

One of the prime merits of the book is its clarity of style and the skill with which new principles and concepts are set forth. In the chapter on X-ray diffraction, for example, a surprising number of relatively sophisticated topics are treated with ease and understandability. Although some subjects such as diffraction geometry and the Ewald construction are presented without proof, the authors do not oversimplify matters, and there is nothing which would have to be unlearned later by the advanced student. The bibliography in this chapter has been selected well, and it is presumed that equal care has been taken with those of other chapters.

In sum, although some fault could doubtless be found with each chapter by a specialist in that field, the non-specialist could hardly ask for a better introduction to the several fields. The reviewer has made the chapters on symmetry and X-ray diffraction required reading for new research students for nearly two years, and the comments in this review stem in part from the excellent results which have ensued. There are some books which are a pleasure to read as well as to learn from, and this is one of them.

DEPARTMENT OF CHEMISTRY
AND CHEMICAL ENGINEERING RICHARD E. DICKERSON
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Toxicity of Beryllium Compounds. By LLOYD B. TEPPER, M.D., Research Fellow to the Beryllium Case Registry and Clinical Fellow in Medicine at the Massachusetts General Hospital, Boston (Mass.), HARRIET L. HARDY, M.D., Medical Department, Occupational Medical Service, Massachusetts Institute of Technology, Cambridge (Mass.), and RICHARD I. CHAMBERLIN, B.S., Industrial Hygiene Engineer, Occupational Medical Service, Massachusetts Institute of Technology, Cambridge (Mass.). D. Van Nostrand Company, Inc., 120 Alexander Street, Princeton, New Jersey. 1961. viii + 190 pp. 13 × 19 cm. Price, \$4.00.

The authors summarize the toxicology of beryllium and its compounds in language and with a point of view appropriate for the industrial hygiene engineer and for the physician specializing in occupational disease. Because two of the authors are specialists in occupational health and the third is an industrial hygiene engineer, the successful fusing of these interests is understandable.

Chapter one defines the terminology of beryllium disease and follows its history and epidemiology in painstaking detail. The role of one of the authors (H.L.H.) in identifying the chronic illness is modestly cited: "The clinical syndrome, now designated as chronic beryllium disease did not appear in the literature until 1946, when Hardy and Tabershaw described illness in 17 fluorescent lamp workers in Salem, Massachusetts, under the diagnostic heading of 'delayed chemical pneumonitis.'" The authors' authoritative discussion is based on "the 616 known cases of beryllium disease in the United States" (including 47 "neighborhood cases") whose records are maintained in the Beryllium Case Registry at the Massachusetts General Hospital, Boston.

The second chapter describes acute beryllium disease: *viz.*, dermatitis, ulcer, conjunctival inflammation, and two forms of acute pneumonitis. Chapter three discusses with illustrative case material chronic beryllium disease, its latency, its signs and symptoms—pulmonary and systemic—its course and prognosis, its differential diagnosis and treatment. The X-ray changes in beryllium disease are illustrated in chapter 4. The pathology of acute and chronic disease is tersely described in chapter 5. The usefulness of pulmonary function tests (chapter 6) and of the beryllium patch test (chapter 7) is critically assessed, *e.g.*, "... the use of the (patch) test in screening persons who are to be exposed to beryllium is undoubtedly best avoided." In chapter 8 experimental animal studies are reviewed, including carcinogenic effects. The authors on occasion leave the final decision up to the reader: "granulomata in the lungs of rats and guinea pigs have been produced by exposure of the animals to several beryllium compounds. It is not possible to say that these lesions represent an experimental counterpart to chronic beryllium disease in man, . . ." (p. 113). Patterns of distribution and excretion of beryllium (chapter 9) depend on dose size, *i.e.*, tracer quantities or

with carrier. Attempts to treat beryllium disease with chelating agents, such as ATA or sodium salicylate, are reported, although objective evidence of improvement cannot be furnished. Chapter 10 entitled "Industrial hygiene aspects of beryllium toxicology" gives (a) materials and uses (b) the principal sources of exposure, (c) recommended methods of air sampling, (d) evaluation of the maximum permissible concentrations which "may be over-conservative" but demonstrate "that the use of beryllium need not be associated with hazardous exposures." A 13-page reference list and a brief index conclude the volume.

This book is clearly stated, readable, and authoritative. The resumes are buttressed by carefully selected detail. The authors offer their own expert opinions to illuminate the subject.

DEPARTMENT OF PHARMACOLOGY HAROLD C. HODGE
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Molecular Orbital Theory for Organic Chemists. By ANDREW STREITWIESER, JR., Associate Professor of Chemistry, University of California, Berkeley, California. John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. xvi + 489 pp. 15.5 × 23.5 cm. Price, \$14.50.

This book attempts a number of things and, on the whole, is remarkably successful, although not all the topics come off equally well. The major fraction of the book (306 out of about 450 pages) is a critical survey of literature concerned with the correlation of measurable properties by Hückel type molecular orbital calculation and its fairly straightforward extensions. No one is better qualified to do such a job than the author and he has done it superbly. The review is both exhaustive and critical and the original work is frequently extended with calculations appearing here for the first time.

The book is also intended to serve as a textbook for the student learning to make molecular orbital calculations. The workbook sections closely resemble Roberts' recent book, "Notes on Molecular Orbital Calculations," and both bear a family resemblance to a set of notes on the same subject which were in use at M.I.T. when the reviewer was a student there. Both current versions are good and will be very helpful to a beginner in this field. The reviewer is inclined to think that the Roberts' version will be easier for a neophyte to follow but this will, no doubt, vary somewhat with the individual.

Chapters introducing quantum mechanics, more advanced methods, and describing matrixes and group theory are also included. (The dust jacket calls specific attention to the latter.) The first two seem too short to be really effective. The first chapter may serve to jog the memory of one who has already had an introduction to quantum mechanics, and it wisely emphasizes those topics that are related to what follows. It will not serve well as an introduction to the subject for the student who is not already well grounded. The chapter on group theory will also be very rough going unless supplemented from other sources. The chapter on advanced methods does a good job of outlining the direction taken by more rigorous methods and this is plainly all that is intended.

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Advanced Organic Chemistry. By LOUIS F. FIESER, Sheldon Emery Professor of Organic Chemistry, Harvard University, and MARY FIESER, Research Fellow in Chemistry, Harvard University. Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y., 1961. ix + 1158 pp. 16.5 × 24 cm. Price, \$14.00.

The Fiesers' "Advanced Organic Chemistry" may be viewed as a new edition of their "Organic Chemistry" which first appeared in 1944 followed by second and third editions in 1950 and 1956. As the authors indicate, the current title was selected to distinguish the present volume from its predecessors and is "advanced" only in the sense of addressing itself to students of all levels of competence.

The authors have been remarkably successful in achieving their goal of presenting "a reasonably up to date and complete account of fundamental organic chemistry as interpreted by modern theory." One can only be amazed by their awareness and comprehension of so many aspects of modern organic chemistry.

Of the forty topics (chapters) comprising the third edition of "Organic Chemistry" twenty-nine are recognizable in a more modern version, in the thirty-one chapters of "Advanced Organic Chemistry." The remaining eleven either have been incorporated in part in the new book, or have been abandoned. Thus, in "Advanced Organic Chemistry" there is less separate emphasis on carbohydrate, lipid and protein metabolism, heterocycles, alkaloids, polymers, dyes, isoprenoids, steroids, vitamins and chemotherapy. However, some of the compounds and reactions formerly placed in these latter categories are encountered in the new book under other headings.

There are many features of "Advanced Organic Chemistry" that are exemplary: generally excellent narration, meticulous attention to nomenclature which is consistent if not always standard, good illustrations, many useful tabular summaries and a helpful glossary. The authors are not overwhelmed by the pontifical edicts of committees on nomenclature. One can understand the Fiesers' preference for the prefix desoxy which officially is sanctified for use with steroids, but sinful when applied to carbohydrates. The reason for their favoring carbobenzyloxy over carbobenzyloxy is less obvious.

The first three chapters on "The Nature of Organic Compounds," "Structural Types" and "Stereochemistry" provide a lively and effective introduction. However, the pedagogical tactic of overstatement used in the first chapter to erect a wall between inorganic and organic chemistry can be questioned. In contrast, the extensive use of molecular models in lieu of qualitative molecular orbital representations to illustrate the geometrical properties of chemical bonds is, in the reviewer's opinion, sound pedagogy. In an otherwise succinct, complete and modern account of stereochemistry the lack of reference to the Cahn-Ingold-Prelog convention is conspicuous.

The second three chapters, dealing with the alkanes, alkenes and acetylenic compounds, set a desirable pattern in which concepts, introduced in part in the previous chapters, are skillfully woven into the fabric of modern empirical knowledge. The advantage of this treatment, which emphasizes the experimental nature of organic chemistry and its development as a science, probably outweighs the disadvantage of having a reaction identified with a particular compound or set of compounds. The latter difficulty can be alleviated by extensive cross indexing which in "Advanced Organic Chemistry" is generally good but not infallible. An attractive feature of the presentation, particularly in the case of the alkenes and alkynes, is the use of conformationally determinate molecules, generally steroids, to illustrate the steric course and mechanism of, for example, addition and elimination reactions.

Chapter seven, "Petroleum," is the only survivor of the more numerous accounts of applied organic chemistry contained in the earlier "Organic Chemistry." While the Fiesers' knowledge of the various facets of petroleum chemistry is extensive, the reviewer felt that he was diverted from an exciting stream of thought by this chapter and was anxious to return to the pattern of the previous ones.

The next three chapters provide a current and encyclopedic account of alcohols, displacement reactions and halides and are focused on an area of organic chemistry that has attracted physical-organic chemists for the past two decades. The treatment has plucked recent results from investigators in the van of this discipline and incorporated them into exceptionally readable and informative chapters. Largely because of a brief exposition of electronic spectra in the chapter on alkenes, the absence of a comparable section on infrared spectra is particularly noticeable when spectral data of the latter kind are abruptly introduced in the chapter on alcohols.

Carboxylic acids, aldehydes and ketones and condensation reactions comprise another homogeneous unit considered in

chapters eleven, twelve and thirteen. The coverage is both modern and extensive. It is not surprising that disagreement will arise about mechanisms—the reviewer finds it difficult to believe that hydroxylamine and base will give rise to significant amounts of HNOH^- as suggested on p. 435. There are others where the authors and readers will disagree. In any case, the readers will be indebted to the authors for centering attention on problems of mechanism.

Chapter fourteen is devoted to amines and fifteen to ring formation and stability. In view of the high quality of these two chapters, and particularly the latter, it may appear trivial to question that tertiary aliphatic amines are indifferent to nitrous acid (pp. 508, 718) and raise the question as to why the authors have not chosen to refer to "Organic Reactions" where, for example, there is a particularly good chapter on the Hofmann elimination. Also, having been conditioned to expect only excellence the absence of reference to the dehydration of amides to nitriles by an acid chloride and a tertiary amine was noticeable. However, this lapse was almost forgotten in reading the next paragraph which describes Cornforth's and Popjak's elegant demonstration of the isotope pattern of cholesterol produced from labeled acetate. The historical account of Perkin's venture into small ring chemistry is most appealing and alleviated the pain produced by lack of reference to NMR data in discussing Feist's acid.

In chapters sixteen through twenty-eight attention is focused on the chemistry of aromatic compounds. Beginning with a recapitulation of the benzene problem, in chapter sixteen, and with the scene set in the following chapter by a brief but generally adequate discourse on aromatic substitutions, the reader is brought face to face with a large and representative body of aromatic chemistry. As before, experiment and theory are effectively wed and except for a few minor lapses the account is excellent, with the chapters on quinones and arenones and on naphthalene being particularly notable. The section on aromatic chemistry is concluded with a chapter on nonbenzenoid aromatics and pseudoaromatics, which is both retrospective and modern. In the chapter on arylamines it was surprising to find no mention of the synthesis of isocyanides by dehydration of N-substituted formamides and formation of phenolic acetates by reaction of the corresponding diazonium fluoroborates with acetic anhydride, the latter being an exceptionally clean route from arylamines to phenols.

"Advanced Organic Chemistry" concludes with three chapters on carbohydrates, lipids and proteins. In the chapter on carbohydrates the Fiesers note but do not consistently use IUPAC nomenclature. The topics chosen for discussion are reasonably representative, but on the whole the treatment is less inspired than that of the preceding chapters. The same can be said of the last chapter on proteins, which tends to become bogged down with a recitation of too many isolated topics. However, it was gratifying to find on p. 1034 that "collagen on being boiled with water is converted into water-soluble gelatin" after encountering on p. 801 the statement that, "Hide contains the water-soluble protein gelatin, the main constituent of glue. A tannin renders gelatin (ox glue) insoluble and thereby converts hide to leather."

The discussion of peptide synthesis suffers from lack of appreciation of the racemization problem and many chemists who have become victims of that deceptively enzyme urease will become even more unhappy on learning, on p. 1061, that it is a "pure crystalline enzyme."

"Advanced Organic Chemistry" is one of the best books of its kind. It is exceptionally well written and the erudition of the authors is most impressive. Its usefulness in instruction is enhanced by many sets of problems. It is compound rather than reaction oriented and could be improved by more extensive cross-indexing not only of compound and reaction, but also compound and physical property. Its production has been described by L. Fieser (*J. Chem. Ed.*, 39, 99 (1962)).

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