ever, that it is void of content unless reformulated with relevance to the changed scientific situation.

LANCELOT LAW WHYTE

Dislocation Theories

Fundamental Aspects of Dislocation Theory. (Proceedings of the National Bureau of Standards, April 1969.) Edited by John A. Simmons and R. de Wit. Vol. 1: Pp. xxv+726. Vol. 2: Pp. xi+729–1138. (US Government Printing Office: Washington DC, December 1970.) $8.25 per set. (Sold in sets only.)

THESE volumes record a conference held in 1969 under the auspices of the Institute for Materials Research, the purpose of which was "to provide a multidisciplinary forum seeking to intermix the viewpoints of solid state physicists and continuum mechanicists on the basic properties of dislocations". The proceedings include seventy-five contributed papers and two panel discussions on diverse topics.

Reactions to the diversity of research described here must inevitably be subjective to some extent: I shall only mention certain contributions which appeal to me, and emphasize that others with a different outlook might validly select a completely different list from the many papers of high quality. My feeling is that significant advances in the understanding of structure-sensitive properties of solids have always arisen from an interest in particular phenomena, such as brittle fracture, work-hardening of metals, or crystal growth at low supersaturation ratios. Attempts to attain a high level of generality, following the example (and sometimes the methods) of relativity or elementary particle theory, have not been rewarded in the same way. Accordingly my criteria for evaluating the papers were these: first, does the subject refer to a general problem in the science of real materials, rather than mathematical development for its own sake? Second, does the paper contain significantly new results relatively insensitive to special assumptions (for example, the form of the interatomic potential)? Third, is the model realistic enough to make predictions in a form suitable for experimental verification?

The papers which strictly answered these criteria were some of those relating to Peierls stresses, activation phenomena, and interaction with electrons and phonons. H. Suzuki presented a particularly interesting paper on the marked effect of the atomic arrangement in the slip plane on the lattice force on dislocations, and the papers by Duesbery and Hirsch and by Foreman, Hirsch and Humphreys on the flow of crystals containing hard particles both compare detailed theoretical models with fairly new experimental data. Those by Gruner and by Klemens on phonon scattering by dislocations also present specific results in an important field in which large effects due to dislocations have still not been satisfactorily explained. There were surprisingly few papers on the interaction of electrons and dislocations, and of these the contribution by Haasen and Schröter best seemed to me to measure up to the importance of the field: they show that a one-dimensional energy band theory of electron states along the dislocation line provides a better understanding of experimental observations on germanium and silicon than the "dangling-bond" picture.

I also, however, found stimulating a number of papers in the section on "Applications of the Geometry of Dislocations". S. Mendelson, for instance, gives a wide-ranging and useful discussion of possible effects due to non-planar dissociation of dislocations, including flow in hexagonal metals and in germanium. Most interesting of all were the papers on disclinations, those Volterra elastic singularities neglected until recently on account of their forbiddingly high energy in nearly perfect crystals. Nabarro provides the conference with a comprehensive review of the topological properties of screw disclinations, while Friedel and Kléman illustrate the application of disclination and dislocation theory to liquid crystals. W. F. Harris shows that the subject may be relevant to certain periodic structures in biological materials.

Altogether, then, I found much to admire in these proceedings, qualified by some disappointment. The reason for this was expressed by Professor Seeger in the second panel discussion, in which he rightly lamented that the contribution of the subject to technologically important fields of fatigue and fracture, or the understanding of yield criteria in macroscopic plasticity, has been, and seems likely to be, small. Since the hope of elucidating these complex matters provided the original stimulus of the subject (and much of the financial support since), these failures should serve as a challenge and a warning against complacency.

K. E. PUTTICK

Solid Surfaces

Tribology. By E. D. Hondros. Pp. 70. (Mills and Boon: London, October 1971.) £1.50.

THIS little book which occupies less than 70 pages is an attempt to provide the engineer with some of the basic ideas that lie behind the term tribology. One of the principal problems that the author has had to face concerns the standard of knowledge and the level of intelligence assumed in the reader. It cannot be said that the author has been particularly successful or consistent in this difficult task. At some times the writing is stiff and technical, at other times over-simple. Again some of the figures seem of little interest to engineers—for example, the subsurface cracking in polished beryllium or germanium. On the other hand, one or two of the schematic diagrams communicate well.

In spite of the rather mixed quality of the book it makes clear the general point that solid surfaces have special topographical, structural, energetic and chemical properties and that these play a crucial part in the majority of sliding processes. Perhaps the most significant phrases of the whole book are to be found in the first couple of pages, where the author points out that the only new feature of tribology is its name and that unhappily the use of this new word will not automatically simplify the complicated phenomena involved in "interacting surfaces in relative motion and of related subjects and practices". Nevertheless a new emphasis has emerged: the recognition that tribology is not only a matter of science and technology. The solution of tribological problems also involves managerial and economic factors of considerable complexity.

DAVID TABOR

Mathematics for Models

Mathematics for Ecologists. By I. Chaston. Pp. 132. (Butterworth: London, November 1971.) £2.20 cloth; £1.50 paper.

THIS book aims to introduce biologists to the most elementary and most essential parts of calculus and matrix theory—easy ideas, but very useful in mathematical theories and models. There is also a fascinating chapter on operational research methods. The concepts are illustrated by interesting examples (even if artificial ones) which give a good insight into the power of mathematical methods. Unfortunately it is less easy to be complimentary about many of the explanations. For example, a determinant is first defined as follows: "If an operation is carried out whereby all the elements within a square matrix **A** are described by a single value . . . this calculated value is known as the determinant . . .". What is a novice to make of this? Later on this becomes ". . . the *n*-th order determinant $A=|a_{ij}|_n$ is the sum of all terms of the form $(-1)^x a_{nj_n}$ . . ." which (like some other equations and statements in the book) is a poetically distant view of the truth rather than a precise and detailed description. If the author could only rephrase such explanations in an unambiguous and accurate way, this would become a most useful book.

CEDRIC A. B. SMITH