

## NEW BOOKS.

**Physikalisch-chemische Uebungen.** Third enlarged and improved edition. By W. A. ROHN, o. Professor at the Technischen Hochschule in Braunschweig. Leopold Voss, Leipzig, 1921. viii + 278 pp. 75 fig. 23 × 15 cm. Price M 30.

This third edition, according to the preface, is photographically reproduced from the second, with 30 pages of additions necessitated by the progress of the science meanwhile. Chief among these is a 20-page section on colloid chemistry, based largely upon an introductory course formerly given by Freundlich at Braunschweig.

In the reviewer's opinion neither the changes from the first edition, nor the 10 pages of additions not concerned with colloid chemistry, suffice to bring the book up to date. At least the author should have included references to the most fundamental contributions to physico-chemical method in the last 10 years.

Waiving the 10-year limit, the reader finds only the Ostwald gas regulator for thermostats, with no mention of the possibilities of electrical heating. For the determination of the density of solids, the ancient specific-gravity bottle, with ground-glass stopper surmounted by a capillary, is still recommended. No mention is made of adiabatic calorimetry, and while there is a reference to Regnault-Pfaundler, the only method for cooling correction described is this: Correct the first half of the readings in the reaction period by the average temperature coefficient in the preliminary period, and the second half of the readings in the reaction period by the average temperature coefficient in the final period.

With the present book as his sole guide, a student could doubtless learn to perform a great variety of measurements with accuracy sufficient for most purposes. But his appreciation of modern possibilities in such work, and his critical powers, dealing with the relative importance of errors, and the underlying principles for their elimination, might be more fully developed.

G. S. FORBES.

**Physical Chemistry for Colleges.** A Course of Instruction Based upon the Fundamental Laws of Chemistry. First Edition. By E. B. MILLARD, Assistant Professor of Physical Chemistry, Massachusetts Institute of Technology. International Chemical Series, H. P. Talbot, Ph. D., Consulting Editor. McGraw-Hill Book Company, Inc., New York, 370 Seventh Avenue; London, 6 and 8 Bouverie Street, E. C. 4. 1921. vii + 411 pp. 61 fig. 14.5 × 21 cm. Price \$3.50.

In this text the author has sought "to bring before college students certain of the more important aspects of physical chemistry, together with accurate modern data which illustrate the applicability of its laws to the phenomena observed in the laboratory." He attempts to emphasize the limitations of the "orthodox laws" of physical chemistry, feeling that "a trusting belief in inadequate physical laws will only retard the scientific progress of the student, and weaken his faith in adequate laws; whereas

a wholesome appreciation that physical chemistry is an unfinished and growing science may stimulate thoughtfulness and research." In his laudable efforts to present a book which is thoroughly up to date the author has paid particular attention to the work of the last decade or so and has omitted much which might better have been included. Tastes differ, but the reviewer has a natural predilection for a certain amount of historical treatment of the subject. The names of van't Hoff, Ostwald, Nernst, Arrhenius, Kohlrausch, Hittorf, Berthelot, Thomsen, Guldberg and Waage, and many others are closely associated with the development of the subject of physical chemistry, in the reviewer's mind at least, yet in this text these investigators and theorists are all but ignored, while there are numerous references to men who have contributed comparatively little to the subject and whose scientific achievements are of comparatively little importance. The development of physical chemistry is one of the most delightful romances in history and the student who is deprived of the personal side of the story not only misses much that is due him but fails to have his enthusiasm and interest aroused. The recital of bare facts shorn of their historical and personal setting is not stimulating.

The reviewer does not believe that students profit greatly by being fed ready-made formulas. Unless they understand the development of the formula its significance is largely lost. All through this book there is a regrettable lack of development and explanation of formulas. For example, the Nernst formula for electromotive force bobs up unannounced.

No development, no explanation, not even the name of Nernst associate with it! The Gibbs-Helmholtz equation fares somewhat better, inasmuch as it is given by name, but it is not developed and the student must take it for granted and swallow it. The frequent repetition of this process must necessarily lead to much mental indigestion.

The book has many excellent qualities and will be of interest to the teacher who desires to brush up on the later developments of his subject and bring his teaching up to date. As a text it is not sufficiently comprehensive and complete for a full year's course such as is now given in most universities, but may serve where a shorter course is given and where the bare facts only are wanted. The author has brought his treatment up to date and has given many excellent examples in his problem work which supplant the time-honored ones. If a student conscientiously solves the problem work laid out he will learn a great amount of solid physical chemistry.

The statements of the fundamental laws and theories are good. A more complete discussion of fundamental units and the methods whereby they are fixed would be welcome, as the average student gets a very hazy idea of this part of the subject. The presentation of the gas laws and equations is good and the development of the kinetic equation and that

of van der Waals is satisfactory. It is believed that a discussion of the commercial liquefaction of gases might well have been included to arouse the interest of the student if for no other reason. The chapter on Solid Substances is modern and well written. Chapter V on Solutions is a mixture of "ideal solutions," "vapor pressure of solutes," "distribution between phases," "vapor pressure of ideal solutions of two liquids," "constant temperature distillation," "boiling point of solutions," "fractional distillation," "mixtures with a minimum boiling point," "distillation with steam," "freezing point of solutions," "molecular weights," and "osmotic pressure." There is no natural sequence in this arrangement nor is there any development of the relations between osmotic pressure on the one hand and boiling-point elevation, lowering of the vapor pressure and freezing-point lowering on the other. The only reference to van't Hoff is an erroneous inference that the term "osmotic pressure" was originated by him in 1886, and Pfeffer's classical work is entirely ignored. By inference (p. 141) again the student is led to believe that osmotic pressure is due to sieve action. In discussing freezing-point lowering the impression is given that thermocouples are necessary for accurate work; and in the discussion of the elevation of the boiling point the only apparatus mentioned is one first described in the literature in 1919. In Chapter VI transference numbers are discussed but no mention is made of Hittorf and his classical researches. Kohlrausch's law is not mentioned as such nor is it stated as a law.

The Chapter on Thermochemistry is excellent though one misses mention of Berthelot and Thomsen. In fact there is but one reference to work done previous to 1910.

Chapters VIII and IX deal with homogeneous and heterogeneous equilibria. In the main the treatment is good and the data well chosen with the possible exception of the example of the equilibrium between sulfur and water. While giving empirical equations for ionization, the Bates equation might well have been mentioned along with that of Kraus and Bray. The author has done well to include a discussion of indicators—a subject usually omitted.

The chapter on Kinetics of Reactions (X) contains a distinct surprise in that the important subject of catalysis is disposed of in half a page. This is indeed a serious omission inasmuch as the subject of catalysis is one of the most important in the whole realm of physical chemistry.

In Chapter XI there is given a very short discussion of the tremendously important subject of Physical Properties and Molecular Structure. This chapter should be considerably expanded and an adequate presentation made of molecular refraction and optical activity. Most of us prefer the equation of Lorentz and Lorenz for molecular refraction rather than the empirical equation of Gladstone and Dale which the author has given, and

the reviewer cannot subscribe to the inference (p. 313) that optical activity is not properly the concern of the physical chemist.

In Chapter XII we have a brief presentation of the periodic table from the modern view point, a presentation which serves well as an introduction to the two succeeding chapters. Chapter XIII gives us an excellent elementary presentation of the fundamental facts relating to Radiochemistry. This chapter and the one following (Atomic Structure) are the most interesting ones in the book and are the ones which will be of most inspirational value to the student. They are particularly acceptable because they present in an interesting way the fundamental facts and modern theories which are being much discussed at the present time. These two chapters are distinctly the high spots in the whole book.

The subject of Colloids (Chap. XV) occupies but 13 pages and suffers from the compression. The importance of Colloid Chemistry in the industries and in daily life is nowhere emphasized and there is little in the chapter to arouse the interest of the student. The final chapter is devoted to electrochemistry.

The appearance of the text is good. There are comparatively few typographical errors and most of them are obvious. The binding of the copy sent to the reviewer was not good.

In a book review the good qualities are too easily submerged. The book in question contains much that is interesting and valuable and the treatment is not a rehash of books that have gone before.

J. H. MATHEWS.

**Some Microchemical Tests for Alkaloids.** By CHARLES H. STEPHENSON, Scientific Assistant, Bureau of Chemistry, U. S. Department of Agriculture. **Chemical Tests of the Alkaloids Used.** By C. E. PARKER, Assistant Chemist, Bureau of Chemistry, U. S. Department of Agriculture. J. B. Lippincott Company, East Washington Square, Philadelphia, Pa., 1921. 110 pp. XXVII Plates (162 photomicrographs). 15.5 × 23.5 cm.

The first compilation of data in a comparatively new field is always an arduous and usually a thankless task: welcomed it is true by fellow workers in the field but rarely appreciated at its full worth. Most of us wonder why the author could not have included more constants, could not have been more specific in his descriptions and included more chemistry in his discussions. Most chemists into whose hands this little book will come will doubtless ask these questions and will be inclined to lay aside the book with a feeling of disappointment. It is only after a careful examination that the reader will appreciate the time and the labor which have been expended in its preparation. It is to be regretted, however, that with so excellent a beginning the work was not completed and that the authors did not give us a comprehensive handbook on the chemical microscopy of the alkaloids, a book which is sorely needed.

The behaviors of 64 alkaloids in varying concentrations with a large number of reagents have been studied under the microscope, and the results which were obtained are briefly described by the author. These descriptions are, in the main, confined to statements of whether crystalline or amorphous precipitates were obtained; in a few instances the reader is told that the crystals formed in the reaction polarize, but in no case is the reader informed as to the character of the extinction, the crystal system or other optical properties of the crystals which are formed, data invaluable in the identification of compounds under the microscope. It is the absence of these data that detracts much from the value of the book for the chemist and the toxicologist. The data presented appear to have been compiled solely from the view point of, and for the average microscopist who is interested only in whether a given reagent will or will not cause the separation of crystals when added to a drop of an alkaloidal solution. Nowhere does the author introduce any statements concerning the chemistry of the alkaloids or of the reactions obtained, nor has he taken advantage of our knowledge of the constitution of many of the common alkaloids and employed organic compounds as reagents and thus obtained identity tests based upon chemical constitution. It is largely due to this lack of chemistry in our literature relating to chemical microscopic tests that the development of chemical microscopy has been retarded and that chemists do not take more kindly to this type of qualitative analysis. The method adopted by the author for performing the tests, "Place one drop of the alkaloidal solution on a microscope slide and add, by means of a glass rod, one small drop of the reagent," is not always conducive to the best results nor can we thus obtain the most uniform and most characteristic crystals.

The photomicrographs illustrating the crystal forms which were obtained in the different tests are excellent and exceptionally well executed. They represent a high degree of skill and have been selected with care and good judgment. An index to the plates adds greatly to their usefulness for ready reference.

Had the arrangement adopted in the first 83 pages (large type headings) been retained in the pages devoted to, "Chemical Examinations" (pp. 84-105) or if an index to the text had been added, it would have materially improved the book and saved the reader time and annoyance. As it is, the discussion of one alkaloid follows immediately after another without change of type or spacing, so that the chemical tests upon a given alkaloid are not quickly found.

As a guide for the beginner in the microscopic detection of the alkaloids, this book, aside from its excellent photographs, has little to recommend it; but considered as a compilation of facts relative to the behavior of alkaloidal solutions toward a number of inorganic reagents it is a distinctly valuable contribution to our heretofore meagre knowledge of these tests and should

find a place upon the shelves of all analysts who have occasion to make analyses of alkaloid-containing materials.

E. M. CHAMOT.

**The Physiology of Protein Metabolism.** Second Edition. By E. P. CATHCART, M. D., D. Sc., F. R. S., Gardiner Professor of Chemical Physiology, University of Glasgow. Longmans, Green and Co., Fourth Ave. and 30th Street, New York; 39 Paternoster Row, London; Bombay, Calcutta and Madras; 1921, viii + 178 pp. 15.5 × 24.5 cm. Price \$4.25 net.

The second edition of this very important and well balanced volume covers essentially the same field as that of the first edition. Since the appearance of the first edition in 1912 many epoch making investigations have been recorded and in the present edition a successful attempt has been made to bring the book up to date. To this end many sections have been entirely rewritten and a new chapter has been added summarizing the influence of the non-nitrogenous foodstuffs on the metabolism of protein. For the student of nutrition the book is invaluable.

FRANK P. UNDERHILL.

**Die Schwimmaufbereitung der Erze.** By PAUL VAGELER. Theodor Steinkopff, Dresden and Leipzig, 1921. pp. v + 98. 23 × 16 cm. Price 4 shillings, 4 pence.

The author was apparently captured in German Southwest Africa during the war and he learned about ore flotation from the English. On p. 6 he points out how much better the Germans study such matters than the Anglo-Saxons. The reviewer does not feel called upon to praise the scientific studies of Minerals Separation; but the author has not carried the matter very far. He states that adsorption is a factor—which everybody knows—and there he stops. There is no adequate discussion of froth formation; there is nothing serious in regard to the difference, if any, between insoluble and soluble flotation agents; there is nothing to show where the ore particles are in the froth though that was a matter of some apparent importance in one of the trials; there is nothing to show why saponin acts as it does; and the Tennessee experiment of adding copper sulfate to a zinc ore is mentioned as an unexplained mystery. There is no question but that several Anglo-Saxons could have written a much better book than this. It is in the general style of Wolfgang Ostwald—high-sounding phrases and nothing that one can take hold of as definite.

There is also a good deal of padding in the book. The diagrammatic pictures of the neutral helium atom and of the oxygen molecule have very little to do with the problems of ore flotation. On the other hand, it is true, though rather obvious, to say, p. 85, that the advantages of the flotation method are relatively less the greater the cost of grinding. The book is utterly inadequate and it is difficult to see how it can be helpful to anybody.

WILDER D. BANCROFT.