JACK CALMAN

GUEST EDITOR'S INTRODUCTION

It is truly amazing that no matter how, and no matter how often, we take a good look at the ocean there is always something new to see. In the few years since publication of the most recent of several *Technical Digest* issues largely devoted to oceanography,[1-8] we have been busy looking at the sea in new ways, observing new things, and making the new knowledge and technology available to the Navy and other sponsors. This theme issue reports on some of these activities at the Applied Physics Laboratory. Two articles investigate basic physical processes, three describe different regions of the ocean, two discuss various ways to obtain ocean data, and two present the latest efforts to make this information useful to the Navy sailor.

In his discussion of the air-sea boundary zone, Hanson concludes that the behavior of microbubbles (an important source of noise in the ocean) is different from what one would at first intuitively expect. With the support of good measurements and an understanding of the more complex surface fluid dynamics, a sensible physical interpretation begins to emerge.

Although optical phase measurements have a long and glorious history of precision, they have only recently been applied to fluid dynamics and oceanography. The article by Baker, Mack, and Vasholz shows how the problem of relating optical phase to fluid motion can be formulated, used in laboratory experiments, and then applied to ocean situations.

Some of the most beautiful images from space are color pictures of the ocean surface. In his article, Stark discusses how quantitative information can be obtained from such pictures to estimate phytoplankton pigment concentrations in the North Atlantic and North Pacific oceans. He also mentions many other applications. We will see more from ocean color pictures when the SeaWiFS satellite is launched next year.

One might go so far as to say that almost all life in the ocean depends ultimately on the part of sunlight that penetrates below the sea surface and is not reflected back into space. The article by Smart describes the seasonal and spatial variations of light absorption in the upper waters of the North Atlantic Ocean.

One way to help our declining environment is to understand the relevant physical processes so as to support more sensible environmental management. The Applied Physics Laboratory can be proud of its support for a number of years of a small research effort on the Chesapeake Bay. In this latest issue on oceanography, Sarabun and Frizzell-Makowski report on numerous measurements designed to help understand mixing in the Bay. In a microcosm of what is required for global environmental management, this effort demonstrates the simultaneous measurement of biological, physical, optical, and chemical properties of the water.

Sometimes using simple ideas and technology to make collecting ocean measurements easier, faster, and cheaper is in itself a beneficial advance. Such a development is described by Grempler in her article on an improved airborne data acquisition system for measuring ocean temperature.

Certainly the easiest way to get ocean data is to let somebody else get it! Making data available in various formats and over computer networks is very rapidly becoming of increasing importance in almost every aspect of modern life. Nevertheless, databases must be built by someone before they can be shared. Myles-Tochko writes in her article about a specialized database being built at APL.

These days, employing computers just to collect, archive, and present data is not enough to make the information useful. More and more we need computers as expert partners to help us understand what the data mean in a given complex situation. In his paper on a coastal ocean expert system, Scheerer shows how such a system is formulated to describe the coastal environment and to manage uncertainties in tactical situations.

Perhaps the ultimate computer aid is one that works without its human partner at the controls. Such an aid has, in fact, been developed and used aboard submarines to alert the crew to certain environmental situations. It is described by Dantzler, Sides, and Neal in their paper on the Tactical Oceanographic Monitoring System.

Taken as a group, the articles in this issue demonstrate how APL as an institution, by integrating basic and applied sciences with technology, serves the national need. As we move further into this decade of drastic changes in the global military, environmental, political, and economic landscapes, we will undoubtedly continue to look at the ocean from different points of view. Different ocean processes, regions, and resources will continue to shift in importance. As always, APL will apply physics and technology to help solve these problems of national and global importance.

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JACK CALMAN is a member of APL's Principal Professional Staff and is also on the faculty of The Johns Hopkins University Whiting School of Engineering, where he teaches fluid dynamics and oceanography. Since joining APL's Submarine Technology Department in 1980, he has used theory, laboratory experiments, at-sea measurements, and satellites to study a variety of topics ranging from turbulence to ocean currents and ice to water flow around submarines. He attended the City College of New York (B.S., 1969, in physics) and Harvard University (M.S., 1970, and Ph.D., 1975, in applied physics). His previous experience includes positions at MIT, The Weizmann Institute of Science, Environmental Research and Technology Corp., and NASA's Goddard Space Flight Center. He is a reviewer for several funding agencies and journals, a member of professional societies, and author of numerous technical papers. Dr. Calman's current interests include fluid dynamics, oceanography, advanced computer applications, and environmental and energy issues.