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REVIEWS

The Dynamics of the Upper Ocean, 2nd Edition. By O. M. PHILLIPS. Cambridge University Press, 1977. 336 pp. £16.00 or $34.00.

The first edition (1966) of this book (which I reviewed in *J. Fluid Mech.* **29**, 1967, 822) appeared at a pivotal time in the development of geophysical fluid dynamics and was received by workers in that field with well-deserved enthusiasm. The second edition has been revised and expanded (from 261 to 336 pages), although the general scope remains unchanged. The introductory chapters 1–3 now include sections on the dynamics of wave trains in moving media, wave refraction and wave breaking, but otherwise stand much as before: lucid, terse and admirable. The remaining chapters have been more extensively rewritten in order to incorporate many of the key developments of the past decade and, in a few places, to eliminate some material that has not stood the test of time.

Chapter 4, 'Ocean surface waves', which makes up nearly a third of the book, incorporates much of the experimental and observational work on the generation of waves by wind that has been carried out over the past decade, omits the controversial material on the wave-induced Reynolds stress outside of the critical (or 'matched') layer, and reviews recent theoretical developments. It is clear that much progress has been made since Ursell's (1956) seminal review; nevertheless, his claim that 'Wind blowing over a water surface generates waves in the water by physical processes which cannot be regarded as known' might still be advanced with some justice, at least with reference to the open sea. A primary difficulty, of course, is turbulence; in the author's words, 'The situation is not one in which firmly established methods lead to results that one might seek, with some confidence, to establish experimentally.' Moreover, the recent experiments of Banner & Melville (*J. Fluid Mech.* **77**, 1976, 825) suggest that local breaking and separation may play a significant role in the energy transfer to long waves on a rough sea (Jeffreys' 'sheltering' hypothesis may be closer to reality than we had recently come to believe). Chapter 4 also comprises much new material on spectral energy transfer through nonlinear interactions, at least some of which may be contradicted by recent work on envelope evolution that suggests that these interactions may lead to Fermi–Pasta–Ulam recurrence rather than a random end state (see A. Ramamonjiarisoa & M. Coantic, *C.r. Acad. Sci. Paris*, B **282**, 1976, 111; B. Lake & H. Yuen, *J. Fluid Mech.* **83**, 1977, 49 and references cited there).

Chapter 5, 'Internal waves', carries over the theoretical development of the first edition and incorporates much of the observational knowledge that has accrued in recent years. It also includes a discussion of critical-layer absorbtion (Booker & Bretherton 1967), which is likely to be significant for the redistribution of energy in the deep ocean but has not yet been adequately explored in that context, and the much cited empirical spectra of Garrett and Munk (GM72 and GM75, 'the initials, as they say, suggesting some planned obsolescence').

Chapter 6, 'Oceanic turbulence', also has been extensively revised to include recent developments, and the controversial suggestion that the gradient of the Reynolds stress in a shear flow is proportional to the local curvature of the mean velocity profile in consequence of a critical-layer mechanism (old § 6.5) has been deleted. The section on thermocline erosion has been completely rewritten and now includes a discussion of the fascinating subject of microstructure. Double diffusion is considered only briefly, but this is not inappropriate in view of Turner's (1973) monograph in this same series.

In fine, this second edition is a significant improvement on the original and should be welcomed by the geophysical-fluid-dynamics community. Nevertheless, I think it unlikely that it will be quite as successful; the field is developing too rapidly, and is perhaps now too diffuse, for that success to be repeated. Still, it is written with the same grace and verve that I found so attractive in the original and continues to provide the best available account of the dynamics of the upper ocean.

JOHN W. MILES

SHORTER NOTICES

Introduction to Fluid Mechanics, 2nd Edition. By R. W. FOX and A. T. McDONALD. Wiley, 1978. 684 pp. $ 19.95.

This edition contains only minor changes from the first (1973) edition. More problems have been added to the text, and SI units have been adopted in a majority of the worked problems. About 30 % of the worked problems are in engineering units 'to provide experience with this traditional system and to highlight methods of conversion among unit systems'. The purpose of the book is to develop the standard theoretical concepts and apply them to fluid statics, incompressible inviscid flow, incompressible viscous flow and (one-dimensional) compressible flow. As in the first edition, each development of the theory is accompanied by worked sample problems.

Flow-induced Gate Vibrations. By P. A. KOLKMAN. Publication no. 164, Delft Hydraulics Laboratory, 1976. 225 pp.

This is a printed doctoral dissertation about dynamic hydraulic gate behaviour, and anyone interested can obtain a copy free of charge by applying to the Delft Hydraulics Laboratory.

Computing Methods in Applied Sciences. Edited by R. GLOWINSKI and J. L. LIONS. Springer, 1976. 593 pp. $ 15.20.

The papers in this volume were presented at a symposium held in December 1975 at the IRIA laboratory, Le Chesnay, France. There are 25 papers in all, 10 of them in French. More than half of the papers are devoted to fluid-mechanical topics, in particular dynamical meteorology and oceanography. In the meteorology section there are, for example, papers on the general circulation problem and the modelling of turbulent fluxes while in the oceanography section the papers include ones on ocean-tide models and the dispersion of pollutants in a shallow sea. In the remaining fluid-mechanics section the papers are more general and discuss broad topics such as the use of numerical methods for the solution of turbulence and boundary-value problems.

Symposium on Applied Mathematics dedicated to the late Professor Timman. Edited by A. J. HERMANS and M. W. C. OOSTERVELD. Delft University Press, 1978. 241 pp. $27.00.

This soft-covered volume records the papers presented in the five sessions of the symposium each beginning with a review paper. The subjects range over several areas of applied mathematics, although problems associated with the hydrodynamics of ships and with the interactions between waves and bodies receive the most attention. Three of the review lectures are devoted to ship problems: 'Maneuvering' by Wehausen, 'Wave radiation from slender bodies' by Newman, and 'End effects in slender-ship theory' by Ogilvie. The other two are 'Slender-body theory for low Reynolds number flows' by Wu and 'Non-linear acoustics' by Wijngaarden. The 11 contributed papers are on a variety of topics, including optimization problems, the mechanics of Cosserat surfaces and different aspects of fluid mechanics.

Workshop on Transonic Aerodynamics. Edited by M. A. RAMASWAMY and S. S. DESAI. National Aeronautical Laboratory, 1977. 664 pp.

This workshop meeting was held in Bangalore in December 1976 and was attended by scientists from 13 Indian Universities, Institutes and Aeronautical Laboratories. There are 23 papers in the volume, divided into 5 sections: 'Two-dimensional aerofoils', 'Unsteady flows', 'Base flows', 'Bodies and wings', and 'Facilities'. The papers are mostly reviews or critical assessments of existing theories and experimental methods and contain extensive reference lists. The workshop gives a comprehensive view of the work being done at present in India on transonic aerodynamics.

Heat Bibliography 1974. Edited by L. B. COUSINS and W. J. RAMSAY. IPC Science & Technology Press, 1977. 227 pp. £18 or $39.00.

A large number of published papers covering all branches of heat technology are here listed in eight categories, each of which is subdivided into about 12 sections. The information provided about each paper is the name of the author, the title, the publication reference, and several 'keywords' indicating the subject of the paper.

Turbulence in Internal Flows. Edited by S. N. B. MURTHY. Hemisphere Publishing, 1977. 573 pp. $39.00.

This book contains the proceedings of a Project SQUID Workshop held at Warrenton, Virginia in June 1976. Eight papers were presented on fundamental problems in turbulent shear flows, seven on 'modelling procedures', and six on turbomachinery applications, mainly new experimental results. As with the previous SQUID Workshop, the discussion is also published. The comments on the papers are often helpful in putting the papers in context and quite interesting, although obviously highly edited. Were they really as polite to each other as that?

Transonic Flow Problems in Turbomachinery. Edited by T. C. ADAMSON and M. F. PLATZER. Hemisphere Publishing, 1977. 660 pp. $39.50.

The complexity of turbomachinery geometry and the general occurrence of transonic flow presents a formidable challenge. This book contains papers on a wide range of topics associated with transonic flow that were presented at a Workshop held in 1976 under the sponsorship of the SQUID project, the US Naval Air System Command and the Air Force Office of Scientific Research.

In addition, discussions on the papers are recorded verbatim. The papers range from analytical studies through those discussing a variety of numerical techniques to descriptions of some of the experimental programmes under way. The particular problems of high-speed turbomachinery flows make optical measuring techniques particularly attractive and several different systems are described. The verbatim discussions are generally enlivening and obviously the presence of a properly critical audience ensured that several questionable aspects of work presented were pointed out.

Stochastic Problems in Dynamics. Edited by B. L. CLARKSON. Pitman, 1977. 256 pp. £7.50.

This book contains the proceedings of an IUTAM Symposium on Stochastic Problems in Dynamics held at the University of Southampton in 1976. The papers reproduced here fall roughly into two groups; the first group is an interesting mixture of mathematical papers on the latest developments in the theory of and the methods of handling stochastic problems. Kingman points out in his foreword that recent work in the theory of stochastic differential equations has a good deal to offer 'if tempered with a dose of engineering scepticism'! The second group of papers is on stochastic problems in engineering; fluid flow enters only as a source of random pressure fluctuations on structures such as beams, plates, aircraft, etc. However, some of the methods described here may well be helpful to fluid dynamicists who actually want to understand these random inputs to other people's systems.

CORRIGENDUM

Finite amplitude instability of plane Couette flow

by TERENCE COFFEE

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In my article on plane Couette flow I overlooked an important result by Davey & Nguyen (1970). In their paper on pipe flow they include a graph (figure 8) corresponding to plane Couette flow. Here they deduce the result that for $R \geqslant 1000$, $R^{\frac{3}{2}}E$ is a function only of $R^{-\frac{1}{2}}\alpha$. The minimum occurs approximately at $R^{-\frac{1}{2}}\alpha = 0{\cdot}185$. (To convert from my notation to Davey & Nguyen's, multiply α and R by 2 and E by 0·75.)

Only a few of my values are in the range graphed in figure 8. These are a few per cent lower than those given by Davey & Nguyen. My results show that $R^{\frac{3}{2}}E$ approaches infinity when $R^{-\frac{1}{2}}\alpha$ is slightly larger than 0·75.

DAVEY, A. & NGUYEN, H. P. F. 1971 Finite-amplitude stability of pipe flow. *J. Fluid Mech.* **45**, 701.