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REVIEWS

Ideal and Incompressible Fluid Dynamics. By M. E. O'NEILL and F. CHORLTON. Ellis Horwood, 1986. 412 pp. £40.00.

This is a surprising book to find being published in 1986. I started to read it with high hopes of finding a clear introduction to Hydrodynamics with lots of interesting physical examples, but I was disappointed. It is a conventional text on Ideal Hydrodynamics presented in a conventional way. Although it is clearly and concisely written, the other claims made for it in the blurb inside the front cover are far from true. It is essentially a mathematics book and undergraduates in other scientific disciplines would find this approach very uncongenial. There is very little reference to the practical aspects of the subject and almost no discussion of the limitations of the ideal-fluid model described in the book. There are as few 'physical applications' as is possible in a book on this subject and almost no 'modern examples in a wide range of practical problems'.

Chapter 1 contains a swift outline of all the basic mathematics needed elsewhere. It starts from the definition of a vector and includes material on vector operators, Green's Theorem and an introduction to tensors. Although there are a number of problems on each section, it would not really be practicable to learn all these subjects from this exposition. However, it does serve as a useful summary of what will be assumed in the rest of the book.

In Chapters 2 and 3 the idea of a continuum is introduced and the equations for an ideal fluid are derived. The explanations are clear and straightforward, but I looked in vain for the 'detailed description of the physical properties of fluids' which was promised by the blurb. Viscosity is barely mentioned and the tensors so carefully introduced in Chapter 1 are used only for a discussion of vorticity.

Chapter 4 concentrates on irrotational flow and presents Potential Theory as a series of theorems. Although the theory is all there, it is written concisely and contains no motivation whatever. Most engineering students would find the approach very hard to take even if they had already mastered all the necessary mathematical tools. The definition of an image system in §4.18 is both confusing and inaccurate. The stream function is introduced in the next chapter and then, in Chapter 6, complex-variable theory for two-dimensional flow is discussed. Conformal mapping techniques occupy Chapter 7 which contains rather more detail about Joukowski aerofoils and the Schwartz–Christoffel transformation than I think necessary for a first course in Hydrodynamics. I was pleased to see a Chapter on water waves included and the physical applications are more in evidence in this chapter, which contains a remarkably complete description of the theory in 37 pages.

Throughout the book there are good examples; a number of worked ones in the text and plenty more at the end of each chapter. I found an irritatingly large number of misprints, particularly in the worked examples. The diagrams, though clear, are basic and more information could have been conveyed by using more sophisticated techniques.

All in all this book is a comprehensive and lucid introduction to the mathematical theory of Hydrodynamics. It suffers from both trying to do too much for a first course and providing too little motivation, so that it may prove indigestible to someone coming to the subject for the first time.

HILARY OCKENDON

Cloud Investigation by Satellites. By R. S. SCORER. Wiley, 1986. £39.50.
Remote Sounding of Atmospheres. By J. T. HOUGHTON, F. W. TAYLOR and C. D. RODGERS. Cambridge University Press, 1984. 343 pp. £35.00 (hardback) or £12.95 (paperback, 1986).

These two books are very different in scope, style and content but both are to be commended for the contribution they make to understanding atmospheric processes.

Professor Scorer's book contains more than 500 splendid satellite pictures, some chosen to illustrate classical meteorological processes and other features of particular interest. In each case a clear and lucid description is given. It is well suited to any student of meteorology. Most of the pictures presented are from the NOAA and Nimbus series of polar orbiting satellites and feature Western Europe from the Advanced Very High Resolution Radiometer and the Coastal Zone Colour Scanner.

The book begins with a section describing the satellites and their instruments, which is very brief, in contrast to the technical detail of Houghton, Taylor & Rodgers, but still forms a useful introduction to the subject. However, I found the discussion of channel 3 in Chapter 4 hard to follow, with apparent confusion between positive and negative images. The remainder of the book consists of 19 sections of satellite photographs covering a wide range of meteorological subjects, from desert dust to convection streets and cells, island wakes, frontal systems, sea ice and many others. Anyone with an interest in meteorology will find these fascinating and instructive. However, this is clearly not a textbook for the specialist.

The early chapters of *Remote Sounding of Atmospheres* provide an introduction to the objectives of satellite remote sensing. This is followed by a comprehensive description of most of the satellites launched in the past 20 years to study the Earth's atmosphere, after which detailed descriptions of the instruments used for visible infra-red and microwave imaging are given. The important role played by satellites in providing measurements of the Earth's radiation budget is discussed in Chapter 4 and results from a number of recent experiments are presented.

Chapter 5 deals with the theory of remote temperature sensing in considerable detail and the computation of weighting functions for the instruments is explained. In the following chapter full descriptions of many of the sounding instruments are presented together with details of their weighting functions. Chapter 7 on retrieval theory deals with the derivation of meteorologically useful data such as temperature profiles from the radiances, and again represents a very thorough treatment of the subject. Chapter 8 deals with the application of the data to weather forecasting models and various analysis schemes that are in use operationally are described.

Satellite data have provided a substantial increase in our knowledge of the structure and dynamics of the stratosphere and atmosphere. The Oxford group has made a particular contribution in this area and Chapter 9 provides an incisive review. Chapter 10 describes the measurement by satellite of the minor constituents of the atmosphere, principally water vapour, ozone and carbon dioxide.

The remote sensing of clouds and precipitation in the atmosphere is of particular importance in resolving the cloud/radiation feedback problem, to assist numerical modellers in the parametrization of clouds and to locate areas of precipitation and quantify their intensity. This subject is reviewed in Chapter 11 and some results from recent experiments are summarized. The final three main chapters of the book describe how the techniques of remote sensing have been adapted to provide information on the meteorology and composition of the atmospheres of the other planets in the solar system.

The book is well produced with few errors and clear, well-labelled diagrams. It is essential reading for students entering the field of remote sensing and is a very useful reference work for more experienced research workers in the fields addressed. The paperback version is especially welcome as the book is now within the price range of individual research workers and students.

T. W. CHOULARTON