BOOK - REVIEWS

Introductory Dynamic Oceanography By Stephen Pond and George L. Pickard, *Pergamon Press, Oxford, 1978, ISBN 0 08 021615, £ 15.00* 241 pp.

In the specialized branches of the natural science which are comparatively of recent origin, research precedes teaching. A stage is soon reached when some kind of regular and definitive study programmes need be introduced at college or university levels. To begin with only a handful universities introduced fulfledged courses leading to degree or diploma for students desiring to be professional scientists or researchers in a specialized branch like oceanography. For such specialized courses the teething trouble begins in finding standard and comprehensive textbooks. A few text books grow out of the lecture notes of the teachers. And for this very reason, depending upon the teachers and the universities, these books tend to be heterogeneous in character; which means that one does not find a 'standard' or 'comprehensive' textbook in any particular topic or branch of the natural sciences which we have earlier called 'specialized'. To ask for a comprehensive text in any branch of science is to ask for the impossible because continuous progress adds new knowledge requiring modification of old ideas and incorporation of new ones.

The necessity of making the above statements arises for reasons of doing justice to the slim volume 'Introductory Dynamic Oceanography' by Professors Pond and Pickard, which should be placed against the proper background it deserves. This becomes obvious when one realises that various texts on physical oceanography as such and on topics related to it are already in existence; but they all happen to be on different yet quite advanced levels and hence do not belong to classrooms. The most important purpose, however, which they serve is by providing necessary support to the textbooks like the one under review.

This book, written basically for students with limited mathematical background, deals with almost all the important aspects of dynamic oceanography within a span of fourteen chapters in a commendable manner with logical sequence and brevity.

Barring the introduction, the contents could broadly be classified into two categories: (a) various physical properties of sea water and (b) the dynamics of various kinds of motions.

Starting from the physical properties of pure water, the authors in a very neat and simple manner move on to explain how these properties change and alter in the case of sea water due to many dissolved salts. This is followed by the main theme of the book, which justifies the title 'Introductory Dynamic Oceanography', forming the major part of the text wherein the classification of forces and motion along with the basic laws of physics and dynamics of fluid motion (in a rotating frame) are systematically explained. The concepts of continuity of volume—in place of mass since sea water is generally treated as incompressible—and its analytical form with applications are presented clearly. Due consideration is given to the increased understanding of some of the recently recognized important processes taking place in the sea water environment such as double diffusion. However, topics like radiation and heat, salt

and water balances, water masses and their mixing are completely omitted as these are the properties dealing with acoustics and optics.

Coming to the second category the authors methodically proceeded from the concepts involved to the derivation pertaining to the forces important to oceanic motions with and without friction. Employing scaling and order of magnitude analysis, treatment of the subject dealing with the derivation of Sverdrup's equation and its applications to equatorial current systems, mass transport to westward intensification and the equatorial undercurrent is very orderly and comprehensive with simple mathematics using Cartesian coordinates and, sometimes, vector notations. The boundary layer approach and its use in obtaining solution to Munk's equation and the definition of Rossby radius of deformation are presented very neatly. Some important topics such as thermohaline effects and the deep water circulation, Reynolds fluxes and eddy diffusivity and mixed layer are introduced to the required extent and at the level desired for beginners.

The presentation on waves is rather brief. The development of the subject matter from the concepts of wave spectrum, general characteristics including orbital motion of water particles, refraction, diffraction and breaking to the methods of measurements and the derivation of semi-empirical relationships is made in an efficient manner. Internal waves and the effects of earth's rotation on long waves leading to development of Kelvin waves are also included. The readers are exposed to the subject on ocean responses to tide producing forces, various tidal components and practical approaches to their prediction. The chapter on numerical modelling is quite informative. The subject matter of Chapter 14, being time dependent, will be of general interest for beginners. The two appendices would also be found to be very useful.

The book in general is well written and provides practical understanding of ocean dynamics at the intended level. It is, however, obvious that to progress further in the field, or, in the case of a reader without proper mathematical background, help and guidance would be required both from the teacher and from further supplementary reading material. The students and the teachers who often grope in the dark looking for an adequate book, would perhaps be very thankful to Professors Pond and Pickard for giving them the benefit of their sincere efforts in bringing out this book in print.

At the end, one is left with the feeling that while the price is reasonable, the getup is good and so is the quality of the paper used, the publishers should have used a proper typehead commensurate with the content and quality of the book. While at the same time it is a little distracting to find that, at least in one place (p. 93), the authors, while presenting a schematic diagram of convergence and divergence due to wind shear, instead of maintaining the grenerality show it for the North Atlantic Ocean. This might mislead an unsuspecting reader that such processes occur only in the Atlantic and not elsewhere.

Considering all these aspects regarding the content and the manner of presentation this book should be received with open arms by the students and the teachers alike. No doubt certain research scientists engaged in the studies other than the physical sciences of the oceans might also find this book very useful.

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