



aminonitriles III (m. p. 66–67°. *Anal.* Calcd. for $\text{C}_{19}\text{H}_{22}\text{N}_2$: C, 81.97; H, 7.97; N, 10.06. Found: C, 81.89; H, 7.71; N, 10.01) and IV (m. p. 90–91°. Found: C, 82.03; H, 8.04; N, 10.04). The high-melting nitrile (IV) reacted with ethylmagnesium bromide to yield a product that possessed all of the properties reported for Amidone.

The methiodide of each of the aminonitriles was converted to its quaternary base and the bases heated to yield isomeric unsaturated nitriles, V (m. p. 63–64°. *Anal.* Calcd. for $\text{C}_{17}\text{H}_{15}\text{N}$: C, 87.52; H, 6.55. Found: C, 87.58; H, 6.56) and VI (b. p. 133–137° (1 mm.), n_D^{20} 1.5750. Found: C, 87.66; H, 6.36). Hydrogenation of these nitriles using Raney nickel catalyst in methanolic ammonia yielded the isomeric amines, VII (b. p. 144–145° (2 mm.), n_D^{20} 1.5830. *Anal.* Calcd. for $\text{C}_{17}\text{H}_{21}\text{N}$: C, 85.36; H, 8.85; N, 5.85. Found: C, 85.07; H, 8.78; N, 5.84) and VIII

(b. p. 142° (2 mm.), n_D^{20} 1.5753. *Anal.* Found: C, 85.07; H, 8.71; N, 5.91). These amines were characterized through the benzoyl, phenylthiourea or ethylurea derivatives and by comparison with the amines prepared from diphenyl-isopropyl-acetonitrile and from diphenyl-*n*-propylacetonitrile.

From these data, it appears that Amidone possesses the structure I although the structure II should result if the reaction followed a normal course. It seems probable that the reaction proceeds through the ethyleneimmonium ion (IX) in a manner similar to that demonstrated for other reactions of halogenated alkylamines.³

MEDICAL RESEARCH DIVISION EVERETT M. SCHULTZ
DEPARTMENT OF ORGANIC CHEMISTRY CHARLES M. ROBB
SHARP AND DOHME, INC. JAMES M. SPRAGUE
GLENOLDEN, PENNA.

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(3) Gilman and Philips. *Science*, **103**, 409 (1946).

NEW BOOKS

Textbook of Physical Chemistry. By SAMUEL GLASSTONE, D.Sc., Ph.D., Formerly Research Associate of Princeton University and Professor of Chemistry in the University of Oklahoma. Second Edition. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y., 1946. xiii + 1320 pages. 15.5 × 23.5 cm. Price, \$12.00.

Definite need exists for textbooks on a more advanced level than that of a number of well-known texts for first-year physical chemistry, and yet not as monumental as, for instance, Taylor's *Treatise on Physical Chemistry*. In a general way Glasstone has accomplished this objective and his book is decidedly useful for an advanced course in

general physical chemistry. It deals with a wide range of physico-chemical topics. The first two chapters, covering some 180 pages, are devoted to the presentation of the theory of atomic and molecular structure, quantum mechanics being discussed to an extent which should give the student some idea as to what it is all about, without getting him into the position of carrying out any quantum mechanical calculations. The contents of the following chapters are best indicated by their titles: First and Second Laws of Thermodynamics; The Gaseous State; The Solid State; Changes of State; The Liquid State; Physical Properties and Molecular Structure; Dilute Solutions; Phase Equilibria; Chemical Equilibrium and Free Energy; Electrochemistry; Chemical Kinetics; Surface Phenomena.

One may dispute the advantages of this sequence of presentation; one may also disagree with the emphasis given to various topics, *i. e.*, 160 pages to electrochemistry but 150 to kinetics, but these factors are so much a matter of individual preference that one could not condemn a book on their score. The point of real and serious weakness is the manner in which quantum statistics is presented: there is no coherent account of statistical methods and basic results, such concepts as statistical entropy, partition functions, various statistics, etc., being introduced in little dribbles, scattered over hundreds of pages of text. Thus no clear and binding relation between the atomic theory and the macroscopic properties of matter is established early in the text, although most of it deals with topics whose understanding has been materially advanced by the use of classical or quantum statistics. The consequence is that in many sections of this book the use of statistical methods is only hinted at or their results are given without detailed justification.

One runs also into several specific statements which are decidedly unfortunate. Thus, on p. 104, discussing the wave functions of valence electrons it is noted that "The p orbital, however, takes the form of two spheres in contact." Since it is not explained what these spheres measure, the student is sure to be misled. On p. 1187 it is stated that photographic development multiplies the quantity of silver formed photochemically in a typical emulsion by about a factor of 300. The correct factor is nearer 10^8 . The reviewer found about a dozen statements of this nature, which is perhaps not too many, considering that the book contains nearly 1300 pages. But then an appreciable fraction of this total is devoted to the historical approach and discussion of rather standard matters adequately dealt with in any elementary textbook.

Counterbalancing these various weaknesses are a number of virtues. By and large the presentation is comprehensive but clear and readable, the theory and the experimental matters being well balanced. The book includes the discussion of many topics which are seldom found in any but highly specialized works.

All in all the book is not an outstanding contribution but there are so few books on this level that it will be welcomed by many students and teachers and will serve a very useful purpose.

G. B. KISTIAKOWSKY

Chemical Crystallography. An Introduction to Optical X-Ray Methods. By C. W. BUNN. Oxford University Press, 114 Fifth Avenue, New York, N. Y., 1945. xii + 422 pp. 15.5 × 24.5 cm. Price, \$7.50.

Chemists who have opportunity to read this book with understanding, and they should be many, will feel pride that a member of their fraternity could produce such a work, for the author is associated with a research laboratory of the Imperial Chemical Industries.

A strange thing about modern crystallography, which has now reached middle age, in terms of a man's life, in an entirely creditable manner, is that it has remained a fragmentary science, lacking a definite status, and that must be acquired piecemeal if it is to be acquired at all. There are several indications that this situation is now at last changing favorably if slowly, among which I count the appearance of the present book an important one, representing as it does a serious attempt by a well-qualified writer to give a generalized presentation of the whole content of modern crystallography.

Crystallography today obtains nearly all of its primary data by optical methods, the systematic steps in any complete examination of a given crystal species being: (1) the external faces are mapped with a reflexion goniometer; (2) the effects on polarized light, especially of transparent crystals, are examined with a microscope; next the diffraction of short waves, commonly monochromatic X-rays of known wave length, by the crystal is observed and analyzed, yielding in its first stage (3) a tabulation of diffraction angles and intensities, in its second stage (4) an exact

description of the unit cell in respect to absolute dimensions, symmetry elements and atomic contents; and in its third (5) the $3N$ coordinates defining the positions of the N atoms that this unit was found to contain in the previous step. While steps 1-4 are straightforward, step 5 frequently taxes the patience and resourcefulness of the crystallographer; here again optical methods of computation, among others, may be used advantageously to shorten the labor. The non-optical data required for completion of steps 4 and 5 are (6) the chemical composition and (7) the density of the crystal. The data of steps 4, 6 and 7 may be calculated to give atomic, molecular or formula weights when this is desired. When the data of steps 1-7 are once fitted together consistently for a given crystal species, then succeeding workers can only add more decimal points to the picture.

Following an introductory chapter the first section entitled "Identification" deals with the growth of crystals and with steps 1-3 listed above; the second section, "Structure Determination" treats steps 4 and 5, and in particular devotes four full chapters, 172 pages, to a clear, thorough and up-to-date exposition, with numerous actual examples, of step 5. This part will be especially welcomed by those who are inadequately prepared for the mathematics required to handle this step understandingly. I would recommend this book strongly as a text for all who wish to teach beginners, or as beginners learn the subject matter of modern crystallography.

It is to be expected that each interested reader will look for a fuller treatment of his special interests in a second edition. Among others, I would suggest laboratory methods of growing single crystals for measurement; use of the two-circle goniometer; useful relations between composition and refractive indices of organic crystals; useful relations between optical and structural symmetry elements of crystals; illustrations of standard forms of presenting data; generalities on the packing of organic molecules in crystals; and an explanation of Buerger's diffraction symbols.

C. D. WEST

BOOKS RECEIVED

November 10, 1946-December 10, 1946

FRITZ FEIGL (Translated by R. E. Oesper). "Qualitative Analysis by Spot Tests." Third Edition. Elsevier Publishing Company, Inc., 215 Fourth Avenue, New York 3, N. Y. 574 pp. \$8.00.

LEICESTER F. HAMILTON AND STEPHEN G. SIMPSON. "Talbot's Quantitative Chemical Analysis." Ninth Edition. The Macmillan Company, 60 Fifth Avenue, New York 11, N. Y. 439 pp. \$4.00.

FREDERICK MARCHIONNA. "Butalastic Polymers." Reinhold Publishing Corporation, 330 West Forty-second St., New York, N. Y. 642 pp. \$8.50.

AVERY A. MORTON. "The Chemistry of Heterocyclic Compounds." McGraw-Hill Book Company, Inc., 330 West Forty-second St., New York 18, N. Y. 549 pp. \$6.00.

H. T. OPENSHAW. "A Laboratory Manual of Qualitative Organic Analysis." The Macmillan Company (Cambridge University Press), 60 Fifth Avenue, New York 11, N. Y. 95 pp. \$1.50.

W. SWIETOSLAWSKI. "Microcalorimetry." Reinhold Publishing Corporation, 330 West Forty-second St., New York, N. Y. 199 pp. \$4.75.

HENRY C. SHERMAN. "Foods: Their Values and Management." Columbia University Press, Morningside Heights, New York, N. Y. 221 pp. \$3.25.

"Abstract Bulletin N. S. No. 10. Abstracts of Current Information on Insect and Rodent Control." Insect Control Committee Coördination Center, National Research Council, Washington 25, D. C. 46 pp.