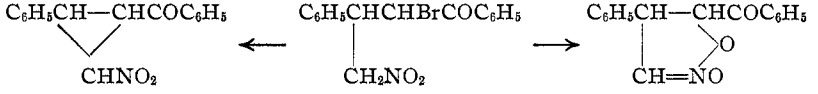
By using an excess of a standard solution and determining the excess it was found that 2 equivalents of base disappear in the process.

The two layers were separated. The ethereal layer was dried and distilled. It contained only phenyl cyanide, which was identified by its odor, its boiling point, an analysis, and hydrolysis to benzoic acid. The aqueous layer was shaken with ether until free from odor, acidified, and extracted with ether. The dried ethereal solution, on evaporation, left a residue that had an extremely pungent odor and partially solidified. By distillation this was separated into a very volatile portion which proved to be formic acid and phenyl acetic acid which was identified by comparison with a specimen on hand. No other products are formed.

By operating in a different manner it has been possible to isolate some of the intermediate product which forms yellow salts with bases, but as the structure of the substance has not been established it seems useless at present to speculate on the mechanism of this reaction.

Summary

1. Elimination of hydrogen bromide from α-bromo-γ-nitro ketones that have hydrogen in the position alpha to the nitro group may result in the formation of two different types of cyclic compounds—a nitrocyclopropane or an isoxazoline oxide.



2. In the case of primary nitro compounds the configuration of the bromine compound determines which of these cyclic compounds is formed.

3. Isoxazoline oxides combine with water, alcohols, ammonia and amines. The resulting isoxazolidine derivatives form characteristic copper compounds when they are shaken with solutions of copper salts.

4. The ring in isoxazoline oxides is not readily opened by acids, but it may be opened with acetic anhydride, which forms the acetate of the corresponding α-hydroxy ketone, or with bases which rapidly transform these oxides into simpler substances.

CAMBRIDGE 38, MASSACHUSETTS

NEW BOOKS

Materie, Elektrizität, Energie: die Entwicklung der Atomistik in den letzten Zehn Jahren (Matter, Electricity and Energy: the Development of Atomistics during the past Ten Years). By DR. WALTHER GERLACH, A. O. Professor der Physik an der Universität Frankfurt A. M. Theodor Steinkopff, Dresden und Leipzig, 1923. iv + 195 pp. 68 figs. 22 × 15 cm.

The knowledge of the nature of the electron both in the free and in the combined condition has taken gigantic strides during the past ten

years. Today, the study of the behavior of this extraordinarily light and widespread substance constitutes one of the most fascinating and rapidly developing branches of natural science. It appears quite certain that our present day chemistry will be profoundly affected by these developments.

So far, the discoveries in this field have been made chiefly by physicists, for the charge which the electron carries, on the one hand makes it possible to apply forces far more intense than those involved in ordinary chemical reactions, and on the other hand permits the physicist to study electrons and atoms individually, while the chemist can only study them in bulk and by essentially statistical methods.

This volume presents a clear and interesting survey of the investigations of the past ten years dealing with the nature of the electron and with the nature of atoms. The titles of the separate chapters of particular interest to chemists are as follows: General Atomistics; Isotopy; Molecular Dipoles; Breakdown of Atomic Nuclei; Spectral Emission and the Periodic System; Characteristic Ultra-red Frequencies of Chemical Radicals, and Crystal Structure; The Physical Basis of Photochemistry; Emission of Light in Chemical Reactions; Electron Affinity; Chemical Reactions by Electron Impacts; Photochemical Catalysis.

This volume is the seventh of the series of monographs published in Germany whose principal aim is to make possible a rapid recovery of the ground lost during the war. It is addressed primarily to those not immediately engaged in the study of the particular field under consideration, but interested in related fields. It is a useful and illuminating book and might well be translated, or its equivalent written in English.

ARTHUR B. LAMB

Kristalle und Röntgenstrahlen (Crystals and X-Rays). By DR. P. P. EWALD, Professor der Theoretischen Physik an der Technischen Hochschule zu Stuttgart. Julius Springer, Berlin W9, 1923. ix + 327 pp. 189 figs. 24.5 × 16.5 cm. Price, unbound, $6.00; bound, $6.35.

In these days the casual reader who attempts to grasp the significance of papers on crystal structure determinations by means of X-rays usually comes to the conclusion that the combined services of chemist, physicist, crystallographer and mathematician are required for intelligent interpretation. Hence the following query is frequently heard: "Where can I find a book which summarizes the essential facts up to date?"

Except for the classical "X-Rays and Crystal Structure" by the Braggs, which treats of only their own investigations very largely, no real summary of all phases of the subject has been hitherto available. A genuinely welcome and truly excellent answer to the above query is now to be found in the sixth of the *Naturwissenschaften* series of monographs and textbooks. It may be said at once that Professor Ewald's book is destined to become widely used as a text or reference by the expert and by the novice

A survey of the chapter headings serves to indicate the wide scope of the work: atomic theory; principles of crystallography; the theory of crystallographic structure; interference (an admirable chapter excellently illustrated by photographs of waves produced by flying bullets, etc.); Röntgen rays; survey of experimental methods; the Bragg method and spectroscopy (including the work of Siegbahn and Seemann); interference in lattice units and structure determination by the Bragg method (a very satisfactory explanation of wave length, amplitude, phase, interference, intensity and mechanism of reflection); the Laue method and the identification of Laue spots; the origin of Laue spots and structure determination from them (introducing also the Lorentz and Debye factors); the Debye-Scherrer (also Hull) method (including the X-ray structure of colloids); complete diagrams (the Seemann-Schiebold method), fiber structures and metal structures (with the effects of mechanical working and single crystal wires); description of the investigated structures (a summary of all investigations up to April, 1923, with complete bibliography is given in the appendix); lattice geometry (complete symmetry considerations); ion lattices, isomorphism and mixed crystals (including atomic and ionic dimensions); the meaning of crystal structures from a chemical standpoint (coördination, valence, organic structures by Bragg); lattice forces and the properties of matter (mechanical, electrical, thermal, dispersion, double refraction, reststrahlen).

The foremost characteristic of the treatment of the subject matter is the almost purely descriptive form. Mathematics are conspicuously absent in the body of the text, and only the most essential derivations are included in a series of notes in an appendix. This method obviously makes the task of the author more difficult, inasmuch as every point must be developed in words so as to be clearly understood. For the most part Professor Ewald has succeeded in doing this just as well as it can be done. The language is uniformly so straightforward and clear (reminding one of Sommerfeld's style) that even those who read German haltingly should have little difficulty. Professor Ewald in his 20 or more years of experience in this field has clearly made himself a foremost authority. Hence he is able to write with a refreshing enthusiasm which is unmistakably imparted to the reader.

By its very nature, therefore, this book is just as elementary as it is possible for one upon this complicated and marvelously growing subject to be. The stated intention is to present an outline rather than in any sense an exhaustive treatise. On the other hand, for a book with a text proper of only 245 pages it is astonishingly complete and eminently satisfactory. The consideration of fiber structures, colloids, organic crystals, etc., and the complete tabulation of investigated structures, show that Professor Ewald is strictly alive to the newest phases of theory and re-

search. Very material assistance towards clarity and completeness is afforded by 183 diagrams and photographs which are faultlessly conceived and reproduced. The typography and paper are much better than has been the case with most of the recent German books. Only a single typographical error was discovered, the spelling of Fedorow on page 24, in a first perusal of the book.

Just as the nature of the book commends itself to those who wish for the subject matter in a nutshell, so it invites to some degree the wish that some of the material were presented more completely. The great science of X-rays is presented in only 14 pages; the quantum theory, which is now playing so large a part in this science, even in the reflection of X-rays from crystals, is not mentioned, except once by name in a final paragraph. Apparently the author is a confirmed believer in the all-inclusiveness of the classical wave theory, and has chosen not to complicate matters by the introduction and explanation of phenomena which are explicable only upon a quantum basis. Too often in these days researches on crystal structures are undertaken without an adequate knowledge of the means to the end—the X-rays themselves. The impression might be gained from this work that the X-ray side was relatively unimportant, whereas it is undoubtedly *most* important. In extenuation of this apparent slight, however, it should be pointed out that great advance has been made in X-ray research even since the publication of this book (after all, the greatest tribute which may be paid is that it was not entirely out of date by the time it left the publisher), and that Professor Ewald is entirely cognizant of shortcomings and several times refers the reader for fuller treatment to Sommerfeld's "Atomic Structure and Spectral Lines."

Taking everything into consideration, the reviewer has only words of highest commendation for this book in its accomplishment of a difficult task and its fulfilment of a great need. Even alone it is adequate for most demands. It will stand with such works as Sommerfeld's "Atomic Structure and Spectral Lines," Braggs' "X-Rays and Crystal Structure," de Broglie's "Les X-Rayons," and Schoenflies' "Theory of Crystal Structures" as one of a series of classics covering all phases of this complex and most fascinating field of research.

GEORGE L. CLARK

Trattato di Chimica Fisica. (**Treatise on Physical Chemistry.**) Seconda edizione Italiana a cura di MICHELE GIUA, with preface by Prof. Ettore Molinari. By HARRY C. JONES, Professor of Physical Chemistry, Johns Hopkins University. Ulrico Hoepli, Editore Libraio della Real Casa, Milan, 1923. xxiii + 731 pp. 90 figs. 16.5 × 24 cm. Price L. 56.

It will be gratifying to all the friends of the late Harry C. Jones to note this second Italian edition of his textbook, "The Elements of Physical Chemistry," for it is an evidence of the wide usefulness of this book and

of the favor with which the earlier edition has been received in Italy. It is based on the fourth American edition, and is clearly superior to it in typography and general appearance.

ARTHUR B. LAMB

Synthetic Inorganic Chemistry, a Course of Laboratory and Classroom Study for First Year College Students. By ARTHUR A. BLANCHARD, Ph.D., and JOSEPH W. PHELAN, S. B., Associate Professors of Inorganic Chemistry at the Massachusetts Institute of Technology. Entirely rewritten and greatly enlarged third edition. John Wiley and Sons, Inc., 432 Fourth Avenue, New York; Chapman and Hall, Limited, London; Renouf Publishing Company, Montreal, Quebec; 1922. xiv + 321 pp. 22 figs. 24 × 15 cm. Price, cloth, $3.00 postpaid (15 s. net).

The first edition of this book was written by Professor Blanchard and appeared in 1908. It was originally a laboratory manual and was distinctive in that it consisted largely of directions for the preparation of inorganic compounds. In preparing the present edition Professor Blanchard has been assisted by Professor Phelan; in fact, these two authors have combined in the present text the material which they formerly published separately. However, much of this material has been entirely rewritten and the volume has been greatly enlarged.

The new edition is designed to be "a textbook of the full year's work in inorganic chemistry." However, "It is to be supplemented by some one of the more comprehensive textbooks which is to be used for reference in looking up the purely descriptive parts of chemistry and the industrial and economic aspects of the subject." The dominant feature of the laboratory work remains as in the original edition and consists largely in the preparation of inorganic compounds.

The first 21 pages of the book are devoted to general directions and notes on laboratory manipulation. Following these directions, Chapter 1, entitled "The Quantitative Aspects of Chemistry," contains directions for such experiments as the determination of the weight of a liter of oxygen and of the volume of hydrogen displaced by a given weight of zinc. The second chapter deals in a similar way with water and solutions, and the third with the theory of ionization. The remaining eight chapters deal mainly with the preparation of typical inorganic compounds. The material in each chapter falls under three heads, as follows: (1) directions for the preparation of a limited number of typical inorganic compounds; (2) experiments designed to acquaint the student with certain fundamental properties of these compounds; (3) general questions, admirably chosen to develop in the student the ability to think and to reason in the domain of chemistry—and this after all should be the primary object of the course in general chemistry.

The text presupposes a year's work in chemistry in the secondary schools. It is an effort, therefore, to solve the important problem as to

what shall constitute the collegiate course in general chemistry for such students. It is only natural that instructors should differ somewhat in their views as to what should constitute such a course and there is no reason why all such courses should be alike. There is no doubt in the mind of the reviewer that the student who masters Blanchard and Phelan's text will have a thorough understanding of the fundamental principles of general chemistry and will be well prepared for the work which naturally follows this course.

WILLIAM MCPHERSON

Organic Syntheses: an Annual Publication of Satisfactory Methods for the Preparation of Organic Chemicals. Editorial Board, HANS THACHER CLARKE, Editor-in-Chief; ROGER ADAMS, JAMES BRYANT CONANT, OLIVER KAMM, CARL SHIPP MARVEL. Vol. III. John Wiley and Sons, Inc., New York; Chapman and Hall, Limited, London; 1923. v + 105 pp. 3 figs. 23.5 × 15 cm. Price $1.50 net.

Organic chemists have come to look forward to the appearance of these little volumes with ever-increasing interest and pleasure. How we all grudge the precious hours spent in attempting to follow directions in which the essential details are either omitted or obscure. Therefore, it is a great satisfaction to realize that there is a constantly increasing number of organic compounds whose preparation has been standardized, and the directions tested in two laboratories of the highest traditions. The preceding volumes of this series have already been reviewed at length in THIS JOURNAL; so it only remains to add that the present one measures up to the high standard established by its predecessors.

The thirty compounds, whose preparation is described, are: acetal, acetamide, 1,4-aminonaphthol hydrochloride, *p*-aminophenylacetic acid, arsanilic acid, benzalacetone, benzoic anhydride, β-bromopropionic acid, catechol (from salicylaldehyde), catechol (from guaiacol), chlorotoluene (*o* and *p*), *p*-cresol, 9,10-dibromo-anthracene, diphenylacetic acid, epichlorohydrin, ethyl β-bromopropionate, ethyl cyano-acetate, ethylene cyanohydrin, hydroxylamine hydrochloride and acetoxime, mercury di-*p*-tolyl, methylamine hydrochloride, methyl *m*-nitrobenzoate, *m*-nitrobenzoic acid, *p*-nitrobenzoyl chloride, *m*-nitrochlorobenzene, nitromethane, *m*-nitrophenol, *m*-nitrotoluene, phenylurea, *p*-tolylmercuric chloride.

F. J. MOORE