

BOOK REVIEWS

PERSPECTIVES IN ORGANIC CHEMISTRY, edited by Sir Alexander Todd. Interscience Publishers, Inc., New York and London. 1956. 527 pages, 9½ × 6 inches, indexed. Price \$7.50.

"This volume is dedicated to Sir Robert Robinson, O. M., F. R. S., on the occasion of his seventieth birthday, September 13, 1956, as a tribute to one of the great masters of organic chemistry." According to the foreword it has its origin "in the desire of a group of friends, colleagues and pupils of Sir Robert Robinson to honor on his seventieth birthday one who has by personal force and through his outstanding contributions, profoundly affected the development of organic chemistry." The book is to be regarded as "a collection of essays covering subjects with which each author is intimately associated; the essays do not seek to present subjects in full detail, but they contain something of the writers' own reflections and speculations."

The list of contributors is a veritable "Who's Who" of scientists active in some branch of organic chemistry, or in areas benefitting by the techniques and theories of organic chemistry, in a significant measure. The names of the authors and the titles of their articles will furnish an idea as to the scope of the book: (1) Linus Pauling, The Nature of the Theory of Resonance; (2) Paul D. Bartlett,

Reaction Mechanisms; (3) Wilson Baker, The Development of the Concept of Aromaticity; (4) D. H. R. Barton, Stereochemistry; (5) V. Prelog, Bedeutung der vielgliedrigen Ringverbindungen für die theoretische organische Chemie (The Role of Many-Membered Ring Compounds in Theoretical Organic Chemistry); (6) A. J. Birch, Biosynthetic Theories in Organic Chemistry; (7) R. B. Woodward, Synthesis; (8) Karl Ziegler, Neue Entwicklungen der metallorganischen Synthese (Newer Developments in Metal-Organic Synthesis); (9) E. L. Hirst, Carbohydrates; (10) Sir Alexander Todd, Nucleic Acids; (11) L. Ruzicka, Bedeutung der theoretischen organischen Chemie für die Chemie der Terpenverbindungen (The Importance of Theoretical Organic Chemistry to the Chemistry of Terpene Compounds); (12) C. W. Shoppee, Steroids; (13) E. Schlittler, Alkaloids; (14) J. W. Cornforth, Isotopes in Organic Chemistry; (15) Karl Folkers, Microorganisms in Organic Chemistry; (16) James Walker, Chemotherapy; (17) Holger Erdtman, Organic Chemistry and Conifer Taxonomy; (18) A. Butenandt, Organische Chemie und Genetik (Organic Chemistry and Genetics).

Four of the contributions (those by Prelog, Ziegler, Ruzicka and Butenandt) are in the German language, all the others are in English.

It would be virtually impossible, within the narrow limits of a review, to extract a sufficiency of typical material from all contributions so as to delineate their respective scopes. It should be said, however, that in spite of the wide variety of subjects, every chapter warrants careful perusal as a means of familiarizing any particular chemist-specialist with the developments and the trends in other specialized fields.

To select but a few salient features in an arbitrary manner, Birch's chapter emphasizes the "comparative anatomy" of organic structures occurring in compounds isolated from biological sources. Examples are the "isoprene" skeleton in terpenes, the pyrrolidine-tropane group in some alkaloids, the quinoline, isoquinoline and indole groups in others. Incidentally, this chapter has a direct bearing upon Follers' chapter on "Microorganisms in Organic Chemistry."

Woodward's contribution refers to the laboratory synthesis of substances occurring in nature which, in the author's opinion, provides a measure of the powers and maturity of organic chemistry. Following a historical introduction, this chapter considers several recent brilliant achievements (in some of which the author played a major role); among other things, the story is told of the synthesis of cortisone, of morphine, of strychnine and of other substances of "natural" origin. The author points to a number of unrealized specific objectives of organic synthesis such as that of colchicine, of tyrocidine, of chlorophyll and several others which he considers to be "clearly vulnerable" and whose "defenses will crumble" before long. On the other hand, penicillin and terramycin are referred to as "diabolic concatena-

tions of reactive groupings which will require the sharpest and most powerful tools for conquest" although some progress has already been made. Beta-corticotropin, a polypeptide consisting of some 39 amino acids, is justly described as "a repetitious monstrosity" whose synthesis may be well beyond the grasp of the organic chemist.

Woodward draws considerable satisfaction, however, from the accomplished synthesis of such materials as thiamine, riboflavin, ascorbic acid, pantothenic acid, biotin and folic acid which match the great technical accomplishments of the last century, *viz.*, the industrial synthesis of indigo and of alizarin. While discussing the synthesis of morphine, he modestly underplays his own role in this important development. He deplors the slow progress in the synthesis of molecules or systems possessing the capacities of enzymes for the direction and control of organic reactions; he feels that in spite of our present lack of understanding of the enzyme action, such systems "must obey the same basic laws to which all material systems are subject." He points to the recent success in the preparation of polypeptide chains by polymerization methods, also to the established fact that many natural proteins and synthetic polypeptides have one structural feature in common, *viz.*, "the beautiful alpha-helix." He emphasizes that some proteins at least, represent spontaneous aggregates of relatively small units, and that the same may be true of "that Brobdingnagian molecule," the tobacco mosaic virus. Woodward concludes the chapter by pointing to the fact that "organic chemistry has literally placed a new Nature beside the old," altering the whole face and manner of society by its prod-

ucts. He is convinced that "the creative function of organic chemistry will continue to augment Nature."

Skipping over to the chapter on "Nucleic Acids" by Sir Alexander Todd, reference is made to the recent work on the structure of desoxy-ribonucleic acid as a double molecule consisting of two polynucleotide chains in the form of right-handed helices coiled around the same axis and held together by hydrogen bonds to form a double helix. The desoxy-ribonucleic acids are constituents of chromosomes and probably represent the genic material. Mutations might be explained speculatively by certain changes in the components of the nucleic acids. Circumstantial evidence suggests that they are concerned with protein synthesis, among other things.

No abstract can begin to do justice to the highly specialized chapter by Ruzicka on the chemistry of terpene compounds. The many involved structural diagrams supply but a faint idea of the complicated character of this chapter of organic chemistry.

Shoppee's chapter on steroids begins historically with the observation made by Chevreul in 1815 that cholesterol is unsaponifiable. It takes the reader through the subsequent work of the many investigators into the areas of estrogens, androgens, andrenocortical hormones and vitamin D₃, all of which proved to be steroids. This dissertation is based upon a digest of 194 references.

Schlittler's chapter on alkaloids reviews their chemistry beginning with the isolation of morphine by Seguin in 1804. Among other things, it gives a comprehensive digest of the Rauwolfia field in which the author has been active.

Folkers' chapter contains a judicious selection of illustrative examples of biosynthesis by microorganisms. Mention is made of the production from sorbitol by *Acetobacter suboxydans* of *L*-sorbose which is converted ultimately to *L*-ascorbic acid or vitamin C. Another example is the formation of *L*-ephedrine from a phenylpropane-dione in which the first stage is carried out by yeast fermentation in the presence of benzaldehyde. Under the heading of biosynthesis belongs the production of the several penicillins; here reference is made to the numerous papers dealing with the identification of the biosynthetic penicillins, as well as to the attempts to verify their structure by laboratory synthesis, culminating with the total synthesis of methyl *d,l*-benzyl penicillinate sulfone.

It is well known that extensive use of pure cultures of various microorganisms has been made in the case of steroids to achieve specific chemical reactions such as oxygenation, hydroxylation and dehydrogenation. Among the microorganisms employed are some common molds of the order of *Mucorales*, several *Actinomycetes*, different strains of *Rhizopus*, and others; bacterial cultures, too, effect specific reactions with, and conversion of cortisone and other steroids (e.g., *Corynebacterium simplex*, *Bacillus sphaericus*). Folkers expresses the hope that among the newer antibiotics some will be found that will provide effective chemotherapy in virus infections which are not susceptible to such treatment at the present time.

Chemotherapy is, of course, directly related to organic chemistry. From this wide field, Walker selects for discussion the drugs used in the treatment of trypanosomiasis and malaria, as well as of bacterial

and viral infections. The theory of antimetabolites is discussed briefly from the viewpoint of obtaining fundamental knowledge for the devising chemotherapeutic agents.

Within the past decade there developed a branch of organic chemistry which Butenandt designates as "chemical genetics"; it inquires into the nature and composition of the genes, their *modus operandi* and their effects upon specific biosynthetic processes such as the formation of pigment in the eyes of insects which, in this chapter is dealt with as a model of gene activity.

This admittedly incomplete and eclectic review of the "Perspectives" aims to suggest the study of a book which can furnish a wealth of specialized information in several important branches of "pure and applied" organic chemical science thereby helping to keep the non-specialist *au courant* with the developments in these areas.—EMIL G. KLARMANN, Lehn & Fink Products Corp.

THE MANUFACTURE OF GLYCEROL. Vol. III, "The Modern Soap and Detergent Industry," by G. Martin and H. J. Strausz. The Technical Press Ltd., London, England. 1956. 256 pages, 6 × 9³/₄ inches, illustrated and indexed. Price 84 s. net.

This book is the Second Edition of Volume III of "The Modern Soap and Detergent Industry," first published in 1926. As stated in the preface, it has been the concern of the new editor to "insure that the basic material of the earlier volume was brought fully up to date." The bulk of the contents of the first edition has been reprinted, some chapters with alteration and many chapters with no alteration at

all. This reviewer feels that a great deal more could have been done by a more rigorous revision of most of the chapters, since while it is true that the basic principles are still valid, many changes have occurred during the past thirty years in equipment and technology which have not been covered adequately in the newer edition. As examples, no mention is made of modern continuous and automatic centrifuges now available for handling salt from the evaporators, equipment for continuous or semi-continuous distillation, nor the use of multistage steam ejectors for high vacuum distillation. In several places it is indicated that two distillations are required to produce chemically pure glycerol. This is no longer correct, except poor grade crudes.

The glycerol content of soap lyes (Sect. I, page 12) is shown as 4-8 per cent. Countercurrent kettle operation, as practiced in a number of plants today, enables a spent lye of 8-13 per cent glycerol. The continuous centrifugal system can produce lyes at 12-15 per cent glycerol.

A number of chapters reprinted from the earlier volume speak of the processes or equipment to be described as "recent" or "current" methods, which adjective was quite correct thirty years ago but not today.

Typographical errors in the original text are repeated in the new edition. For example, in Section I, Chapter VIII, page 66, the conversion from U. S. Gallons to British Imperial Gallons is the reverse of what it should be. In Section VI, Chapter V, page 34, the specific gravity of dynamite glycerol is given as 1.261 at 1.55°C. whereas on page 36 it is given as 1.262 at 15.5°/15.5°C.

In some cases the values shown for yields and operating conditions do not reflect modern practice. For example, in Section I, Chapter I, page 7, the "practical yield" of glycerol from some of the more widely used fats calculates to be only about 70-75 per cent. Few modern plants would tolerate such a low yield. Similarly, in the section on distillation, Section II, Chapter VII, page 35, an older reference is quoted saying that the loss during the distillation of crude glycerol runs from 15 to 40 per cent again very doubtful in modern practice. Similarly, in Section II, Chapter I, page 3, the statement is made that "usually 5% of glycerol is lost by decomposition, etc." On the same page the vacuum employed during distillation is shown as "Usually 25 inches."

In Section II, Chapter V on the bleaching of glycerol, the text describes the use of bone black and animal charcoal, but does not emphasize that these have been superseded very largely by activated carbons which are more effective.

Where monetary values are shown for material or operating costs, these are carried over exactly as they were in the first edition.

In the copy provided for review, the illustration facing page 6 in Section II was upside down.

The book as a whole is an excellent review of the development of the industry from early times, but suffers by the retention of too much that has become obsolete, and the lack of much that is new.

Good features of the book include the new chapter on synthetic glycerol, the description (somewhat brief) of the ion exchange process, the inclusion of new specifications, some of the newer analytical methods and newer references.

In general, this volume is a useful

addition to the library of those who wish to have the whole story on glycerol manufacture as it has developed through the years, but it has a limited value for those who wish to study the newest equipment and processes in use today.—W. A. PETERSON, Colgate-Palmolive Co.

INTRODUCTION TO CHEMICAL PHARMACOLOGY, by R. B. Barlow. Methuen and Co., Ltd., London and John Wiley & Sons, Inc., New York 16, N. Y. 1955. 343 pages, $5\frac{1}{2} \times 8\frac{1}{2}$ inches, illustrated and indexed. Price \$6.25.

This book is intended to bridge chemistry and pharmacology. For while most chemists look at pharmacology as a distant and mysterious science, the solution to the problem of drug action is a chemical problem. Yet without a fundamental background in some of the related sciences, the chemist will find himself in a physiological and pharmacological morass. Realizing this, the author has included a useful appendix to cover just this contingency. Perhaps the chemistry student should know this first, for by doing so he can understand the balance of the book.

The division of the material is satisfactory and easy to follow. The use of many structural formulas is definitely a chemist's approach.

If you do not have a book on pharmacology in your library, you will want to add this one; it is fairly priced.—M. G. DENAVARRE.

CHEMICAL BUSINESS HANDBOOK, by John H. Perry, Editor-in-Chief. McGraw-Hill Book Co., Inc., New York 36, N. Y. 1942 pages, $7\frac{1}{4} \times 9\frac{7}{8}$ inches, illustrated and indexed. Price \$17.

This book covers practically every facet of the chemical business from financing through accounting, chemical development, research in all its phases, purchasing, production, sales, advertising, credit, business and patent law, business mathematics, reports, toxicology and insurance to name some of the main divisions of the book.

A drawback is the small size of the type in many portions of the text.

In addition to the author, a host of collaborators or contributors have prepared many sections. Their names look like a who's who of the chemical industries.

This is not a mere handbook but an encyclopedia of information on every aspect of the chemical business. Many of the data are applicable to other businesses. The book will not run out of date. The material is basic.—M. G. DE-NAVARRÉ.