of "atomic energy" or to ignore its social implications. It is hoped that this very competent second edition will be even more popular than the first.

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Chemical Thermodynamics

Frederick T. Wall, University of Illinois. W. H. Freeman & Co., San Francisco, 1958. vii + 422 pp. 16 × 24 cm. $8.

This book is meant to be a textbook for graduate students or advanced undergraduate students in chemistry (it is not a treatise for experts). For this purpose, the reviewer feels that it is not only an excellent work but is, indeed, the best available at the present time. For example, Lewis and Randall is out of date; MacDougall is out of print; Klotz is a little too classical and overemphasizes numerical work somewhat; and Guggenheim is too advanced for most beginners (though it would be the book of choice for a class consisting of potential theoretical chemists). Wall presents a nice balance between theoretical and applied thermodynamics, and at the right level for the average chemistry graduate student. The problems are especially refreshing—departing in many cases from the usual exercises in numerical manipulation.

An elementary presentation of statistical mechanics is interspersed with the thermodynamics. This is becoming more popular, at least in books. The reviewer prefers in lectures, at least, to treat thermodynamics and statistical mechanics as separate courses, though an indispensable part of the thermodynamics course would be a molecular interpretation, *in words*, of as much thermodynamic data and as many equations as possible. Fortunately, the statistical mechanics in Wall's book can be omitted at the instructor's option.

The reviewer finds one very annoying feature: following Lewis and Randall, Wall sees fit to use the partial molal Gibbs free energy symbol ($\bar{F}_i$) instead of the chemical potential symbol (μ_i). This is unfortunate for two reasons: (*a*) the chemical potential plays a very special and important role (along with pressure and temperature) in determining phase and chemical equilibria and so deserves a special symbol; and (*b*) the chemical potential is related mathematically (as a differential coefficient) not only to F, but also to A, E, and H. Wall's choice in this matter is especially surprising in a book which includes some statistical mechanics, since statistical mechanicians almost always use μ_i.

Professor Wall, as a textbook writer, has the advantage of being, in his own research, a skilled practitioner of both statistical mechanics and thermodynamics. This advantage is not only evident throughout the book, but is perhaps its most obvious feature.

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Principles of Geochemistry

Brian Mason, Professor of Mineralogy, Columbia University. Second edition. John Wiley & Sons, Inc., New York, 1958. vii + 310 pp. 48 figs. 44 tables. 15.5 × 23.5 cm. $8.50.

This book is suitable for a one-semester course in geochemistry aimed principally at geologists, and emphasizing areas where chemical principles are applicable. The approach to all subjects is that of the geologist and the chemical principles used are mostly of an elementary nature. A chemist might have difficulty deducing that $KAlSi_3O_8$(Or) is orthoclase since it is not clearly indentified in the text, p. 102. The chapter on Thermodynamics and Crystal Chemistry is somewhat hazy from the viewpoint of a chemist. Thus the statement on p. 65, "it is the change in internal energy which the system undergoes in passing from one state to another that is significant," needs considerable amplification. The citing of Le Chatelier's principle, p. 67, might arouse J. de Heer (THIS JOURNAL, **34,** 375 (1957)). The statement on p. 210, "*no* loss of gases into interplanetary space should have taken place since the earth cooled to its present temperature, because even for hydrogen the mean square velocity is considerably less than the velocity of escape," needs qualification. The normal distribution of velocities would allow *some* molecules to have velocities equal to the escape velocity.

The material in the text has been brought up to date since the first edition in many ways. For example, the astronomical age of the universe has been revised and more data on geologic dating has been added. The description of the makeup of the crust above the Mohorovicic discontinuity has been changed to conform to more recent seismic work. The type has been enlarged to more readable size in most tables.

Since the first edition of this book was published, interest in the field of geochemistry has increased markedly. The Geochemical Society was formed in 1955 and has over 1500 members. As a textbook in this special field, giving a rapid over-all picture of the field, this book should be useful. As a general reference book in the field, one should rather consult Goldschmidt or Rankama and Sahama. No exercises or problems are included in Mason's book.

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Biological Treatment of Sewage and Industrial Wastes. Volume 2: Anaerobic Digestion and Solids-Liquids Separation

Edited by *Brother Joseph McCabe* and *W. W. Eckenfelder, Jr.*, Manhattan College. Reinhold Publishing Corp., New York, 1958. vi + 330 pp. Many figs. and tables. 15 × 23 cm. $11.50.

The text contains the papers presented at the Conference on Anaerobic Digestion and Solids Handling held at Manhattan College in April, 1957, and is a companion volume to Volume 1, "Aerobic Oxidation." The book is divided in three parts: Part I, Anaerobic Treatment (14 papers), Part II, Sedimentation and Flotation (10 papers), and Part III, Vacuum Filtration and Sludge Conditioning (4 papers). Each paper is followed by a list of references. An author index and a subject index appear at the end of Part III.

Each paper is well written, and accompanying figures and tables are easily understood. The book is not for the layman but is intended for those who have a strong background in wastes treatments and problems and who wish in one volume to acquaint themselves with recent advances in these areas. Representative paper titles are as follows: Anaerobic Digestion of Pulp and Paper Wastes, The Uniflow Tank—An Improved Settling Tank, and Sludge Elutriation.

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The Properties of Gases and Liquids

Robert C. Reid, Assistant Professor of Chemical Engineering, and *Thomas K. Sherwood*, Professor of Chemical Engineering, both of Massachusetts Institute of Technology. McGraw-Hill Book Co., Inc., New York, 1958. xii + 386 pp. Many figs. and tables. 16 × 23.5 cm. $10.

Not enough physical data on the new compound to design a plant to make it? Don't say it can't be done! Estimate the properties from equations and rules given by Reid and Sherwood.

The physical chemist likes to work with thermodynamically exact equations to calculate unknown properties from experimental data. The Clapeyron equation is an exact equation. The chemical engineer will make approximations to put this equation in a form that can be used with the data available. The Clausius-Clapeyron equation and graphical methods, as the Othmer plot, are approximations from the exact equations.

Reid and Sherwood have selected a number of important properties of gases and liquids and have given the better equations to calculate approximately the values of these properties. The properties, given by chapters, are: critical properties; *P-V-T* properties; vapor pressures and latent heats; heats, free energies of formation, and heat capacities; viscosity; thermal conductivity; diffusion coefficients; vapor-liquid equilibria. A number of methods are given, starting with one which requires the least data and continuing to the more complex, but accurate, equation. Tables are given which show the percentage deviation of values calculated by several equations from the experimental values. Finally a recommendation is made as to the equation to be used with the data available.

No mention has been made of the excellent series of articles on "Estimate Engineering Properties" by W. R. Gambill

(Continued on page A166)