

this phrase can be justified in more than one way. How can teachers (let alone students) expect to keep abreast of a tide of research papers of oceanic proportions? Both Levin and Harrison have attempted to solve this problem in solid state science by combining chemical and physical concepts to achieve global perspectives, and this apparently indicates a growing consensus for this approach. My feeling is that of the two Harrison's treatment is much the more sophisticated and successful, and that his substantial effort notwithstanding, Levin's results primarily

demonstrate the difficulties inherent in condensing the work of others without the benefits of personal contact and free discussion. In any event both Harrison and Levin have shown that the need for simplification and synthesis is greater than ever.

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James C. Phillips is a member of the technical staff of Bell Laboratories. He has done research on electronic structure, optical spectra and chemical bonding in crystals and on crystal surfaces.

Ocean Acoustics

J. A. DeSanto

258 pp., Springer-Verlag, New York, 1979, \$37.40

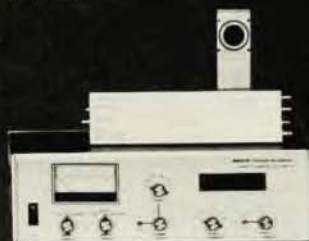
During its relatively brief history the field of underwater acoustics has been a useful tool for many of the major advances in the earth sciences. The discovery of the deep scattering layer and the subsequent use of acoustic scattering to assess biomass, and the use of fathometers to determine the geological characteristics of the sea floor that was so important in the development of plate tectonics are but two examples. There is now a rapidly growing interest among acousticians and oceanographers in applying acoustics to the quantitative study of the ocean dynamics. *Ocean Acoustics* is one of three books recently written on the subject of acoustic propagation in a varying ocean medium. (The other two are *Sound Transmission through a Fluctuating Ocean*, Stanley M. Flate, ed., Cambridge University Press, 1979 and *Wave Propagation in Underwater Acoustics*, J. B. Keller, ed., Springer, 1977.) John DeSanto, who has been involved in underwater acoustics for some time, is the editor. He has assembled authors in various sub-disciplines of underwater acoustics, each contributing a chapter. DeSanto himself has written the introduction and a chapter on theoretical methods.

Each chapter is essentially the author's independent view of his own part of underwater acoustics, although there is a small amount of cross reference. Theory and computational techniques are covered by DeSanto, Frederick R. DeNapoli and Roy L. Deavenport (numerical modeling) and by Norman Bleistein and Jack K. Cohen (inverse scattering theory and computation). Experimental measurements at sea are addressed by Robert P. Porter and experimental laboratory modeling by John G. Zornig. John P. Dugan introduces the dynamics of the sea from an oceanographer's viewpoint.

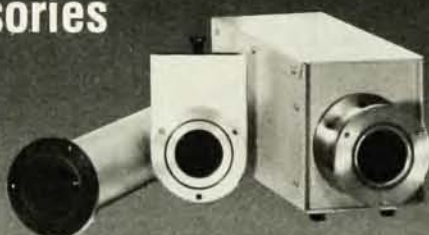
The chapter by Dugan contains the key oceanographic notions that affect long-range low-frequency acoustic propagation. No discussion is given of surface waves, although they are addressed by DeSanto and Zornig. Logically this chapter should follow the introduction, since the magnitude of the variation in acoustic parameters that drives the acoustic wave theoretical approximations are found there. A glossary of oceanographic terms would have been of great value.

The task of introducing physical oceanographic theory and observation in but 37 pages is a heroic task and Dugan has made the best of it. He apparently is not aware that many acousticians do not know much oceanography. He uses many terms without definition (for example,

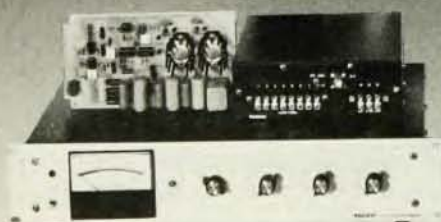
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geostrophic, barotropic, baroclinic, β -plane model).

DeSanto's chapter on theoretical methods begins with the derivation of the acoustic wave equation, thus making it possible to trace the origin of important physical parameters and mathematical approximations. In 67 pages the theory of propagation in a deterministic (static) ocean, scattering from surfaces and volume inhomogeneities, and the parabolic equation method are introduced. It is too compact to be readable, except by someone already familiar with the literature. Much space is devoted to surface scat-

tering, but most of it is related to periodic surfaces, of little direct application to random sea surfaces.

The chapter on numerical models contains the views and contributions by its authors. Although the notation and terminology is cumbersome the chapter stands by itself.

J. G. Zornig's chapter is one of the most comprehensive in the book. The author has had extensive experience in small scale tank modeling. In a tank it is possible to study separate physical effects such as surface scattering. Zornig's presentation of the current state of the art in

modeling, especially on surface scattering, is excellent.

The chapter on inverse scattering is an interesting review. Since the inversion methods will be the basis of acoustic remote sensing of the ocean, it is a useful introduction. To the reviewer's knowledge and judging from the list of references, the methods presented have not heretofore been successfully applied to the ocean.

The final chapter, by R. P. Porter on acoustic probing of space-time scales in the ocean, gives most of the important experimental results that have been used to infer dynamic properties of the sea. It is an excellent comprehensive presentation. It covers the gamut of oceanographic events from very large to very small acoustic wavelengths, and therefore oceanographic regimes.

In summary, *Ocean Acoustics* covers a wide variety of topics. Some chapters will stand by themselves to the reader interested in special topics. It is not clear that the entire book is of interest or of use to a "general reader" or of value as the primer in advanced ocean acoustics. The book can be criticized for lack of connection between chapters. Often notation is different from chapter to chapter and in a few instances it changes within a chapter. The price is a bit high for anyone interested in using only a few of its chapters.

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Activity

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Projects and Demonstrations in Astronomy

D. Tattersfield

340 pp. Halsted (Wiley), New York, 1979
(First published, Thornes, Cheltenham, U.K. 1979). \$27.50

Recognizing, as he notes, that the skies of his native England "... are often overcast with cloud ... and ... [that] not everyone interested in astronomy has access to a telescope," Donald Tattersfield has written this book to serve as a *pot pourri* of exercises in "practical astronomy" that can be carried out indoors. The book consists of over 60 exercises (or "projects" as they are called) grouped according to subject matter in rather standard fashion and ranging in topic from coordinate systems to Kepler's Laws to various properties of stars, galaxies and quasars. Each exercise or major section is prefaced by a brief description or explanation of the subject matter under investigation. In many places, these explanations may suffer, however, from being too brief. Some mathematical expansions and tables are located in appendices. The only materials needed to complete the exer-

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