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BOOK REVIEWS

Dynamics of Meteorology and Climate. By R. S. SCORER. Wiley-Praxis Series in Atmospheric Physics, 1997. 608 pp. ISBN 0471 96816 1. £29.95.

This book, published in an Atmospheric Physics series aimed at graduate students and researchers in the area of meteorology, has developed over the last forty years. It was first published as *Natural Aerodynamics* (1958); the material was elaborated to give *Environmental Aerodynamics* (1978) (reviewed by J. S. Turner in vol. 90 (1979), p. 369), and expanded to the current volume (608 pages). Much of the material remains highly original, and gives revealing accounts of many fundamental aspects of fluid mechanics, discussed with relevance to meteorological observations. The author has communicated his enthusiam for fluid mechanics and has illustrated many points visually using experimental observations and satellite images. This an excellent book and is required reading for all fluid mechanicians especially in areas as diverse as aerodynamics, meteorology, environmental and geophysical fluid mechanics.

The book consists of three parts, totalling 20 chapters. Part 1 deals with fundamental aspects of fluid mechanics, waves and instability (274 pages in 8 chapters), Part 2 deals with turbulence, jet/plume theory, clouds and dispersion (283 pages in 7 chapters) and Part 3, where most of the new material appears, deals with forecasting and climate change (93 pages in 5 chapters). In Part 1, the author gives a clear and concise description of the fundamentals of fluid mechanics, including in Chapter 3 the clearest and only account, as far as I am aware, of 'secondary flow' analysis in a graduate textbook. This powerful method is still being applied to new practical problems. A wide range of intriguing photographs are provided to illustrate the lee wave generation, wave propagation in stratified fluids, and flow instabilites. Part 2 contains treatments of jet and plume dynamics in inhomogeneous flows, which is especially topical given the resurgence of interest in enviromental and geophysical flows. A number of diverse subjects, such as locust swarms in deserts intertwined with biblical quotes, provides stimulating reading. Part 3 contains a very general discussion of forecasting and long-term climate change.

Some critical comments must be made. The material in Part 3 is quite wide-ranging and unfocused in parts, with the author jumping between many different subjects on a single page. There appears to have been little attempt to integrate Part 3, which is non-technical, with the remainder of the book. Moreover, the new title, *Dynamics of Meteorology and Climate*, does not adequately describe the contents of this book and refers principally to Part 3. Far too many typographical errors appear to have been created by re-typesetting Parts 1 and 2, for example there are two errors in the second equation on page 44, although the meaning (for an experienced reader) remains clear. Furthermore, the list of recommended additional reading refers primarily to climate change and does not include more recent references to supplementary material for Parts 1 and 2 (the lack of up-to-date references in the previous version was criticized by Turner).

Despite these criticisms, this is a inspiring book based on Professor Scorer's lifetime experience in the area of meteorology. This book is strongly recommended for undergraduates, graduates and researchers in the general area fluid mechanics, and is expected to have a wide appeal to chemical/mechanical engineers, students of environmental and geophysical fluid mechanics and meteorologists.

I. EAMES

Mechanics of Fluids, 2nd Edn. By M. C. Potter, D. C. Wiggert & M. Hondzo. Prentice Hall, 1997. 689 pp. ISBN 013 207622 5.

Fundamentals of Fluid Mechanics, 3rd Edn. By B. R. Munson, D. F. Young & T. H. Okiishi. John Wiley, 1998. 877 pp. ISBN 0471 17024 0. $84.95.

For the most part these two books are basic fluid mechanics textbooks for undergraduate engineers. Both contain the standard arrangement of material found in any number of similar textbooks. There are of course differences in the treatment and presentation and choosing one over the other will boil down to the individual preference of the professor or student. In the short space here I will try to provide an overview, from my perspective, of the difference in the flavour between the two books.

In terms of the overall treatment of the core material, Potter, Wiggert & Hondzo (PWH) tend to be much more direct, quickly establishing the key equations; this is a useful approach for a student with a good intuitive feel for the subject. On the other hand, Munson, Young & Okiishi (MYO) take a more detailed approach to the derivation of the main concepts; a nice feature is the careful word description of the physical meaning of each equation, creating, for the student, a solid physical link to the mathematics.

Well-constructed worked examples are used extensively in both texts. PWH have fewer examples focused on the application of the key concepts. A worthwhile feature is the working of the examples in both Imperial and SI units. MYO use more worked examples and in many cases they are the principal device for uncovering and explaining the core material in an engineering setting.

Both books also have extensive exercise problems for students. Those in PWH tend to be very straightforward and are related to the main points of the material. This is a more than adequate approach but to my taste the questions are a little dry and the use of illustrative materials is limited. The exercises in MYO, however, are more inventive: many are based on practical engineering scenarios, and almost all are illustrated with appropriate figures.

In general, I think it fair to say that MYO has a stronger engineering tone. One way to see this is to compare chapter headings that contain essentially similar material. For example PWH have a chapter called 'Internal flows' which is identical in scope and content to MYO's chapter 'Viscous flow in pipes'. Likewise, PWH's chapter 'External flows' is called 'Flow over immersed bodies' by MYO.

There is an additional point worth mentioning about each book. PWH have additional chapters on specialized topics such as measurement techniques in fluid mechanics. Of particular note is an excellent chapter on 'Environmental Fluid Mechanics', contributed by M. Hondzo. This is a concise and comprehensive coverage of the key engineering issues in this emerging new field in fluid mechanics. As an undergraduate textbook MYO is very thorough and complete. The authors have recognized, however, that the material in their book is far too much to cover in a typical undergraduate semester course. To rectify this they have written an abridged paperback version (*A Brief Introduction to Fluid Mechanics*, also published by John Wiley in 1997). This is an ideal summary of the key parts of a fluid engineering curriculum that retains much of the style and flavour of the full text.

In summary both are excellent undergraduate textbooks which provide a comprehensive coverage of the core material. As mentioned at the beginning of the review the choice of one or the other to use in a course will depend on the style and background of the professor and students. From my perspective I feel that MYO offers a more detailed step-by-step approach that would help first time students through the

material. PWH is more precise and would be a useful long-term reference book; this is particularly true for the later chapters that cover specialized topics.

Both books belong in a basic library of fluid mechanics texts.

V. R. VOLLER

SHORT NOTICES

Dynamics of Complex Fluids. Edited by M. J. ADAMS, R. A. MASHELKAR, J. R. A. PEARSON & A. R. RENNIE. Imperial College Press, 1998. 485 pp. ISBN 1 86094 086 2. £60.00.

This reports the proceedings of a meeting (the Second Royal Society–Unilever Indo–UK Forum) that took place in mid-1996. As an account of recent research it is therefore rather late in appearing: several papers have since been published elsewhere that supersede those reproduced here. There are 33 separately authored contributions, and in some cases a report of the brief discussion following the paper is included. The papers are grouped under four headings, each including experimental, theoretical and numerical work: viscoelasticity (largely non-Newtonian fluid mechanics); polymeric and self-assembled systems; particulate dispersion; and viscoplasticity.

Sixteenth International Conference on Numerical Methods in Fluid Dynamics. Edited by C.-H. BRUNEAU. Springer, 1998. 568 pp. ISBN 3 540 65153 5. DM168.00.

This volume, dedicated to Professor Maurice Holt on his 80th birthday, is the proceedings of a conference on Computational Fluid Mechanics that took place in July 1998. It contains five sections labelled: Numerical methods; Incompressible flows and turbulence; Compressible flows; Schemes and methods analysis; and Complex flows. The variety of fluid dynamical applications considered is enormous, as is the range of numerical techniques displayed. Each section is prefaced with an invited lecture of about ten pages (first authors Berger, Schoppa, Radespiel, Coquel and Yabe respectively), and includes about twenty multiauthored papers.

A Practical Guide to Pseudospectral Methods. By B. FORNBERG. Cambridge University Press, 1999. 231 pp. ISBN 0 521 64564 6. £19.95.

This is the paperback version of the book that appeared in hardback in 1996. It was reviewed by D. Broutman in *J. Fluid Mech.*, vol. 360 (1998), p. 377.

Annual Review of Fluid Mechanics, vol. 31. Edited by J. L. LUMLEY, M. VAN DYKE & H. READ. Annual Reviews Inc., 1999. 650 pp. ISBN 0 8243 0731 3.

Here is a list of articles and authors in the current volume of this periodical.

Nuclear Magnetic Resonance as a Tool to Study Flow, Eiichi Fukushima
Computational Fluid Dynamics of Whole-Body Aircraft, Ramesh Agarwal
Liquid and Vapor Flow in Superheated Rock, Andrew W. Woods
The Fluid Mechanics of Natural Ventilation, P. F. Linden
Flow Control with Noncircular Jets, E. J. Gutmark and F. F. Grinstein
Magnetohydrodynamics in Materials Processing, P. A. Davidson
Nonlinear Gravity and Capillary-Gravity Waves, Frédéric Dias and Christian Kharif
Fluid Coating on a Fiber, David Quéré
Preconditioning Techniques in Fluid Dynamics, Eli Turkel
A New View of Nonlinear Water Waves: The Hilbert Spectrum, Norden E. Huang, Zheng Shen, and Steven R. Long
Planetary-Entry Gas Dynamics, Peter A. Gnoffo
Vortex Paradigm for Accelerated Inhomogeneous Flows: Visiometrics for the Raleigh-Taylor and Richtmyer-Meshkov Environments, Norman J. Zabusky
Collapse, Symmetry Breaking, and Hysteresis in Swirling Flows, Vladimir Shtern and Fazle Hussain
Direct Numerical Simulation of Free-Surface and Interfacial Flow, Ruben Scardovelli and Stéphane Zaleski