

which are isolated from demonstrable ones and are effectively inaccessible to demonstration, the answer is no. The argument is ingenious, but many will wonder about its value for the psychology of invention in physics, since physicists will presumably go merrily on pushing their imagination to the limit in the endeavor to understand experience. Grünbaum's handling of the a priori is largely confined to his attempt to refute Duhem's conclusion that there is no such thing as a crucial experiment. He appears to succeed in weakening Duhem's argument to a certain extent without, however, completely invalidating it.

The well-known theoretical physicist, Alfred Landé, provides a boiled-down version of his attempt to restore unitary reality to the prevailing dualism in the interpretation of quantum mechanics. To understand his point of view in detail the reader must, however, turn to Professor Landé's numerous more formal expositions of the past few years.

The relevance of physical knowledge for ethics is discussed by George P. Klubertanz, S.J. Finally, Raymond J. Seeger endeavors to sum up the significance of the symposium as a whole and succeeds in emphasizing the essential difficulty in any undertaking of this kind, namely, the lack of any uniform definition of the terms used by the participants. The book raises many stimulating questions but scarcely settles anything. It is of course unreasonable to expect philosophy to do so.

Underwater Acoustics Handbook. By Vernon E. Albers. 290 pp. The Pennsylvania State U. Press, University Park, Pa., 1960. \$10.00. *Reviewed by M. A. Breazeale, Michigan State University.*

FEW media for the propagation of sound, except possibly the Earth's crust, are as vexing in their defiance of simple, all-encompassing description as the ocean. Thermal gradients, surface and bottom reflections, various types of discontinuities, and even snapping shrimp join together in a haphazard fashion to make the interpretation of acoustic measurements difficult. The difficulties do not stop here, however. It is apparent from this book that they extend into the organization of descriptive literature on the ocean as well.

The difficulty in organization is exemplified by the fact that an equation relating the velocity of sound in the sea to temperature, density, and salinity is not to be found in the section entitled "Velocity of Sound in the Sea". Rather, it is found under "Refraction, General". Such displacements are concentrated primarily, although not exclusively, in the introduction where they do a minimum of damage, except possibly to scare away potential readers. The other three parts are better organized.

In Part 2, "The Medium", the factors affecting sound transmission are well described. Ray diagrams illustrate clearly how the sound path deviates from a straight line under certain conditions and show the strange effects which can then result. The effects of discontinui-

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ties and inhomogeneities, as well as the subjects of ambient noise and reverberation, are also considered.

After some irrelevant discussion of crystal systems, Part 3, "Generation and Detection of Underwater Sound", describes various types of transducers and arrays, as well as ships and marine organisms, as sound sources. The detection of underwater sound is given less emphasis than is its generation.

"Acoustic Measurement Techniques" (Part 4) expands on the subject of detection of underwater sound in that it describes hydrophone calibration, measurement of sound and noise under various conditions, and the effect of environmental factors on calibration and measurement.

In general, the exposition in Parts 2, 3, and 4 is good; however, it appears to the reviewer that the ratio of data to exposition is rather low for a handbook. Although there is neither preface nor jacket blurb to allure or to warn the prospective reader, the book is evidently intended as a kind of introductory text on underwater acoustics for technicians and engineers, and as such it is a step in the right direction.

Mathematical Methods for Digital Computers. Anthony Ralston and Herbert S. Wilf, eds. 293 pp. John Wiley & Sons, Inc., New York, 1960. \$9.00. Reviewed by Peter L. Balise, University of Washington.

WITH the increasingly common use of large digital computers in solving scientific and engineering problems, a book like this has obvious wide application. As the title implies, it is a compendium of procedures, but it also includes considerable discussion of applications and limitations of methods. However, it is not a text on numerical analysis; it is primarily a reference for the computer user who has a basic understanding of the mathematics involved in digital computation. In particular, the reader lacking in mathematical maturity will generally not appreciate the interrelations and essentially common bases for many techniques which appear superficially to be quite different when presented in the form of procedures.

The twenty-six chapters are written by different contributors, but with a common format. Each chapter begins with a brief statement of the purposes of the procedure to be described, followed by a discussion of the mathematics. These are generally well written, indicating quickly whether the user's problem is amenable to the particular technique, and providing information such as error analysis, comparisons with other methods, and ample references. Each calculation is summarized as a sequence of steps. The procedures are presented in flow-chart form, supplemented by descriptions to clarify each step. The charts are sufficiently detailed for coding but are written in general language rather than in terms of particular hardware. They are, therefore, appropriate for the automatic coding systems which are increasingly being developed and which encourage wider computer use. Each chapter includes a sample problem and a list of needed subroutines, memory requirements,