equilibrium constant, and applies it to the internal motions of the molecules in an ideal gas. For such motions the two free energies are identical. This reversed approach, perhaps more familiar to chemists than to physicists and perhaps less elegant than Gibbs's, proved its value long ago in the calculation begun by Giauque of thermodynamic from spectroscopic data; the author has carried it much further. The physicist interested in chemical (as contrasted with physical) changes will find it worth his while to become familiar with chapters 2, 3 and 4 even though these presuppose a prior knowledge of the language of chemical thermodynamics.

Among topics directly interesting to most physicists are the classical treatments of ideal and imperfect gases, order–disorder phenomena and liquids, and the quantum treatment of these same substances with emphasis on liquid helium. A chapter of about 40 pages is given over to the solid state, mainly to the Einstein and Debye models. The Debye model for solid argon is carefully tested against experimental data.

A book of this length cannot hope to embrace much of chemical kinetics. The theoretical groundwork for the prospective fusion of this subject with the other two disciplines is laid; but the author considers the calculation of activation energies, an important activity carried forward particularly by Henry Eyring and his coworkers, to be outside the scope of his book. The preëxponential factor in the expression for the rate constant receives full attention. Recombination of atoms, dissociation of diatomic molecules, and unimolecular reactions are the principal reactions discussed, again with careful comparison of theory and experiment.

As this book and numerous related books make clear, modern statistical mechanics has set itself a goal much more ambitious than that of Gibbs, who was faced by difficulties that quantum theory has resolved. The goal might be described as understanding Gibbs's "mysteries of nature" completely enough so that reliable predictions can replace experiments. With computers available, is this a realistic goal? How far along the road are we now? The author's opinion on such general questions would have been valuable.

I believe that this book will prove difficult for undergraduates. I recommend it strongly for advanced study. Although it does not include some material of particular interest to physicists (for example, a discussion of metals and semiconductors), it may be regarded as required reading for physicists seriously interested in chemical reactions.

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After a long research career in the General Electric Company, Herman Liebhafsky resumed academic work last year and is now professor of chemistry at Texas A & M University. He has been concerned with thermodynamics and kinetics for about 40 years.

Points for graduate students

DEFAUTS PONCTUELS DANS LES METAUX. By Y. Quére. 236 pp. Masson, Paris, 1967. 80 F.

by Daniel C. Mattis

The topic of point defects in metals is reviewed exhaustively in this volume, one of a series of monographs happily aimed at the graduate student. What in an ordinary book would be a stern collection of formulas and references is here filled out with explanations and derivations that are not only helpful to the student, but help the researcher to understand the limits of validity of the theory being discussed.

The application of each theory to experimental data is carried out in almost every chapter. The reader is provided with an elementary, but adequate, review of elastic theory of defects, atomic models, potential and phase-shift theory, thermodynamics of point defects (equilibrium and metastable) point defect generation, diffusion and effects on electrical and other properties of the metal. The author shows a good grasp of the large number of metallurgical and physical disciplines coördinated into the present work. Although one would not turn to this book for authoritative, deep, or new insights into any of the main topics considered, a student would find the book indispensable prior to commencing serious study or research involving point defects. In the preface, the series editors (P. Aigrain, A. Blanc-Lapierre, M. Levy and J. Friedel) state: "We think there is room in France for a new collection of this type, presenting limited topics which are of up-to-date interest to readers with a good general background in modern physics." I would merely add: there is room for such a collection here too!

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Daniel C. Mattis is professor of physics at the Belfer Graduate School of Science, Yeshiva University, and has done research on several aspects of the physics of metals.

In the matter of materials

MATERIALS: A SCIENTIFIC AMERICAN BOOK. 210 pp. W. H. Freeman, San Francisco, 1967. Cloth $5.00, paper $2.50

by L. Marton

Cyril Stanley Smith, whose outstanding contributions to our knowledge of materials are well known, introduces this volume, a reprint of the September 1967 issue of *Scientific American*. There is perhaps no better way to characterize his attitude toward the whole subject than by a quotation from the May 1968 issue of *Science and Technology*. There Smith says: "The discovery of most metals and alloys came out of aesthetic curiosity —not intellectual—and the first beginnings of science led away from the enjoyment of the wonderful qualities of materials; but I think this is now coming back." The lead article by Smith in the present volume gives a delightful introduction with plenty of historical material on the study of materials.

The compilation contains altogether thirteen chapters, each written by an outstanding authority of the subject treated. These chapters are as follow: Smith, "Materials;" Nevill Mott, "The Solid State;" A. H. Cottrell, "The Nature of Metals;" John J. Gilman, "The Nature of Ceramics;" R. J. Charles, "The Nature of Glasses;" Harman F. Mark, "The Nature of Polymeric Materials;" Anthony Kelly, "The Nature of Composite Materials;" John Ziman, "The Thermal Properties of Materials;" Henry Ehrenreich, "The Electrical Properties of Materials;" Howard Reiss, "The Chemical Properties of Materials;" Frederick Keffer, "The Magnetic Properties of Materials;" Ali Javan, "The Optical Properties of Materials," and W. O. Alexander, "The Competition of Materials."

All the articles are very concise,