J. Fluid Mech. (1998), *vol.* 354, *pp.* 376–378. Printed in the United Kingdom

BOOK REVIEWS

Water Waves Generated by Underwater Explosion. By B. LEMÉHAUTÉ & S. WANG. World Scientific, 1996. 367 pp. ISBN 981-02-2083-9 (hardback) $79 or £55; 981-02-2132-0 (paperback) $46 or £32.

This book brings together in one volume a connected account of studies to assess the water waves generated by explosions. Extrapolation to the waves that might be generated by a nuclear explosion were of particular concern for most of the studies quoted. However, such work is relevant not only from the point of view of defence or offence with weapons but also for peaceful explosions. In addition the techniques that are used can be relevant to other rapidly produced waves, such as those from landslides, or the impact of celestial objects. The initial creation, and then the propagation, of such waves in varied circumstances are covered. Except for the first stage the aspects covering wave propagation can be of general utility.

The initial chapter gives an overview of the topic which may put off many readers since, as in the rest of the book, the original units of all the, mainly US, reports are retained. Feet, yards and fathoms all appear in the caption of one figure, nm are not nano-metres, and the uncomfortable unit slug/ft^3 is used for density. However, these are the practical units that have been used, and as is to be expected for this topic the units of energy are either pounds, tons or even MT of TNT. It is this latter aspect that is well illustrated and makes this a distinctive and interesting book. There are not many opportunities to measure waves from large explosions, and most such opportunities have been missed since other effects of the explosions have been of greater import. Even for small explosions, there are few laboratories that would, or could, contemplate experiments. Although there is not a comprehensive account of such experiments much data is presented alongside the theoretical estimates.

Chapters 2 and 3 are on the linear theory of wave propagation from a central disturbance, and its comparison/calibration/validation with experiment. For deep water, as so often, the results are far better than one could reasonably expect, even after allowing for considerable use of empirically determined formulae. One can argue that the very short initial motions of the explosion are relatively unimportant, and this appears to be so in that a model using a 'crater' described by just two parameters gives satisfactory results. Here, as is noted elsewhere in the book, the relatively large scatter of results from experiments with explosives leads to a fairly loose criterion for accuracy.

As happens in other applications, wave behaviour is very different in shallow water, and chapters 4 and 5 give models for nonlinear shallow water generation and propagation: using a bore model close to the explosion and a Korteweg–de Vries equation for the wave propagation. Again there is reasonable success when compared with experiments. Chapter 6 on wave dissipation and chapter 7 on transient waves over non-uniform beds complete the discussions of wave propagation. The last two chapters return to the generation process, one describing simulation, mainly by dropping a heavy plate onto water, the last chapter giving results of boundary integral computations for the hydrodynamic phase of the bubble and 'crater' caused by explosions. In this latter case the effect of varying the depth and energy of the explosion is important.

As an account of the work that has been done in the USA on explosion-generated water waves the book achieves its aim. Its general value depends on its utility for those interested in a somewhat wider range of more or less impulsive wave generation. From this point of view the book is also useful but any reader should be wary, as the authors indicate, rather strongly, at one point:

> The experimental evidence on which the empirical formulae are based simply does not exist, and one should be careful in extrapolating the range of application of the formulae presented in this chapter beyond the range of experiments on which they are based.

One point merits special note: the bore model used for shallow water explosions. This covers the crater collapse and immediately subsequent motion. However, it is grossly simplified by ignoring wave motion inside the central bore region, and simplifying the bore motion, thus giving an inappropriate transition to smoother wave motion. This is probably of little consequence for an explosion where this domain covers only a relatively small region of space-time, but could lead to major discrepancy if similar simplifications were used for a slower or more extensive disturbance such as landslide.

In compiling their book the authors seem to have concentrated too much on reporting past work, rather than giving an up-to-date commentary. The shallow water flows with bores have been amenable to easy numerical computations since the work of Lax & Wendroff (1960), e.g. Hibberd & Peregrine (1979) shows computations with strong bores and an exposed bed, and better numerical methods are now available. This lack of ease with modern approaches is clear elsewhere, in particular where a 'simplification' given for the rate of wave dissipation is more complicated than obtaining and solving an appropriate differential equation.

The book has value as a record of past achievements and the frequent clear statements of where more work is needed are a useful guide for future research, though as noted some topics can already be improved upon.

REFERENCES

Hibberd, S. & Peregrine, D. H. 1979 Surf and run-up on a beach. *J. Fluid Mech.* **95**, 323–345.

Lax, P. & Wendroff, B. 1960 Systems of conservation laws. *Commun. Pure Appl. Maths* **13**, 217–316.

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SHORT NOTICES

Magnetic Fluids. By E. Blums, A. Cebers & M. M. Maiorov. Walter de Gruyter, 1997. 416 pp. ISBN 3-11-014390-0. DM 378.

Magnetic fluids are stabilized colloidal dispersions of small magnetic particles in various carrier liquids. These novel particles have a wide range of applications in engineering and technology. The aim of this book is to present a systematic picture of knowledge of the interaction between magnetic fluids and an external field.

The book is based on a Russian edition by the same authors, and is characteristically severe and comprehensive. Two other books on magnetic fluids have recently been reviewed in *J. Fluid Mech.* vol. 337, 1997, p. 413. The field is well served with advanced relevant books, and readers seeking an introductory text are likely – fortunately – to find it in *Ferrohydrodynamics* by R. E. Rosensweig (Cambridge University Press).

Nonlinear Magnetohydrodynamics, 2nd Edn. By D. Biskamp. Cambridge University Press, 1997. 378 pp. ISBN 0-521-59908-0. £29.95.

This paperback edition of an outstanding research monograph differs from the first hardback edition by having a few corrections, and has already been reviewed in *J. Fluid Mech*. vol. 263, 1994, p. 375.

Flow and Dispersion through Groups of Obstacles. Edited by R. J. Perkins & S. E. Belcher. Oxford, 1997. 249 pp. ISBN 0 19851190-6. £75.

Many practical problems require models of the flow of a gas or a liquid through a group of obstacles. From a mathematical viewpoint the number of obstacles might be small, and the associated flow is deterministic, and at the other extreme the obstacles might be numerous and regarded as statistically homogeneous. Either way there is scope for practical applications. This book contains the texts of 15 of the talks given at a Conference in Cambridge in March 1994. The relation between theory and application was productive, and the whole meeting was evidently one of those which one should not have missed.

Tables for the Calculation of Friction in Internal Flows. Edited at Wallingford and later by D. I. H. Barr. Telford, 1995. 331 pp. £45.

It is impossible to describe the many uses of these tables. Suffice it to say that the governing equation deals with uniform turbulent flow of incompressible fluid in circular tubes or pipes, and that the equation can predict the resistance characteristics of flow in pipes and conduits to a degree not matched by other approaches.

Handbook of Hydraulic Resistance, 3rd Edn. By I. E. Idelchik. Begell House, 1994. 790 pp. ISBN 0-8493-9908-4. £138.95.

According to the publisher's blurb, this English edition is an updated and expanded new edition of a bestselling reference. Earlier editions have been in Russian, and it must be said that the appearance of the book has that look. There is a heavy emphasis on applications and on use of the book in industry. There are applications of many formulas involving the resistances to relative motion of a solid boundary and a fluid, but theoretically based formulae are not explained. A reader needs to find his way round a large handbook.

Geomechanics and Fluidodynamics with Applications to Reservoir Engineering. By V. I. Nikolaevskiy. Kluwer, 1996. 349 pp. ISBN 079233793X. Dfl 235.

This book evidently has a place in the Russian literature and in advanced lecture courses at Moscow. But how does one judge it in terms of publications in English? It looks very specialized, and beyond that those who are concerned with the teaching of reservoir engineering will need to inspect it to see whether it meets their needs. Judgement of the scientific quality of the book is also relevant, of course, but a more disciplined text is needed for that.