

reach a wide audience including "the businessmen, the pharmaceutical executives, the government officials who must make decisions to spend research dollars" as well as stock brokers, chemists, teachers, biologists and clinicians. Probably no single one of these individuals will be entirely satisfied since the biologist, for example, will find some of the biology rather elementary, and the chemist may find the description of some of the processing not too informative. Nonetheless, the author has succeeded in presenting an extremely readable account of each of the phases of what has become a far flung industrial and research empire.

The author finds the important therapeutic applications to be in inflammatory disease, cancer, problems of reproduction, renal and cardiovascular disease, atherosclerosis, growth and aging, and in a group of minor conditions affecting hemodynamics, central nervous function and skin and hair (including cosmetic applications). In discussing these presently practiced therapeutic applications, the author automatically recognizes the ubiquity of the steroids as regulatory hormones. It is indeed a fact that very few if any tissues and organ systems are exempt from steroid regulatory activity. That therapy is necessarily an application of steroid physiology is, on the other hand, clearly debatable in many instances. The author recognizes this in stating: "Already the use of the natural steroid hormones and their modification has assumed enormous importance in the treatment of diseases which are not primarily due to endocrine dysfunction." It is primarily for this reason that the steroids are considered as drugs which act to stimulate hypoactive tissues or to inhibit tissues which are excessively active. The remarkable feature of these drugs is that, used for a specific effect, they have a large number of "side effects." These side effects are merely reflective of the inherent biological activity of the steroid molecule in one or more special configurations.

Perhaps the greatest service that the book renders is the painstaking cataloging of biological activities for well over one thousand compounds. The structural formula of each is given along with the major functional potency or potencies. Moreover, wherever possible the author gives quantitative data on relative potencies in a special tabular listing. Finally, a most useful table is a list of the commercially available steroid drugs with the trade name of each and the name of the manufacturer.

There are a number of additional useful features of this book including a fairly comprehensive bibliography to each of the several chapters. It is rather interesting that in presenting citations to the biological literature the author is careful to give the title of each publication, whereas in referring to production processes only the author and journal are given. Much more important are the detailed discussions of endocrine principles involved in the use of various types of steroid. The author thus becomes involved in such diverse questions as: "Is coronary atherogenesis an endocrine problem?", aldosterone and edema, disorders of menstruation, hormones and carcinogenesis and so on. The degree of attention given to each of these matters is, as might be expected, quite varied and to some extent reflects practical usage rather than biological interest. However, a generally well balanced presentation is made, particularly in view of the type of audience envisaged by the author.

In summary, this book merits careful reading as a treatise on steroid chemistry, industrial technology and biology. In addition to this analytical presentation, an extraordinary service is done in the steroid cataloging and classification, and in the presentation of biological activity and chemical structure.

THE WORCESTER FOUNDATION FOR EXPERIMENTAL BIOLOGY
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Anorganische und Allgemeine Chemie in Einzeldarstellungen.
Band III. **Chemische Bindung und Molekülstruktur.** By L. E. SUTTON, D. Phil., F.R.S., Oxford. Translated by Dr. EKKEHARD FLUCK, Heidelberg. Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf, Germany. 1961. vii + 122 pp. 15.5 × 23 cm. Price, DM. 19.80.

This book is the compilation of a series of lectures given by Dr. Sutton before the scientific and mathematical faculty at the University of Heidelberg and it was translated into German by Dr. Ekkehard Fluck. The book treats the molecular structure and chemical bonding of inorganic compounds, principally. The material is divided into the following seven chapters.

1. Basis of Atomic Structure
2. Molecular Structure of Diatomic Molecules
3. Stereochemistry of Polyatomic Molecules
4. Resonance Electron Delocalization
5. d-Orbitals and Chemical Binding
6. Coordination Compounds of the Transition Metals
7. The Aromatic Complexes of the Transition Metals

Sutton makes much use of group theory in discussing various compounds as well as in developing crystal field theory. The text is well illustrated, showing many diagrams of molecular orbitals. Of necessity the theories developed are largely qualitative but

liberal use is made of the known parameters of molecular structure. The resulting discussion is useful and interesting. Those who are interested in molecular structure and who are not deterred by the language barrier will find the book a valuable addition to the literature.

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Heterocyclic Chemistry. An Introduction. By ADRIEN ALBERT, Ph.D., D.Sc., F.R.I.C., Professor of Medical Chemistry in the Australian National University, Canberra. Oxford University Press, Inc., 417 Fifth Avenue, New York 16, N. Y. 1959. viii + 424 pp. 14.5 × 22 cm. Price, \$9.00.

This excellent book treats heterocyclic chemistry in a unified fashion and succeeds in presenting in a very readable style a coherent picture of underlying principles. The experimental results of heterocyclic chemistry are now summarized in descriptive (ring system) monographs which adequately cover the field. However, in organic and theoretical organic texts purporting to cover the entire field of organic chemistry, heterocyclic chemistry is either not mentioned or is treated in a cursory manner certainly not commensurate with its chemical significance and its proportion of organic compounds. Therefore, there has been an urgent need for books to fill this void. Of the few texts on heterocyclic chemistry published to date, only this book and one by A. R. Katritzky have broken with precedent and presented the subject in new ways.

The general format of the book is novel and good. The major part is devoted to heteroaromatics which are divided into π -deficient (Ch. IV) and π -excessive (Ch. V and VI) sections. The theoretical basis for the chemical differences is discussed in these chapters as well as in introductory Chapter III. Included with the "parent" π -excessive rings containing NH (Ch. V) or O and S (Ch. VI) electron-donating centers, is the effect of introducing varying numbers of electron-attracting sp^2 nitrogens ($=N-$) to give imidazole, tetrazole, oxazole, thiadiazole, etc. In view of the reactivity of some of these azoles and their derivatives toward nucleophiles, it may seem misleading to classify them as π -excessive (having an electron-donating hetero center). However, the varying and possibly vanishing degree of π -excessiveness and the presence, e.g., in thiazole, of centers of both π -deficiency and π -excess is pointed out.

The three main chapters consider physical and chemical properties in a correlative manner, taking up first the unsubstituted rings and proceeding to reactions at substituted carbons and then to reactions in side chains. Use of the same sequence of subdivisions in each chapter facilitates comparison between π -deficient and π -excessive types. Comparison within these types is accomplished by having all the appropriate ring systems under each subdivision. These subdivisions are: (a) solubility, (b) acidic and basic strength, (c) ultraviolet spectra, (d) action of acid and alkali, including ring stability, (e) nature of tautomeric derivatives, (f) electrophilic substitution, (g) nucleophilic substitution, (h) addition reactions, (i) oxidations and reductions, (j) homolytic reactions and (k) side-chain reactions. These units total about two-thirds of each of the three main chapters and are followed by a section of "monographs" discussing ring-syntheses and the general significance of compounds containing the rings (arranged systematically), with references to the latest reviews and monographs. One valuable feature is the inclusion throughout the text of recent literature references, totaling 950, to all significant items. The chapter on heteroethylenics discusses dihydro and polyhydro derivatives of heteroaromatics of the previous chapters and also brings in new ring systems having varying degrees of π -electronic character in their uncharged (e.g., γ -pyrone) and charged (e.g., 4-methoxypyronium cation) forms. Further comparisons of heterocycles (differing in number and nature of hetero atoms) with each other and with their carbocyclic analogs as well as the effects of substituents are discussed in separate short chapters on Spectra (43 pp.), Ionization Constants (11 pp.), Oxidation-Reduction Potentials and Dipole Moments (11 pp.), and Rational Approaches to Ring Syntheses (8 pp.). The format of the book makes clear where gaps exist in present knowledge both in relation to type of reaction and to ring system. It also makes clear certain effects of heterocyclic rings on reactions and properties which are obscured by the frequent admonition to regard heterocycles simply as somewhat modified carbocycles (analogous to nitrobenzene, etc.).

The inclusion of heteroparaffinics (Ch. II, 27 pp.), the polyhydro portion (ca. 7 pp.) of heteroethylenics (Ch. VII) and Interpretation of Complex Formulae (Ch. XI, 10 pp.) has a certain justification. However, they are mainly descriptive portions which illustrate the principle quite clearly stated in the first two sentences of Chapter II: *saturated heterocyclics are essentially aliphatic in nature.* These items could be omitted without loss to the main contribution of this text: the organization of hetero-

aromatic chemistry around electronic theory. Inclusion of the dihydro derivatives is deemed pertinent because of their tendency to revert to aromatic structures. Although the space involved is small (*ca.* 44 pp.), more benefit would be derived from devoting it to an enlargement of Professor Albert's treatment of hetero-aromatics by (1) expansion of Chapter III (now only 8 pp.) by including more theoretical detail as well as the general aspects of electrophilic and nucleophilic substitution and of ring stability, (2) use of more structural formulas in the text, and possibly (3) additional discussion of the rings with three or more hetero atoms. Additional space and a smoother presentation in Chapter VIII could be provided by using much smaller spectral tracings (these occupy a separate section of 24 pages, many half-filled) and inserting them on the appropriate pages with the legend in the text. This suggestion is not intended to disparage this very worthwhile chapter on spectra.

Errors and mis-statements are rare: line 16, p. 244 should read "unstable"; line 8, p. 274 should read "hydrogenation"; and on p. 373 the ring syntheses of the first paragraph yield 6- and 7-membered rings rather than 5-membered rings as stated.

The index comprises a good choice of entries emphasizing subject matter and is quite adequate (22 pp.).

This book should be useful for students as well as research workers entering the field. Its organization around electronic theory and the discussion of physical methods can provide a new slant for "old hands" as well.

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