HETEROCYCLIC COMPOUNDS

Six-Membered Heterocyclic Nitrogen Compounds with Four Condensed Rings

By C. F. H. Allen, in collaboration with D. M. Burness, Jean V. Crawford, F. W. Spangler, Eleanor R. Webster and C. V. Wilson. (The Chemistry of Heterocyclic Compounds, Vol. 2.) Pp. xiii+345. (New York and London: Interscience Publishers, Inc., 1951.) 10 dollars.

Thiophene and its Derivatives

By Howard D. Hartough; with Special Chapters by F. P. Hochgesang and F. F. Blicke. (The Chemistry of Heterocyclic Compounds, Vol. 3.) Pp. xvii+533. (New York and London: Interscience Publishers, Inc., 1952.) 16.50 dollars.

THESE two volumes are the second and third, respectively, of a series of monographs which are designed ultimately to cover the entire field of heterocyclic chemistry.

The contents of the second monograph of this series, "Six-Membered Heterocyclic Nitrogen Compounds with Four Condensed Rings", call for rather careful description. Regarding pyridine as aza-benzene, it will be appreciated that several poly-aza-benzenes are conceivable and, since the fusion of four benzene rings gives rise to seven distinct aromatic structures, the possible aza-analogues of these and of their hydroaromatic derivatives must be very numerous indeed. Relatively few are known, however, and in the present volume the number is further reduced by exclusion of benzacridine and benzophenazine types and of all compounds in which nitrogen as hetero-atom is shared between rings. Subject to these restrictions the compounds are classified and treated in the following order: aza- and poly-aza- derivatives of naphthacene, benz[*a*]-anthracene, benzo[*c*]phenanthrene, chrysene, triphenylene, benzanthrene and pyrene. Further subdivision is based on the number and position of the nitrogen atoms in the molecule, and sectional discussions are followed by descriptive lists of individual compounds, complete with references to the end of 1950. Nomenclature is treated in a rational manner, and, as is explained in the preface, an attempt is made through a comprehensive index to anticipate and cope with the difficulties of those who consult the volume on a particular quest.

The method of presentation is open to the criticism that it uses a canvas which is too large for the present-day picture. Apart from certain groups of dyestuffs and alkaloids of the chelidonine and aporphine types, there has been little systematic investigation and still less correlation among the known compounds of the class. None the less, it is the authors' achievement to have rescued this family of heterocycles from its interment in the journals or from, at best, the seclusion of dispersed and neglected paragraphs in major text-books. The volume is not only a record of existing knowledge but also, both explicitly and by implication, it points the need and marks a field for future research.

The monograph on "Thiophene and its Derivatives" presents, in fifteen chapters, a comprehensive account of these compounds, covering published work almost to the end of 1949. An additional chapter deals with selenophene and tellurophene analogues, but compounds containing condensed ring systems are reserved for a later volume. The earlier chapters contain such general topics as the history, occurrence and synthesis, together with the general physical and chemical properties, of thiophene and its homologues. A special chapter (contributed by F. F. Blicke) describes the toxicology and pharmacology of the compounds. Another special chapter (by F. P. Hochgesang) presents an informed discussion of the molecular structure and spectroscopy: it contains diagrams and tables relating to ultra-violet and infra-red absorption spectra, together with mass-spectral data, as obtained in the author's industrial laboratory. A helpful survey of factors affecting substitution in the thiophene nucleus precedes the systematic treatment of the various classes of thiophene derivatives, which occupies the major portion of the book. The treatment here is both authoritative and critical: it is kept within reasonable limits by the judicious use of tabulated information, all of which is fully documented. Each chapter is provided with an appropriate set of footnote references, and, in an appendix, laboratory preparations are given for some thirty representative thiophene derivatives. An efficient index completes the volume, which will undoubtedly become a standard work of reference for thiophene chemistry and, in its early chapters at least, will amply repay the attention of the general reader of chemistry.

QUANTUM MECHANICS OF VALENCE

Valence

By Prof. C. A. Coulson. Pp. x+338. (Oxford: Clarendon Press; London: Oxford University Press, 1952.) 25*s*. net.

DURING the past twenty-five years the application of quantum mechanics to the problem of the structure of molecules has led to great clarification of the chemical concept of valence. Prof. C. A. Coulson, who has made important contributions to the subject, has pointed out that every chemist should have an understanding of the quantum mechanical theory of valence, and he has written a book, as a supplement to the text-books of chemistry, to provide a basis for this understanding.

Chemistry is a large subject; and quantum mechanics, even the parts of quantum mechanics that relate to chemistry, is also a large subject, and quite different in general character. The problem of presenting quantum mechanics in relation to chemistry in a short book in such a way as to be helpful rather than confusing to the student is a difficult one. Coulson has attempted to solve it by giving sketchy accounts both of the mathematical methods of quantum mechanics and of the facts of structural chemistry. In his book the empirical system (the chemical system) of valence and molecular structure is discussed only briefly. The quantum mechanical system, however, is also presented rather briefly and superficially. It is my opinion that a student (the author says in the preface that the book is intended for chemical students) needs to build up a solid and complete framework of one sort or another, without gaps. Although the author states that practically no mathematics is needed for his purpose, the book contains many quantum mechanical equations, some of which are obtained from earlier equations in the book by methods that are not presented to the reader. This treatment—which might be called