Numerical Methods in Laminar and Turbulent Flows. C. Taylor, K. Morgan, and C. A. Brebbia, Eds. Halsted Press, John Wiley & Sons, New York—Toronto. 1978. Pages 1006. Price $55.

REVIEWED BY T. J. R. HUGHES[3]

This volume contains the *Proceedings of the First International Conference on Numerical Methods in Laminar and Turbulent Flow,* held at the University College of Swansea, July 17–21, 1978. The texts of 81 papers are included, loosely grouped into nine sections: General Viscous Flow, Turbulent Flow, Boundary Layer Analysis, Flow With Heat Transfer, Free Surface Flows and Lubrication, Turbomachinery and Airfoil Flow, Two-Phase Flow and Meteorology, Mass Transport and Convection, and Numerical and Mathematical Concepts. The papers tend to be somewhat short, averaging about 12 pages in length, and some appear to be only brief overviews of works documented more thoroughly elsewhere. Nevertheless, a great deal of information is included on a wide array of fluid mechanical problems. Probably no individual would be interested in all this volume contains, but anyone interested in computational fluid mechanics will no doubt find several papers bearing upon his area of specialty.

Both finite-element and finite-difference methodologies are well represented among the contributed papers. Although computational fluid mechanics has been in the past dominated by finite-difference techniques, the increasing interest in finite elements is apparent in that the majority of papers are here concerned with element procedures.

In reading through the many papers, one cannot help but be impressed by the number and variety of innovative numerical approaches currently under investigation in fluid mechanics. The potential of these efforts is significant and augurs increased use of computational methods in simulating fluid flows in engineering and the physical sciences.

It is indicative of the size of the field that, despite the number of papers contributed, and topical comprehensiveness of the volume, many leading researchers and major schools of thought are not represented. At the same time the volume serves as an extensive sampling of current endeavors and provides a very valuable source of references to the contemporary literature. Individuals concerned with research in computational fluid mechanics will find this book a very worthwhile addition to their libraries.

Fracture Mechanics. Edited by Nicholas Perrone, Harold Liebowitz, David Mulville, and Walter Pilkey. University Press of Virginia, Charlottesville, Va. 1978. Pages xi–722. Price $25.

REVIEWED BY M. F. KANNINEN[4]

This volume contains the *Proceedings of the Tenth Naval Structural Mechanics Symposium,* held at George Washington University, September, 1978. It is divided into four sections. In the first, "selected overviews of fracture mechanics," representatives of four government agencies provide their views on current uses and future research needs in the field. Six surveys of progress in fracture mechanics research abroad appear in the second section, "international fracture mechanics research." The third and fourth sections, "fracture mechanics in materials and structures" and "fracture mechanics technology," contain 29 papers representing a combination of new work and reviews. The book includes a subject index.

Possibly because all of the papers were solicited by the editors, their quality is generally above that of most proceedings volumes. Hence, selecting a few papers for special notice is basically unfair. Nevertheless, some can be identified to give at least a flavor of the content of the volume. These are roughly in the order of their appearance in the volume.

The paper by G. T. Hahn, et al., provides a sound basic account of dynamic crack arrest together with a good collection of dynamic toughness data. The design of alloys for fracture resistance is nicely covered by A. J. McEvily. Van Leewan and Wanhill provide extensive data on stable crack growth in various structural materials. Freiman and Wiederhorn cover ceramic materials. Masubushi and Itoga provide a starting point for a relatively new and important area for future work—weld fracture.

While most of the material contained in the book is based upon linear elastic fracture mechanics concepts, work with more advanced constitutive relations is also represented. Schapery utilizes a viscoelastic fracture mechanics approach to look at solid propellents. Hutchinson, et al., develop a plastic fracture mechanics approach. Achenbach and Kanninen give a preliminary step toward the explicit recognition of crack tip plasticity in dynamic crack propagation.

A number of excellent papers on basic principles and applications of fatigue crack growth are included in the volume along with several papers on nondestructive inspection. Experimental fracture mechanics techniques are reviewed in some detail by Kobayashi. Liebowitz, et al., present a thorough study of biaxial loading effects in fracture mechanics. One relatively lightly covered area is on the use of numerical methods for the determination of crack growth parameters. The paper in finite-element crack tip analysis by Swedlow is the only one in this area.

As the partial list of authors and titles just cited suggests, this volume provides an unusually complete coverage of the field by recognized authorities. This is clearly the book's strong point. On the negative side, the division of the research papers into the two specific categories that the editors have selected seems to this reviewer to serve no good purpose. It would have been more useful to the reader to have instead delineated the broad-based review papers from the more narrowly focussed current research papers. It is not easy to tell which are which at first sight in the present format. In addition, in view of the absence of any national character to fracture mechanics research, the value of geographically oriented research reports is questionable. However, these are minor points. On balance, while *Fracture Mechanics* may not be too useful to newcomers to the field, this reviewer believes that it will provide a comprehensive source of background information for specialists that will be of value for years to come.

Continuum Mechanical and Statistical Approaches in the Mechanics of Granular Materials. Edited by S. C. Cowin and M. Satake. Published by the Association for Science Documents Information, OH-okayama, Meguroku, Tokyo. 1978.

REVIEWED BY D. E. KENYON[5]

This book contains the proceedings of a joint U.S.-Japan seminar on the continuum mechanics and statistical concepts now being applied to granular materials. The proceedings contain 28 presentations which cover three broad topical areas. The first area concerns the identification and measurement of what is known as the "fabric" of a granular material. The second area concerns statistical approaches to modeling fabric of granular materials and predicting gross behavior from a knowledge of the local interaction of the grains. The third area covered by the proceedings concerns continuum mechanical concepts as applied to granular materials, and papers here concern both solid-like displacement and fully developed flow of dry granular materials and of suspensions of granular materials.

Papers by Oda and others reveal strong dependence of static stress-strain relations of granular materials upon the fabric, and the single-most important measure of fabric beyond void ratio appears to be the distribution of orientation in contact normals. A somewhat less significant parameter appears to be the number of contacts on an individual granule by its neighbors. These measures of fabric are

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