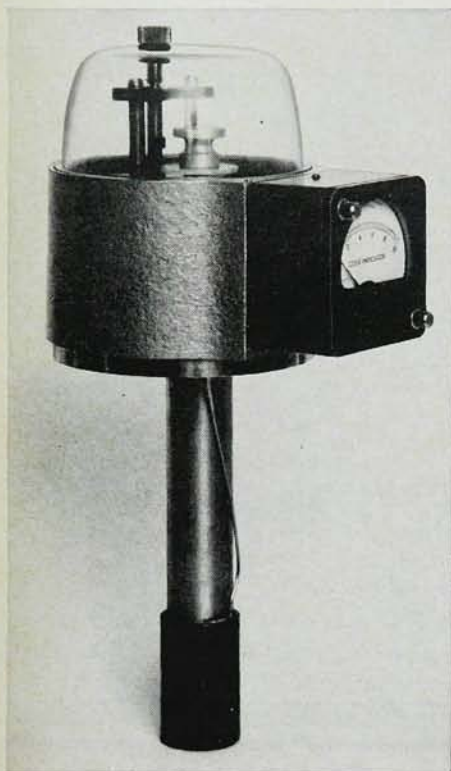


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glecting diffusion and double-injection effects. The results of the formal theory are compared with experimental results for anthracene and especially with Many's work on iodine. In the last chapter some applications are described, such as the cadmium-sulphide solid-state triode (after Ruppel and Smith) and Weimer's triode. A great number of references and an index are included.

This book on a very special field is in fact—as intended by the author—a report on what has been done in the field of space-charge conduction in solids, trying to combine the results of experiments with a theory developed step by step with a lot of simplifications. It will be, however, very valuable for people working in the field as a condensed treatment of different investigations and experimental results. The book fulfills the purpose stated by its author in the preface as a stimulator for discussion and research in this special field of solid-state physics.

A specialist in electronics, H. J. Hagger is associated with Albiswerk/Zürich in Switzerland.

For physical metallurgists

ALLOY PHASE EQUILIBRIA. By A. Prince. 290 pp. American Elsevier, New York, 1966. \$30.00

by H. M. Otte

Phase diagrams, equilibrium diagrams or constitutional diagrams, as they are variously called, are convenient methods for concisely plotting the equilibrium relationships in a system of chemical reactants, which, in the case of the book under review, are confined to metals and alloys. J. Willard Gibbs may, without much fear of contradiction, be called the "father" of phase diagrams, although, as with much of Gibbs's work, his publications went unnoticed for many years (until the turn of the century). The present volume, then, deals with alloy phase equilibria only. It does not attempt to trespass on the complementary fields of the kinetics of phase transformations, and only passing ref-

erence is made to the structural approach to alloying behavior, adequately covered in other textbooks.

Phase diagrams, by their nature, only consider thermodynamically equilibrium conditions. They give no clues as to the rates of reaction, they yield no information on the effect of point and line defects on the properties of the phases, they say nothing about the phase distribution morphologically, and they ignore surface boundaries and strain energy effects in transformations. Data on these topics are nevertheless frequently gathered in the course of the determination of a phase diagram. A useful check on the experimentally determined phase equilibria is provided by the application of thermodynamics, whereby also extension is possible to regions difficult to establish by experiment. Consequently, the first two chapters are devoted to a consideration of thermodynamics, but rigor in treatment is deliberately diluted in an attempt to aid comprehension. Considerably more emphasis has been put on the thermodynamic approach compared with the majority of previous works.

Binary systems are treated fully (five chapters), ternaries more selectively (six chapters), and quaternaries covered in one chapter at the end of the book. Diagrams are generously dispersed throughout the text, and, once past the binaries, are two-tone (black and red). This is of considerable assistance in thinking three-dimensionally. Also, at appropriate points throughout the book, reference is made to actual alloy systems.

Recent Russian work (principally by L. S. Palatnik and A. I. Landau) on the application of topo-analytical methods to the study of phase diagrams is introduced towards the end of the book (chapter 14).

From the dust jacket we gather that Alan Prince graduated from Sheffield University, England, in 1948 and during the last few years has been chief metallurgist at the General Electric Company, Hirst Research Center. Together with J. L. Haughton he also compiled the second edition of *The Constitutional Diagrams of Alloys: A Bibliography* (1956), an Institute of Metals (London) monograph. The book under review is a highly spe-

cialized one even though the principles expounded in it are of wider application; nonetheless it is likely to find extensive use, probably more among physical metallurgists than among solid-state physicists.

H. M. Otte is manager of the Materials Research Laboratory at the Martin Company in Orlando, Florida.

Hydrodynamic problems

METHODS IN COMPUTATIONAL PHYSICS. Advances in Research and Applications. Vol. 4, Applications in Hydrodynamics. Berni Alder, Sidney Fernbach, Manuel Rotenberg, eds. 385 pp. Academic Press, New York, 1965. \$14.00

by J. Gillis

This volume, like its immediate predecessor, is devoted to hydrodynamics and related subjects. The work is up to the usual high standard of the series, and all that the reviewer can do is give some idea of the contents.

The first paper, by Leith on numerical simulation of the earth's atmosphere, describes the system set up and the precautions found necessary. No actual results are given. The paper by Bryan on nonlinear effects in wind-driven ocean circulation includes a critical comparison between linear theory and observation, and also an estimate of what nonlinear theory can do to bridge the gap. Lewis' article on numerical analytic continuation is interesting mathematics, relevant here in that hydrodynamic problems have often to be inverted in some way to make them "well posed."

Following Chahine's article on shock waves in the Boltzmann equation we have the longest article in the book, that by Haviland on a Monte Carlo attack on two molecular-flow problems: heat flow between parallel walls and the plane shock wave. Both problems are suitable for Monte Carlo treatment, since in both there are large bodies of results obtained on various approximative assumptions. The most effective use of Monte Carlo methods is after all to test an hypothesis or select among

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