

variations of the extent of adsorption with temperature and pressure, abnormal variations of the heats of adsorption with temperature and pressure, large variations in the velocity of attainment of adsorption equilibrium in different systems and in the velocity of evaporation of adsorbed gases. These several factors also influence the velocity of chemical processes occurring at the surfaces in question.

It has now been found that all of these difficulties can be removed and a unified method of treatment results once it is grasped that adsorption processes, in general, require an activation energy. It can be shown that the activation energies of such adsorption processes may vary from very small values to magnitudes such that the adsorption phenomena may first be obtained at quite high temperatures. Moreover, the magnitude of the activation energy is determined not only by the adsorption process in question but also by the nature of the surface area on which the process occurs. Thus, for example, the adsorption of hydrogen on the most active areas of catalytic metals involves such a small activation energy that the process is rapid at temperatures as low as -100° . With various oxide surfaces the adsorption process only manifests itself at temperatures several hundred degrees above room temperature. Numerous examples of these factors involving a variety of surfaces and the gases hydrogen, oxygen, nitrogen, carbon monoxide and water vapor as adsorbates have been collected. The detailed discussion of the subject will be communicated shortly.

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NEW BOOKS

Tables annuelles de constantes et données numériques de chimie, de physique, de biologie et de technologie. (Annual Tables of Constants and Numerical Data Chemical, Physical, Biological and Technological.) Published under the auspices of the International Research Council and the International Union of Pure and Applied Chemistry by the International Committee appointed by the Seventh Congress of Applied Chemistry (London, June 2, 1909). Vol. VII, Parts 1 and 2, 1925-1926. McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York, 1930. Part 1, xxxv + 946 pp. Part 2, xv + 950 pp. 22.5 × 28 cm. Price, \$25.00 per set.

All workers in the natural sciences will welcome the appearance of this double volume of the Annual Tables covering the years 1925-1926. Naturally the arrangement and mode of treatment followed in the earlier volumes are retained here. There are, however, certain minor changes and additions. English versions of some portions of the French text which might present some difficulties to the reader have been introduced. Two new chapters on Explosions and on Explosions in Gaseous Mixtures have been added

and two old chapters treating of Photography and Geophysics have been omitted, since the specialists in charge of these subjects prefer to have them published only once in every two volumes. Numerous detailed indices to the substances mentioned in the tables and to memoirs whose data are not susceptible of inclusion in the Tables have also been added.

Dr. Marie, Secretary of the International Committee, announces that Volume VIII covering the years 1927 and 1928 is already in press and should be published by the beginning of 1931. With the next volume thereafter (Volume IX) covering 1929, the yearly publication of the Annual Tables will be resumed. Dr. Marie also calls attention to the forthcoming General Index covering Volumes I-V and this in the meantime has appeared.

These tables impress one with the beneficent results which can flow from an international coöperative effort of this kind entrusted to intelligent and public-spirited men.

ARTHUR B. LAMB

Non-Interpolating Logarithms, Cologarithms and Antilogarithms. By FREDERICK W. JOHNSON, M.A., Instructor in Chemistry, California College of Pharmacy, University of California. The Simplified Series Publishing Company, 1381 Third Avenue, San Francisco, California, 1930. 16 × 21.5 cm. Price, \$1.60.

Five years ago no one would have considered that tables of logarithms offered much scope for any significant improvement. Nevertheless, within that period the graphical tables of Lacroix and Ragot [THIS JOURNAL, 48, 842 (1926)] have appeared and now we have these new tables of four- and five-place logarithms where, within substantially the compass of ordinary tables, logarithms (and antilogarithms) to four and five places, respectively, can be read off by inspection, without any calculation whatever. This is achieved very simply by the ingenious use of a new vertical arrangement and a mixture of bold-faced and ordinary type.

There seems to be no doubt in the case of the five-place logarithms that the new tables save both time and mental effort as compared with the ordinary tables. Moreover, it is not difficult to learn how to use them. In the case of the four-place logarithms the advantages are less pronounced. The elimination of interpolation is of less moment here, because anyone who uses frequently an ordinary four-place table can make the interpolations very quickly and easily. Moreover, the somewhat greater complexity of the new tables is here a noticeable drawback.

There is less to choose between these new tables and the above-mentioned graphical tables. So far as speed is concerned they are about on a par, at least for a person equally familiar with both. However, the mental effort involved in the use of the graphical tables, where one must correlate the two abutting scales to obtain the last two figures seems greater than in the use of these new tables.

There are also included in this volume the usual introduction, several pages of conversion factors, trigonometric functions and formulas and a table of "International Atomic Weights." This table besides being out of date (1925) gives logarithms of atomic weights to five places, irrespective of the number of significant figures in the atomic weights themselves.

Anyone who has to use five-place logarithm tables frequently would do well to give these tables a trial.

ARTHUR B. LAMB

Einführung in die technische Behandlung gasförmiger Stoffe. (Introduction to the Technical Methods of Handling Gaseous Materials.) By W. BERTELSMANN, Dipl.-Ing. Dr. phil., and F. SCHUSTER, Dr.-Ing. Verlag von Julius Springer, Linkstrasse 23-24, Berlin W 9, Germany, 1930. x + 411 pp. 288 figs. 15.5 × 24 cm. Price, unbound, RM. 38; bound, RM. 40.

The authors state that their book was written for the purpose of acquainting technologists in various fields with the methods technically employed in the generation, handling and purification of gases.

In the introduction (40 pages) an attempt is made to explain and summarize the physical-chemical laws which govern the behavior of gases and the reactions which occur in gaseous systems. Some of the material in this introduction is so elementary that the authors would have been justified in assuming that it would be familiar to the reader. The discussion of the more important topics is so condensed that it would be of but little value to a reader who was not already familiar with these topics. The lack of clearness and completeness in the introductory chapter is not, perhaps, a very serious defect, since in the subsequent chapters of the book little reference is made to the underlying theory developed here.

Chapter I, on Warming, Cooling, Compression and Liquefaction of Gases, contains a rather elementary and descriptive discussion of these subjects. The general equation for the rate of flow of heat by conduction is given, but the reader will find little information as to the actual rates of heat transfer to be expected in any specific case.

The second chapter, on the methods for obtaining gases, includes a rather detailed description of the procedure followed in drilling for natural gas. To the reviewer, this topic does not appear to have sufficient general interest to justify the emphasis placed upon it here. The discussion of the fractional distillation of liquefied gases is so elementary and incomplete that it would be of little assistance to the reader who desired to gain even a general knowledge of this subject.

The third, fourth, fifth, sixth and seventh chapters deal with the preparation, purification, measurement, storage and distribution of gases, respectively. The treatment is largely descriptive.

The eighth chapter, on methods of testing and analyzing gases, is very

incomplete. Many of the methods and types of apparatus described therein are obsolete. Many of the newer methods actually used in the industries are not described.

In their attempt to cover a wide field in a single volume, the authors have omitted much which would be of great importance to any technologist who is called upon to prepare or handle industrial gases. In the opinion of the reviewer, the material which has been included has not been well selected nor ably presented. The reviewer does not regard this book as a particularly valuable contribution to the technology of gases.

F. H. RHODES

Lehrbuch der organischen Chemie. (Textbook of Organic Chemistry.) By Professor Dr. JULIUS SCHMIDT, Stuttgart. Fourth revised edition. Ferdinand Enke Verlag, Stuttgart, Germany, 1929. xxxvi + 896 pp. 17 figs. 16 × 25 cm. Price, unbound, RM. 45.50; bound, RM. 49.

In reviewing so compendious and so excellent a volume as this, one may dismiss the whole matter with a mere word or two of unstinted praise, or proceed to comment on the features good or otherwise. If the latter seem numerous it is only because space forbids the mention of all the good points and the relation between the acceptable and the unacceptable statements in the book is thus not accurately indicated.

The third edition of this splendid text, running to about 800 pages, was called a "Short Textbook." In closer accord with the facts, the present edition, the fourth, 850 pages, has had the adjective dropped from the title, a most pleasing change. The additional pages have permitted the inclusion of much new material as well as an amplification of the biochemical accomplishments of recent years, and have greatly increased the value of the book. The literature references, numerous and well-selected, are also surprisingly up-to-date, publications appearing as recently as 1929 being mentioned. This volume has very good author and subject indices, and the mechanical features of the book's production have been handled in the usual excellent manner of the Enke press.

As in the earlier editions there still appears, in the first part of this book, too much, and some quite superfluous, freshman chemistry; *e. g.*, (p. 14) the method of calculating the empirical formula from the analytical results is given in detail. The distinction between an empirical and a molecular formula (p. 16) is not so clearly made as is desirable. It is a poor compliment to the prospective readers of this book that the author felt called upon (p. 29) to take a short section for an explanation of just what constitutes an hydroxyl group.

In discussing the cause of optical activity (p. 44), too much stress is laid on the presence of an asymmetric carbon and too little attention is devoted to the really essential feature, namely, that the molecule shall be asym-

metric. A quite needless statement concerning the existence of compounds with water of crystallization (p. 66) is given, and Fig. 17 (p. 68), showing a flask with contents, presumably ready for distillation, indicates the thermometer improperly located. The diagram serves no real purpose in a book of this character. The statement (p. 82) to the effect that monovalent hydrocarbon radicals, aliphatic as well as aromatic, are generally called alkyls is not in line with general American practice at least. It is pleasing to note that the text mentions the members of the paraffin series higher than $C_{60}H_{122}$, since such compounds, though known for some years, are rarely referred to even in supposedly modern texts. It is certainly regrettable that the astonishingly incorrect statement, at least so by inference (p. 91), that Pennsylvania is still the center of the American petroleum industry, should have been permitted to remain in this new edition. The bad impression left with the reader by the foregoing is, however, promptly eliminated by the pleasure in finding the structure of phytol correctly presented. All too few writers have as yet become really aware of the beautifully conclusive work of F. G. Fisher with this interesting and important substance.

One is rather surprised that, under the topic of fat syntheses (p. 189), he finds no mention of materials with an odd number of carbon atoms in the acid chain; this is especially so in connection with this book because the medical aspects of most of the subjects are splendidly presented. The formula for pelargonic acid (p. 194) has a subscript written as an exponent. This slip in proofreading makes the text combine French and German practice. This unintentional stressing of the international aspect of chemistry may, however, be pardoned when one appreciates that this volume is very well supplied with formulas among which are discoverable surprisingly few typographical errors. In the discussion of dynamite (p. 250) reference is still made to the use of infusorial earth with no mention of the fact that wood powder, at least in this country, has long since replaced it.

The introductory statements under carbohydrates (p. 297) indicate that they "unquestionably" occupy *first* place in the study of foodstuffs. Without meaning to quibble too much, it might be pointed out that, in the absence of proteins, the carbohydrates, important as they are, are still insufficient for the continuance of life. The state of flux that still lingers in the minds of many concerning the nature of the cyclic forms of the hexoses is fairly presented by Schmidt.

In certain equations (p. 347) elementary diatomic gases are indicated without subscripts. As long as coefficients are required, and given, in the equations as presented, there seems to be no good reason why these gases should not be written to conform with common practice. Disodium malonic ester is to be found (p. 369), under the synthesis of a group of ring compounds, with two sodium atoms on the same carbon. Doubtless this

formula is so given merely for convenience, but at least a word to indicate that the formula does not represent the accepted views would not come amiss. In this same section compounds are sometimes named, and referred to, in one place on the polymethylene basis and elsewhere the cycloparaffin nomenclature is used. It is to be hoped that in subsequent editions the author will adopt whole-heartedly the latter and more generally accepted naming scheme.

A rather surprising failure to indicate a modern advance in the field of industrial organic chemistry is shown (p. 436) by the appearance of the hoary statement to the effect that halogen on the aromatic nucleus cannot be replaced by hydroxyl by the action of alkali. The Dow phenol process is a daily, and important, refutation of this contention. Perhaps only purists would interpret "artificial camphor" to mean a substance *resembling camphor* in some of its properties, but not the same structurally, whereas "synthetic camphor" would be taken to mean *camphor* prepared by laboratory methods. If, however, this view is adopted generally by chemists, and many hold it, Schmidt's objection to the term "artificial camphor" is not so potent, or so well taken, as it might be.

The writer is happy to report that here is a text, the first seen by him at any rate, which presents the latest developments of the Beckmann rearrangement, including the *trans* shift. Meisenheimer's work with the oximes of benzil is also included.

The presentation of the subject of alkaloids is more than adequate, and quite unusual in a book of this type; approximately 75 pages are devoted to this important subject. Though the treatment of proteins is very well done, one is rather surprised to note no mention of Svedberg's ultracentrifugal method for determining the molecular weights of these substances. The section devoted to the structure of proteins has been very carefully prepared, and each of the important theories has received considerate attention.

This is an admirable text as far as book-work, content and manner of presentation are concerned—and there is not much more that can be said for a text.

G. ALBERT HILL