

our dissociation data, on a graph similar to that given by Kistiakowsky and Richards on page 4666 (Reference 1). The differences between this curve and the curve representing the direct experimental measurements of Kistiakowsky and Richards $V_{\text{experimental}}$ are given in the second column of the following table. In the last column are given the differences based on Bodenstein's data without the pressure corrections for the equilibrium constant.

Pressure in mm.	$V_{\text{experimental}} - V_{\text{theoretical}}$ (in meters/sec.)	
	Verhoek and Daniels	Bodenstein
200	2.9	2.2
300	3.0	1.2
400	2.9	0.7
500	2.4	.1
600	1.9	-.3
700	1.5	-.7

While the agreement between the experimental curve and the theoretical curve can hardly be said to be any better using our data, the deviation is nearly constant, and the calculated velocity is always less than the observed velocity. This fact seems to indicate some constant error, either in theory or experiment. In the derivation of Einstein it is assumed that the gas is only slightly absorbing and that the dissociation proceeds according to a unimolecular reaction. It is possible that these assumptions are not sufficiently well satisfied.

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NEW BOOKS

Periodisches System. Geschichte und Theorie. (Periodic System: History and Theory.) By DR. EUGEN RABINOWITSCH, Göttingen, and DR. ERICH THILO, Berlin. Verlag von Ferdinand Enke, Stuttgart, Germany, 1930. xii + 302 pp. 50 figs. 16.5 × 24.5 cm.

This is a textbook which takes up the periodic system both from a chemical and physical point of view. It is a welcome addition to our list of textbooks as it collects in one place a considerable amount of related material of great importance to the chemist who is at all interested in theoretical things, and which, as far as the reviewer is aware, has not previously all been brought together in one place in textbook form. It is to be recommended for advanced students of chemistry who wish to (or ought to) learn something about quantum theory (even though it be mostly old quantum theory) and its applications, without wading through too much material of a highly mathematical character. But many people to whom most of the material is already familiar will undoubtedly be glad to find it

assembled in simple and readable form, though to them the inclusion of references to original sources would have greatly increased its value.

The book is divided into five parts. The first part is an historical treatment of the ideas leading up to the development of the periodic system. This seems to the reviewer to be very useful, inasmuch as it brings forth clearly the difficulties by which early chemistry was beset (and which are often the student's difficulties) and the methods by which these difficulties were straightened out. The second part treats of electrons, protons and the way they combine to build up nuclei. The fundamental experiments are briefly presented and discussed. The next part takes up the Bohr theory of the atom, and considers the energy states both of hydrogen and the more complicated atoms, the various types of coupling of electrons, the Pauli exclusion principle, etc., and ends with a chapter on wave mechanics. The mathematics is kept to a minimum, and on the whole it is quite clearly written. The fourth part deals in detail with the building-up of the periodic system and the energy diagrams of individual atoms. The fifth part consists of a discussion of the periodicity of the chemical properties of the atoms, and takes up such topics as the Born-Haber cycle, polar and non-polar compounds, etc. It contains much valuable material in tabular form (as do, indeed, other parts of the book). Particularly suggestive is the attempt to calculate the existence limits of ionic compounds, though some of the assumptions involved seem hardly tenable. For example, the reviewer can hardly see how the radius of the ion Ca^+ , in a crystal, could be smaller than that of Ca^{++} , but it looks possible that the final results of the calculation would not be much altered if more reasonable values for some of the ionic radii were taken instead of those used by the authors.

There are some misprints in the mathematical portions, and in the lettering of Figs. 43, 46, 48 and 49; on p. 255 "endotherm" is written once for "exotherm." The typography would have been more attractive if italics had been used for mathematical symbols, and it would have been easier to distinguish between l and 1.

OSCAR K. RICE

The Study of Crystals. A General Introduction. By T. V. BARKER, Fellow of Brasenose College, Oxford. Thomas Murby and Co., 1 Fleet Lane, Ludgate Circus, London E. C. 4, England, 1930. xvi + 137 pp. 195 figs. 15.5 × 25.5 cm. Price, 8/6 net.

The text is accompanied by exercises, descriptions of experiments, and excellent illustrations. Parts of the book on geometrical and physical properties may be used as an elementary laboratory manual; other parts, including the following topics, may be read with profit by more experienced students: crystallization from jellies, space-lattice theory, x-rays, polymorphism, "liquid crystals," isomorphism, equilibria between liquid and

crystal phases (this general topic occupies about one-fifth of the book and includes such subjects as reciprocal salt pairs, the microscope as a check on crystallization, mixed-crystals, isodimorphous phases).

Hardness, birefringence and optical orientation are not discussed.

H. E. MERWIN

Systematic Crystallography: An Essay on Crystal Description, Classification and Identification. By T. V. BARKER, Fellow of Brasenose College, Oxford. Thomas Murby and Co., 1 Fleet Lane, Ludgate Circus, London E. C. 4, England, 1930. xi + 115 pp. 76 figs. 16 × 25.5 cm. Price. 7/6 net.

An account is given of a method, which seems as simple as possible, for treating the angular measurements of crystals so that determinative tables can be constructed by listing a minimum number of interfacial angles.

Only slight burdens would be imposed upon describers of new crystals, but the time-consuming task of completing the tables "seems to be a matter for coöperation, personal and financial, and any suggestions toward its fulfilment would be very welcome." The tables will require that many crystals be reoriented and/or have their axial ratios changed. Transformations are based upon the principle of simplest indices, and the pseudo-tetragonal and pseudo-cubic rules.

Appendices contain useful formulas, tables of tangents and multiple tangents, and stereographic nets of 1 and 2¹/₂ in. radii.

H. E. MERWIN

Chemische Thermodynamik. Einführung in die Lehre von den chemischen Affinitäten und Gleichgewichten. (Chemical Thermodynamics. Introduction into the Study of Chemical Affinities and Equilibria.) By DR. HERMANN ULICH, Professor at the University of Rostock. Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany, 1930. xvi + 353 pp. 30 figs. 15.5 × 23.5 cm. Price, unbound, R.M. 18.50; bound, R.M. 20.

In the February, 1930, number of THIS JOURNAL I reviewed a textbook on Thermodynamics by Schottky, Ulich and Wagner. One of the two chemists among the three authors has now written a much simpler text for students interested in the chemical applications, based on the same principles.

These principles are: Consider first the reaction, and build it up from elementary reactions. Then it is only necessary to know the thermodynamical data for these standard elementary reactions. A second step taken in the latter part of the book, is to build up the data of the elementary reaction from data of the substances concerned in it.

Other innovations of the book, taken over from the larger work, are the use of the concept of "resistant groups" instead of molecules, especially useful in mixtures with dissociation and association, and the systematic use of "partial" quantities, extended further than by Lewis and Randall.

The outstanding advantage of the book to my mind, however, is that it is the only one that familiarizes the reader both with the American and with the German method of calculating free energies. The former, which is due to Lewis, gives for every substance the entropy at room temperature and needs therefore only relatively small corrections for other temperatures to be made with the help of the specific heats. The German method starts for every solid pure phase with the absolute zero and the Nernst theorem, integrating the specific heats from zero up. This procedure is more fundamental, but much more cumbersome and subject to inaccuracies.

The book contains a comprehensive table of the thermodynamical data of standard reactions.

It is written in an agreeable style and can be well recommended as a textbook. Sometimes the wish to make the book readable seems to have induced the author to use not quite accurate expressions. There is one error, however, in the statement on page 187 that the identity of energy and free energy at the absolute zero is not self-evident, because the entropy might become infinite. This is, however, multiplied with T and it would take an infinite specific heat, which is most unlikely, to overcome this.

K. F. HERZFELD

A Textbook of Organic Chemistry. By A. F. HOLLEMAN, Ph.D., LL.D., D.Sc., F.R.S.E. Seventh English edition, completely revised with the coöperation of the author. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, 1930. xx + 594 pp. Illustrated. 15.5 × 23.5 cm. Price, \$3.50.

A recent musical comedy advises us that "50 million Frenchmen can't be wrong." Be that as it may, it is more than equally safe to assume that when the editions of a book reach the 50's, and this is one of the 52nd, there must be a great deal that is right about it.

The seventh English edition of Holleman's excellent text not only upholds the high standard of its predecessors, but has been revised to include such recent advances in organic chemistry as Haworth's work on the sugars and Robinson's on strychnine. As no pearl is flawless, so no text, to a reviewer, is quite perfect. It is regrettable that in using the Geneva system, two naming schemes have been introduced. Also some may take exception to the author's usage, consistent though it be, of numbers instead of Greek letters, to designate positions of substituents on carbon chains. All the numerous diagrams do not, unfortunately, depict the best modern laboratory technique. No explanation appears for the term fire-damp, and the writer is led to wonder what students think this term means anyway. The element, now generally called beryllium, is unfortunately designated by a less satisfactory name. Nitriles are always called carbonitriles, but with no seemingly adequate

reason, and the term saponification, which should be reserved for the alkaline hydrolysis of esters, is too loosely used. It is rather surprising, considering the generally superior quality of this book, that the *trans* shift in the Beckmann rearrangement is not mentioned, and that Paneth's work on free methyl and ethyl is ignored. The possibility of replacing nuclear halogen to give phenol, likewise is not mentioned. The rather objectionable term disodium malonic ester is employed without indicating that it is merely a convenience and is not to be taken literally. The suggested mechanism for the addition of sodium phenolate to a certain acetylenic compound seems to pay too little attention to the effects of conjugated unsaturation; while the formula for carotene does not agree with that which is commonly assigned to this hydrocarbon.

However, to more than offset the points just taken exception to, mention should be made of the splendid correlation between physical and organic chemistry, to the part given to alicyclic compounds, of the unusually good presentation of the carbohydrates, and of the treatment of the Walden inversion. The Svedberg molecular weight method for proteins is described, and the formula for that interesting substance thyroxine is included. Furthermore, there appears a good account of the low temperature distillation of coal.

This volume is, without doubt, one of the best one-volume texts available. It is meaty, but it is digestible.

G. ALBERT HILL

Neuere Torfchemie. (Modern Peat Chemistry.) By PROF. DR. G. STADNIKOFF. Introduction by Wo. Ostwald. Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany, 1930. viii + 167 pp. * 17 figs. 15.5 × 23.5 cm. Price, unbound, R.M. 12.

An industry as old as the preparation of peat for the market for use as a fuel might seem to have but little room for technical improvement, but the author has demonstrated that not only is there much to be done but also that in the last years very notable advance has been made in fundamental knowledge of the chemical and physical relations of peat and of its decomposition products. It might also be assumed that peat has but little immediate interest for the United States since there is but little prospect of any large scale utilization of a low grade fuel. On the other hand, the enormous acreage of peat lands in this country, over 100,000,000 acres, and the fairly large importations of foreign peats, mostly for agricultural uses, together with utilization of considerable domestic peat for purposes other than heating render additions to our knowledge of the properties of peat timely and useful.

The author, who is scientific director for the National Institute for Coal Research at Moscow, has assembled all the pertinent and reliable published

data on the water content of peat, the processes and principles of its dehydration, the components of peat and their chemical and physical properties, the bitumen content and its character, the humus content and its components and the liquid products of peat distillation. To this assemblage of data the author has added the results both of technical development and of scientific research in the laboratories of the Soviet jurisdiction during the past ten years. The scientific data are presented for the most part in the form of tables, seventy-seven in number. The whole body of material is clearly presented and discussed without any attempt to develop a particular or personal point of view. In each topic every material advance in scientific knowledge of peat is developed.

On the whole the booklet, small as it is, probably presents the most compact and readily accessible body of information available. The text is accompanied by numerous references to the best scientific and technical literature both in Europe and America down to 1930.

HORACE G. BYERS

Nutrition and Food Chemistry. By BARNARD S. BRONSON, State College for Teachers, Albany, N. Y. John Wiley and Sons, Inc., New York, 1930. viii + 467 pp. 34 figs. 15 × 23 cm. Price, \$3.75.

The purpose of this book, as stated by the author in the preface, is to lessen the burden which is carried by human knowledge regarding food and diet due to the mass of accumulated misinformation about this subject. "It is the outgrowth of attempts over a number of years to sift the grain from the chaff in presenting the elements of nutrition and foods to a group of college students with little foundation in physiology and none in organic chemistry." There is a short introductory chapter on "The Organism and its Environment," followed by eighteen chapters covering the following general topics: "Food, and Mechanics of Digestion;" "Chemistry of Digestion;" "Chemical Changes in the Intestine, and Absorption;" "Composition of Foodstuffs," including two chapters on carbohydrates and one covering both fats and proteins; "Fate of the Foodstuffs," two chapters; "Protein Requirement;" "Energy Requirement;" "Inorganic Salts and Acid-Base Balance;" "Vitamins;" "Milk and Milk Products;" "Butter, Oleomargarine, Cheese, Condensed Milk, and Ice Cream;" "Eggs and Meat;" "Vegetable Foods;" "Legumes, Root Crops, and Green Vegetables," and "Fruits." Several appendices cover the subjects of "New York State Milk Standards," "Distribution of Vitamins," in tabular form, "Terms Used in Standardization of Eggs," and tables showing recent analyses of the iron and copper content of foods.

The author has, in general, covered the field in a very clear and pleasing manner, and shows that he has been a very critical student of the many subjects presented. It is perhaps too much to expect a teacher to be

absolutely up to date in a field of applied science in which such a large volume of research is being published yearly. Although the author has brought his subject up to the very latest word in certain fields, the book would be benefited by considerable "sifting," as it stands, and will no doubt require considerably more in the future.

A feature of the book which may appeal to many teachers and students is the etymology of many terms, given in footnotes. The book is well illustrated and the text fortified with many valuable tables, taken from numerous sources, all of which are acknowledged.

The author's style is not as uniform as one might wish, suggesting that the various sections of the subject matter were prepared at different times and not re-written for publication. This is borne out by the considerable amount of tautology in the text, which in a few cases has led to diametrically opposing statements.

Although the author has prepared the chemical sections of his text for students with no foundation in organic chemistry, he does not hesitate to introduce structural formulas in the chapters on the composition of carbohydrates, proteins and fats. This may give the text some appeal to students with more advanced chemical training, but the reviewer questions whether it is possible to teach enough organic chemistry in a few pages of text to make heterocyclic structural formulas intelligible to students who have only the most elementary chemical training. Incidentally, the structural formulas for the sugars are not those most generally accepted by biochemists at the present time and the author's explanation of the gamma sugars is hazy.

L. S. PALMER

BOOKS RECEIVED

February 1, 1931–February 15, 1931

- JAMES C. MUNCH. "Bioassays. A Handbook of Quantitative Pharmacology." The Williams and Wilkins Company, Mt. Royal and Guilford Aves., Baltimore, Maryland. 958 pp. \$10.00.
- WO. OSTWALD. "Kolloidwissenschaft Elektrotechnik und Heterogene Katalyse." Sonderausgabe aus den Kolloidchemischen Beiheften. Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany. 113 pp. RM. 5, unbound.
- ALFRED RIECHE. "Alkylperoxyde und Ozonide. Studien über Peroxydischen Sauerstoff." Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany. 172 pp. RM. 10, unbound.
- ALFRED WAGNER, ALFONS M. BURGER AND F. ELZE, Editors. "Die Riechstoffe und ihre Derivate." Erste Abteilung: Aldehyde der aliphatischen Reihe. Zweite Abteilung: Aldehyde der alizyklischen Reihe. Dritte Abteilung: Aromatische Oxyaldehyde mit gesättigter Seitenkette—Zweiwertige Oxyaldehyde—Äther aromatischer Oxyaldehyde mit gesättigter und ungesättigter Seitenkette—Aroxylaldehyde.