BOOK REVIEWS

Frontiers of Fluid Mechanics
Shen Yuan, Editor
Pergamon Press/Peking University Press, 1988

The proceedings of the international conference on Fluid Mechanics (July 1987, Beijing), sponsored by fluid-mechanics-oriented societies in China, USA, Germany and Japan, contain 1265 pages, with 214 papers by authors from 24 countries. The stated goal of the conference was to bring together many different branches of fluid mechanics for cross-sectional review and exchange of ideas. That goal was accomplished beyond the dreams of any one reader or reviewer. There are papers on everything from cruciform parachute dynamics to liquid crystal flows to dust deposition on trees.

The articles are grouped into packets of about thirteen papers on each of sixteen topics: turbulence, stability and transition, transonic flow, boundary layers, gas dynamics, water waves, hydraulics, bubbles and drops, jets and wakes, geophysical flows, two-phase flow, porous media, physico-chemical flow, biofluid mechanics, industrial applications, and heat transfer. The scope and quality are variable: some papers are only one-page abstracts; others are full, stand-alone, state-of-the-art efforts. The reviewer suspects that peer review was probably impossible for such a broad-based conference. A further suspicion is that the authors are free to re-use or further develop their papers and resubmit them to serial journals.

The volume begins with seven modestly successful review articles on various topics, including porous-media flow. Later (p. 917), there is a brief review of biofluid mechanics by Y. C. Fung. Perhaps the main advantage of such a comprehensive conference is the opportunity for readers to see and learn about such a vast array of subjects—and to capture those 214 bibliographies for later use! Some of the papers are not truly useful: they are prose descriptions of work published elsewhere. But many papers are very good. This reviewer, for example, thoroughly enjoyed articles on (1) boundary layer freestream-turbulence effects; (2) shock-wave/boundary layer interaction on a curved wall; (3) pile-up of solitons in a stratified fluid; (4) the comparison of real bubbles with plastic replicas; and (5) a numerical model and suggested control system for an unstable wake.

The papers are printed from author-prepared mattes, and the reproduction is light, but readable. Some of the figures are too small, and photographs tend to be a bit washed-out. This volume affords a good look at the vast field of fluid mechanics and is a tribute to a fine conference plan by the Chinese Society of Theoretical and Applied Mechanics.

Frank M. White

Transport Phenomena in Turbulent Flows: Theory, Experiment, and Numerical Simulation
Edited by M. Hirata and N. Kasagi
Hemisphere Publishing Corporation, New York, 921 pp., $150 (U.S. and Canada)

This thick volume of 943 pages contains all the papers from the *Second International Symposium on Transport Phenomena in Turbulent Flows*, held at the University of Tokyo in October, 1987. Each of the 56 general papers is 10 to 14 pages, whereas the 6 keynote papers average 20 pages each. Thus, the volume details a substantial body of current research in turbulence. About half of the papers involve strictly incompressible turbulence. With the exception of three papers on compressible turbulence, the rest contain elements of heat transfer, scalar concentration, combustion, stratification, mass transfer, or thermal convection. The vast majority of the papers (61%) are experimental in nature, about 25% are numerical or describe efforts in modeling, and the remaining 14% are either theoretical or a mix of experiment and theory (or calculation). Of particular interest in this last group is the keynote paper by Hanratty and Vassiliadou in which linear theory, experiment, and full simulations are combined in a study of mass transfer at the wall in turbulent pipe flows at high Schmidt numbers.

Many interesting papers may be found in this volume, only a few of which can be mentioned here. Of note is the well-written review by Blackwelder describing his understanding of near-wall dynamics, structure, and inner/outer scaling in wall-bounded turbulent shear flows. Fundamental issues of self-similarity and persistence of initial conditions are discussed by George, Chatwin and Sullivan, and Criminale. Nagano and Tagawa document up to third order moments and PDF's of velocity and temperature from the wall to the centerline in a uniformly-heated turbulent pipe flow. A triple-moment velocity closure model is developed by Amano and Chai. Two interesting papers, by Yokota *et al.* and Takagi *et al.*, describe advanced instrumentation techniques for simultaneous measurement of velocity and concentration fields. Reynolds *et al.* detail the use of full numerical simulations in the development of a simple but useful model of the turbulent scalar flux; and papers by Kim and Horiuti uncover a strong correlation between passive scalar concentration and streamwise velocity in the near-wall region of turbulent channel flows using numerical simulations.

The volume is nicely organized in ten sections. In descending order by number of papers (given in parentheses), the sections are: Coherent Structures (12), Modeling and Prediction (10), Wall Shear Flows (8), Free Shear Flows (7), Measurement Techniques (6), Scalar and Buoyant Transport (6), Numerical Simulations (6), Fundamentals (5), and Turbulent Transport in Applications (4). Overall, the quality of the type is good, and a well-constructed index has been included at the end. Perhaps the only useful item that is lacking is the inclusion of authors' names in the index. Researchers in turbulence and turbulent transport should find it most worthwhile to examine this well-edited volume of papers. Unfortunately, the extremely high price of $150 makes it improbable that one could consider adding it to one's personal library.

James G. Brasseur