J. Fluid Mech. (1968), *vol.* 33, *part* 4, *pp.* 826–829
Printed in Great Britain

REVIEWS

Radiation Heat Transfer. By E. M. Sparrow and R. D. Cess. Brooks/Cole, 1966. 322 pp. 76*s*, or $8.50.

Heat Transfer. By A. J. Chapman. Macmillan, 1967. 617 pp. 105*s*. or $12.95.

An Introduction to Heat Transfer Principles and Calculations. By A. J. Ede. Pergamon, 1967. 287 pp. 63*s*.

There is very little similarity between the theoretical aspects of conduction, convection and radiation despite the fact that they are all concerned with the transmission of heat. Authors of books on heat transfer are almost inevitably specialists in one of these three fields and they must therefore rely on second-hand knowledge for much of their text. *Radiation Heat Transfer* by E. M. Sparrow and R. D. Cess is a particularly useful addition to the literature, since it covers this, the most neglected aspect of heat transfer, in some detail and is written by two active research workers in the field. As the title suggests, this book is concerned with thermal radiation as a means of heat transfer; the emphasis is on prediction rather than explanation, and the physical and experimental aspects are largely neglected. Although the subject is taken from a fairly elementary level, the authors are at their best in discussing recent developments; a bibliography including very recent papers is provided and the text is particularly suitable for intending research workers in the field. However, the more elementary theory suffers from a rather confused presentation; in particular, the definitions of fundamental concepts are often difficult to find in the text.

Heat Transfer by A. J. Chapman is intended as an undergraduate text, a wide range of problems being included at the end of each chapter. There is a strong bias towards the theoretical aspects; indeed, a more extensive consideration of the applications would have produced a greater unity in the subject matter. It is encouraging to find that the analysis of heat conduction is treated more rigorously than is usual in general texts on heat transfer and that an extensive chapter is included on the numerical methods suitable for the computer solution of conduction problems. However, it is unfortunate that, in all the worked examples, the boundary conditions are specified in terms of temperature rather than heat flow. It is also rather surprising that the principle of superposition is only introduced at an advanced stage of the text. Certain other techniques, such as the use of the instantaneous point source and the method of images, which are in many ways easier to grasp than the direct solution of the differential equation, are not discussed. It is not practical to expect the student of heat transfer to be familiar with all the complex mathematical techniques of heat conduction theory and it is therefore inevitable that a selection of relevant problems should be made. However, a more serious omission is that of a specific reference to the more comprehensive collections of results such as that of Carslaw and Jaeger. The author achieves a better presentation and a more lucid style in the section on convection, but he could have simplified the derivation of the mathematics of fluid flow by using a vector notation.

In general the text is easy to follow, except in some of the more elementary sections, but it could have been considerably improved by providing more specific reference to current work.

An Introduction to Heat Transfer Principles and Calculations by A. J. Ede is an example of that rarity in scientific literature: a book for which the publishers' claims are if anything too modest. It is designed as a text for the HNC student of heat transfer or the non-specialist engineer and consequently has a bias towards applications and practical problems. The treatment of the theoretical aspects is therefore somewhat curtailed, but sources of further information are very clearly indicated in the text. The author minimizes possible confusion about the units of dimensional quantities by stating the dimensions of each equation as it occurs and emphasizing the need for a self-consistent system. Each branch of the subject is taken from its basis in elementary physics and a commendable clarity of style and presentation is achieved throughout. For this reason it will also prove invaluable for those university students who are confused about the fundamentals of the subject.

J. R. BARBER

Simple Dense Fluids. Edited by H. L. FRISCH and Z. W. SALSBURG. Academic Press, 1968. 430 pp. £9 2*s*.

From the jacket: 'This volume provides theoreticians and experimenters with a compendium of facts on the statistical mechanics of simple dense liquids.' It does indeed, seventeen authors having displayed almost incredible industry in compiling and evaluating literally hundreds of references, the data being presented, in the form of tables and graphs, in nine chapters. Eight of these deal with equilibrium properties and scattering of light, X-rays and neutrons, while the ninth deals with transport properties. The brief is wide, 'simple' liquids including not only the inert elements but also substances with symmetrical molecules like carbon tetrachloride and also diatomic molecules that, because of their rotation, behave like spheres.

The discussion and evaluation of the results is generally of a high standard. In the present state of knowledge it is not at all easy to know just what weight to give to apparent 'agreement' or 'disagreement' between theory and experiment. A key function in the modern theory of liquids is the two-molecule distribution function, which can be calculated theoretically or measured by X-ray and neutron scattering experiments. Relatively small changes in this function can, as is pointed out, have absurdly large influence on calculated values of the pressure and of the transport coefficients. The real crux of the matter is that this two-molecule distribution function is itself rather insensitive to the actual interactions between the molecules. An actual liquid has a distribution function very similar to that of a hypothetical liquid of rigid spheres of diameter equal to the gas-kinetic diameter of the molecules. Conversely, small inaccuracies in the calculation (or measurement) of this function can have relatively large effects. One mystery at present is why some theories seem to fare much better than others. These difficulties are faced and not glossed over.

The book can be warmly recommended to any serious worker in this interesting field, and is likely to remain a standard work of reference for many years to come.

H. N. V. TEMPERLEY

SHORTER NOTICES

Formulaire des Conduits Forcées Oléoducs et Conduits d'Aération. By L. LEVIN. (In French.) Dunod, 1968. 224 pp. 74.05 francs.

This is essentially an engineers' handbook containing a useful collection of formulae giving the loss of head in flow through ducts under a wide variety of conditions. The formulae are largely empirical, and they are supplemented by numerical examples to illustrate their application, and by a wide range of diagrams showing the variation of various parameters under different conditions of practical interest.

Tranzitia de la Scurgerea Laminara la cea Turbulenta. By St N. SĂVULESU. (In Rumanian.) Editura Acad. Rep. Soc. Romania, 1968. 312 pp.

The preface and the table of contents of the paperback on 'Transition from Laminar to Turbulent Flow' are given in English as well as in Rumanian, and these give the impression that the book is both ambitious and imaginative. The author certainly devotes as much space to non-linear aspects of the transition problem as to linear stability theory. It is to be hoped that a translation will be available soon.

Similitude: Theory and Applications. By VICTOR SKOGLUND. International Textbook Co., 1967. 340 pp. $13.75.

The principles of similarity (geometrical, kinematic, etc.) and dimensional analysis are developed in the first part, and applications to various systems, solid, fluid, electrical, thermal, and 'analogue' are discussed in the second part. An attempt is made in the various chapters to select problems that illustrate the methods of similarity analysis, but the resulting selection of topics is somewhat random, and the treatment tends to be superficial. This is particularly true of the chapter on fluid mechanics.

Proceedings of the 1967 Heat Transfer and Fluid Mechanics Institute. Edited by PAUL A. LIBBY, DANIEL B. OLFE and CHARLES W. VAN ATTA. Stanford University Press, 1967. 486 pp. £5. 14*s*.

This volume contains the proceedings of the 20th meeting of the Heat Transfer and Fluid Mechanics Institute, held at the University of California at San Diego in June 1967. There are 23 papers in all, eight on 'Post-Apollo re-entry phenomena', seven on propulsion fluid mechanics and heat transfer, and eight on vortices, wakes and boundary layers. The printing of the volume has been by a photographic technique from prepared manuscripts.

The Structure and Properties of Liquids. Butterworths, 1967. 248 pp. £4. 10*s*.

The 21 papers prepared for a 'Discussion of the Faraday Society' in April 1967 on the above topic have been reproduced, together with the associated discussion. There is a good balance of theory and experiment, and the high standard of the contributions will obviously make the volume of interest to specialists.

The non-specialist will conclude, so far as the relevance to the dynamics of liquids is concerned, that phenomenological methods will be needed for some time yet.

Advances in Molecular Relaxation Processes. Edited by W. J. Orville-Thomas and J. Meixner. Elsevier. Vol. 1, 1967–68. Subscription per volume of four parts. £10. 9*s*. 6*d*. or $25.00.

This is a new international journal containing review articles. The first part of volume one, published in November 1967, contains three articles, with the following titles: Dielectric relaxation by intramolecular mechanisms, Stochastic theory of multistate relaxation processes, Relaxation processes in gases. The subject of molecular relaxation processes seems to be rather specialized for a journal, especially one devoted wholly to the reporting of recent advances. Free examination copies of the first part are available from the publishers.

Applied Hydrodynamics, 2nd edition. By H. R. VALLENTINE. Butterworths, 1967. 296 pp. £2. 10*s*.

The first edition of this book has been reviewed in the *Journal* (vol. 7, 1960, p. 317). The second edition differs mainly by the addition of a (much-needed) short chapter on flow with vorticity. The passage of nine years since the first edition makes it even odder that a text-book on *applied* hydrodynamics should be confined almost wholly to irrotational flow of inviscid fluid of the classical kind, with a third of the book devoted to conformal transformation and its use. The writing is clear and accurate, but the old-fashioned choice of subject matter limits the value of the book for engineering students; and for applied mathematics students the theoretical development is not adequate.

Basic Engineering Thermodynamics. By F. J. WALLACE and W. A. LINNING. Pitman, 1968. 486 pp. £2. 10*s*.

The authors have based their development of thermodynamics in this first-year text on that of Keenan (before Hatsopoulos), although, like many others who have written similar thermodynamic texts, they intend a more palatable presentation for engineers. Particular features are a complete chapter devoted to availability and another to one-dimensional gasdynamics, the latter covering more ground than is usual, or perhaps warranted, in the first year. The units of lbf, ft, °F are used throughout.

Advances in Applied Mechanics, volume 10, fascicle 1. Academic Press, 1967. 112 pp. $4.75.

Following a new policy, volumes in this well-known series are to be published in successive fascicles of one or two articles as they are completed. The articles in fascicle 1 are 'Wave Propagation in Real Gases' by W. Liek and 'Magneto-Elasticity and Magneto-Thermo-Elasticity' by G. Paria. The former reviews theory of one-dimensional motion generated by an impulsively started piston. Beginning with the effect of dissipative terms—viscous, reaction-rate and radiative—in the linearized equations, discussion ranges over the continuum theory of the structure of shock-waves and their formation in the piston problem.