NEW BOOKS

The Principles of Thermodynamics. By GEORGE BIRTWISTLE, Fellow of Pembroke College, Cambridge. The University Press, Cambridge, England, 1925. ix + 163 pp. Illustrated. 22.5 × 14 cm. Price 7s. 6d. net.

Most, if not all, students of chemistry seem to find less difficulty in acquiring some idea of the more formal development of thermodynamics than in learning how to help themselves in solving chemical problems by application of thermodynamical principles and formulas. Moreover, to solve a problem in which all of the necessary quantities are explicitly given is one thing, but quite another if one has oneself to secure the necessary data from tables or by interpretation of actual experiment. Many students can do the former, comparatively few can do the latter, not to speak of the vast majority on whom one attack of thermodynamics has conferred complete and lasting immunity. In other words, a textbook of thermodynamics for chemists should aim first to induce the student to make effective use of thermodynamical reasoning in correlating apparently diverse phenomena—a discipline which might lead him to an appreciation of the beauty of the methods of thermodynamics; whereas the purely formal presentation, as in the book under review, he regards as a rather uninteresting series of exercises in logic, to be memorized until the examination is over. Birtwistle's book contains the substance of lectures given at Cambridge "to men whose future interest may have been any of mathematics, physics, chemistry, astronomy or mechanical science. The object was to set out with care the foundation principles of the subject and to illustrate them by applications to these various branches of science." On turning over the pages one might suppose it to be a textbook of mathematics, an impression which would be corroborated by the fact that numbers or numerical data are hardly to be found except as follows: in a calculation of the gas constant R (p. 6), of the Avogadro number (p. 7), of a probability (p. 35), of internal energy of water (p. 52), of the efficiency of a Rankine cycle (p. 63), of C_p/C_v for mercury (p. 73), two applications of the Clapeyron equation (p. 90) and one of the Clausius equation (p. 93), a calculation of R from osmotic pressure (p. 109) and of a molecular weight in solution (p. 114), an application of Planck's formula to compute the specific heat of carbon monoxide (p. 138) and the constant h (p. 160). Several pages are devoted to the van der Waals equation, but it is not pointed out that this is merely an approximate equation; a page is given to the distillation of a mixture of two liquids and to the theory of a reversible cell; the law of mass action is not even mentioned. I cannot recommend the book as likely to be useful to students of chemistry.

JOHN JOHNSTON

Physico-Chemical Evolution. By Ch. Eug. Guye, Professor of Physics at the University of Geneva. Translated by J. R. Clarke, Assistant Lecturer in Physics, University of Sheffield. E. P. Dutton and Company, 681 Fifth Avenue, New York, 1925. xii + 172 pp. 4 figs. 19 × 13.5 cm. Price $2.40.

This book is a collection of three related papers: the first, entitled "Einstein's Principle of Relativity in the Classification of the Sciences," originally appeared in the *Archives de Psychologie* of Geneva, April, 1918, and "was written with the special object of showing how the principle of relativity is able to constitute a first step toward the union of sciences which are metaphysically separated by the conceptions on which they are founded;" the second, "The Evolution of Physico-Chemical Phenomena and the Calculus of Probabilities" [*J. chim. phys.*, **15**, 215–272 (1917)], has for its object "to show—as far as possible without the introduction of mathematical developments—the statistical significance of Carnot's principle, and how, under this new conception, the principle is found to be limited by fluctuations;" the last paper, "Carnot's Principle and the Physico-Chemical Evolution of Living Organisms" (*Arch. Sci. phys. nat.*, May–June, 1920), "endeavors to show that Carnot's principle considered as a statistical principle, must disappear when it is sought to apply it to more and more heterogeneous media, such as very probably constitute living matter, as the law of large numbers on which it rests then ceases to be applicable."

The statistical conception leads to conclusions opposite to those which result from the classical thermodynamics. The cause and origin of life and thought must be sought in individual actions, the causes of the phenomena with which our ego is associated, in the unknown region of the atom or electron, or even beyond.

Tenney L. Davis

Ostwald-Luther. Hand- und Hilfsbuch zur Ausführung physikochemischer Messungen. (**Physicochemical Measurements.**) Edited by C. Drucker. Fourth revised edition. Akademische Verlagsgesellschaft m. b. H., Leipzig, 1925. xx + 814 pp. 564 figs. 23 × 16 cm. Price, bound, $8.35; unbound, $7.60.

This new edition of "Ostwald-Luther" is very welcome. Many advances in the technique of physical chemistry have taken place in the fifteen years that have elapsed since the publication of the last (third) edition. Indeed, wholly new domains of physical chemistry have come into being, each with its new and specialized technique. These advances are reflected in the increase from the 573 pages of the old, to the 814 pages of the new edition, and in the appearance of new chapters on Radioactivity, X-Ray Analysis, Dielectric Constants and Electron Tubes. This new edition appears to maintain the high standards of the old. The simple and thoroughly tested methods are rightly given the most prominence and attention, so that the book remains useful both for the beginner and the expert.

It appears unfortunate, nevertheless, that so little attention has been paid to much recent work, particularly on precise methods of measurement. Thus, Cottrell's improved boiling-point apparatus is barely referred to in an appendix; the many advances made in this country in the technique of conductivity measurements are only mentioned in a footnote; no mention is made of the methods of vapor-pressure measurements worked out by Rosanoff and his co-workers, nor of the electrically controlled float for the accurate determination of the density of liquids. However, the editor points out that great efforts had to be made to keep the size of the book within bounds, and this is, perhaps, an adequate explanation of the omissions noted. In any case, this volume will be indispensable to the library of all laboratory workers in physical chemistry, and indeed to almost all laboratory workers in the natural sciences, so wide have become the applications of physical chemistry—thanks in no small degree to this very handbook itself.

ARTHUR B. LAMB

General Chemistry. By H. I. SCHLESINGER, Professor of Chemistry, The University of Chicago. Longmans, Green and Company, 55 Fifth Avenue, New York, 1925. vi + 631 pp. Illustrated. 22.5 × 14.5 cm. Price $3.75.

This book has been written for the use of university students who have had a year of high-school chemistry. The author believes that students of this type should have both class work and texts of quite a different nature from that given students who have had no such elementary training. "College chemistry for students already somewhat familiar with the rudiments of the science should concentrate on the fundamental phenomena and principles, and on the simpler applications which can be discussed with some degree of thoroughness. The more complex technical processes are thus left to later courses when the student is prepared to take them up from a detailed, scientific point of view. In this way the respect with which chemistry is regarded will be increased far more than by surfeiting the student with descriptions, the scientific significance of which he is unable to appreciate."

The reviewer's experience in organizing a separate course for students who have had one year of high-school chemistry convinces him that the chemistry of the average high-school graduate cannot be taken as a foundation ready to be built on. The entire subject, both theoretical and descriptive, must be thoroughly reviewed and then enlarged upon. This is the point of view of the author, for the first 79 pages of his book are taken up with a clear and concise review of the molecular and atomic hypotheses and the meaning of chemical formulas and equations. Oxygen is then considered, followed by a discussion of the more important elements in the conventional sequence. Each chapter is closed with a list of well chosen exercises of the "thought-question" type. An excellent list of

references at the end of each chapter gives the ambitious student a guide for further study and will be of great help to the teacher as a source of assigned readings.

There are several outstanding features of the book. It is very readable. The style is very clear and the development of the subject is logical and stimulating. The reviewer was particularly pleased with the chapters on solutions, radioactivity, and the structure of atoms and of molecules. Throughout the book there is an entire absence of the dogmatism that has characterized many elementary texts of chemistry, for the limitations of theories are in every case frankly admitted by the author. By continual reference to the unexplored fields of the subject, moreover, the student feels the challenge of chemistry as a growing science with its many unsolved problems.

The reviewer feels that a few more illustrations could have been introduced to advantage and that a somewhat more detailed discussion of the metals and the carbon compounds would have made this text of more general application, for while a certain percentage of the class may gain its knowledge of technical processes from advanced courses, the large majority takes but one year of chemistry.

The book is attractively printed, with a judicious use of heavy type and is unusually free from typographical errors. Cross references are frequently used, and the text is supplemented by a number of explanatory footnotes which are of real value and do not in the least detract from the continuity of the discussion.

There is a real contribution to the teaching of elementary chemistry in such a thoroughly up to date and scholarly text, developed by such a careful and experienced teacher.

JAMES H. WALTON