

RNA, and the current concepts of mechanisms whereby these macromolecules transmit information. The significance of the data cited is not always evident. In attempting to indicate some of the difficulties in technique and experimentation, clarity and the development of logical sequence are often sacrificed. The presentation unfortunately is further marred by errors due to oversight in editing (*e.g.*, p. 19).

The chapter "Biochemistry of Cancer Cells" describes some of the aberrations in metabolism and composition of proteins, DNA, and RNA of cancer cells, and serves to illustrate that knowledge and understanding about this disease are still lacking despite the large amount of research done. The hypothetical mechanism of carcinogenesis based on the removal of "suppressors" by carcinogens and other "promoting factors," is in need of experimental substantiation.

This book is compiled for medical students, general practitioners, and medical specialists. The starting level of proficiency in biochemistry and medicine that the reader is assumed to have varies from chapter to chapter. It is difficult to assess which group will find the book most useful. However, each chapter is followed by a fairly extensive bibliography.

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**Technique of Organic Chemistry. Volume XI. Elucidation of Structures by Physical and Chemical Methods.** Part One and Part Two. Edited by K. W. BENTLEY. Interscience Publishers, John Wiley and Sons, Inc., 605 Third Avenue, New York 16, N. Y. 1963. Part One, 642 pp. 16 × 23.5 cm. Price, \$19.50. Part Two, 535 pp. 16 × 23.5 cm. Price, \$16.50.

I, Isolation, Purification and Preliminary Observations, K. H. Overton; II, Applications of Ultraviolet Spectroscopy, J. C. D. Brand and A. I. Scott; III, Applications of Infrared Spectroscopy, A. R. H. Cole; IV, Applications of Nuclear Magnetic Resonance Spectroscopy, J. B. Stothers; V, Applications of Mass Spectrometry, K. Biemann; VI, Applications of Dissociation Constants, Optical Activity, and Other Physical Measurements, J. F. King; VII, Biogenetic Theory in Structural Elucidation, Edward Leete; VIII, Detection and Protection of Simple Functional Groups, G. A. Swan; IX, Reduction and Hydrogenation in Structural Elucidation, F. J. McQuillin; X, Dehydrogenation, Z. Valenta; XI, Zinc Dust Distillation, Z. Valenta; XII, Alkali Fusion and Some Related Processes, B. C. L. Weedon; XIII, Carbon-Oxygen Fission: Degradation of Polysaccharides, J. K. N. Jones and M. B. Perry; XIV, Carbon-Nitrogen and Carbon-Oxygen Fission, K. W. Bentley; XV, Hydrolytic Degradation of Polypeptides and Proteins, E. Y. Spencer; XVI, Carbon-Carbon Single Bond Fission, K. T. Potts; XVII, Carbon-Carbon Double Bond Fission, K. W. Bentley; XVIII, Degradation of Side Chains and Long Chain Compounds, N. Polgar; XIX, Determination of the Stereochemistry of Natural Products by Chemical Methods, B. Belleau and S. McLean; XX, Molecular Rearrangements, Paul DeMayo.

Natural products chemists will be delighted to find in these two volumes, at last, a comprehensive collection of all the diverse means used in structure determination, gathered together under one roof and treated at length. The teacher who, like this reviewer, has struggled to unfold the subject to students using only the traditional chemically-oriented qualitative analysis texts will be equally pleased to have available this balanced treatment of traditional chemical and modern physical methods, for, although the two volumes are too expensive to assign as a text, this important addition to the eminent Weissberger series must surely be incorporated into every academic library and so be available for reading assignments. Finally, with the trend of synthetic and mechanism studies to more subtle and complex reactions, the structure elucidation of unusual products is increasingly a separate and important phase of the work and chemists in such areas should also find the book valuable. Although the orientation throughout is strongly to natural product studies, the generalized nature of the exposition in most chapters renders it equally suitable for other chemists.

Before proceeding to a more detailed examination of the merits of individual chapters, we may consider several general comments on the treatise as a whole. It is increasingly and most deplorably true that multi-authored works of this kind are subject to intolerable delays between pen and print. Almost all of the chapters here contain no references later than 1960; some are even more outdated. Several authors, probably partly in pique, specifically state a cut-off date, one (Chapter II) as early as February, 1959, nearly five years ago! In view of the rapid pace of modern developments, not only should editors be urged to take drastic measures to avoid these lacunae, but potential authors may well be warned to exact meaningful assurances of publication time.

In general, the value of these books lies in bringing together a collection of previously widely scattered methods and in presenting them, together, as a unified armory for attacking unknown structures. In judging the books we may therefore ask not only for exposition of the methods but for specific attention, in dealing with their application, to the nature of the problem as it appears to an investigator with an unknown compound in hand. Exposition and breadth of applicability are easier and generally well done; applications are commonly approached with examples from the literature, often many and well-chosen, but these are outlined as *faits accomplis* with frequently not enough attention paid to the practical situations that must be faced by the investigator during the work, the pitfalls of interpretation, and the bases for experimental choice and sequence. Admittedly this cavil is somewhat vague, but should the authors one day revise the work, it could be valuable to others if they would apply this point of view more consistently. In this connection we may applaud the high incidence of attention to practical experimental detail in most chapters, however.

Finally, the chapters may be judged both on completeness and on the extent to which they duplicate other treatments. Much of Part One (primarily on physical methods) covers ground which has been extensively treated before. These chapters are generally admirable in their combination of adequacy and brevity with ample references to more exhaustive treatments of individual topics; the attention here to the point of view of the analyst's problem (*vide supra*) and to the breadth of applicability is commendable. Many of the chapters on chemical methods are not as good and we may observe that the good chapters often have previous models while the chapters with no previous models, although often not as good, may ironically be more useful by being unique of their kind! One very important deficiency in the chemical chapters is the failure to point up the value of combining physical techniques with the chemical procedures in order more fully to assess reaction course and to obtain the maximum amount of data. Examples are cited below.

The introductory chapter wisely refers the reader to other texts for the common techniques, although a somewhat more extensive treatment of practical pitfalls might have been in order. On molecular weights, the manuscript was too early to include the excellent thermistor osmometer, but should certainly have referred to the Signer-Clark method for isothermal distillation. The invaluable assemblage of important color test fills in an important gap and is generally excellent although the reviewer was distressed to note that the modern studies of the tetranitromethane and Gibbs tests were missing; they turned up however in Chapter II! The second chapter is generally admirable throughout. A somewhat more extensive commentary on how to approach interpretation of the spectrum of a completely new compound would enhance the value, however. The value of comparisons with actual curves of model compounds is not sufficiently emphasized, since often the particular shape of a curve is more revealing than a simple catalog of maxima. Also the value of spectral shifts in acid and base is hardly hinted at. Chapter III is concise, excellent in its treatment of experimental matters, and amply stocked with references to more exhaustive works, but it deals too exclusively with the author's chief interests in steroids and triterpenes (one eighth of the references are the author's work). The presentation of nuclear magnetic resonance is exemplary and includes an excellent compendium of structure with chemical shift, ample, clear, and useful. The exposition of mass spectrometry is also superb, a lucid introduction to the method and the extent or potential extent of its value; if this chapter seems now somewhat rudimentary or outdated, it is largely because of Prof. Biemann's own work since it was written! The application of acidity measurements is well handled and notable also for its useful and extensive tables of pK values. Prof. Leete's exposition of the important role biogenetic theory has played, and can increasingly play, in the unravelling of natural structures is very commendable in calling attention to this often overlooked or maligned theoretical tool.

Chapters VIII and IX contain serious deficiencies. Very little appreciation is given to the importance of mechanistic understanding of the reactions discussed to generalize and clarify their use. Is reduction with dissolving metals such a mystery, for example? Would the section on carbinolamines not be much more comprehensive and comprehensible if an appreciation of their ready formation of anhydro salts were included? The treatment of carbonyl reduction by hydrides is mechanistically inadequate and handled far better in Chapter XIX. Secondly, the value of instrumental techniques in conjunction with chemical reactions is not adequately treated, *e.g.*, recognition of -COOH by its infrared shift in -COO<sup>-</sup>, or of anilines by chromophoric destruction in acid, or the value of deuterium equilibration or introduction when used with n.m.r. studies. Chapter VIII is also deplorably weak on protecting groups (*e.g.*, no mention of the carbobenzoxy derivative of amines) as well as on quantitative determination of functional groups. The organization of Chapter

IX is inconsistent as it starts with a section on hydrogenation then proceeds to sections on functional groups so that, while Lindlar's catalyst is mentioned in the hydrogenation section, it is not found in the acetylenes section. No mention is made of catalysts other than Pd, Pt, and Ni.

Chapters X and XI are very good indeed and Chapter XII serves the useful purpose of pointing up the often underestimated value of alkali fusion as a meaningful degradation tool but does not include enough alkaloid cases; some of the alkali fusions in the strychnine field, for example, would have been illuminating examples. The chapter on polysaccharides is deficient in instrumental adjuncts to the chemistry, but beyond this the reviewer is not qualified to comment. Also inexpert in modern peptide degradation, the reviewer would only point to the lack of nonhydrolytic cleavages and the short section on selective cleavage in the protein chapter. One may wonder whether any substantial value can accrue in devoting only 28 pages to this extensive field. Chapter XIV, although written by the editor of the series, is careless and parochial to the point of self-indulgence; the examples are almost exclusively from the morphine field and only six of the 112 references date later than 1954, the date of the author's monograph on morphine chemistry. The examples rarely lead to generalization and no rationale is offered for these reactions (Hofmann, Emde, von Braun) taking different courses in different cases. The statement, unqualified by any mechanistic discussion, that cyanogen bromide reacts preferentially at benzylic sites is not borne out in the case of lycorine, but this important example is not cited. The two chapters on carbon-carbon bond fission (of which XVI is the better by far) should have been unified as one, for the present organization is confusing; the first two methods dealt with under single-bond fission being in fact reagents for double bonds! Grob's conversion of vicinal diacids to olefins with lead tetraacetate is omitted, as is epoxidation with pertrifluoroacetic acid. The very short chapter (XVIII) on degradation of side chains and long chains seems also an unnecessary separate division, more properly fused into a single chapter on carbon-carbon cleavage.

If it were not for the long and superb collection (XIX) of methods for stereochemical determination by Belleau and McLean, the second of these two volumes would probably not be worth buying. This chapter, more than one-third of the book, gathers together, as no other review has, the many different approaches to solving problems of stereochemistry and expounds them lucidly and in a modern vein. It is the only chapter in the two volumes to deal with the use of kinetics in structure determination. Finally, de Mayo's chapter on rearrangement is, as he points out, different in that it does not intend to provide a methodological guide but is merely "a record of the unexpected, the unintended, and, occasionally, the unfortunate." It is a fitting last chapter and makes fascinating reading. It also contains, as many other chapters do, formulas CCXXXIX, CXLVIII, CLXXXVIII, etc.; how long must chemical readers yet be frustrated by these vestiges of a dead civilization?

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**Gas Chromatography.** By HOWARD PURNELL, Lecturer in Physical Chemistry, University of Cambridge; Fellow of Trinity Hall. John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. 1962. vii + 441 pp. 15.5 × 23.5 cm. Price, \$12.00.

The development of gas chromatographic applications for a seemingly infinite variety of problems continues to flood the literature with improvements and innovations in techniques, practices, and chromatographic theory. Until the past year or so, comprehensive and up-to-date treatments of all of these aspects have been rather lacking. Now, several books have appeared almost simultaneously that do cover the whole spectrum of chromatographic usage, and which can furnish the necessary introduction and background for the increasing number of chemists who find that chromatographic knowledge and skill is a must. One of the best of these is the well-written "Gas Chromatography" by Dr. Howard Purnell.

Dr. Purnell is an active participant in chromatographic development and has made significant contributions to both theory and practice. The present book derives much of its strength from this breadth of experience and knowledge on the part of the author.

The book is divided into three sections: the physicochemical background of gas chromatography, chromatographic theory, and chromatographic practice. The background in physical and chemical theory is rather succinctly described in the first section, and covers the relevant aspects in sufficient detail for the non-physical chemist to understand the basic principles underlying the separations.

The section on chromatographic theory is much more detailed, especially in the coverage of the rate theories and experimental

tests of their validity. The total coverage of physicochemical background and chromatographic theory is quite extensive, more so than in most treatments of chromatography, and very welcome in the profusion of largely empirical chromatographic knowledge.

For a large number, perhaps the great majority, of gas chromatographers, the application of this technique is a matter of finding satisfactory substrate and column conditions for the separation, without sufficient opportunity to optimize conditions or check the pertinent theory. At the present rate of publication of gas chromatographic papers, new solutions to problems will make any book largely out-of-date at publication. However, spot checks in areas of particular interest to our own research showed sufficient detail to lead to the current best solutions. For example, the detection of radioisotopes in a flow system is barely mentioned, but the included references would readily lead to useful descriptions; the separation of isotopic molecules is covered rather well for H<sub>2</sub>, HD, D<sub>2</sub>, and *ortho-para* varieties of H<sub>2</sub> and D<sub>2</sub>, and mentioned for others; the beginning to a solution for some other difficult separation problems we have faced is also to be found.

This book furnishes a solid basis for the gas chromatographer and should maintain its usefulness for many years.

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## BOOKS RECEIVED

December 1, 1963-January 1, 1964

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ROBERT DUNCAN EASTHAM. "Biochemical Values in Clinical Medicine." The Williams Wilkins Co., Baltimore 2, Md. 1963. 160 pp. \$4.75.

ALFRED W. FRANCIS. "Liquid-Liquid Equilibria." Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. 288 pp. \$12.00.

NORMAN G. GAYLORD, Editor. "Polyethers." Part I. "Polyalkylene Oxides and Other Polyethers." Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. 491 pp. \$16.00.

PHILLIP H. GEIL. "Polymer Reviews." Volume 5. "Polymer Single Crystals." Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. 560 pp. \$16.00.

DAVID GLICK. "Quantitative Chemical Techniques of Histo- and Cytochemistry." Volume II. Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. 513 pp. \$15.75.

ERNEST J. HENLEY and H. KENNETH STAFFIN. "Stagewise Process Design." John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. 213 pp. \$2.95.

C. KITTEL. "Quantum Theory of Solids." John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. 435 pp. \$13.50.

I. M. KOLTHOFF and PHILIP J. ELVING. "Treatise on Analytical Chemistry." Part 1. Volume 4. Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. 954 pp. \$25.00.

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ALBERT ROSE. "Concepts in Photoconductivity and Allied Problems." John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. 168 pp. \$5.95.