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Book reviews

E. Becker und W. Bürger, **Kontinuumsmechanik, Eine Einführung in die Grundlagen und einfache Anwendungen,** Leitfäden der angewandten Mathematik und Mechanik, LAMM, Band 20, B. G. Teubner Verlag Stuttgart, 1975, 228 Seiten, Preis DM 29,—.

In the beginning of the fifties, the pioneering work of Truesdell and Rivlin ushered in a renaissance of the mechanics of deformable bodies with an emphasis on the fundamental study of the exact structure of non-linear continuum mechanics. In all publications in this specific area (among which those of Noll take a prominent place) free use is made of modern notions from linear algebra, group theory and functional analysis. This made the field less accessible for the common worker in mechanics, and therefore it received little appreciation from that side. From this viewpoint, it is gratifying that recently several books have been published with the apparent aim to serve as an introduction to the field. Some of them are intended to be not too difficult textbooks, and the present booklet is the first one of this kind written in German. The greater part of it can be characterized as a very successful excerpt from the well-known chapter by Truesdell and Noll in the Encyclopedia of Physics with original contributions of the authors at a number of places in the form of clarifying explanations, examples and physical interpretations.

The seven chapters are called: 1. Kinematische Grundlagen, 2. Deformation, 3. Mechanische Bilanzgleichungen, 4. Thermodynamik der Deformation, 5. Unstetigkeitsflächen, 6. Spezielle Materialgleichungen, 7. Mechanische Materialtheorie. Within the restricted scope of the book the odd position of thermodynamica becomes obvious: in fact, Chapter 4 does not "fit" in the rational construction of the remainder of the book in which heat does not play a role. To avoid difficulties for the reader, no use is made of curvilinear coordinates (except for pp. 35–37), and matrix notation is mainly applied with the only explanation that it is a "symbolical" notation (pp. 18 and 33). The excellently written Chapters 1 and 5 clearly show that the authors come from the field of fluid mechanics. This influence is also noticeable from the series of well-posed excercises throughout the book (often with hints). The book can be recommended to any interested teacher or student.

M. Kuipers

J. M. T. Thompson and G. W. Hunt, **A general theory of elastic stability,** John Wiley & Sons, London, 1973, VII + 322 pages, price £7.50.

The title of the book does not show that it is concerned only with conservative systems having a finite number of degrees of freedom. When dealing with continuous structures authors replace them by discrete systems obtained by a finite element technique or by retaining a finite number of terms of a suitable series expansion. The criterium of stability

used throughout the book is the static one, i.e. only stationary values of the potential energy are considered and any relation with stability in the sense of Liapunov is dismissed in two axioms on page 87. As stated in the preface the treatise represents a sizeable contribution to bifurcation theory of classical mechanics in the spirit of H. Poincaré. The authors pay high tribute to the pioneering work of W. T. Koiter, much of which has been incorporated in the treatise. From a mathematical point of view the authors consider a family of scalar functions on $\mathbb{R}^n$. Each function represents a potential energy and the family is generated by two positive numbers Λ and ε, representing the load parameter and the imperfection parameter of the system, respectively. The parameter Λ may have any finite value, while the parameter ε is small. With respect to the path of points in $\mathbb{R}^n$ where the functions are stationary, representing equilibrium states, authors classify four different kinds of critical points for $\varepsilon = 0$, one so called limit point and three branching points. The effect of ε on each class is assessed, and in a number of cases the effect appears to be disastrous for real structures in that buckling strengths are reduced drastically by small unavoidable manufacturing imperfections. The consequences of coinciding branching points, the compound failure of columns and the erosion of structural optimization solutions are treated in separate chapters. The book has been written for the engineering profession and the mathematical findings are simply illustrated in different structural elements, such as struts and frames, arches, columns, circular plates, cylindrical and spherical shells. It is of immediate concern not only to structural engineers, but also to wider audiences across the physical sciences, such as cosmology, hydrodynamics and crystallography. Finally it can be remarked that there is an interesting parallelism between the ideas developed in the book and the qualitative catastrophe theory of R. Thom, which has been applied recently to problems in sociology, economics and biology.

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