NEW BOOKS

QUANTITATIVE ORGANIC ANALYSIS VIA FUNCTIONAL GROUPS, 3rd edition, by Sidney Siggia (John Wiley and Sons, New York, 697 pp., 1963, $19.00). Although instrumental methods and techniques have increased rapidly in recent years, wet chemical methods still remain as an important phase of the analytical laboratory's operations. In fact the scope of these procedures has also broadened steadily over the past several years. These changes are reflected in the increased size of this third edition; the original edition contained 152 small pages whereas the new edition has 697 standard pages.

Twenty-two chapters contain discussions on individual functional groups such as: hydroxyl, carbonyl, acids and esters, alkoxyl, peroxides, unsaturation, active hydrogen, amino, imino, quaternary ammonium, mercaptans, sulfonic acids, and others. The discussions include pertinent historical background, the chemistry involved with each analysis, a detailed procedure, the interferences, and applicability of each analysis, and, where available, trace methods. Although the format is similar to the prior editions, the presentations in this edition are completely revised. The historical background and the comparative evaluations of the various procedures, including interferences are essentially all new. The practicing analytical chemist, or anyone interested in organic analyses, should find the presentations very lucid but concise and therefore most helpful.

The detailed methods that are given in the text are adaptations of published procedures that have been modified by the author. In all cases the original literature is clearly referenced. In this reviewer's opinion these methods all appear to provide the maximum in simplicity and ease of handling while providing a high degree of accuracy.

A new feature is the chapter on reaction rates for analyzing mixtures. Procedures for handling hydroxy, carbonyl, amine, unsaturated compounds, diazonium, amide, and nitriles are described. A considerable amount of the information is new data from the author's laboratory. Undoubtedly this is an area that will witness increased applications and diversity in the future.

The overall editing appears to be very good. There is a minimum of typographical errors. The clear type and durable binding should permit regular laboratory use. The price, however, will probably restrain a number of chemists from purchasing their own copies.

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THE HANDBOOK OF ANALYTICAL CHEMISTRY, by Professor Louis Meites (McGraw-Hill, 1806 pp., 1963, $47.50). This book should definitely be considered as a ready reference for anyone having responsibility for analysis of inorganic or organic materials either by chemical or physical (including instrumental) techniques. Unlike the multi-volume analytical treatises now descending on the practicing analyst, the 130 contributors to this Handbook might be said to have been at a loss for words. A handbook it is, with only about 300 pages devoted to what might be called textual material. The remainder includes tabular data regarding the substituent under analysis, basic experimental conditions, interferences and references to detailed methods. Fundamental data are given on formation constants of metal complexes, acid dissociation constants, polarographic half-wave potentials, structural formulae and uses of organic analytical reagents, electrographic tests, optical rotation data, radioisotopes, paper, gas and ion exchange chromatographic separations and many others. It is especially noteworthy that this Handbook contains spectra-structure correlations for the far infrared as well as for the NaCl and near infrared regions.

The latter third of the Handbook is devoted to methods for determining specific substances—elements, functional groups, and methods for the analysis of technical materials—alloys, paints, paper, petroleum products, soaps and syndets, oils and fats, etc.

This Handbook, like any handbook, cannot be used to the total exclusion of more detailed works. It does serve, and admirably so, to point a well documented and generally up-to-date finger towards detailed reports.

As is frequently the case with multi-author works such as this, lack of coordination of reports leads to erratic tabulations. As a result, many methods reported in the analysis of materials sections fail to appear in the tables of methods compiled in the earlier parts of the book on the basis of technique. The very excellent index overcomes most of these difficulties but cannot give proper credit for versatility of a method when only listed by one contributor as applicable to a specific sample.

A number of complete omissions were noted by this reviewer. Examples include failure to mention the use of glyoxal [bis(o-hydroxyanil)] in its major role as a spectrophotometric reagent for calcium. It is mentioned as a volumetric indicator, certainly a minor application. Alizarin complexan is also tabulated as a volumetric indicator whereas its principal use today is for the spectrophotometric determination of fluoride. Both of these principal uses have been in the literature for at least four years.

It is unfortunate that no indication is made of the best method to use when a barrage of possible methods is listed under a given technique. For example, which of the 55 indicators for direct EDTA titration of calcium are best? Or is one of the 12 indirect indicator systems superior? Perhaps this is bowing to the idiosyncracies of analytical chemists and their tendency towards "pet" methods. But then, a handbook is designed to give guidance to those unfamiliar with a particular situation and thus some indication of the preferred, simplest, or most reliable method(s) would be very helpful.

Some of the more specific shortcomings of this Handbook that would probably be of concern to readers of this Journal are briefly noted. The section on nonaqueous titrations is woefully inadequate although contributed by a recognized authority in the technique. No specific techniques or tabulations of titratable substances are given. Only a smattering of indicators are suggested and no electrode combinations for potentiometric titrations are mentioned. The method cited for determining the peroxide value of fats and oils is questionable. The reaction time specified (one minute) is at variance with the organic chemical literature (and this reviewer's experience) regarding the rate of reaction of alkyl peroxides with the iodide ion. The iodine value procedures given neglect to mention carrying out the 30 minute reaction time in the dark to avoid halogen photolysis and substitution side reactions. These inaccuracies point out the need for referral to more detailed methods before blindly applying the procedures suggested in the Handbook.

Despite some of the shortcomings of the Handbook, there is no doubt in this reviewer's mind that this single volume reference will definitely ease the task of locating suitable methods for an analytical determination. In addition, it can be extremely valuable in reminding the practicing analyst that techniques other than his old standbys may well be more appropriate in a specific instance. The price of the Handbook will preclude its presence on every analysts's desk but every analyst should have a copy readily available. Professor Meites and his contributors are to be congratulated on their efforts.

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MECHANISMS OF SULFUR REACTIONS, by William Pryor (McGraw-Hill Book Co., Inc., 241 pp., 1962, $9.75). An addition to the McGraw-Hill Series in Advanced Chemistry, Pryor's *Mechanisms of Sulfur Reactions* joins a growing number of selective monographs dealing with the organic chemistry of sulfur compounds. Modest in size, and more limited in scope than the title indicates, it is nevertheless a valuable contribution in summarizing recent advances in the understanding of the mechanisms of some reactions of sulfur-containing molecules. It contains a valuable and extensive bibliography (nearly 1200 references) for those who wish to study the subjects in more

(Continued on page 52)

New Books . . .

(Continued from page 48)

depth. An interesting and useful feature in the inclusion of 28 experimental procedures illustrating some of the reactions described in the theoretical sections.

The scope of the book may be indicated by a rapid survey of its contents. Following a brief introductory treatment of the nomenclature of allotropes, molecular species, ions, and compounds of sulfur, the diverse reactions of elemental sulfur in the melt and in hydrocarbon, aqueous, and amine solvents are discussed. A lengthy third chapter, somewhat misleadingly entitled "Thiols, Disulfides, and Polysulfides," occupies nearly half the text of the main body of the book. It deals with the bond strengths, angles, and lengths of S-S, S-H, and C-S bonds in a great variety of sulfur compounds and summarizes suggestions for the character of the bond, particularly for di- and trisulfides. The interesting and important topic of *d*-orbital bonding by sulfur is next interpolated; it could be profitably given separate chapter status. The stabilization of adjoining carbanion sites by mercapto, sulfonium, and sufone groups and the non-coplanar resonance which appears to occur with *d*-orbital involvement are well summarized. Thermal and photolytic homolyses of disulfides are briefly treated. A more extended discussion is given the radical displacement reactions of peroxides and disulfides, especially the chain transfer reactions of disulfides in polymerizations. Treatment of the heterolytic scission of S-S bonds by electrophilic and nucleophilic attack on sulfur follows. The chapter concludes with a brief consideration of the ionic and a fuller description of the radical addition reactions of thiols.

The remainder of the book deals with reactions of sulfur compounds which are less well understood. The reactions of mono- and diolefins, terpenes, and polyenes with sulfur to form organic sulfides are discussed. The mechanistically obscure dehydrogenation, aromatization, and dehydrocyclization reactions are well summarized. An especially provocative chapter is given to polysulfides as oxidants. The unsatisfactory state of understanding of the Willgerodt reaction is emphasized, and the less studied oxidations of aliphatic and alkylaromatic compounds are discussed from a mechanistic view. Brief chapters on the oxidation of ketones to thiazolines and α-mercaptoketones and on oxidations by sulfur at other sites (sulfide, amine, phosphine) conclude the main portion of the book.

A valuable addendum to the book is a comprehensive list of compounds whose oxidation by sulfur or polysulfide was studied during the period 1947–57. The reactants, conditions, products and yields are given along with references to the original work.

While the book does not pretend to be comprehensive, it is generally successful in its aim to provide a framework of mechanisms for organizing and summarizing some of the reactions of sulfur and sulfur compounds. It is even more successful in conveying a sense of the unusual features of sulfur chemistry and of some of the very serious gaps in our existing knowledge. It can be recommended as profitable reading to anyone having interest in the novel and complex chemistry of sulfur.

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FAT RANCIDITY, Summary Report from the Third Scandinavian Symposium on Fat Rancidity (Acta Polytechnica Scandinavica Ch. 21, 320/1962, Oslo 1962, 108 pp. 50 Norwegian crowns). This volume contains summaries of 8 papers, and of the discussions that followed the papers, given at the Third Scandinavian Symposium on Fat Rancidity held in Sandefjord, Norway, Aug. 28–30, 1961.

The papers deal with various aspects of the chemistry and technology involved in the autoxidation and rancidification of purified fatty compounds, soaps, food fats, and vitamins. Some of the biological aspects of rancidity problems also are considered. Although the Symposium was limited to 90 participants from Scandinavian countries, it gives a quite complete picture of all recent research done in Scandinavia on fat rancidity.

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COMPARATIVE NUTRITION OF MAN AND DOMESTIC ANIMALS—VOL. 1, THE NUTRIENT REQUIREMENTS OF THE ANIMAL BODY, by H. H. Mitchell (Academic Press, New York, 701 pp., 1962, $25.00). This large volume is divided conveniently into eleven chapters, most of which have numerous subheadings, as would be expected from the origin of the book. Dr. Mitchell, who has made valuable contributions to this field over the years, developed the text from his notes for teaching a graduate course in comparative nutrition. Consequently, the format is not like that of most books on nutrition, which were written for use as undergraduate texts. The early chapters cover the energy, protein, water and mineral requirements for maintenance. Next, he deals with nutrient requirements for muscular work, and for growth and senescence. A large section is devoted to the storage of nutrients in the body, with particular reference to fattening and obesity. Finally, the last three chapters discuss the nutrient requirements for mammalian reproduction, for lactation and also for egg production. The subject matter of each chapter is substantiated adequately by its own list of references, many of which go back over thirty years, but few of which represent publications during the last five years.

(Continued on page 56)

New Books . . .

(Continued from page 52)

In certain instances however, due to recently developed and more reliable analytical procedures, current results would have been more pertinent. To complement the extensive lists of contents, an author index and a complete subject index are included.

In many scientific books, comprehensive treatment is limited to the area related to the author's principal research interests. In this instance, however, with over seventy of his own publications cited, which embrace every chapter, Dr. Mitchell has provided a comprehensive treatment throughout. The book is bound attractively, and is typographically clean; only four errors were noted. In the chapter headings, there are unfortunate discrepancies in the use of prepositions, such as: 1) "The Maintenance Requirement of Protein," 2) "The Water Requirements for Maintenance," and 3) "The Mineral Requirements of Maintenance." The first example is ambiguous. For the present-day student, teacher or investigator in the field of nutrition, it is impossible to read more than a fraction of the vast volume of pertinent literature published during the last few decades. In view of this, the extensive coverage afforded by this text in a ready reference form is a welcome addition. The mood of the writing is that of an understanding teacher; thus the thoughts and appraisals are presented clearly, and this makes enjoyable reading regardless of the subject in question.

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Surface Chemistry: Theory and Industrial Applications, by Lloyd I. Osipow (Reinhold Publishing Corp., New York, 1962, 467 pp., $13.50). Of the sixteen chapters, the first nine provide theoretical background, while the latter are concerned with practical applications. Since many of the terms used have not been standardized, the introduction provides a well chosen glossary. Appropriately the first chapter is concerned with surface energy and surface tension. Since surfactants act through physical adsorption and chemisorption, these chapters necessarily follow. Solid and soluble monolayers at liquid interfaces exemplify the primary adsorption phenomena and chapters are devoted to each type. Necessary to a study of surface chemistry are the definition and properties of surfactants, and of their solutions. Chapters on wetting, emulsions, foams, detergency, oil flotation, lubrication, and corrosion inhibition complete the practical treatment of the subject.

This volume, ACS Monograph 153, follows well the purposes of the monograph series in providing the chemist, in form usable for those working in essentially unrelated areas, a thorough treatment so that use of the field may stimulate and expand research in their own areas. Surface chemistry, wetting agents, surfactants, and related subjects have been popular areas of publication. Many such books have exhaustively treated specific areas of surface chemistry, others have been aimed at highly theoretical treatments, others have covered only the very practical aspects, and still others have effectively surveyed the entire literature. Mr. Osipow has covered sufficient theory that reference to more extensive treatments may be made, and has included the more generally recognized mechanisms and procedures. A good approach to practical application of theory to measurements has been attained by including data useful as reference points.

The practical aspects of measurement, preparation of emulsions, and effect on foam for example, point up the utility of this reference volume. The complexity of detergency is discussed, and the practical knowledge and mechanisms of soil removal so far as theory applies is moderately up-to-date. More recent data are available to the specialist in this field, but the author has handled the subject well.

The chapter on lubrication could have been strengthened by consideration of available data on aqueous systems: The discussion cited is concerned almost exclusively with nonaqueous lubrication. More effort should have been given to enlarging the chapter on corrosion inhibition since the discussion contains little not available in other reference books, possibly more effectively handled.

The quality of this reference is such that were only one choice to be made applicable to general coverage of the theoretical and practical aspects of surface chemistry, this monograph should be chosen. Workers in other disciplines can rapidly and effectively learn how the chemistry of surfaces can apply to his own discipline.

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• *Industry Items*

Swift & Company, Chicago, Ill., recently announced a joint business venture with Liverpool Central Oil Co., Ltd., Liverpool, England, to be known as Swift's Chemicals (U.K.) Ltd. They will manufacture lubricants for steel mills, such as rolling mills; metallic soaps for wire drawing, and metal stamping industries. They will also produce Enstaph, an antibacterial laundry compound for hospitals. Other products will be emulsifiers and defoamers for the chemical and pharmaceutical industries and brominated oils for the beverage industry. Manufacturing will be in existing facilities now owned by the Liverpool Central Oil Co.