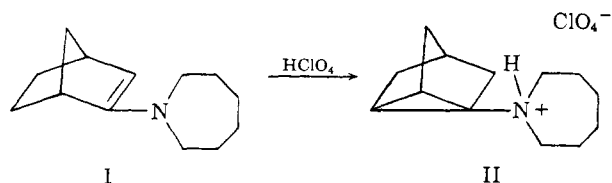


stituted nortricyclenes by the attack of electrophilic reagents on norbornene has been observed before.⁹⁻¹³ However, the electrophilic reagents used previously did not possess the simplicity of the proton, nor did the reactions proceed in such a quantitative and readily reversed manner as the reaction described here.

2-N-Hexamethyleniminebicyclo[2.2.1]heptene (I), b.p. 92-93° (0.9 mm.), n_D^{20} 1.5000, ν_{\max}^{film} 1685 cm.⁻¹, was prepared in the usual manner¹⁴ from hexamethylenimine and norcamphor in a 33% yield. Treatment of an ether solution of compound I with perchloric acid in ethanol quantitatively produced N-tricyclo-



[2.2.1.0^{3,6}]heptane-2-hexamethyleniminium perchlorate (II), m.p. 311-312° dec. (Calcd. for C₁₃H₂₂ClNO₄: C, 53.51; H, 7.60; N, 4.80. Found: C, 53.66; H, 7.68; N, 4.91.) The nortricyclic type structure of compound II was suggested by analysis, an infrared

spectrum maximum at 3150 cm.⁻¹ due to \geq NH stretch and the absence of any maxima in the 1500 to 1800 cm.⁻¹ region which might correspond to $\overset{+}{\text{C}}=\overset{+}{\text{N}}$ or $\text{C}=\text{C}$. The presence of an unshifted carbon-carbon double bond is further excluded by the absence of a vinyl proton peak in the n.m.r. spectrum.¹⁵ Chem-

(9) J. D. Roberts, E. R. Trumbull, Jr., W. Bennett and R. Armstrong, *J. Am. Chem. Soc.*, **72**, 3116 (1950).

(10) J. D. Roberts, F. O. Johnson and R. A. Carboni, *ibid.*, **76**, 5692 (1954).

(11) H. Kwart and R. K. Miller, *ibid.*, **78**, 5678 (1956).

(12) K. Alder, F. H. Flock and H. Wirtz, *Chem. Ber.*, **91**, 609 (1958).

(13) H. Krieger, *Suomen Kemistilehti*, **33B**, 127 (1960).

(14) F. W. Heyl and M. E. Herr, *J. Am. Chem. Soc.*, **75**, 1918 (1953).

(15) The author expresses his sincere appreciation to Dr. John Ferraro,

ical evidence supporting the indicated structure of compound II is shown by the inability of 98-100% formic acid to reduce compound I under the usual conditions¹⁶⁻¹⁸ (as shown by the lack of evolution of carbon dioxide and product analysis). Upon basification of the reaction mixture with aqueous sodium hydroxide, then extraction and distillation, the reactant, compound I, was recovered in a 62% yield with the balance of the material being the enamine hydrolysis products, namely, norcamphor and hexamethylenimine. The possibility that the tricyclic amine corresponding to II was liberated in the cold and that heat from distillation caused the opening of the three-membered ring to form compound I is eliminated by a study of the residual oil resulting from the basification of perchlorate salt II in the cold with aqueous sodium hydroxide in the presence of diethyl ether followed by drying of the ether extract and removal of the solvent *in vacuo* at a temperature no higher than 35°. The infrared spectrum of this product was identical with that of enamine I except for a weak band at 1750 cm.⁻¹ (norcamphor impurity). Alternatively, enamine I may have been produced by the nucleophilic attack of hydroxide ion on the alpha carbon atom of the freed tricyclic amine corresponding to II to form a bicyclic pseudobase followed by elimination of water. The norcamphor and hexamethylenimine by-products could have been formed from the same intermediate.

Studies are now in progress on the generality of this reaction and similar electrophilic reactions in other bicyclic enamine systems such as the substituted norbornadiene enamine system. These results will be reported in subsequent publications.

Argonne National Laboratories, Argonne, Ill., for the determination of this spectrum.

(16) P. L. deBenneville and J. H. Macartney, *J. Am. Chem. Soc.*, **72**, 3073 (1950).

(17) P. L. deBenneville, U. S. Patent 2,578,787 (1951).

(18) N. J. Leonard and R. R. Sauer, *J. Am. Chem. Soc.*, **79**, 6210 (1957).

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A. GILBERT COOK

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BOOK REVIEWS

Analyse des Stéroïdes Hormonaux. Tome I. Méthodes Générales. Par M. F. JAYLE, Professeur de Chimie biologique à la Faculté de Médecine de Paris. Avec la collaboration de E. E. BAULIEU, O. CRÉPY, J. POLONOVSKI et S. H. WEINMANN. Masson et Cie., 120, Boulevard Saint-Germain, Paris 6, France. 1961. 275 pp. 16.5 × 24.5 cm. Price, 45 NF.

Analyse des Stéroïdes Hormonaux. Tome II. Méthodes de Dosage. Par M. F. JAYLE, Professeur de Chimie biologique à la Faculté de Médecine de Paris. Avec la collaboration de E. E. BAULIEU, O. CRÉPY, P. DESGREZ, R. HENRY et R. SCHOLLER. Masson et Cie., 120, Boulevard Saint-Germain, Paris 6, France. 1962. 497 pp. 16.5 × 24.5 cm. Price, 80 NF.

The two volumes contain an authoritative review and exposition on procedures for the qualitative and quantitative analyses of the steroid hormones and their metabolites. The first volume contains the theory and technical aspects of the general procedures that have been employed for steroid analysis. The second volume describes in detail many analytical procedures for the separation and measurement of individual steroids or of specific groups of steroids. A third volume, not yet published, is intended to review the application of these analytical procedures for the investigation of the functioning steroid-producing endocrine glands.

Volume I, "Méthodes Générales," consists of six chapters, beginning with a brief but adequate discussion of the nomenclature and stereoisomerism of steroid compounds. The second chapter treats in detail the techniques for the separation, isolation

and identification of the conjugate forms of the steroids. This chapter will be particularly welcome and useful for the reader since it contains, in addition to the work of other investigators, a complete description of the techniques evolved in the authors' own laboratories, where initial pioneering efforts and subsequent advances in this area have been developed. The volume contains separate chapters on the procedures for the hydrolysis and extraction of steroids, counter-current distribution, paper and column chromatography, and spectrophotometric analyses of the steroids. There are many valuable tables of physical constants including: absorption minima and maxima in the ultraviolet and visible regions for steroids dissolved in sulfuric acid and in phosphoric acid; the wave numbers in the infrared region for steroid functional groups; and the optical rotation, melting point and molecular weight of a comprehensive list of steroids.

Volume II, "Méthodes de Dosage," is divided into four large chapters which faithfully reproduce in great detail the published methods for the individual as well as group measurements of 17-ketosteroids, adrenocortical compounds, pregnanediol, pregnanetriol and related compounds, and the phenolic steroids. In addition, there is an appendix which contains procedures for the purification of solvents and reagents including possible dangers of usage and toxicity.

The two volumes will be valuable additions to the reference shelf for laboratories engaged in research and in routine clinical analysis, since both aspects of steroid analysis are discussed. A most attractive feature of the presentation is the liberal use of illustrations which, along with a precise and detailed exposition

of the text, will help to clarify the technical aspects of the procedures for initiates in the field of steroid analysis. The many tables of data included and the excellent bibliographies found at the end of each chapter will ensure the usefulness and maintain the value of these books for the expert and the novice in the steroid field for many years to come.

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FRANK UNGAR

Ion Exchange. By FRIEDRICH HELFFERICH, Shell Development Company, Emeryville, California; Lecturer at the University of California, Berkeley. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y. 1962. ix + 624 pp. 16 × 23.5 cm. Price, \$16.00.

"Ion Exchange" is essentially a straightforward English version of "Ionenaustauscher," first published in German in 1959. Although the format and style of the original version have been preserved generally in the translation, the author has wisely taken the opportunity to revise, expand and polish the original treatise to a state very close to perfection. In particular, the author has tried to bring the reader completely abreast of recent developments in the expansive field of ion exchange and to render the contents of the book palatable even to the mathematically disinclined by separating the qualitative and quantitative treatments in such a manner that the more casual reader can skip all mathematical equations and deductions without loss in continuity. The most substantial revision has been wrought in Chapter 9, which deals with the practical and theoretical aspects of the operation of ion-exchange columns, by the addition of eleven figures, seventy-one references and thirty-five pages of text.

This new English edition of "Ion Exchange" is without a doubt the most complete, lucid and authoritative account of the intricacies of ion exchange which is available to students and workers in the ion-exchange field.

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JACK E. POWELL

Atomic Spectra. By H. G. KUHN, F. R. S. Academic Press, Inc., 111 Fifth Avenue, New York 3, N. Y., 1962. xvi + 436 pp. 16 × 23 cm. Price, \$13.00.

There has been a real need for a current book on atomic spectra suitable as an introductory text but extensive enough to serve as a reference work. Kuhn's book fulfills this need very well by maintaining a good balance between interpretation of spectra by means of the Bohr-Sommerfeld theory and quantum mechanics. Likewise, the mathematical portions have been well supplemented with descriptive material.

An introductory chapter on theoretical methods is used to present the formulas and techniques used in later chapters, which aids greatly in maintaining continuity in the text. This is not intended as a general introduction to quantum mechanical methods, and references to advanced works are given for the more complex treatments. The major deficiency in this chapter lies in the introduction of terms without clear definitions, and thus possibly confusing the beginning student. This reviewer would also have preferred a more complete section on dipole radiation and intensities. This is an important area in present studies on atomic spectra and unfortunately it is not always well understood by beginners in the field.

The principal sections in this book are simple spectra (136 pages), periodic table and X-ray spectra (27 pages), complex spectra (75 pages), hyperfine structure and isotope shift (59 pages) and width and shape of spectral lines (23 pages). The latter two sections are particularly good and serve as a review of the significant work done in these areas.

In general, the format of the book is good and the illustrations excellent. The subject index is rather short and could be improved. An excellent bibliography enhances the volume's usefulness as a reference work. This book is heartily recommended to all chemists and physicists interested in the origin and interpretation of atomic spectra.

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BOOKS RECEIVED

January 10, 1963–February 10, 1963

EUGENE W. BERG. "Physical and Chemical Methods of Separation." McGraw-Hill Book Company, Inc. 330 West 42nd Street, New York 36, N. Y. 1963. 366 pp. \$12.50.

CHARLES M. HERZFELD, Editor-in Chief. F. G. BRICKWEDDE, Edited by. "Temperature Its Measurement and Control in Science and Industry." Volume Three. Part 1. "Basic Concepts, Standards and Methods." Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y. 1962. 848 pp. \$27.50.

KATHERINE BLOOD HOFFMAN. "Chemistry for the Applied Sciences." Prentice-Hall, Inc., Englewood Cliffs, New Jersey. 1963. 429 pp. \$6.95.

LEE H. HORSLEY with the coöperation of WILLIAM S. TAMPLIN. "Azeotropic Data—II. Number 35, Advances in Chemistry Series." American Chemical Society, 1155 Sixteenth Street, N. W., Washington 6, D. C. 1962. 100 pp. \$4.50.

GUSTAV KORTÜM. "Anleitungen für die Chemische Laboratoriumspraxis." Band II. "Kolorimetrie, Photometrie, und Spektrometrie. Eine Anleitung zur Ausführung von Absorptions-, Emissions-, Fluoreszenz-, Streuungs-, Trübungs- und Reflexionsmessungen." Vierte Neubearbeitete und Erweiterte Auflage. Springer-Verlag, Heidelberger Platz 3, Germany. 1962. 464 pp. DM. 48.

K. B. LEBEDEV, Translated by L. RONSON in Collaboration with A. A. WOOLF. "The Chemistry of Rhenium." Butterworth and Co. (Publishers) Ltd. London, 88 Kingsway, W. C. 2, England. 1962. 105 pp. \$7.50.

W. O. LUNDBERG, Edited By. "Autoxidation and Antioxidants in Two Volumes." Volume II. Interscience Publishers, John Wiley and Sons, 440 Park Avenue South, New York 16, N. Y. 1962. 1156 pp. \$25.00.

EMIL J. MARGOLIS. "Qualitative Anion-Cation Analysis. An Interpretative Laboratory Text of Semimicro Procedure in Basic College Chemistry." John Wiley and Sons, Inc. 440 Park Avenue South, New York, 16, N. Y. 1962. 300 pp. \$5.00.

EUGEN MÜLLER, Edited by. With O. BAYER, H. MEERWEIN and K. ZIEGLER. "Methoden der Organischen Chemie (Houben-Weyl)." "Vierte, Vollig Neu Gestaltete Auflage." Band XIV. "Makromolekulare Stoffe." Teil 2. Georg Thieme Verlag, Herdweg 63, Stuttgart, Germany. 1963. 1251 pp. DM. 272. Vorbestellpreis DM. 244.80.

J. R. PARTINGTON. "A History of Chemistry." Volume Three. St. Martin's Press, Inc., 175 Fifth Avenue, New York 10, N. Y. 1963. 854 pp. \$25.00.

KURT RANDEATH. "Dünnschicht-Chromatographie." Verlag Chemie, G.m.b.H., Weinheim/Bergstr., Postfach 149, Germany. 1962. 243 pp. DM. 22.

E. H. RODD, Edited by. "Chemistry of Carbon Compounds." Volume V. "Miscellaneous. General Index." American Elsevier Publishing Company, Inc., 52 Vanderbilt Avenue, New York 17, N. Y. 1962. 912 pp. \$29.00.

E. T. SEVERS. "Rheology of Polymers." Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y. 1963. 180 pp. \$7.50.

EGON STAHL, Edited by. "Dünnschicht-Chromatographie. Ein Laboratoriumshandbuch." Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf, Germany. 1963. 534 pp. DM. 56.

EDWARD STAUNTON WEST. "Textbook of Biophysical Chemistry." Third Edition. The Macmillan Company, 60 Fifth Avenue, New York 11, N. Y. 1963. 435 pp. \$9.50.

P. G. WATSON and D. E. S. TRUMAN. "Metabolic Intergrations." W. Heffer and Sons Ltd., Cambridge, England. 1962. 9 pp. Price, 6 Shillings net.