References

1. **Lax P. D. and Wendroff B.** Systems of conservation laws. *Communs. Pure Appl. Math, 1960,* 13
2. **Maclaren J. F. T., Tramschek A. B., Sanjines A. and Pastrana O. F.** A comparison of numerical solutions of the unsteady flow equations applied to reciprocating compressor systems. *J. Mech. Eng. Sci., 1975,* 17
3. **Benson R. S., Garg R. D. and Woollatt D.** A numerical solution of unsteady flow problems. *Int. J. Mech. Sci., 1964,* 6
4. **Lax P. D.** Weak solutions of nonlinear hyperbolic equations and their numerical computation. *Communs. Pure Appl. Math, 1954,* 7
5. **Shapiro A. H.** The dynamics and thermodynamics of compressible fluid flow. *Ronald, 1954*
6. **Courant R., Isaacson E. and Rees M.** On the solution of non-linear hyperbolic equations by finite differences. *Communs. Pure Appl. Math, 1952,* 5
7. **Hartree D. R.** Numerical Analysis. *Oxford 1958*
8. **De Haller P.** The application of a graphic method to some dynamics problems in gases. *Sulzer Technical Review No. 1, 1945*
9. **Courant, R., Friedrichs, K. O. and Lewy, H.** Uber die Partiellen Differenzengleichungen der Mathematischen Physik. *Math. Ann. 1928,* 100
10. **Richtmeyer R. D. and Morton K. W.** Difference methods for initial value problems. *Interscience, 1967.*

BOOK REVIEW

Developments in Flow Measurement

Ed. R. W. W. Scott

In-depth analyses of several individual meter types combined with a number of excellent surveys of broad aspects of flow measurement make this book very good value. With eight authors who have already written extensively on their subjects in journals and for Conferences it would be surprising if there was much that was new in the book but few will have had the opportunity to follow the dozens of references at the end of each chapter. In consequence collecting together their expertise to produce an overview of the status of flow measurement at the beginning of the 1980's is certainly valuable to all who are involved in the art and science of this subject.

Each chapter has its own distinctive flavour melded together by the editor who has himself contributed a very useful introduction and a detailed appraisal of liquid (mainly water) flowmetering. Similar general studies of petroleum and gas measurement are followed by two detailed examinations of present developments in turbine and electromagnetic flowmeters. Another broad look, this time at open channel flow, leads to the final chapter on assessing the uncertainties which occur in every measurement.

I have purposely left Chapter 2 for special mention. This is by Dr Mattingly of the National Bureau of Standards in the USA and deals with calibration facilities and the dynamic traceability which should be determined between every measurement installation and the eventual national primary standards of mass, length, time, etc. However accurate or inaccurate the actual user wishes to be, it is only by the conscious effort to find out the answer in his case to dynamic traceability that his measurement can have real meaning.

E. A. Spencer

Published by Applied Science Publishers, London. 6×9″ (15.5×23 cm), x 326 pages, 136 illustrations, 1982, price £36

Modern Compressible Flow

J. D. Anderson

Compressible fluid flow is a subject of considerable interest to students, but one which can easily become an apparently endless parade of equations. The lecturer must enliven the subject by discussing practical applications, experimental results, personal experience and occasionally commenting on the historical development of the subject. This 'filling out' of the subject is not too difficult for a lecturer, but few authors have followed Professor Anderson's approach of including historical and biographical notes in a text book. These notes provide an interesting background to the theory, placing the work in perspective and making the book more readable. The result is a book to which students and teachers can turn without being 'turned off'.

After a general introduction to compressible flow, the governing equations are derived and applied to one-dimensional flows and normal shocks. The Fanno line and Rayleigh line are introduced at this stage, but the flow in nozzles is discussed later. There is a thorough treatment of oblique shocks, shock reflection, shock interaction and expansion waves, with some interesting notes on the development of the subject by Prandtl and Taylor. The chapter on nozzle flows contains an interesting biographical sketch on de Laval and a summary of the pioneering work of Stodola. Linearised compressible flow theory is described and there is a short chapter dealing with the Taylor–Maccoll equation for compressible flow over a cone. The first 259 pages, as outlined here, provide a good treatment of compressible flow theory prior to the development of digital computers.

The remainder of the book, another 200 pages, is an introduction to modern numerical methods in fluid dynamics. The method of characteristics is described, with application to nozzle design. This is followed by finite difference methods and an outline of time-marching techniques, with the last two chapters adding real gas effects with reactions at high