

any great amount of light is obtained. Nor is the hypothesis advanced by other workers^{1,2} borne out that the brightness is proportional to the molecular weight, C_2H_3MgI being fainter than C_2H_5MgBr , but the latter probably little if any fainter than C_3H_7MgBr , or brighter than CH_3MgBr . In connection with this latter idea, the writer is indebted to Dr. N. J. Beaber, of the Mellon Institute, for the suggestion, with strong evidence, that the compound formerly^{5,6} regarded as $p-IC_6H_4MgBr$ should be assigned the structure $p-BrC_6H_4MgI$. If this be correct, the compound should have been placed in the series $p-ClC_6H_4MgI$, $p-BrC_6H_4MgI$, $p-IC_6H_4MgI$, instead of the series previously suggested by the writer; but, in either case, the series would be one in which the brightness would decrease with increase in molecular weight.

COLUMBIA, MISSOURI
RECEIVED DECEMBER 7, 1927
PUBLISHED JUNE 5, 1928

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NEW BOOKS

Handbuch der Anorganischen Chemie. (Handbook of Inorganic Chemistry.) By DR. R. ABEGG, DR. FR. AUERBACH AND DR. I. KOPPEL. Fourth Volume, Third Section, First Part. **The Noble Gases.** By DR. EUGEN RABINOWITSCH. S. Hirzel, Königstrasse 2, Leipzig, 1928. xii + 522 pp. 50 figs. 17 × 24 cm. Price, unbound, M. 45; bound, M. 48.

This volume represents the first instalment of the last subdivision of the Abegg Handbook. The elements which it discusses, although they exhibit scarcely any chemical activity, have nevertheless exerted a profound influence on our views as to the relationship of the elements and the structure of matter.

One can hardly escape a comparison of this volume with the corresponding one of the Gmelin Handbook recently published. Both are excellent, but the methods of presentation are radically different. This volume arranges the material under general headings, such as Occurrence of the Rare Gases; Preparation of the Rare Gases; Detection of the Rare Gases; Nuclear Properties of the Rare Gases; Atomic Properties of the Rare Gases, etc. The corresponding volume of the Gmelin Handbook, except for an introductory chapter, arranges the material wholly under each separate element. This latter method may perhaps make possible the more rapid location of the particular information desired, an advantage that is consonant with the general purposes of the Gmelin Handbook. The arrangement of the present volume, however, makes the subject matter more interesting and readable. This effect is still further favored by the inclusion of much more explanatory material and discussion of theoretical considerations. Apparently, also, a fuller presentation of the available numerical data has been attempted. Finally, it should be

particularly mentioned that there is an excellent treatment of the spectra of the rare gases, from the point of view of the quantum theory.

This volume is, therefore, a valuable accession to the literature of the rare gases.

ARTHUR B. LAMB

Adsorption und Kapillarkondensation. (Adsorption and Capillary Condensation.)
Band 7 of *Kolloidforschung in Einzeldarstellungen*. By Erich Hückel. Akademische Verlagsgesellschaft m. b. H., Markgrafenstr. 4, Leipzig C 1, Germany, 1928. vii + 308 pp. 34 figs. 15 × 22 cm. Price, unbound, M 18; bound M 20.

A systematic treatment of the theory of the subject. The first chapter contains definitions and a very careful analysis of the thermodynamics involved. The theory is then developed, partly by thermodynamical and partly by statistical methods, beginning with the simplest possible case, adsorption on a plane surface of a number of molecules so small that their mutual influence vanishes. Attention is then paid to the complications caused by the unevenness and inhomogeneity of the surface of a real adsorbent, as well as by the mutual influences which appear when the number of molecules adsorbed increases. The final chapter is devoted to phenomena near saturation, which are considered to be caused by capillary condensation. This section is logically preceded by a review of the theory of surface tension and wetting.

The point of view from which the book is written is that of the mathematical physicist. Much emphasis is placed upon the electrical theory of the origin of adsorption forces, as developed by Debye and Jaquet. The treatment of mutual molecular influences, and of surface tension, follows van der Waals. The author is, however, by no means one-sided, but gives due consideration to other important theories of adsorption.

The book will prove a valuable stimulus to those interested in the theoretical aspects of the subject. A possible fault is the paucity of experimental illustrative material. Recent American work seems to have been overlooked.

ALBERT SPRAGUE COOLIDGE

The Mechanism of Homogeneous Organic Reactions from the Physical-Chemical Standpoint. By FRANCIS OWEN RICE, Associate Professor of Chemistry in the Johns Hopkins University. American Chemical Society Monograph Series. The Chemical Catalog Company, Inc., 419 Fourth Avenue, at 29th Street, New York, 1928. 217 pp. 11 figs. 15.5 × 23.5 cm. Price, \$5.00.

The author's point of view is illustrated by a statement taken from the two-page discussion of homogeneous gas reactions with which the book concludes: "In the last year or two several homogeneous reactions in the gas phase have been studied. Although the actual examples are not catalytic it is obvious that such studies will throw much light on the

mechanism of reaction kinetics and should therefore be included in any discussion of homogeneous reactions." As might be expected from this quotation, the main portion of the book is devoted to a discussion of homogeneous *catalysis*, although heterogeneous reactions are not entirely excluded. It is stated in the introduction that the intention is to give a systematic account of organic reactions from the point of view that they are all catalyzed either by dry (unhydrated) hydrogen ions or by dry hydroxyl ions. This treatment tends to unify a great amount of rather heterogeneous information, but it seems to the reviewer that some of the explanations are rather unsatisfactory; for example (p. 28), the catalytic action of hydrogen ion in the bromination of acetone is supposed to be the production of the enol form of acetone from the keto form, which is strange since the equilibrium should be shifted toward the enol form by alkali. The theory of dry-ion catalysis is successful in explaining many of the facts, including some very peculiar effects of traces of water, but in its present form at least it does not seem to be universally applicable. It would be very strange if at least one class of reactions, thermal decompositions, did not have a natural rate in the absence of all catalysts.

After a brief introductory chapter, there follows a mathematical treatment of reaction rates, devoted to the calculation of the rates from experimental data; in addition to the usual equations for first and second order reactions, a brief treatment is given of catalysis, opposing reactions, consecutive reactions and side reactions.

Chapter III is devoted to the formation of addition compounds. The results of freezing-point measurements are correlated with chemical character. This chapter will be of interest to many physical chemists who may never have considered the subject from this point of view. The statement (p. 49) that hydrochloric acid has a dissociation constant of 1.0 is unfortunate.

Chapter IV deals with various theories of reaction rates. It is, in the reviewer's judgment, the least satisfactory part of the book. The original Arrhenius postulate of activated states which are unstable tautomeric forms is outlined, and four pages are devoted to a rather vague discussion of the radiation hypothesis; there is only a brief mention of activation by collision, which has been for several years the most satisfactory way of accounting for bimolecular reactions at least, and which now seems superior to the radiation hypothesis for unimolecular reactions. The very significant theoretical papers of Hinshelwood and of Fowler and Rideal, which appeared in 1926, are not mentioned, although later experimental work of Hinshelwood is referred to.

The remaining six chapters are devoted to a consideration of various organic reactions. It is in this field that the author's own work has been done, and here his presentation is most successful. Isomeric changes,

chiefly between keto and enol forms, are treated at length. Another chapter is devoted to hydrolytic reactions; this includes a brief discussion of esterification and lactone formation. Chapter VII treats the reactions of aliphatic hydrocarbons. Chapter VIII deals with substitution in the benzene ring, with emphasis on the modern work, such as the competition experiments of Francis. In place of the usual rather hackneyed re-statements of Crum Brown's rule, there are quantitative statements of definite value. It is an unusually clear presentation of a very complex field. A number of other reactions, such as the Friedel and Crafts reaction and the Walden inversion, are treated more briefly in the last two chapters. The amount of material which has been compressed into these six chapters is tremendous. There is at times a tendency to become encyclopedic, but on the whole the treatment is very readable. Anyone looking for research problems in physico-organic chemistry will find the book most suggestive. There are about five hundred references to the literature, which will prove of great value to all workers in this field.

LOUIS S. KASSEL

Fortschritte der Mikrochemie in ihren verschiedenen Anwendungsgebieten. (The Progress of Microchemistry in its Various Fields of Application.) By Dr. GUSTAV KLEIN, Professor at the Biochemical Institute of the University of Vienna, and Dr. ROBERT STREBINGER, Lecturer at the Institute of Analytical Chemistry of the Technical High School of Vienna. Franz Deuticke, Leipzig and Vienna, 1928. 436 pp. 16 × 24 cm. Price, M. 24; bound, 26.6; s. 36; bound, 39.90.

The rapid growth of microchemistry during the past decade is well illustrated by the wealth of material presented in this book. The titles of the chief subdivisions will serve to indicate the method of treatment. They are as follows: Quantitative Inorganic Microanalysis; Quantitative Organic Microanalysis; Microcrystalloscopy; The Microchemistry of Minerals; Colloid Chemistry and its Relation to Microchemical Analysis; The Chemistry of Plant Tissues; The Chemistry of Animal Tissues; The Application of Microchemical Methods to the Investigation of Drugs and Poisons; and, finally, The Progress of Microchemistry from 1915 to 1926, to which the remaining 300 odd pages are devoted.

The book presents a very adequate review of the German literature of microchemistry and allied fields, but would have a wider degree of usefulness if it covered the similar fields of literature in English more adequately. Amplification of the material dealing with the microscopy of ore minerals would enhance the value of the book to a number of investigators and the addition of a section on the application of microchemistry to sedimentary petrography would be advantageous in view of the increasing importance of the latter to petroleum geology. It is to be hoped that future editions will include an author and a subject index.

These however are rather minor points. "Fortschritte der Mikrochemie" is a serious, systematic attempt to correlate the literature of a very rapidly growing and important phase of chemistry and as such it deserves unqualified support.

LAWRENCE T. FAIRHALL

Die Alkaloide, eine Monographie der natürlichen Basen. (*The Alkaloids, a Monograph on the Natural Bases.*) By Dr. GEORG TRIER, Lecturer at the Technical High School of Zürich. Second, revised edition, Part I. Gebrüder Borntraeger, Schöneberger ufer 12 a, Berlin W 35, Germany, 1927. 356 pp. 18 × 26.5 cm. Price 18 M.

This work is the first section of what is without doubt a pretentious and well-balanced treatment on the subject of the Natural Bases. The absence of a Table of Contents and an Index are to be regretted but no doubt the latter will be supplied subsequently.

This monograph will make a splendid addition to the chemist's library shelf, and may well be placed alongside Henry's "Alkaloids" and Barger's "The Simpler Natural Bases." It is less valuable and convenient to use as a reference book than either of these volumes but it differs from them in its exhaustive treatment of the historical phases of alkaloid chemistry. Its extensive discussion of the pharmacological behavior of the products is also valuable. Many references are given in these sections.

An interesting introductory chapter of thirty-four pages which abounds in historical details is followed by sections on (1) Aliphatic Bases, (2) Aromatic Bases, (3) Acid Amides, (4) Urea Derivatives (including cyclic ureas such as imidazoles, purines, etc.), and (5) Heterocyclic Bases of the Pyrrole-Pyridine Group.

Serious errors are few and the more striking ones, such as the incorrect formula for novocaine (p. 55) and the assignment of the caffeine formula to theophyllin (p. 222), will be apparent to the reader. It is unfortunate that important advances made during 1926-1927 as, for example, the new information concerning Spermine, Thyroxin, Ergothioneine, etc., fail to receive attention.

The general impression gained from reading this monograph is most excellent. One is tempted to read on and on, to be sure not with the excitement created by a romance but rather with the sustained interest of a well-written biography. The reviewer called to mind his experience one summer, when he included volume one of Boswell's *Life of Johnson* in his vacation equipment expecting to read a few chapters only. Soon he found himself at the end of the volume, but in the woods a hundred miles from a library where the remaining five volumes might be procured. He will look forward with just as much interest to the remainder of this monograph on alkaloids.

OLIVER KAMM