

the lead block permitted accurate measurements of the temperature. In the temperature range covered, liquid or solid chlorine was present in the reaction vessel and therefore the rate could be followed by observing the pressure change.

At the present time we are investigating the rate law over the temperature range mentioned above. Preliminary results indicate that the dependence on the light absorbed changes from the first power to the square root as the temperature is lowered.

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NEW BOOKS

Hundert Jahre Liebigs Annalen der Chemie. (One Hundred Years of Liebig's *Annalen der Chemie*.) By RICHARD WILLSTÄTTER. Verlag Chemie, G. m. b. H., Corneliusstrasse 3, Berlin W 10, Germany, 1932. 12 pp. 14 × 22 cm.

The appearance during December, 1932, of the 500th volume of Liebig's *Annalen der Chemie* is a significant event in the life history of our science. This periodical, founded by Liebig just one hundred years ago, has had in the past as editors a succession of the great organic chemists of Germany—Wöhler, Kopp, Hofmann, Kekulé, Erlenmeyer, Volhard, Fittig, Von Baeyer, Wallach, Fischer, Graebe and Zincke. Today its editorial board consists of Willstätter, Wieland, Windaus and H. Fischer—every one of them a Nobel Prize laureate. In the pages of the *Annalen* are to be found a large proportion of the great classics of organic chemistry. Its five hundred volumes constitute substantially a history of the development of that science.

What other scientific journal has so inspiring a past and so brilliant a present!

ARTHUR B. LAMB

An Introduction to Chemistry. By FRANK B. KENRICK, Professor of Chemistry in the University of Toronto. The University of Toronto Press, Toronto, Canada, 1932. viii + 434 pp. 33 figs. 15 × 23 cm. Price, \$3.00.

Not since Ostwald's attempt, a quarter of a century ago, to account for the fundamental laws of chemistry without the use of the atomic theory, has appeared a more interesting and consistent development of the principles of the science from actual laboratory observations than in "An Introduction to Chemistry" by Professor Kenrick. It is difficult to believe that in these days elementary students will "struggle" (to use the author's own word) with the labored and involved presentation of the subject, which is necessary when all terms and conceptions which are not rigidly defined by experiment are abandoned. It is equally difficult to believe that teachers will consider that a student can afford the time to master, for example, one hundred and forty-five difficult pages, in order to get the distinction between mechanical mixtures, solutions and pure substances. In short, to quote directly from the preface, "This will not be found to be a 'teachable' book; a teachable book must be a learnable book, and that is a most danger-

ous educational weapon. Chemistry is not a teachable subject; it is a thing to be struggled with."

If, however, this book is to be viewed, not as one to be used by a beginner, but as a protest by the author against the current elementary books, which are top-heavy with theory and riddled with vague and ambiguous terms, then it should be commended to those who can appreciate its significance and especially to teachers of elementary chemistry. A brief description of the processes of the manufacture of salt, chlorine and caustic soda, and of the refining of crude sugar and accounts of the compositions of wood, of air, and of rocks, serve as illustrative material for the interpretation in laboratory terms of a number of the common chemical words, such as constituent, dissolved constituent, composition, solution, pure substance, element, atomic weight, molecular weight, chemical formula, ion, dissociation and some others.

The meaning of the term "constituent," for example, is developed with great care and at some length, since it is constantly referred to throughout the book. "A set of constituent substances of a material" is defined as "either a set of substances into which the material can be turned quantitatively or a set from which it can be made quantitative." This definition leads to the description of 26% brine as having eight different sets of constituents depending upon the point of view—namely, (1) salt + water, (2) concentrated hydrochloric acid + 32.5% caustic soda solution, (3) oxygen + hydrogen + salt, (4) chlorine + hydrogen + cell liquor, (5) chlorine + hydrogen + water + salt + caustic soda, (6) chlorine + hydrogen + water + caustic soda, (7) chlorine + hydrogen + water + oxygen + sodium, (8) chlorine + oxygen + hydrogen + sodium. While it must be granted that the term "constituent" is commonly used with different meanings in different connections, it does not seem to the reviewer to add to the clarity of the situation to say that the constituents of brine are solutions of hydrochloric acid and of caustic soda.

The strictly logical derivations of many other terms as based upon experimental observations lead to equally unusual definitions, which the reader is at first inclined to challenge. The book is thus most stimulating. While it is true that the meanings of many of our most common words, such as acid, are vague, the cumbersome phraseology of precise usage, which often involves long parentheses, is frequently unnecessary and confusing. This insistence on precision in all cases is not unlike a demand that all weighings should be made with the utmost accuracy, whether or not the final figures have significance. So, in some instances, the author of this book may be open to criticism as to his sense of proportion.

In conclusion, the book is a most timely reaction against the current looseness of phrase and thought which has wandered too far into theory and away from experimental facts. If, in turn, this book may have gone too far in the other direction to be a practical textbook, yet a careful reading of it should have a most desirable influence on the thoughtful students and teachers of the principles of chemistry.

KENNETH L. MARK

The Structure of Molecules. Edited by P. DEBYE. Authorized Translation by Winifred M. Deans, M.A., B.Sc. Blackie and Son, Ltd., 50 Old Bailey, London, E. C. 4, England, 1932. xii + 190 pp. 14.5 × 21.5 cm. Price, 15/-.

This is a collection of the papers presented at the fourth summer conference at Leipzig (1931), introduced by a two-page preface by Debye. The first paper, by Wolf, Bodenheimer and Herold, presents a qualitative discussion of rotation about valence bonds together with applications of the concept of hindered rotation to the relative yields of optical isomers obtained in a number of type reactions. This is followed by an account of the experimental results of the study of the band spectra of polyatomic

molecules by Mecke, in which the classification and notation of normal vibrations receive special attention. Rasetti offers a brief treatment of the theory of the Raman effect and of the experimental technique employed in the study of this effect in crystals. In the succeeding paper Placzek presents a detailed mathematical analysis of the intensities and polarizations of Raman lines obtained from molecules of various symmetry types. The application of band spectra to the study of the dissociation of diatomic molecules is discussed by Sponer. Predissociation is reviewed in two papers, the first, by Henri, containing a large amount of experimental data, and the second, by Kronig, presenting a brief theoretical discussion of the topic. The concluding paper, by Herzberg, deals with that branch of the recent additions to the theory of valence which has been developed chiefly by Hund, Mulliken and Herzberg, and which will apparently be of more value to the band spectroscopist than to the chemist.

The papers vary somewhat in scope, but for the most part they are rather more comprehensive than the usual seminar report and less so than the average article of the review journals. They are not well suited to those unfamiliar with the topics discussed, but to the fairly advanced student they offer interesting and suggestive discussions of the several subjects. It is only natural that these discussions should be strongly colored by the personal interests of the authors. A small proportion of the material has not been published elsewhere, except in the German original.

The work of translation has, on the whole, been well done, but one is led to question the desirability of translating books of this type both because the majority of their readers would prefer the original, and because the time consumed in translation is a considerable portion of such books' periods of usefulness.

HUGH M. SMALLWOOD

Fixed Nitrogen. Edited by HARRY A. CURTIS. American Chemical Society Monograph. The Chemical Catalog Company, Inc., 419 Fourth Ave., New York, 1932. 517 pp. 82 figs. 15.5 × 23.5 cm. Price, \$12.00.

To one interested in the question of nitrogen fixation, this volume on Fixed Nitrogen, edited by Harry A. Curtis, being No. 59 of the American Chemical Society Monograph Series, will prove a welcome and ready means of obtaining at once a fairly up-to-date record, both theoretical and practical, for such it is. Dr. Curtis himself, the author of four general introductory chapters covering the history, sources and utilization of fixed nitrogen, the Chilean nitrate industry, and fixed nitrogen from coal, chose well his collaborators. They were chosen from the research staff of the Fixed Nitrogen Research Laboratory or from past members of the staff who have served an important apprenticeship there. No one can read their contributions without admiration for the thoroughness of the work done.

The reviewer has found nothing to criticize and much to praise. The whole plan of the book has been under each chapter to give the most modern development with a discussion of the theory upon which that development has been made and by which it is still guided. Careful reference has also been given to the best literature on each topic so that the student who desires more detail can readily obtain it.

"The Arc Method of Nitrogen Fixation" has been covered by Norman W. Krase; "Synthetic Ammonia," by P. H. Emmett; "The Cyanamide Method of Nitrogen Fixation" and the "Synthesis of Urea," by H. J. Krase; and "The Alkali Cyanide Method of Nitrogen Fixation," by E. W. Guernsey. The chapter "Nitrogen Fixation by Living Organisms," by F. E. Allison, gives, too, a careful résumé of this subject, through which nitrogen is made available in soil. Aside from these specific topics, C. H. Kunsman and Richard Wiebe have important chapters covering the important role which physics has played in the problem, with the physical properties of the gases involved

and the studies of catalytic surfaces. An important chapter on "High Pressure Equipment and Technic," by J. R. Dille and W. L. Edwards, will be of special importance to the mechanical engineer interested in this subject, not only in its application to nitrogen fixation but in other fields. The chapter reproduces detailed drawings to scale, clearly showing some of the mechanics by which the difficulties incident to high pressure have been overcome. The book closes with a chapter on "Synthetic Nitrogenous Fertilizers," by Wm. H. Ross and Albert R. Merz, and a chapter on "Nitrogen Statistics," by P. E. Howard.

The book is well written and the typography is a credit to the series to which it belongs.

The reviewer realizes that the statement he has given is little more than a restatement of the table of contents, but the book is so replete with information, so well illustrated, so entirely up to date theoretically and practically, that nothing else is possible within the limits available to him. He has no hesitancy whatever in recommending the book as having no equal in the field which it covers, *viz.*, that of the fixation of nitrogen.

CHARLES L. PARSONS

BOOKS RECEIVED

December 15, 1932–January 15, 1933

- KENNETH C. BAILEY, Editor. "The Elder Pliny's Chapters on Chemical Subjects." Part I, with Translation and Notes. Longmans, Green and Co., 55 Fifth Ave., New York. 249 pp. \$5.00.
- HORACE G. DEMING. "Introductory College Chemistry. An Elementary Course Developed Historically." John Wiley and Sons, Inc., 440 Fourth Ave., New York. 590 pp. \$3.00.
- I. M. KOLTHOFF AND HARRY FISCHGOLD. "Säure-Basen-Indicatoren. Ihre Anwendung bei der colorimetrischen Bestimmung der Wasserstoffionenkonzentration." Gleichzeitig Vierte Auflage von "Der Gebrauch von Farbindicatoren." Verlag von Julius Springer, Linkstrasse 23–24, Berlin W 9, Germany. 416 pp. RM. 18.60; bound, RM. 19.80
- WILLIAM ALBERT NOYES AND W. ALBERT NOYES, JR. "Modern Alchemy." Charles C. Thomas, Publisher, 300 East Monroe St., Springfield, Ill. 207 pp. \$3.00.
- Wo. OSTWALD, Editor. "Filme und Fäden." Sonderheft der *Kolloid-Zeitschrift*, Band LXI, Heft 2. Hauptvorträge Gehalten auf der IX Hauptversammlung der Kolloid-Gesellschaft im Mainz, vom 28–30 September, 1932. Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany. 184 pp. RM. 12.
- HANS RUPE. "Adolf von Baeyer als Lehrer und Forscher. Erinnerungen aus seinem Privatlaboratorium." Verlag von Ferdinand Enke, Stuttgart, Germany. 26 pp. RM. 2.50.