

Fluid Mechanics

Stromungsmechanik. By E. Truckenbrodt. Springer-Verlag, Berlin, 1968. xi and 532 pages. \$17.25.

REVIEWED BY R. I. TANNER¹

A GREAT DEAL of information is packed into the pages of this book. It deals with both basic theory and applications, and emphasis on the latter aspect differentiates it from the usual one or two-semester book currently used in this country. Comparison with five current undergraduate textbooks produced here showed only one which came close to the subject coverage given by Truckenbrodt: fluid properties, statics, kinematics, kinetics, conservation principles and basic viscous flow equations, elementary aspects of compressible flow, potential flow (compressible and incompressible), vortical flows, turbulence, open-channel flows and boundary-layer theory all find a place. The author gives a wide selection of applications including turbines and pumps, wing theory, open channel flows, waves and lubrication theory. The mathematical treatment is, not unexpectedly, similar to that of H. Schlichting (*Boundary-Layer Theory*, 6th edition, McGraw-Hill, New York, 1968). The writer does not use vector methods very convincingly and at least once (p. 68) makes an elementary error in basic development; however, this particular error should mislead few.

The book is not likely to be popular with teachers in this country as it lacks routine exercises at the end of the chapters; the more mature and ultimately more useful idea of giving a large selection of original references is followed instead. In short, it is not a book intended only to smooth the unwilling students' path toward graduation; it is also a book which will be of professional value afterwards. This air of permanent value is enhanced by the magnificent production and printing; in particular, the line drawings make many "modern" text illustrations look like subway graffiti.

Material Research

Advances in Materials Research, Vol. 3. Edited by Herbert Herman. Interscience Publishers (division of Wiley), New York, 1968. 417 pages. \$19.50.

REVIEWED BY J. R. RICE²

Two of the five articles in this book will certainly be of interest

¹ Professor, Division of Engineering, Brown University, Providence, R. I. Assoc. Mem. ASME.

² Associate Professor of Engineering, Brown University, Providence, R. I.

to many readers of the JOURNAL. These are: "The Continuum Theory of Dislocations" by T. Mura (108 pages), and "Lattice Dynamics and the Stability of Crystals" by D. C. Wallace (73 pages). Mura's article is perhaps the most complete available summary of the continuum elasticity fields due to dislocations. Emphasis is placed on the Green's function construction of general solutions, both static and dynamic, for specified dislocation distributions of either a discrete or continuous type. Several examples are worked out, and the overall presentation is quite readable. The scope is limited, however, and little attention is directed to subjects such as dislocation intersections, multiplication, sources of drag, thermal activation, etc. The greatest part of Wallace's article consists of a review of the theory of crystal lattice dynamics in the harmonic approximation. Results of stability calculations for several lattice types, as based mostly on central forces with Leonard-Jones potentials, are reported in terms of a configuration variable representing changes in lattice spacing from an equilibrium value at zero temperature and stress.

As for the additional three articles, "Fatigue Hardening in Face Centered Cubic Metals" by R. L. Segall discusses dislocation arrangements and cell structures observed in fatigue, comparing them with results in unidirectional deformation, and attempting to rationalize variations among different materials in terms of stacking fault energies, cross slip, point defects, etc. "The Crystallography of Martensitic Transformations in Alloys of Iron" by C. M. Wayman reviews the phenomenological theory of these transformations, as dependent on crystallography of the transformed platelets and matrix, and on the resulting shape transformation as resolved into Bain distortion, relative rotation, and an accommodating shear. "Properties Calculations for Heterogeneous Systems" by S. P. Mitoff presents some approximate methods for calculating properties such as conductivity and dielectric constant for composite materials, without the complication or benefit of mathematical formulations and bounding theorems.

Proceedings, Collections of Individual Papers, etc.

An Introduction to Structural Optimization. Study No. 1, Solid Mechanics Division, University of Waterloo, Waterloo, Ontario, Canada. \$7.

Viscous Drag Reduction. Edited by C. Sinclair Wells. Proceedings of the Symposium on Viscous Drag Reduction, Dallas, Texas, 1968. Plenum Press, New York, 1969. xi and 500 pages. \$22.50.

Theory of Thin Shells. Edited by F. I. Niordson. Second Symposium, Copenhagen, September 5-9, 1967. (International Union of Theoretical and Applied Mechanics.) Springer-Verlag, Berlin, Heidelberg, New York, 1969. In English. viii and 388 pages. DM 88; \$22.