

deal with physical aspects; Chapters 3 through 6 present a sufficiently detailed and exact mathematical treatment to allow the student to proceed directly to the original literature. Chapter 7 (labeled "Current Topics") mentions many of the results available prior to 1964, but so many new results are being published that a revised edition of this book will soon be necessary. Nonetheless, as an introductory work, it is a book that one can presently recommend.

The Direct Observation of Dislocations. By S. Amelinckx. 487 pp. Academic Press, New York, 1964. \$17.00.

Reviewed by Leonard Muldrew, Temple University.

Twenty years ago the dislocation was only a theoretical concept required to explain the strength of crystals, and many physicists were skeptical about its existence. Today we have an entire book devoted to the observation of dislocations, a subject which has mushroomed since 1956. This book is both a review and a text and should be very useful to those having any interest in dislocations. Dr. Amelinckx has contributed heavily to dislocation observation, and he has gone to great pains to produce an excellent and complete survey.

As is to be expected there are photographs resulting from the observations of the dislocations by various methods: electron microscope using transmission and replication, optical microscope, x-ray diffraction, moiré patterns, etc. These are superb illustrations and were impossible only ten years ago.

More than three-fourths of the book is devoted to the electron-microscope methods which are discussed in the chapter on thin films. The main sections of this chapter are on transmission theory, transmission applications, direct resolution, and moiré patterns. Chapters on surface and bulk methods take up about 50 pages each.

Theory, other than some dislocation theory, is supplied, with mathematical derivations often given in great, readable detail. Where dislocation theory is needed, it is skillfully presented so as to make the observations meaningful. The electron microscope theory of diffraction contrast and its appli-

cation to dislocation observation are presented fully with an intuitive discussion given first and then the kinematic and dynamic theories.

Among the minor blemishes we might include the lack of length calibrations and a failure to give the technique used in obtaining the photographs of Chapter 1, a slight confusion as to the chapter location of decoration etching (placed in Bulk Methods rather than Surface Methods) and the neglect of the Chapter 3 dislocation decoration when the subject is discussed in Chapter 2. These are truly minor and perhaps indicate the separateness of the chapters.

Generally speaking, the style is good and particularly so in the major sections dealing with electron microscopy. However, in the first chapter the writing is a bit terse as is often the case in reviews when a large number of papers is summarized.

There are useful tables (e.g., a ten-page list of etchants), subject, author, and substance indices, numerous line drawings among the 237 figures, and 462 references.

This is an excellent book for review and reference.

Ionized Gases. (2nd ed.) By A. von Engel. 325 pp. Clarendon Press, Oxford, 1965. \$8.80.

Reviewed by L. Marton, National Bureau of Standards.

Ten years have gone by since the first edition of von Engel's book on ionized gases, and in view of its popularity there is not the slightest doubt about the necessity of a second edition. The first edition has been a classic since its first appearance, and further praise of it would seem to be carrying coals to Newcastle.

The changes consist mostly in a considerably enlarged chapter on collision processes. This includes sections "dealing with the production and properties of excited atoms and molecules, photoionization including that by laser beams and kindred subjects." Another important addition is the inclusion of extensive tabulation of numerical data. I think many users of the book will welcome the new system of references which includes empty pages adjoining each reference page for addition of new references at the

choice of the reader. This is a clever idea, and I think it should be followed in many other books. Another innovation in the book is the addition of problems. These problems are quite numerous at the end of each chapter and excellently illustrate the problems raised in the text itself.

Oxford University Press has again done an excellent job in producing the book, and to the many friends of *Ionized Gases* it will be welcome news to find a revised edition.

Theoretical and Mathematical Biology. Talbot H. Waterman and Harold J. Morowitz, eds. 426 pp. Blaisdell, New York, 1965. \$12.50.

Reviewed by Joseph G. Hoffman, State University of New York at Buffalo.

The fundamental rationale of living matter is unknown. Hence, a book on theoretical biology deals with subjects that may possibly lead to an understanding of the basic mechanism, whatever it turns out to be. Some of the subjects here are: models and mathematical principles in biology (Rashevsky); thermodynamics and chemical kinetics (Eyring and Urry); molecular structure, biochemical function, and evolution (Bernal); theory, experiment, and the nerve impulse (Cole); cochlear mechanics (von Békésy); and genetic consequences of natural selections (Levins). There are several chapters on computer methods, cybernetics, and systems analysis. This book was developed from a course of lectures and discussions and can serve admirably as a guide for class work. It is among the first books devoted to the subject: it describes the best analytic tools one may use in a formulation of the obscure and tantalizing processes of life.

There are 17 chapters by 17 contributors, of which two chapters, the first and last, are by Talbot H. Waterman. He formulates The Problem of Biology in Chapter 1. The reader may have a hard time understanding what is meant by: "The ultimate scientific explanation of life must indeed be biological." The implication is that physical and chemical explanations of life may not be possible. Systems analysis may well be the best direction for basic biological research to take. The organismal concept has yet to be