

lurgy have been adopted by other fields such as ceramics and polymers. This is, in a way, appropriate because physical metallurgy has itself evolved from and is nurtured by solid-state physics and chemistry.

Peter Haasen, the author of the present book, has himself evolved from such a background and is in the midst of a productive career in physical metallurgy. He is the director of the Institute of Metal Physics, Göttingen University and is well known for his studies of the mechanical properties of materials, especially studies of dislocation motion in covalently bonded crystals.

Haasen has now written a very good intermediate-level textbook on physical metallurgy, covering a well designed treatment of physical metallurgy. He states that the main aim of *Physical Metallurgy* is "... a discussion of the principal object of metallurgy, namely the mechanical hardening of metals..." In pursuing this goal he treats various aspects of physical metallurgy, including microstructures and how they are studied, thermodynamics of solids (including a physicist's approach to phase diagrams) and a number of chapters on defects in crystals. These subjects form the background for the final portion of the book, which includes a treatment of the hardening of materials—work hardening, transformation hardening, alloy hardening—followed by a shorter discussion of the reverse process of recrystallization.

Haasen, however, does not give all the topics equal weight. For example, he mentions the importance of microstructure quite early in the book, in conjunction with a section on grain boundaries, but he does not emphasize this aspect of physical metallurgy throughout the book. The emphasis of the book is on relating properties—mechanical properties—to dislocation structure(s).

The level of presentation of these subjects is quite high, well above those found in many books, mostly qualitative or phenomenological, used in American universities. The treatment does assume, however, some background in solid-state physics—a suggested reference being Charles Kittel's well known book *Introduction to Solid State Physics* (3rd edition, Wiley, New York, 1966)—but Haasen includes enough material in the text to make it reasonably self-contained. These factors make the book more suitable for a second course in physical metallurgy or perhaps for a graduate course for physics or chemistry students first entering physical metallurgy. Haasen, however, does not treat corrosion, a subject that is usually included in introductory books on physical metallurgy and is of importance to the use of metals and alloys, although he does include a discussion of the question of oxidation.

This is a minor point, though, because the book is written at a relatively high

level, is quite readable, and should serve as a very useful book on the subject. Graduate students may find it more challenging than present texts, but for those starting out in physical metallurgy the effort of reading it will be amply rewarded.

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Electrical Interactions in Molecular Biophysics: An Introduction

R. Gabler
352 pp. Academic, New York, 1978.
\$25.00

The purpose of this book is to provide the reader with introductory discussions on the subject of electrical properties of biological molecules and the origin of electrostatic forces between them. Raymond Gabler assumes no previous knowledge of the subject by the reader. He makes great efforts to explain, using easy-to-understand language, the meaning of existing concepts and theories about electric charge, dipole moment and polarizability and also the mechanism by which these quantities contribute energies that may attract or repel neighboring molecules.

Roughly, this book consists of two parts. The first part describes basic concepts of electrostatics and dipoles. The second provides detailed discussions of electrostatic interactions between biological molecules utilizing the concepts and theories discussed in the first part of the book. The discussions of electrostatics and dipole moments are rather elementary and by no means complete. However, Gabler's intention is obviously to discuss the basic concept behind theories. He explains derivations of fundamental equations step by step so that the reader will have a clear understanding of the meaning of the theory. Many textbook authors ignore these discussions and, in that sense, Gabler takes a unique approach to the problem. Therefore, the book is valuable to the reader who does not have a background in electrostatics. Many biochemists and biologists are not familiar with the concepts of dipole moment and dielectric constant. One of the reasons for this is the lack of good introductory books on this subject. This book will certainly serve the purpose of introducing these concepts to those readers.

The second part of the book describes various types of electrostatic interactions between biological molecules. Gabler lucidly explains the origin of attractive and repulsive forces due to charge-charge, charge-dipole and dipole-dipole interactions. He further discusses the origin

and physical nature of hydrogen bonds and van der Waals forces, which are sometimes loosely understood by biological scientists. In the discussion of the Debye-Hückel theory for electrolytes, he takes great pains in deriving the Poisson equation starting from Gauss's theorem. This may be very useful for many readers in understanding the meaning of this important equation.

Gabler's book is very easy to read and his description of the development of theories systematic and clear. Discussions are careful, thorough and tactful. He uses mathematical equations whenever their use facilitates the understanding of theories; the extent of this use, however, is quite reasonable. As stated before, he does not assume any previous knowledge by the reader and often discusses, in detail, elementary topics such as pH and chemical formulae of simple molecules. Some readers may wish to simply skip these discussions and move on to the next section. For advanced readers, this book may not provide satisfaction because the author did not intend to do so. On the other hand, the book may be very helpful for undergraduate-, as well as graduate-course instructors. It is often difficult to find a book that describes derivations of basic equations of theories. For teaching, explanation of basic concepts and meaning of equations are most important to students. This book will be very valuable for these purposes. Gabler supplies sufficient numbers of references for each subject and they will be convenient for interested readers. He gives no exercise problems and thus this book may not be most suitable for use as a textbook. However, this can be an excellent reference book to supplement standard textbooks.

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Diffraction from Materials

L. H. Schwartz, J. B. Cohen
558 pp. Academic, New York, 1977.
\$27.50

Investigations of the interactions of x rays and, to a lesser extent, neutrons and electrons, with matter provide students of materials sciences and related disciplines with their most powerful tools for the analysis of the relationships among structures and properties of solids. *Diffraction from Materials* represents an ambitious effort to provide the reader with a sound theoretical basis for an understanding of such interactions.

The authors, Lyle H. Schwartz and Jerome B. Cohen of the Department of Materials Sciences and Engineering of Northwestern University, are well known