

satisfactorily by the above method. It was, therefore, decided to attempt the reduction of complex salts of copper and nickel by passing hydrogen over silica gel containing these salts. When solutions containing complex cupric ammonium ions were poured on silica gel a surprising result occurred. The complex ammonium ions were found to be very strongly adsorbed by the silica gel. The first liquid which came through the silica gel was almost completely decolorized by the silica gel. The same result was found when complex ammonium ions of nickel were used. When these adsorbed ions are reduced by passing hydrogen over the dried gel an excellent metallic deposit results. The deposit resembles the palladium deposit of the previous method very much. We are continuing the investigation with regard to the specific adsorption of complex ions as well as the use of the metallized gels thus produced.

SCHOOL OF CHEMISTRY
UNIVERSITY OF MINNESOTA
MINNEAPOLIS, MINNESOTA

RECEIVED MAY 26, 1930
PUBLISHED JUNE 6, 1930

GRANT W. SMITH
L. H. REYERSON

NEW BOOKS

Experimental Physical Chemistry. By FARRINGTON DANIELS, J. HOWARD MATHEWS and JOHN WARREN WILLIAMS. McGraw-Hill Book Company, Inc., New York, 1929. xvi + 475 pp. 132 figs. 14.5 × 21 cm. Price, \$3.50.

The authors state in their preface that the purposes of this book are "to illustrate the principles of physical chemistry, to train in careful experimentation, to develop familiarity with apparatus, to encourage ability in research." These purposes have led them to divide the material into three sections: Laboratory Experiments (Part I, 285 pp.), Apparatus (Part II, 145 pp.), Miscellaneous Operations (Part III, 29 pp.).

Part I provides a laboratory manual of physical chemistry which is unique both in the number and variety of exercises listed and in the treatment of the individual experiment. One might hope to cover about a third of the 78 experiments in the usual one-year laboratory course. Harassed instructors who want their laboratory outlines ready-made will get little comfort from this book, but others will find its wide scope a convenience where equipment is limited, and a powerful stimulus to the ambitious student. If necessary or desirable, a course of 25 or more exercises may be selected, involving only the conventional types of experiments and simple forms of apparatus. On the other hand, the material is sufficiently extensive to meet the needs of an advanced course such as electrochemistry, or a course introductory to research. Some of the topics covered which are seldom if ever included elsewhere are: viscosity of gases, specific heats of liquids, partial molal volumes, conductance in mixed solvents, decomposition potentials and overvoltage, the manganese

hydroxide electrode, activity and salt effect, application of the electron tube to electrometric titration, adequate experiments in colloid chemistry, excellent experiments in reaction velocity, including the decomposition of nitrogen pentoxide in carbon tetrachloride solution, electrochemistry of gases, phase-rule study of a 3-component system, photochemistry, radioactivity, including radioactive indicators, and a particularly detailed treatment of dielectric phenomena. In view of this profusion of material, some may regret the absence of experiments on gas-solid equilibria, oil films and the thermal conductivity of gases.

Each experiment is treated under the headings: Theory, Apparatus, Procedure, Calculations, Practical Applications, Suggestions for Further Work, References. "The imperative is not used. Procedures are described but orders are not given. The student must study the experiment first and then set his own pace—a method which develops both his power and his interest." In the majority of cases the theoretical treatment is adequate, even for experiments which must occasionally be performed before the material has been studied in class. The procedures as described will keep the instructor busy, but the able student is given a chance to show his mettle.

Part II briefly describes the apparatus which has been found most suitable for advanced work or research on the topics covered by Part I. While not intended as a substitute for Ostwald-Luther, this section will impress the reader with its concise and critical description of satisfactory technique and apparatus, and with its numerous and well-selected references to the original literature.

Part III consists of short chapters on Calibration, Thermostats, Thermometers, Glass Blowing and the Purification of Materials. An appendix gives tables for corrections to barometer readings, vapor pressure and density of water, and four-place logarithms. A useful subject index is included.

Only a negligible number of errors or loose expressions have been detected. For example, exception may be taken to "the D line of hydrogen" (p. 38), to the occasional loose use of "concentration" (p. 67), to the statement that "from a knowledge of the degree of ionization and concentration of the solute, it is possible to predict the electrical conductance" (p. 143), to the statement that the principle of the ordinary flowmeter is "that of the Pitot tube" (p. 293), etc. On the whole, however, the text gives evidence of unusually careful preparation.

In the reviewer's opinion this book deserves the serious consideration of every teacher of physical chemistry. It is a volume from which the capable student may obtain enough, but not too much, guidance and real inspiration, both during his course and afterward.

ARTHUR F. BENTON

Conférences d'Actualités Scientifiques et Industrielles, 1929. (Lectures on Scientific and Industrial Actualities.) Preface by J. LEMOINE. Hermann et Cie., Paris, 1930. viii + 270 pp. 126 figs. Price, paper cover, 35 francs.

This collection is a series of popular lectures delivered during the spring of 1929 under the auspices of the Conservatoire National des Arts et Métiers. The subjects and authors are: The Recent Crisis in Undulatory Optics, L. de Broglie; The Magnetic Properties of Mesomorphic Substances, G. Foëx; Atoms of Light and Quanta, E. Bloch; The Photo-Electric Cell and Its Applications, L. Dunoyer; Radiation from Incandescent Objects, G. Ribaud; Electrical Production of Sound, Jullien; Structure of Spectra and of Atoms, L. Bloch; High Pressure Vapors (applied to heat engines), V. Kammerer; Directed (radio) Waves and Their Applications, R. Mesny. In all cases the treatments are non-mathematical. Naturally, therefore, the laboratory and technical applications are treated in greater detail than the theoretical issues involved. For the most part the discussions are such as to be easily grasped by one unfamiliar with the methods of advanced physics. As such, they form an interesting résumé of recent developments in the respective fields.

HUGH M. SMALLWOOD

L'Atomistica Moderna e la Chimica. (Modern Atomistics and Chemistry.) By DR. M. HAISSINSKY, with a preface by NICOLA PARRAVANO. Ulrico Hoepli, Milan, 1930. xii + 315 pp. 45 figs., 16 × 23.5 cm. Price, 35 lire.

This book, written by a young Russian chemist who studied in Rome, is intended to show how much the newer development of atomic physics can do for the chemist in explaining his results.

The first two chapters give a general and from necessity a rather sketchy review of the atomic constitution of matter, the kinetic theory of gases, the elementary charge, X-rays, radioactivity and the periodic system, the laws of thermodynamics and Nernst's theorem, with the necessity of introducing quanta.

The third chapter explains the Bohr theory of the atom and its consequences for radiation and the periodic table.

The next five chapters deal with the nature of the chemical forces from Bohr's standpoint and the connection between structure and properties, mainly for polar compounds. The author starts with Kossel's theory, the formation of complexes, dissociation, then describes the theories of Lewis and Langmuir—which are taken up again later—and then goes over to the case in which the purely electrostatic treatment has been most successful, namely, Bohr's theory of salt crystals. Chapter VII is devoted to the researches, due to a large extent to Grimm, which systematize the physico-chemical properties of inorganic compounds and connect them with the electron structure of their parts.

The eighth chapter, on the deformation of electron orbits, forms a transition to homeopolar compounds. It starts with the polarizability of atoms, proceeds then to the influence of this property on the forces of attraction in solids and solutions, on crystal structure and color and ends up with a discussion of metals and pseudo-atoms (Goldschmidt and Grimm).

The next three chapters treat reaction velocities, namely, in turn, photochemistry and its connection with absorption spectra, including the dissociation of molecules by light, then the role played by radiation in general in supplying the heat of activation, finally the connection between adsorption and catalysis. In this chapter the theory of intermediate compounds and the theory of active surface patches are explained.

The last chapter (XII) introduces the new quantum mechanics, giving first the general ideas. Then the author shows in detail, that this theory gives the real clue to the nature of the homeopolar valence bond and that the results agree very well with the older theory of Lewis and Langmuir. The new theory of metallic conduction concludes the book.

The author shows a real enthusiasm about his subject, is very clear in the presentation and shows excellent judgment in the difficult question how much deduction should be given in such a book. The first chapters contain a few errors (*e. g.*, that in Bohr's atom the *kinetic* energy is higher farther out (p. 49)), but on the whole the book is very good. A few misprints occur (*e. g.*, Figs. 14 and 15 should be interchanged).

KARL F. HERZFELD

Atoms, Molecules and Quanta. BY ARTHUR EDWARD RUARK, Ph.D., Physicist, Mellon Institute of Industrial Research, Lecturer in Physics at the University of Pittsburgh, and HAROLD CLAYTON UREY, Associate Professor of Chemistry at Columbia University. McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York, 1930. xvii + 790 pp. 230 figs. Price, \$7.00.

The enormous volume of work which has appeared in the last few years on atomic physics has made the writing of text and reference books particularly laborious and thankless. On the other hand it has increased the necessity for such summaries. The present volume will go a long way toward filling this very real need in that it presents a coherent and detailed account of both the experimental and theoretical sides of the subject.

The authors state that their book was written to fulfil the requirements of both the newcomer to the subject and the experienced worker in the field. Regarded as a textbook the work possesses a number of advantages over its predecessors. In the first place, it is, of course, more up-to-date than the previous works. Aside from this, the authors are to be commended for having written in a style readily comprehensible to the reader who has not been trained in advanced physics. Too many of the previous books on atomic structure have been written exclusively for the physicist,

leaving the chemist, among others, to puzzle over an unfamiliar vocabulary and mode of presentation. This fault has been obviated in the earlier parts of the book and minimized in the more advanced portions.

The approach to the subject is made by a detailed description of the classical experiments which led to the formulation of the older quantum theories. The authors then give a concise review of theoretical mechanics. This chapter will be of particular value to the student. The treatment is amplified by a number of illustrative examples worked out in detail, but it is regrettable that the authors have not seen fit to include a number of workable problems. The development continues with a complete account of atomic and molecular spectra and the allied topics. Detailed discussions of the periodic system and of collision processes are also included in the review of the experimental work. Throughout this part of the book the Bohr model of the atom is to a large extent retained. This is a procedure which may be open to criticism, but on the whole the authors have made their point to the effect that this retention of the older picture, in opposition to the trend of recent work toward elimination of too concrete models, is justifiable in a textbook in view of the greater clarity attained. Wherever the conclusions of the older theory have been altered by the new, the fact is pointed out and reference to the later treatment is given. The last two hundred pages of the book are devoted to a description of the quantum mechanics of Schrödinger, Heisenberg and others. The treatment is clear and the material well arranged, but it is with this section that the student will probably experience the greatest difficulty, due for the most part to the slowness of becoming conversant with the mathematical vernacular.

Taken as a textbook the work should be a valuable addition to the student's library, from which he may expect to obtain the ability to read current papers on the subject with intelligence and to apply the material both to his immediate work and to the formulation of new problems.

Regarded as a reference, the volume cannot be expected to be as valuable as it may be as a textbook. This is due to the fact that the large number of topics considered has necessitated a brevity of treatment which seems inconsistent with the function of a work of reference. Even so, a book of this size cannot be justly criticized for the omission or compression of particular topics. One wonders, however, why the subject of radioactivity has been condensed to a scant four pages and why no mention is made of the recent theoretical treatment of this topic.

On the whole, however, the authors are to be congratulated on having made a distinctive addition to the literature of the new physics; an addition which, it may confidently be hoped, will be a source of inspiration to all those who approach this latest field of conquest.

Kristallzeichnen. (Crystal Drawing.) By DR. ROBERT L. PARKER, Lecturer at the Technical High School of Zurich. Gebrüder Borntraeger, W 85 Schöneberger Ufer 12 a, Berlin, Germany, 1929. vi + 112 pp. 35 figs. 24 × 23.5 cm. Price, M. 30.

Chemists have shown increasing interest in the problems of crystallography and crystal structure. This is one of the few books devoted entirely to the subject of crystal drawing and should prove very useful to those interested in the subject. It does not claim to be an exhaustive treatise.

The book is divided into two parts. The first part deals with the theory and practice of crystal drawing methods. Formulas are derived and methods of drawing are presented by figures. After a discussion of orthographic and clinographic projections, the methods of intersection of edges on an axial cross, of coordinates of direction points of intersections on an axial cross, of stereographic projection and of gnomonic projection, are described.

The author presents in detail a new method using the directions of intersection edges. The directions of these edges are calculated in terms of azimuth angles from [001] taken as 0°.

Tables, used to determine azimuth angles of various intersection edges for isometric crystals and twenty common, non-isometric minerals, are given in the second part of the book. A moderate supply of drawing sheets accompanies the book for use with the tables in drawing.

This book should be in every chemical library where crystal problems are being studied.

J. F. SCHAIRER

Jahrbuch der organischen Chemie. (Yearbook of Organic Chemistry.) By Professor Dr. JULIUS SCHMIDT, Stuttgart. Franz Deuticke, Leipzig, Germany, and Vienna, Austria, 1930. xvi + 249 pp. 17.5 × 25.5 cm. Price, unbound, M. 24; bound, M. 27.

In fulfilment of the promise made in the preceding number, the fourteenth volume of the Jahrbuch, dealing with the investigations completed in 1927, has appeared within half a year. The general plan and scope are the same as heretofore. The contents reflect the increasing interest of organic chemists in natural products but the author also devotes considerable space to papers that deal with subjects of more general interest—the stereochemistry of nitrogen compounds and of bicyclic ring systems, the metallic derivatives of the aliphatic hydrocarbons, polynuclear hydrocarbons with condensed ring systems, and the like.

E. P. KOHLER

A Brief Introduction to the Use of Beilstein's "Handbuch der organischen Chemie."

By ERNEST HAMLIN HUNTRESS, Ph.D., Assistant Professor of Organic Chemistry, Massachusetts Institute of Technology. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, 1930. viii + 35 pp. 15 × 23 cm. Price, \$1.00.

Beilstein, the "organic chemists' Bible," is too widely known to warrant description. There are, however, exceptional cases. One such was a foreign student who after having our beginners' course at Iowa State College went to Michigan to complete his undergraduate work. Incidental to some orienting questions, Professor Gomberg asked him if he knew "Beilstein." The reply was "No, he does not teach at Ames."

Refreshing as such ignorance may be, it is as nothing compared with a beginner's facile use of the fourth edition of Beilstein now appearing as occasional volumes. In November, 1926, Dr. Stelzner informed us that there were then approximately 240,000 organic compounds, and the annual growth was about 6000. There will be then in June, 1930, about 261,000 organic compounds. This is, of course, a rough approximation, but it gives one a fair idea of the increasing importance of the correct use of the system of classification to be followed in the continuous flow of new Beilsteins. Particularly is this the case when one reflects that "complete indexes" will only be available at about 10-year intervals.

"The magnitude of the classification is such that some explanation of the main plan is desirable before the significance of its details can be appreciated. The main purpose of the pamphlet is to present the fundamentals of the scheme of classification in such a form that its students can obtain a sort of aerial view of the plan before proceeding with its details. For this reason, many interesting and intrinsically important phases have necessarily been omitted or restricted in scope of treatment." Dr. Huntress' pamphlet admirably achieves its objective. There are many who will want to read it before turning to the guide for the use of Beilstein which was published last year by The German Chemical Society. Some may despair at the thought that the system is such that we now have, in a manner of speaking, an elementary guide to the use of a complete guide for the ready use of Beilstein. Whether we like it or not, and we may rejoice in it in time, there is a system for all compounds to come and the mastery of this system is essential for the proper use of Beilstein.

HENRY GILMAN

Die Methoden der organischen Chemie. Ein Handbuch für die Arbeiten im Laboratorium. Vol. III. (Methods of Organic Chemistry. A Handbook for Laboratory Work.) Third, fully revised and enlarged edition. Edited by Professor Dr. J. HOUBEN, Berlin. Verlag Georg Thieme, Antonstrasse 15/19, Leipzig C 1, Germany, 1930. xxxviii + 1451 pp. 41 figs. Price, unbound, M. 166; bound, M. 176.

Few new editions can be so certain of a cordial reception from organic chemists as Houben's "Methods of Organic Chemistry." Refinements of

technique, new applications of physico-chemical methods to problems in organic chemistry, and new methods of detection, analysis and synthesis are usually dispersed in such a mass of current literature that only the most patient search discloses the best method available for preparing a substance or attacking a problem. Here "the Houben" brings relief because each succeeding edition has invariably reviewed the literature almost to the date of issue. The present edition of the third volume is no exception.

For those who have used the second edition it will be sufficient to know that nearly the whole of this volume was prepared by the same competent men who were responsible for the second edition. The ground covered is likewise nearly the same—the only change being the inclusion of a chapter on anthocyanins in place of the section on polymerization which has already appeared in the third edition of the second volume. The great increase in size, therefore, is due to the incorporation of the new material which has accumulated in the decade between the two editions.

For those who are unfamiliar with the earlier edition it may be useful to point out that the title of this text very inadequately describes its contents. This is in reality a very extensive treatise on organic chemistry written not merely—or even primarily—for those who need to know something about organic compounds, but for all those who have occasion to work with them, and the separate sections have been prepared by collaborators who have worked with distinction in the subjects which they present. It comes from, and it is intended for the workshop, but its authors have not been content with merely providing directions for mechanical experimentation. A summary of a chapter taken at random from one of the shorter sections will serve to illustrate the treatment.

The chapter on oxido compounds was prepared by Meerwein, who is familiar with the field because he has made a systematic investigation of the action of benzo peracid on unsaturated hydrocarbons. It begins with a brief discussion of the classification and nomenclature of oxido compounds, then proceeds to a description of seven methods of preparation including the most recent methods for obtaining oxido ketones and glycidic esters. The description is accompanied by a discussion which gives a knowledge of the facts necessary for an intelligent choice, the reactions involved, numerous illustrations and an excellent bibliography. The methods of preparation are followed by a section dealing with the detection, properties and transformations of oxido compounds. This includes intramolecular rearrangements as well as the numerous addition reactions and like the section on preparation is accompanied by discussion, illustration and bibliography. No systematic text on organic chemistry contains such an adequate account of the chemistry of oxido compounds, and here as well as in many other sections it is a distinct advantage to have open-chained and cyclic representatives treated in the same place.

The volume contains an excellent author and subject index and its typography and arrangement are admirable. Evidently such a treatise should not only be accessible in chemical libraries, but should also be on the tables of organic investigators to whom it is indispensable. The reviewer regrets, therefore, that with increase in size, its price has mounted until it is almost beyond the reach of the individual.

E. P. KOHLER

The Chemistry of the Colloidal State. A Textbook for an Introductory Course. By JOHN C. WARE, Sc.M., Ph.D., Associate Professor of Chemistry, New York University (Washington Square College Division). John Wiley and Sons, Inc., 440 Fourth Avenue, New York, 1930. xiv + 313 pp. 96 figs. 15.5 × 23.5 cm. Price, \$3.75.

This book containing fourteen chapters has been written for the beginner in colloid chemistry. The author has treated the subject in a non-mathematical style. The text appears to be written for students having a meager training in physical chemistry.

There is lacking in the text the continuity which the reviewer had hoped for. The chapter on Interfacial Phenomena (non-electrical) is followed not by a chapter on Interfacial Phenomena (electrical) but by one on Turbidity in Colloidal Suspensions. A whole chapter is devoted to Turbidity, Nephelometry and Colorimetry. Another chapter is devoted to Silica Gel and its Use in Adsorption. The three hundred pages are rounded out with a concluding chapter on Catalysis by Contact Agents.

The reviewer is disappointed not so much with the treatment of the subject matter which is presented as with the selection and arrangement of that included. The beginner in the field of colloid chemistry will find much of interest in this text. The numerous references to the literature will stimulate his desire for further reading.

A. L. ELDER

Ultraviolet Light and Vitamin D in Nutrition. By KATHARINE BLUNT, President of Connecticut College, and RUTH COWAN, Instructor in Home Economics, The University of Chicago. The University of Chicago Press, Chicago, Illinois, 1930. xiii + 229 pp. 39 figs. 14.5 × 21.5 cm. Price, \$2.50.

This interesting book of 229 pages is a very well written summary of the work of the last few years in the study of the effects of ultraviolet light and vitamin D. Inasmuch as the discovery of vitamin D is really less than ten years old, it is remarkable how much work has been accomplished by these studies. In fact, it has been extremely difficult to keep up with the literature in this field. Miss Blunt and Miss Cowan have summarized the enormous amount of work and done it in an extremely interesting way. They have recorded the literature in sufficient detail and then, at the end of

each chapter, have summarized the results. The book, therefore, is very interesting reading as well as an excellent source of information. To anyone who is interested in the field this book is an excellent beginning for further studies. It has summarized in a very fair way all the literature up to 1929.

JOSEPH C. AUB