  

Department of Commerce  
3300 Whitehaven Street, N.W. (20235)  

Department of Defense  
Public Service Division  
The Pentagon (20301)  

Department of Energy  
12th St. & Pennsylvania Ave., N.W. (20461)  

Department of Health, Education and Welfare  
330 C Street, S.W. (20201)  

Department of the Interior  
U.S. Fisheries and Wildlife Service  
Main Interior Building (20240)  

Department of the Interior  
Office of Energy Resources and Marine  
Geology, Reston, Virginia 22092  

Department of Transportation  
400 7th Street, S.W. (20590)  

Environmental Protection Agency  
401 M Street, S.W. (20460)  

Marine Technology Society  
1730 M Street, N.W. (20036)  

National Aeronautics and Space Administration  
400 Maryland Avenue, S.W. (20546)  

National Marine Education Association  
546-B Presidio Boulevard  
San Francisco, California 94129  

National Marine Fisheries Service  
Department of Commerce (see above)  

National Ocean Education Foundation  
3710 Whispering Lane  
Falls Church, Virginia 22041  

National Ocean Industries Association  
1100 17th Street, N.W. (20036)  

National Oceanic and Atmospheric Administration  
6010 Executive Boulevard  
Rockville, Maryland 20852  

National Research Council  
Henry Building  
2100 Pennsylvania Avenue (20500)
National Science Foundation
1800 G Street, N.W. (20550)
Office of Coastal Zone Management
  Department of Commerce (see above)
Office of Sea Grant
  Department of Commerce (see above)
Smithsonian Institution
  900 Jefferson Drive (20560)
U.S. Government Printing Office
  Superintendent of Documents
  710 North Capitol Street, N.W. (20402)
ABOUT THE AUTHOR

Robert B. Abel is a marine educator, scientist and administrator. Prior to his recent appointment as director of the New Jersey Sea Grant Consortium, he was assistant vice president for marine programs at Texas A&M University. From 1967 to 1977, he served as the first director of the National Sea Grant Program and was instrumental in the early development of this nation-wide organization, which provides funding for marine research, education and advisory services.

Dr. Abel was educated at Brown University in chemistry, Johns Hopkins University in oceanography, George Washington University in engineering and engineering administration, and American University, from which he received a Ph.D. in political science.