

Book Reviews

A Modern Version of the Properties of Metals

The Physics of Metals. Vol. 1, Electrons. J. M. ZIMAN, Ed. Cambridge University Press, New York, 1969. xviii + 436 pp., illus. \$14.50.

Sir Nevill Mott, whose contributions to physics in general and to solid state physics in particular over the past 40 years have placed him among the Olympians in the profession, could ask for a no more fitting tribute on the occasion of his 60th birthday than the present volume. Its editor, J. M. Ziman, has shown excellent taste in collecting a group of what may best be described as pedagogical reviews of various aspects of the theory of metals. The authors for the most part have at one time or another been associated with Mott at Cambridge or Bristol. Their names, too numerous to list here *in toto*, but including Chambers, Friedel, Heine, Pippard, Shoenberg, and Ziman, are surely familiar to everyone having even a passing acquaintance with the field. This partial list emphasizes the fact that Mott has always managed to attract the most gifted solid state physicists to the universities in which he has held professorships.

As indicated in the editor's preface, the prime intention was to write a modern version of the 1936 book by Mott and Jones on *Properties of Metals and Alloys*, which is still used as the standard reference in most solid state physics courses. The present volume, in fact, is a sequel to the earlier work, for the reader is expected to be already thoroughly familiar with its contents or those of more modern works on the same level.

Much, of course, has happened since 1936. The barbarisms "Fermiology" and "pseudism" had not been invented then. Appropriately enough, the subject matter encompassed by these

terms, the former in particular, is summarized quite comprehensively. The very detailed and beautiful studies of the Fermi surface of metals which began in the middle '50's and have occupied many for well over a decade are discussed in detail by some of the outstanding practitioners, among them Shoenberg, Pippard, and Chambers. Since there are many different types of experiments each dealing with one or another aspect of the Fermi surface, it is natural that in a volume of reasonable size some of these should be emphasized at the expense of others. Thus, the de Haas-van Alphen effect, cyclotron resonance, and the anomalous skin effect are given fairly detailed discussion in several of the chapters, whereas, for example, positron annihilation and the Compton effect are treated in more cursory fashion. This shortcoming, however, is adequately compensated for by a copious list of references both to the original contributions and to previous comprehensive review articles. The pseudopotential approach to band structure, encompassed by the term "pseudism," is surveyed fairly briefly, but incisively, by Heine. Because this theory has proven to be of central importance in the interpretation of Fermi surface experiments and other more general electronic properties of metals, Heine's contribution serves as an excellent introductory chapter to the book.

In addition to the aforementioned there are contributions devoted to the transport properties of both ordinary and liquid metals, structural properties of metals and alloys, and finally transition metals. The entire sequence is arranged in a logical and pedagogically attractive order. In each instance the reader is taken to the frontiers of ex-

perimental knowledge and theoretical understanding. The opportunities for further research are thereby made abundantly clear. Friedel's phenomenological and strongly physically motivated account of the electronic and magnetic properties of the transition metals serves to illustrate this point. Although this account is not entirely representative of the degree of understanding that has been achieved, as set forth, for example, in Herring's excellent book concerning magnetism in metals, it nevertheless indicates implicitly the fruitful directions for further work. The state of our understanding of the transition metals should be contrasted with the far more complete picture that now exists of the electronic energy levels and the Fermi surface of simple metals.

The egocentric demands of book reviewing, which require demonstration of erudition by way of a list of topics omitted in a given volume that might very well have been appropriate, should be suppressed in this case: the subjects discussed are treated authoritatively. Moreover, they constitute a sufficiently rich subset of the physics of metals that the book will surely be immensely useful. In any case, a second volume, dealing more extensively with structural properties and defects, is promised. If the high standards of volume 1 serve as an indication, its appearance is to be eagerly awaited.

In a recent letter to *Science* entitled "Fest me no schriften," the contributions to the usual festschrift were severely criticized as not representative of their authors' best work or of the impact of the person to whom the festschrift is dedicated on the field in question. This book provides a clear-cut counterexample. One final wry, amusing note: at a time when many graduate physics departments at universities in this country are eliminating the knowledge of foreign languages as a requirement for the doctorate, the authors have chosen to contribute the royalties accruing from their contributions to this volume to a fund which will "encourage study and expertise in foreign languages amongst professional scientists." It is to be hoped that this goal will be achieved.

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