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Book reviews

F. J. Lockett, **Nonlinear viscoelastic solids,** Academic Press, London, 1972, xi + 195 pp., price £. 4.40.

In the field of mechanics linear infinitesimal-strain theory of viscoelasticity has been used over many years. It serves to model real polymeric materials and to solve problems of practical interest. It is obvious that any application has to be limited to materials with a linear behaviour in the sense that twice the load produces twice the response. However, the increasing use of plastics in the manufacture of various articles has given rise to situations where a characterization of nonlinear behaviour cannot be dispensed with. It was only during the last twenty years that such a theory was developed, for the greater part based on the pioneering work of Rivlin and Truesdell. In this relation the author states in the introduction: "It is unfortunate that, in this case, the relationship between theory and practical application is far from satisfactory. This is partly due to the complexity of nonlinear material behaviour, but, to a large degree, it is due to a lack of communication between theoretical workers and those involved in handling and using materials. It is the purpose of this book to assist in bridging this gap by demonstrating the extent to which present theoretical development can contribute to nonlinear material characterization. In so doing the theoretician should be able to identify better the objective towards which future developments should be directed and the non-mathematician will be provided with an insight into the possibilities and limitations of existing theoretical work".

After an introductory chapter the author reviews the linear theory in Chapter 2, "Classical Linear Theory of Viscoelasticity", and in Chapter 3, "Experimental Determination of Linear Properties". Chapter 4, "Nonlinear Theory of Viscoelasticity", gives an outline of relevant theoretical results, and Chapter 5, "One-Dimensional Green–Rivlin Behaviour", deals with available experimental data pertaining to one-dimensional behaviour. In Chapter 6, "Three-Dimensional Green–Rivlin Behaviour", the author shows, that present theories bearing on general behaviour, are too complex to be used in practice. The last three chapters, 7 "Single-Integral Constitutive Relations", 8 "Material Characterization in Special Situations" and 9 "Semi-Empirical Approach to Material Characterization", are devoted to various theories, simplified on account of mathematical, physical or empirical considerations.

In my opinion this book, written by an expert in the field of viscoelasticity, gives an exceptionally clear, systematic account of the pertaining mathematical theory and of its consequences with regard to a rational evaluation of experimental results. As far as I know, a book like this is unique, and therefore I expect that it will be indispensable as a supplementary text to be used in courses dealing with viscoelastic behaviour. In addition, it will of great value for those who are involved in related theoretical and experimental research. It requires no more than an understanding of some fundamental concepts of linear algebra.

M. Kuipers

W. Prager, **Introduction to mechanics of continua,** Dover Publications Inc., New York, 1973, x + 230 pp., price $ 3.—.

This Dover edition is an unabridged, slightly corrected republication of the (1961) English edition based on the "Einführung in die Kontinuumsmechanik" (Birkhäuser Verlag, Basel). In my opinion it will preserve its value as an introductory course serving as a common basis for many special courses in mechanics of continua.

M. Kuipers

I. G. Petrovski, **Ordinary differential equations,** Dover Publications, Inc., New York, 1973, x + 323 pp., price $ 3.50.

This English translation of the fifth revised Russian edition (Moscow, 1964) of Petrovski's book was first published by Prentice Hall Inc. in 1966. The book consists of two parts dealing with the equation $y' = f(x, y)$ and systems of ordinary differential equations, respectively, and a large supplement on first-order partial differential equations involving one unknown function. This organization of the book leads to some duplication in the presentation, for instance after treating existence and uniqueness theorems for $y' = f(x, y)$ in part I, this is virtually repeated for systems of equations in part II. However, the book is written in a clear style and it contains a large number of exercises. It may serve as an introduction to the field of differential equations for students in applied mathematics, physics and engineering.

H. W. Hoogstraten

Annual Review of Fluid Mechanics, Vol. 6, Annual Review Inc., Palo Alto, California, U.S.A., 1974, viii + 371 pp., price USA $12.00, foreign $12.50.

In this volume for the first time a subject already surveyed in an earlier volume has been reconsidered, which shows the rapid progress in the field. Moreover, several authors from the first volume reappear in the present one, which shows that the Annual Review of Fluid Mechanics is able to keep its high level. The contents of Volume 6 are:

The interaction between experiment and theory in fluid mechanics, by G. I. Taylor,
Harbor seiching, by J. W. Miles,
Double-diffusive phenomena, by J. S. Turner,
Waterhammer and surge control, by V. L. Streeter and E. B. Wylie,
Sampling techniques in turbulence measurements, by C. W. van Atta,
Nonlinear dispersive waves, by O. M. Phillips,
The meaning of viscometry in fluid dynamics, by C. Truesdell,
The atmospheric boundary layer below 150 meters, by H. A. Panofsky,
Superfluid mechanics, by P. H. Roberts and R. J. Donnelly
Transport properties of two-phase materials with random structure, by G. K. Batchelor,
Spin-up, by E. R. Benton and A. Clark Jr.,
Numerical simulation of viscous incompressible flows, by S. A. Orszag and M. Israeli,
Aerodynamics of powered high-lift systems, by G. K. Korbacher.

H. W. Hoogstraten