
NEW BOOKS

Die Umwandlungen der chemischen Elemente. (The Transmutation of Chemical Elements.) By ARTHUR HAAS, Dr. Phil., Professor of Physics at the University of Vienna. Walter de Gruyter and Co., Genthiner Strasse 38, Berlin W 10, Germany, 1935. viii + 118 pp. 31 figs. 15 × 23.5 cm. Price, RM. 4.30; bound, RM. 5.

The five lectures reprinted in this booklet serve a very useful purpose in connecting the earlier attainments of physics and chemistry with the more recent fundamental discoveries in the realm of atomic nuclei.

Professor Haas, an expositor of great skill, in his first lecture treats of the equivalence of mass and energy, the discovery of the positive electron, the significance of electron pair production or the materialization of light, and positron annihilation radiation. The second lecture considers the development of the periodic system of the elements, mass-spectrography and isotopic analysis, the separation of isotopes by the Hertz diffusion method, and the discovery of deuterium. The agents and techniques of atomic transmutation experiments are described in the third chapter. The story of the discovery of the neutron is presented concisely and comprehensively. The rapid development of the cyclotron is apparent when a comparison is made of the recent accomplishments of Lawrence's instrument with the capabilities of the 1935 model. The fourth chapter presents in detail typical results of disintegration experiments made prior to 1935, including the important case of photo-disintegration of the deuteron. The disintegrations resulting in unstable radioactive nuclei are considered in the fifth lecture.

The thirty-one illustrations are excellently reproduced. The large proportion of cloud chamber pictures emphasizes anew how much the development of atomic and nuclear physics is indebted to Professor C. T. R. Wilson.

K. T. BAINBRIDGE

Die Chemie des Pyrrols. II. Band. Pyrrolfarbstoffe. I. Hälfte. Porphyrine—Hämin—Bilirubin und ihre Abkömmlinge. (The Chemistry of Pyrrole. Vol. II. Pyrrole Pigments. Section 1. Porphyrins—Hemin—Bilirubin and their Derivatives.) By HANS FISCHER, Munich, and HANS ORTH, Troisdorf. Akademische Verlagsgesellschaft m. b. H., Sternwartenstrasse 8, Leipzig C 1, Germany, 1937. xi + 764 pp. 16 × 24 cm. Price, RM. 42; bound, RM. 44.

In spite of the apparent limitations of the title, the authors were forced by the extent of the work under review to divide their second volume into two parts. The consideration of chlorophyll, the imido-porphyrins and, presumably, phthalocyanine, is postponed. For workers in the field of blood and bile pigments the monograph will be indispensable, the authors having performed an invaluable service by selecting the methods which, in their opinion, are most satisfactory for the preparation of a wide variety of substances.

To chemists and physicists interested in the correlation of structure with absorption spectra and other optical phenomena, the sections devoted to these subjects will be provocative. Clinicians interested in the significance of the pathological excretion of porphyrins will find only a brief summary with references to the literature on the subject. The discussion of the biological origin, structure and chemistry of urobilin is much more extended, however. Biochemists interested in the Gmelin reaction or the Ehrlich-van den Bergh diazo-reaction will find the author's latest interpretation of these color changes, although little attention has been devoted to the causes of the differences between the "direct" and the "indirect" diazo-reactions. Biochemists interested in the porphyrin-containing enzymes will find only a brief summary with some literature references.

The book is directed primarily to the organic chemist who wishes to secure an adequate understanding of the methods used in this special field and of the reasoning upon which the accepted structural formulas are based. Here for the first time the gist of hundreds of papers in the literature has been brought under a single cover. In the main, this is necessarily a summary of the now classical researches of the senior author and his collaborators on the blood and bile pigments for which he was awarded the Nobel prize. Earlier contributions are given due credit where they were decisive in the development of theory or practice but spatial limitations do not permit the introduction of much historical material. The topical arrangement used interrupts the logical development of the story of the structure of hemin, which must be pieced together with the aid of the frequent cross references, but will be most convenient for purposes of quick reference.

One gains the impression that the section on the structure of the porphyrins has been more ruthlessly abridged than that on the bile pigments. For instance, no mention is made of the significance of the author's alternative syntheses of pyrro- and rhodo-porphyrin by progressive pairing of quadrants, a possibility geometrically limited to cyclic structures. This constitutes the most subtle proof of the cyclic nature of porphyrins, attained by reasoning unique in organic chemistry.

In this reviewer's opinion, "Fischer-Orth" will take its place on the shelves of chemical libraries beside such classics as the works of Emil Fischer on purines and proteins.

ALSO PH H. CORWIN

The Catalytic Action of Surfaces. By J. E. NYROP. Second edition. Levin and Munksgaard, Nørregade 6, Copenhagen, Denmark, 1937. 103 pp. 20 × 27 cm. Price, 10 Danish Krone.

In the introduction the author states, "The assumptions on which the theory is based are included in the following postulates.

"Postulate A. In a chemical reaction furthered con-

siderably by the presence of a surface, the surface is at the temperature in question able to ionize those molecules among the reactants most difficult to ionize and the surface will cause a strong adsorption as ions formed are attracted by the surface.

"Postulate B. A surface able to ionize molecules of a gas or liquid and hence able to yield a strong adsorption produces an increased adsorption when the molecules are substituted by others having a lower ionization potential, assuming that all other conditions are the same."

In Chapter I after discussing practice and theory in the ammonia synthesis at length, the author concludes by telling us where his theory comes from. "The new theory of catalysis was initiated by the experience gained regarding electronic bombardment synthesis in gas mixtures which occurs only when the accelerating voltage is higher than the ionization potential of those molecules amongst the reactants most difficult to ionize, a condition similar to postulate A."

The reviewer is unable to understand the basic equations in the mathematical formulation of the theory at the beginning of Chapter II. This the reviewer believes to be due to conceptual error but in any case these basic concepts are insufficiently explained.

The author quotes a considerable amount of experimental material in support of his postulates, which many will no doubt find interesting. The reviewer regards the book as an interesting but necessarily inconclusive attempt to demonstrate that surface catalysts expedite reactions by behaving like an ionizing solvent toward at least some one of the reacting molecules.

HENRY EYRING

Heat and Thermodynamics. An Intermediate Textbook for Students of Physics, Chemistry and Engineering. By MARK W. ZEMANSKY, Ph.D., Associate Professor of Physics, College of the City of New York. McGraw-Hill Book Company, Inc., 330 West 42d Street, New York, N. Y., 1937. xii + 388 pp. 101 figs. 16 × 24 cm. Price, \$4.00.

This is an interesting book, mainly on thermodynamics. Very few pages have been noted on heat that contain material not treated in books on thermodynamics. There is an obvious attempt to include much, rather than to omit parts of the theory that are not essential, so as to make clearer the essential. This attempt at completeness, plus certain lapses, seems likely to defeat the attempt of the reader to find out what is necessary and important in the theory and to boil it down into a system that can be viewed as a whole.

Examples of the unessential: the Irreversible Process of Planck (that cannot be reversed without a permanent change in the universe), and the "unavailable energy." In this text reversible process is defined as the opposite of the Irreversible Process, thus complicating the second law proofs. Other complications of Planck's treatment are retained: the ideal gas is used in a proof that the entropy of an isolated system cannot decrease.

No attempt is made to prove the existence of the energy from the first law, but the discussion starts with an assumed energy, the first law is discussed in terms of energy, and heat and work are discussed later.

Most students are willing to accept that thermodynamics is correct and want to know what it is and how to use it. For them, such a discussion of the first law may be sufficient, or nearly so. But if it is good pedagogy to give them such a treatment of the first law, it would be even better to give them a similar treatment of the second, in which the existence of the entropy is simply assumed and they are informed how to use it. Teachers who have this point of view may like this book very well. They may discharge the students of responsibility for the logical development of the second law theory and yet hold them in the main responsible for understanding the applications, both with respect to the principles and to the mathematics. The text seems very good as respects the mathematics.

There are numerous problems, including some excellent simple questions about the theory. The completeness of the book lends interest and increases its usefulness from this point of view.

Some criticisms of details follow.

On page 19 there is a promise to show later that absolute temperature is equal to Kelvin temperature and in section 82 this is stated to be proved, whereas this has not been proved, but something different and easier.

The italicized part of the first paragraph of section 28 looks like a definition of work, but is as it stands a remarkably incorrect theorem about work. By two insertions of the word "adiabatic" it can be made correct, but it is not so easy to make it simple. The treatment here is obscure, like the definition of reversible process, and requires reference to the second law and probably to the universe. The incorrectness here is minor.

In section 34 work of expansion is defined in terms of the work done by the system when the work is not necessarily received as work of expansion by the surroundings. This is not simple, and the reviewer cannot see what is gained by it.

In section 43 one calorie of heat is defined, but not 2 calories. In section 49 the reviewer would prefer the use of calculus to algebra in the final proof. Problem 3 on page 123 is to justify a theorem, and the statement of the theorem needs qualification as regards at least a temperature of absolute zero. Lagrange's method of multipliers is used in section 163 with some implication that elementary calculus is not sufficient, whereas the problem at hand can be more simply solved by elementary calculus.

In section 165 the rules for counting the number of components in ionic systems are obscurely given and incorrectly applied. For it is obscure to call the additional restrictions on the values of the mole fractions "additional dependent mole fractions," and this results in forgetting the necessary condition of electrical neutrality. This omission compensates in the last case of the section for an incorrect count of the number of independent equilibria (the first is not independent of the next five). Furthermore, no reason is given for the flat assertion that $(\text{OH}^-) = (\text{H}^+)$ in this system. This equality would follow from what is on the page, but does not follow if the formation of other species (such as NaOH) from the ions is represented, and the reviewer does not regard it as a chemical fact that the equality holds exactly. The resulting puzzle can be solved by admitting the ions of water when any of the salts

are in fact hydrolyzed—in which case there are five components and the system can act like a five-component system—and by excluding the ions of water when there is no perceptible hydrolysis—in which case there are four components (as was expected in this case). This explanation is available if we do not restrict the discussion to cases in which no new phases are formed; such restriction is undesirable and does not seem to simplify the problem.

Instead of the term "variance" the text uses the phrase "number of degrees of freedom," which many like to reserve for something different.

L. J. GILLESPIE

Die Fermente und ihre Wirkungen. (Enzymes and their Action.) Supplement, Lieferungen 7-8. (Band II, Spezieller Teil: Hauptteil XVI, XVII.) By Prof. CARL OPPENHEIMER. W. Junk Verlag, Scheveningsche Weg 74, The Hague, Holland, 1937. 160 + 160 pp. 2 + 3 figs. 20.5 × 28 cm. Price, Fl. 10 + 10.

The first fifty pages in Lieferung or Part 7 deal with the chemistry of the clotting of blood. Not only is the more recent knowledge which has accumulated in the literature on this difficult subject presented, but also a brief historical background is given for a better evaluation of the more recent progress in this field. The remainder of Part 7 and all of Part 8 contain, besides a brief historical summary, a review of recent literature concerning biological oxidation processes, and the enzymes related to this type of reactions, such as dehydrogenases, oxidases and co-ferments.

The author's attempts to correlate these recent difficult and often confusing data, as well as views and theories which have been advanced, leave the reader not only in a somewhat mentally bewildered state but with the wish that all of this vast amount of material could have been presented in a more condensed and more easily comprehended form. Considerable parts of both supplements have been written with the collaboration of Dr. W. Roman.

J. M. NELSON

BOOKS RECEIVED

December 15, 1937-January 15, 1938

- C. H. DOUGLAS CLARK. "A Comprehensive Treatise of Atomic and Molecular Structure. Vol. II. The Fine Structure of Matter. Part 1. X-Rays and the Structure of Matter." John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 216 + lxxii pp. \$4 25.
- J. DUCLAUX. "Pression Osmotique. Partie Théoretique." Hermann et Cie., Éditeurs, 6 Rue de la Sorbonne, Paris V, France. 54 pp. Fr. 15.
- WILLIAM LLOYD EVANS, JESSE ERWIN DAY AND ALFRED BENJAMIN GARRETT. "An Elementary Course in Qualitative Analysis." Ginn and Co., 15 Ashburton Place, Boston, Mass. 234 pp. \$2.00.
- L. A. GOLDBLATT, Editor. "Collateral Readings in Inorganic Chemistry." D. Appleton-Century Co., Inc., 35 West 32d St., New York, N. Y. 225 pp.
- A. JOUNIAUX. "Exposés de Chimie Analytique. II. Colorimétrie. III. Potentiométrie. IV. Méthodes de Détermination du Terme des Réactions Chimiques Quantitatives. V. Réfractométrie." Hermann et Cie., Éditeurs, 6 Rue de la Sorbonne, Paris V, France. 44 + 41 + 40 + 31 pp. Fr. 10 + 10 + 10 + 10.
- ALFONS KLEMENC. "Die Behandlung und Reindarstellung von Gasen. Ein Hilfsbuch zur Einführung in das Arbeiten mit Gasen für Chemiker und Physiker." Akademische Verlagsgesellschaft m. b. H., Sternwartenstrasse 8, Leipzig C 1, Germany. 215 pp. RM. 14.80; bound, RM. 16.80.
- FREDERICK C. KOCH. "Practical Methods in Biochemistry." Second edition. William Wood and Company, Mt. Royal and Guilford Aves., Baltimore, Md. 302 pp. \$2.25.
- THEODORE J. KREPS. "The Economics of the Sulfuric Acid Industry." Stanford University Press, Stanford Univ., Calif. 284 pp. \$5.00.
- WM. KRUMBHAAR. "The Chemistry of Synthetic Surface Coatings." Reinhold Publishing Corp., 330 West 42d St., New York, N. Y. 200 pp. \$4.00.
- AVERY ADRIAN MORTON. "Laboratory Technique in Organic Chemistry." McGraw-Hill Book Co., Inc., 330 West 42d St., New York, N. Y. 261 pp. \$2.50.
- CARL NAEGELI, Editor. "Grundriss der organischen Chemie." Fifteenth edition. Georg Thieme Verlag, Rossplatz 12, Leipzig C 1, Germany. 297 pp. RM. 6.80.
- W. ALBERT NOYES, JR. "Photochemie. I. Le Rapport entre la Spectroscopie et les Réactions Initiées par la Lumière." Hermann et Cie., Éditeurs, 6 Rue de la Sorbonne, Paris V, France. 45 pp. Fr. 10.
- C. W. PORTER. "The Carbon Compounds. A Textbook of Organic Chemistry." Third revised edition. Ginn and Co., 15 Ashburton Place, Boston, Mass. 495 pp. \$4.00.
- JOHN A. WILKINSON. "Calculations in Quantitative Analysis." Second edition. McGraw-Hill Book Co., Inc., 330 West 42d St., New York, N. Y. 154 pp. \$1.75.