great convenience. However, the absence of this is compensated for by three fairly complete indexes for author, subject and materials. Omissions could be found; thus apparently, "fracture toughness" does not come within their terminology, although fracture is discussed in great length and detail. On page 21 I was puzzled to find only brass listed in the table of "... Some Common Inorganic Compounds and Alloys ..." under a column merely headed "Compound"! In contrast, there are occasionally useful nontechnical footnotes, such as on page 148 with respect to the way librarians list some books under, "International," "Conference," "Congress," "Symposium," the city, etc. rather than under the name of the editor. On page 443 there is a footnote comment on the use of "-er" and "-or;" apparently the former is common on newer and less legal words; thus "indenter" is used in preference to "indentor." These are all minor comments on a book that is a worthwhile addition to the technical literature and that makes a useful contribution to the dissemination of current information and understanding on the explosively growing field dealing with the mechanical behavior of materials.

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Physics at Kiel

300 JAHRE PHYSIK UND ASTRONOMIE AN DER KIELER UNIVERSITÄT. By Charlotte Schmidt-Schönbeck. 261 pp. Verlag Ferdinand Hirt, Kiel, 1965. Paper, DM 15

by R. B. Lindsay

In 1965 the University of Kiel celebrated the 300th anniversary of its founding. In honor of this event the book under review was prepared to tell the story of the development of teaching and research in physics and astronomy at this distinguished German institution of higher learning. In her preface the author says the work was stimulated by the well known astrophysicist A. Unsöld, who provided valuable advice in the course of writing.

The University of Kiel has an interesting history. Founded in 1665 by the Archduke Frederick III of Gottorf in Schleswig-Holstein, it passed in 1772 through the vicissitudes of European wars and politics to the domination of Denmark and remained a Danish institution until the war between Prussia and Denmark in 1863. The modern German university dates from this time.

In addition to providing a brief review of the general history of the university the author summarizes the careers of the various holders of the chairs in physics and astronomy over the years and tries to place the scientific contribution of each in the perspective of the development of these sciences throughout Europe as a whole. The results are a bit too sketchy to be successful as genuine history of science. To the physicist the most interesting thing brought out by the book is the rather large number of well known German physicists who started their careers in Kiel. These include Heinrich Hertz, Max Planck, Philip Lenard, Conrad Dieterici, Erwin Madelung, Walter Kossel, Hans Geiger and Otto Klemperer. Only a few of these, to be sure, stayed for more than three or four years in Kiel. Most used the place as a means of transferring rather soon to other institutions where physics seemed to command more attention.

The book is clearly written and contains some interesting sidelights on the personalities of the physicists whose work is described.

For practical use, too

ELECTROSTATIQUE, VOL. 2: PROBLEMES GENERAUX CONDUCTEURS. By E. Durand. 443 pp. Masson et Cie, Paris, 1966. 72 F.

by L. Marton

I have not had a chance to see the first part of Durand's work on electrostatics; if it is as good as the second part, many teachers of the subject will, or should, be interested in a closer look at this treatise.

In his preface to the second volume the author sketches briefly the contents of the first one. According to him, in volume 1 he started from Coulomb's law for two point charges and defined the potential. This was followed by deriving the force for a given field.

The second volume starts with the general properties of the potential and the transformations needed for arriving at the solution of the equations. Particular attention is paid to singularities and their treatment by numerical methods with the help of computers. The next chapter deals with different problems, such as the problems of Dirichlet, of Neumann, etc. and the methods used for their solution, such as separation of variables, Green's functions, conformal mapping, etc.

Chapter 3 is devoted to a treatment of conductors, the distribution of charges on them when in electrostatic equilibrium, the calculation of electrostatic forces, and so on. Chapter 4 is more mathematical, dealing with complex variables and conformal mapping, Schwarz-Christoffel transformations and similar subjects. This kind of treatment is continued in chapter 5 with a thorough presentation of separation of variables, development in series of different functions and the treatment of systems in a wide variety of systems of coördinates.

Each chapter ends with a number of practical problems with answers. In addition, the text contains a remarkable number of numerical examples illustrating the application of the mathematical principles developed in the different chapters. Thus the book can be recommended not only to the student, but to the practical user or designer of electrostatic systems, such as, for instance, elements of electron-optical systems. The general approach shows that the author himself is not only a teacher of applied mathematics, but a highly successful user of the methods exposed.

Components of thin films

THIN-FILM MICROELECTRONICS. L. Holland, ed. 284 pp. Wiley, New York, 1966. $9.00

by H. J. Hagger

The electronic engineer accustomed to design circuits with discrete components must for special applications switch now to the use of recently developed devices that are in both the

fields of thin films and integrated electronics.

In chapters 1 and 2 of this book the properties of passive and active thin-film circuit elements are discussed. These sections contain a detailed description of the properties of matter in very thin films and the research done in this field; it gives the facts and sometimes the know-how, but it states only what has been done and does not go very deep into the physical behavior of the materials applied in thin films. The first chapter on passive elements gives about 120 references, the second on active components mixes a little bit of integrated solid-state devices with thin-film active elements, but it does not provide very much knowledge in this field.

Chapter 3 deals with semi-conductor integrated circuits and discusses technological problems of isolation in solid-state regions. In a second part we find some remarks on manufacturing and packaging problems. Chapter 4 consumes about one third of the book and deals with vacuum deposition apparatus and techniques. The discussion of the equipment for thin-film production is insufficiently broad and thus not adequate to the space it consumes in the book. In chapter 5 on thin-film monitoring techniques we find not very much more than a review of this very important field in thin-film manufacture.

The last chapter is entitled "The Layout of Microcircuits, Masking and Etching Techniques." It does discuss very roughly masking and etching techniques for thin-films, but nothing about microcircuits in the sense of integrated circuits. The index at the end of the book is very short and should have been extended because this book is a collection of facts and technological methods that should have been referred to in a well organized index.

Unfortunately the book gives only a rough picture of thin-film electronics—it contains too many research results without providing the strings holding them together. The appearance of a chapter on semiconductor integrated circuits is strange in a book on thin films and it is far too short to be complete (only 30 pages). Thin films made of magnetic materials have not been treated. The book, however, will certainly be useful for component makers and may also be of some value for circuit engineers engaged in thin-film applications who wish to obtain some knowledge of the capabilities of thin films.

BRIEFLY NOTED

OPTICAL PROPERTIES AND ELECTRONIC STRUCTURE OF METALS AND ALLOYS. Conf. proc. (Paris, Sept. 1965) F. Abelès, ed. 643 pp. Wiley, New York, 1966. $18.50

The proceedings of the first international meeting devoted to optical properties of metals and alloys describe the kinds of information that can be learned about their electronic structures from their measurement. 54 papers are organized into nine sections on simple, 3-*d* transition, rare-earth, and liquid metals; on photoemission, optical plasmas, superconductivity, and magneto-optical effects; and on the properties of nonperiodic systems. The papers describe primarily experimental studies although a number of theoretical papers are also included, some of which are fairly general.

Probably one of the most attractive features of this compendium is the inclusion of discussions following the papers and the concluding summary by A. B. Pippard. The importance of the discussions manifests itself most clearly when some of the more controversial papers are examined. Citing just one example, the relationship between the band models of 3-d transition metals, and their optical (including x-ray) properties was the entire or partial subject of about one tenth of the papers presented. In one of these, reporting the results of photoemission measurements, Spicer presented evidence purportedly proving that the rigid-band model does not apply to nickel. Taken by itself, his arguments sound quite convincing, but when viewed in terms of the discussions by P. A. Wolff, J. Friedel, H. Brooks, V. Heine, N. Mott, and later by A. B. Pippard, alternatives to his interpretation of the experimental results begin to emerge. The discussions are as important as the papers themselves in transmitting the import of a confer-