

$$\langle \psi_j | \mathbf{m} | \psi_i \rangle = -i \sum_A [\{ (C_{sA_j} C_{zA_i} - C_{zA_j} C_{sA_i}) \mathbf{x} + (C_{sA_j} C_{yA_i} - C_{yA_j} C_{sA_i}) \mathbf{y} + (C_{sA_j} C_{xA_i} - C_{zA_j} C_{sA_i}) \mathbf{z} \} \times \mathbf{R}_A W_{sp}^A + (C_{yA_j} C_{zA_i} - C_{zA_j} C_{yA_i}) \mathbf{x} + (C_{zA_j} C_{xA_i} - C_{zA_j} C_{zA_i}) \mathbf{y} + (C_{zA_j} C_{yA_i} - C_{yA_j} C_{zA_i}) \mathbf{z}] \quad (2.9)$$

On page 4161, second column, the first sentence should read: The equatorial proton of carbon atom 2 lies in a negative octant, and almost in the plane *B*. The octant rule predicts a small negative rotation for H₇ in methylcyclohexanone. On page 4162, line 5 of column 1, delete the words "shown in Figure 3."

Stereochemical Consequences of Methoxyl Participation. The Stereochemistry of the Cyclization of 5-Methoxy-2-pentyl Brosylate to 2-Methyltetrahydrofuran [*J. Am. Chem. Soc.*, **89**, 73 (1967)]. By ERNEST R. NOVAK and D. STANLEY TARBELL, Department of Chemistry, University of Rochester, Rochester New York 14627.

Add the following sentence to the last paragraph in the second column on page 74: If this assignment of configuration is correct, the [+-]-2-chloro-5-methoxy-pentane is formed from the (*R*)-brosylate **3b** by a process involving *one* inversion. On page 76, revise the last sentence of the first paragraph under Discussion of Results to read as follows: Attack of chloride ion at C-5 of the methoxonium ion yields the 5-chloro-2-methoxypentane, the latter with (*R*) configuration, because removal of the chlorine yields (*R*)-2-methoxypentane.

A New and Convenient Alkylation and Acylation of Pyridine N-Oxides [*J. Am. Chem. Soc.*, **89**, 1537 (1967)]. By R. A. ABRAMOVITCH, MAITREYI SAHA, and ELIZABETH M. SMITH, University of Saskatchewan, Saskatoon, Saskatchewan, Canada, and R. T. COUTTS, University of Alberta, Edmonton, Alberta, Canada.

On page 1538, the structures just above the Acknowledgment should be numbered VII.

Book Reviews

The Chemistry of Technetium and Rhenium. By R. D. PEACOCK, Professor of Inorganic Chemistry, The University of Leicester, Great Britain. American Elsevier Publishing Co., Inc., 52 Vanderbilt Ave., New York, N. Y. 1966. 137 pp. 14 × 22 cm. \$10.00.

Although one book and six review articles on one or the other of the elements technetium and rhenium have appeared during the period 1957-1964, a critical discussion and comparison of the chemistry of these two metals, last published in one volume 10 years ago (in French), is now most welcome. Despite the rarity of these two elements (technetium has only recently become available in weighable quantities at a price of about \$200/g), there have been over 500 citations in the literature about them and interest is increasing. This no doubt is due in part to the chemical novelties discovered through this group such as the first demonstration of Lewis base properties for a transition metal in its complexes (in the reaction $(C_5H_5)_2ReH + H^+ \rightarrow (C_5H_5)_2ReH_2^+$), the unique ions TcH_9^{2-} and ReH_9^{2-} containing only transition metal to hydrogen bonds, the polynuclear halogenometalate $Re_2Cl_8^{2-}$ whose diamagnetism can best be explained by a *quadruple* bond between rhenium atoms, and the first polynuclear carbonyl hydrides, $H_3Tc_3(CO)_{12}$, $H_3Re_3(CO)_{12}$, and $HRe_3(CO)_{14}$. (The latter was characterized too recently to be included in this monograph; another recent discovery in this group is the rare trigonal prismatic coordination for $Re(S_2C_2Ph)_3$, the first known molecular complex to display this geometry.)

In the present monograph the literature is well covered through 1963 with some references to later work appearing in scattered portions of the text. A general bibliography and further references (through June 1965) are presented in two appendices which will be useful to the reader. The first two chapters in the text deal with the discovery, isolation, and general properties of the two elements. A systematic survey is presented in the next eight chapters, under the following headings: Oxides; Oxoacids and Oxosalts; Halides and Oxide Halides; Complex Halides, Complex Oxide Halides and Complex Hydrides; Chalcogenides and Compounds with Non-metals and Metalloids, Alloys; Complex Cyanides and Related Compounds; Carbonyls and Organometallic Derivatives; Compounds with Group V and Group VI Ligands. Seven figures are scattered throughout these chapters summarizing related chemical

reactions in a schematic way; these will also be a help to the reader. A chapter on analytical methods and three appendices (two mentioned above and one containing notes on the laboratory handling of technetium) conclude the text. A subject but no author index is available.

In the area of organometallic chemistry and polynuclear carbonyl hydrides, the coverage of the literature was incomplete, and the cited references suffered from more than the average typographical errors. Furthermore this reviewer takes issue with the heading "M-C**," first column of infrared frequencies in Table 28 (p 105). These are alleged to have been assigned by the original workers to the M-H frequency. In the first place, no such assignment was proposed by those authors, but even so the substitute chosen for it is little better. In all likelihood the absorptions in question are mixtures of the several characteristic modes, the M-CO and M-H deformation as well as the M-C stretching vibrations, which fall in this range of energy.

The discussions of many subjects are extremely brief, and only a moderate number of tables of data are supplied. I do not believe a specialist would find this book useful as a desk copy. However, for others it should be valuable as an introduction to the literature. In this respect it is only somewhat more up to date than a monograph on precisely the same subject matter (by R. Colton) which was published a short time before (in a competing series on inorganic chemistry from Interscience). Such duplication is wasteful and of no advantage to the scientific community. The present divided and competing efforts are even more regrettable since they come from two former coauthors (R. Colton and R. D. Peacock, "The Chemistry of Technetium," *Quart. Rev.* (London), **16**, 311 (1962)). There ought to be some mechanism either between publishers or between authors to combine such efforts for the benefit of the readers and produce one work of greater scope and usefulness; for the present, at least one of these two monographs should find a place in any library specializing in chemistry.

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Actions of Chemicals on Dividing Cells. By BENGT A. KIHLMAN, Fil. dr. Swedish Natural Science Research Council, Research Professor of Biochemical Cytogenetics, Institute of Physiological Botany, Uppsala, Sweden. Prentice-Hall, Inc., Englewood Cliffs, N. J. 1966. xi + 260 pp. 16 × 23 cm. \$10.00.

The molecular mechanisms by which genes mutate have come to be fairly well understood in recent years. Since many of the physical and chemical agents that induce gene mutation also cause chromosome breakage and rearrangement, there has been reason to hope that our knowledge of these latter phenomena would advance rapidly. Moreover, in understanding what it takes to break and reorganize chromosomes, one could also expect to learn a good deal about chromosome structure and replication. Unfortunately, however, as this book makes abundantly clear, the problems of chromosome organization and breakage have not yielded to analysis as swiftly as have the analogous ones of gene structure and mutagenesis. Although a satisfactory explanation for the effects of chemical agents on chromosomes is not yet available, Professor Kihlman has performed a great service in condensing and arranging all of the relevant facts. His book will certainly be used with profit by students of the chromosome for many years to come.

Professor Kihlman has not been afraid to confront experimental data that are contradictory or difficult to reconcile or out of line with attractively plausible hypotheses. While many knotty questions are left open, the author manages to keep our attention and to avoid confusion. The first part of the book is a brief review of the chemistry and physiology of the interphase cell, of DNA synthesis, chromosome replication, and mitosis. This review serves as a helpful background for the second part, which is devoted to the inhibition of mitosis and the production of chromosomal aberrations by chemical agents. A critical assessment of the experimental findings leaves us with little doubt that most of these agents affect either the structure or synthesis of DNA, but a clear relation between the primary action of a chemical agent and a specific aberration cannot be unequivocally discerned. Nevertheless, we may hope with Professor Kihlman that "once fundamental chromosome structure is understood, the damaging effect of chemicals will be more readily comprehensible, and all of the pieces of the puzzle may then fall into place." In the meantime, this book provides a useful summary of what we know and what we need to know.

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Insoluble Monolayers at Liquid-Gas Interfaces. By GEORGE L. GAINES, JR., Research Laboratory, General Electric Co., Schenectady, N. Y. Interscience Division of John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1966. viii + 386 pp. 15.5 × 23 cm. \$14.00.

A half-century ago Irving Langmuir, one of the true geniuses in American chemistry, invented the surface balance and initiated quantitative investigations on the properties of insoluble films on aqueous sub-solutions. Not only did he confirm the speculation of Lord Rayleigh and Agnes Pockels that these films were truly unimolecular, but he also discovered that the molecules in them were oriented with their polar groups immersed in the water and their long, nonpolar chains directed nearly vertically up from the surface. During the first 25 years after Langmuir's first publication, there was much activity in the United States and elsewhere, and the discipline of surface chemistry became firmly established. In the period following World War II, however, there appeared to be a slackening of interest until quite recently when the relevance of monolayers to the control of evaporation from water reservoirs and to the understanding of the structures of membranes in living systems was recognized. This renaissance of research activity on insoluble monolayers is accurately reflected by this important new monograph; its appearance is timely and it is likely to stimulate further the realization of the elegance of the experimental method and its promise for understanding intermolecular forces.

The monograph has been written primarily for the research worker who wishes to study unimolecular films either for their own sake or to gain an understanding of natural phenomena involving liquid interfaces and oriented molecules. The tone of the book is essentially descriptive and critical with emphasis on modern

experimental methods and data with a minimum of interpretation. The coverage of laboratory procedures and techniques is comprehensive, and detailed accounts are given of the methods for measuring surface pressures, areas, contact potentials, and viscosities. The applications of optical and related methods, of radioactive tracers, and of measurements of gas transport and evaporation in the elucidation of monolayer behavior are also treated.

The organization and scope of the treatment is revealed by the thoughtfully chosen titles of the nine chapters of the book: Historical Introduction, The Properties of Liquid Surfaces, Experimental Methods: Properties of Liquid Surfaces, Experimental Methods: Properties of Monolayer Films, The Properties of Various Substances in Mono-molecular Films, Mixed Monolayers, Reactions in Monolayers, Transfer of Monolayers to Solids, and Scientific and Technological Applications. The usefulness of the work is augmented by its subject and author indexes and particularly by its index of film-forming compounds. The style of writing is graceful, clear, and concise when appropriate. The author, himself an active research worker on monolayers, is to be congratulated for his scholarly effort in getting out this highly useful, up-to-date summary.

Because of the detailed, almost handbook character of the long discussion (105 pages) on experimental methods, it was surprising that nothing seems to be said about methods for purifying the film-forming compounds themselves or about criteria for their purity. Dramatic examples of the importance of this factor may be found in the discrepancies reported in the literature between experienced investigators. Gas chromatographic techniques in their preparative and analytical applications should do much to ensure that highly accurate measurements will not be performed on impure compounds. Yet, this apparent omission is surely minor compared to the over-all usefulness of the book, which is recommended strongly for the beginner as well as for the experienced investigator.

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Recent Developments in the Chemistry of Natural Carbon Compounds. Volume I. By G. FODOR, D.Sc., Member of the Hungarian Academy of Sciences, Stereochemical Research Laboratory, Hungarian Academy of Sciences, K. NADOR, D.Sc., Institute for Experimental Medicine, Hungarian Academy of Sciences, and I. V. TORGOV, D.Sc., Institute of Organic Natural Compounds, Academy of Sciences of the USSR. Akadémiai Kiadó, Publishing House of the Hungarian Academy of Sciences, Budapest, Hungary. 1965. 319 pp. 17 × 24 cm. \$16.50.

This book is Volume 1 in a series, "Recent Developments in the Chemistry of Natural Carbon Compounds," the individual feature of which will be to collect "for the first time the relevant work of Hungarian chemists which so far has been available only scattered throughout the pages of various journals."

This first volume contains three sections, the first two of which are clearly directed toward the goal of making the results of Hungarian chemical research more readily available. G. Fodor, late of the Stereochemical Research Laboratory of the Hungarian Academy of Sciences and presently of Laval University, Quebec, Canada, writes on "New Methods and Recent Developments of the Stereochemistry of Ephedrine, Pyrrolizidine, Granatane and Tropane Alkaloids," with particular emphasis on work done in Hungary, though the entire field is very extensively reviewed. Most of the Hungarian work has used chemical interrelations between appropriate substances; modern physical techniques have not played a major role. A significant amount of work on biosynthesis of these alkaloids is also reviewed.

The second section, on "Relationships between the Structure and Pharmacological Activity of Tropeines" by K. Nador of the Institute of Experimental Medicine, also of the Hungarian Academy of Sciences, is an appropriate companion to the first. Nador, likewise, stresses the work in Hungary on this problem, particularly his own work and hypotheses. A large number of tables summarize the semiquantitative aspects of work in this area.

I. V. Torgov, of the Institute of Natural Organic Compounds of the Academy of Sciences of the USSR, has contributed the third section on "Achievements in the Total Synthesis of Natural Steroids," which, in a very different vein from the first two sections, reviews very concisely the work from the early synthesis of equilenin by Bachman, Cole, and Wilds in 1939-1940 to the synthesis of the

cardiac aglycone, digitoxigenin, and the steroidal alkaloid, connessine, in 1962. In the 84 pages of this section, Torgov has effectively outlined the many milestones in steroid synthesis. Because the literature is not reviewed beyond 1962, neither Barton's retraction of his first report on the synthesis of connessine nor Stork's synthesis of this substance are mentioned. Much of the material in this section is available already in L. F. Fieser's "Steroids," though the conciseness of Torgov's treatment and the importance of the subject make this the most generally interesting section of the book.

The text contains many instances of grammatical constructions unknown to Fowler, though the meaning is seldom, for this reason, unclear. The present volume can be recommended for those interested in the Hungarian work on stereochemistry and pharmacological activity of a family of alkaloids or in a concise review of steroid synthesis. The book suffers, badly, however, from the absence of either a subject or an author index.

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BOOKS RECEIVED; April 1967

ADRIEN ALBERT. "The Acridines. Their Preparation, Physical, Chemical and Biological Properties and Uses." Second Edition. St. Martin's Press Inc., 175 Fifth Ave., New York, N. Y. 1966. 604 pp. \$32.50.

ALLEN J. BARD, Editor. "Electroanalytical Chemistry, A Series of Advances." Volume 1. Marcel Dekker, Inc., 95 Madison Ave., New York, N. Y. 1966. 426 pp. \$15.75.

ANDRÉE GOUDOT. "La Chimie Quantique Appliquée a L'Étude du DNA et du RNA." Gauthiers-Villars and Cie., 55 Quai des Grands-Augustins, Paris 6, France. 1966. 187 pp. 40 F.

DIETER O. HUMMEL. "Infrared Spectra of Polymers in the Medium and Long Wavelength Regions." Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1966. 207 pp. \$12.00.

HAROLD S. JOHNSTON. "Gas Phase Reaction Rate Theory." The Ronald Press Co., 15 East 26th St., New York, N. Y. 1966. 362 pp. \$10.00.

K. M. MACKAY. "Hydrogen Compounds of the Metallic Elements." Barnes and Noble, Inc., 105 Fifth Ave., New York, N. Y. 1966. 186 pp. \$10.00.

E. E. NIKITIN. Translation edited by E. W. SCHLAG. "Theory of Thermally Induced Gas Phase Reactions." Indiana University Press, Bloomington, Ind. 1966. 155 pp. \$5.00.

LESLIE E. ORGEL. "An Introduction to Transition-Metal Chemistry Ligand-Field Theory." John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1966. 186 pp. \$5.95.

ROLAND S. YOUNG. "The Analytical Chemistry of Cobalt." Pergamon Press Inc., 44-01 21st St., Long Island City, N. Y. 1966. 170 pp. \$7.00.