

Book Review

Research Trends in Fluid Dynamics

Edited by J. L. Lumley, A. Acrivos, L. G. Leal, and S. Leibovich, American Institute of Physics, Woodbury, NY, 1996, 328 pp., \$50.00

This volume is the second in a series of reports commissioned by the U.S. National Committee for Theoretical and Applied Mechanics. The purpose of the volume is to illustrate the excitement, and research frontiers, of diverse aspects of fluid mechanics. This it does very well. The Executive Summary prepared by the editors summarizes the field as a whole and is itself a contribution of note.

The volume's riches are to be found, however, in the individual sections from a "wish list" of contributors ranging from A to Z (Aref to Zabusky). The subjects covered also range from A to Z (acoustics to vortex-dominated flows). A special treat is that no equations are used, setting the individual contributors the challenge of articulating the field and its research frontiers. This each author does well. This reviewer is pleased, and no doubt lucky, to find that both dynamical systems and fractals are reviewed. Lucky in the sense that in a 1985 U.S. Department of Defense Topical Review, I remarked that both these areas could be important to several branches of fluid mechanics, including, of course, turbulent flow. More than a decade later, this remains a prediction, as the two reviews in the volume make clear.

This volume is "a good read" and well worth the reader's time. It is as uniform in depth as one might achieve and relatively uniform in presentation. Readers will probably be most rewarded by the contributions in fields to which they are themselves not contributors. The topics covered and by whom are as follows: Application of Dynamical Systems Theory to Fluid Mechanics (H.

Aref); Turbulent Boundary Layers (P. Bradshaw); Laminar Boundary Layers and Separation (S. N. Brown); Computational Aerodynamics (D. A. Caughey); Particulate Flows and Sedimentation (R. H. Davis); Issues in Non-Newtonian Fluid Mechanics and Rheology (M. M. Denn); Thermal and Mass Diffusion Driven Flows (B. Gebhart); Rapid Flows of Granular Materials (J. T. Jenkins); Acoustics (E. J. Kerschen); Molecular Dynamics of Fluid Flow (J. Koplik); Stability of Fluid Motion (S. Leibovich); Compressible and Hypersonic Flows (S. K. Lele); Environmental Fluid Mechanics (E. J. List); Turbulence and Turbulence Modeling (J. L. Lumley); Water Waves and Related Coastal Processes (C. C. Mei); Direct and Large Eddy Simulation of Turbulence (P. Moin); Research Directions in MHD for the 1990's (R. Moreau); Rarefied Gas Dynamics (E. P. Muntz); Hydrodynamics of Ships and Offshore Platforms (J. N. Newman); Reacting Flows and Combustion (S. B. Pope); Multi-Phase Flow, Cavitation, and Bubbles (A. Prosperetti); Control of Turbulent Flows (W. C. Reynolds); Fractal Geometry and Multifractal Measures in Fluid Mechanics (K. R. Sreenivasan); Capillary and Interfacial Phenomena, Wetting and Spreading (P. H. Steen); Biofluid Dynamics (S. Weinbaum); Geophysical Fluid Dynamics (J. A. Whitehead); and Vortex Dominated Flows (N. J. Zabusky).

The only criticism one might make of the volume is that it lacks a subject index. Highly recommended!

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