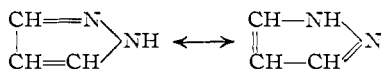


discussed. This enthusiasm no doubt would wane rapidly as the student gained maturity and came to realize that most of the subjects are accorded only a very shallow treatment. Since this is also true of almost any useful elementary text, there would be no harm done if it were not for the danger that some fundamental misconceptions will have taken permanent root in our student's mind.

The book fairly bristles with curious inconsistencies which perhaps teach a sobering lesson. It seems that the author has thought carefully about many recent developments in the areas of structural theory and reaction mechanisms. As a consequence, his statements of principle often are made with care and precision. Unfortunately, the reduction to practice is not carried out with similar care. As a consequence, statements occur in the discussion of specific problems which seem to be in direct conflict with the author's best understanding of basic principles. We are presented with an example of the deadly influence which one's early impressions exert on his intellectual functions. As an example of this conflict between ingrained reflex and mature thought, one turns naturally to Chapter V which bears the title, "The Bonding of Atoms to Form Molecules." In section 15, the terms *resonance* and *mesomerism* are discussed with considerable insight. The singularity of molecular structure and the useful artifice of writing down resonance structures are discussed very nicely and a clean-cut distinction is drawn between the *phenomenon* of tautomerism and the *resonance method* for the description of molecules. However, in the very next section this clarity of presentation is lost. For example, in the discussion of the structure of urea, the reader will surely be guided by his own predisposition if he finds a basis for distinction between resonance and prototropic tautomerism in the author's discussion. Deference is paid to the distinction at the end of the discussion, but it is probably too late to protect the sanctity of the intellect of our neophyte and even then the issue is clouded by the author's concern about the non-isolability of both tautomers. Similarly, on page 102, it is unequivocally stated that pyrazole "can be symbolized as a resonance hybrid thus



No substantial improvement in tone is found in the later chapters which deal with reaction mechanisms. The best sections are those in which the author states he has made "special use" of Hammett's "Physical Organic Chemistry" and such material has not been improved by the transfer from the earlier book. In general, various suggestions concerning mechanisms are presented in a rather uncritical manner and the reader is given no reliable means of distinguishing between classic studies and the most casual suggestions of other authors. In some instances, the presentation of conclusions is not even faithful to the original works. It is doubtful that Roberts and his co-workers will be pleased to find themselves credited on p. 257 with the suggestion that the ethyl cation has a bridged structure since it was their conclusion that their work rigorously disallowed this possibility.

Since the author has contributed important work to the field of free radical chemistry, it is disappointing to find that the discussion of radical mechanisms propagates many of the usual errors and generally presents the field as it stood some ten or fifteen years ago.

It is the considered opinion of this reviewer that Hermans has not succeeded in properly *introducing* theoretical organic chemistry and that the acute need for a text which will do so remains unabated.

DEPARTMENT OF CHEMISTRY  
IOWA STATE COLLEGE  
AMES, IOWA

GEORGE S. HAMMOND

**Biochemistry of the Aminosugars.** By P. W. KENT, M.A., B.Sc., Ph.D., D. Phil., F.R.I.C. and M. W. WHITEHOUSE, B.A., B.Sc., A.R.I.C., Department of Biochemistry, University of Oxford. Academic Press Inc., Publishers, 125 East 23rd Street, New York 10, N. Y. 1955. ix + 311 pp. 14.5 × 22 cm. Price, \$6.80.

Thirty years have elapsed since the publication of P. A. Levene's monograph on hexosamines and mucoproteins.

During this period, the field of amino sugars has increased tremendously and the publication of *Biochemistry of the Aminosugars* by Kent and Whitehouse fills a very urgent need.

While Levene's treatise was mostly a discussion of the chemistry of aminosugars, of chondroitin sulfuric acid and some considerations on mucoprotein and glycoprotein, with more than a quarter of the literature being Levene's own publications, Kent and Whitehouse report the work of more than a thousand scientists. Subjects as varied as the interaction of influenza viruses with cells, the bacterial polysaccharides or the synthesis of aminosugars are discussed. The book is divided into two parts, one devoted to the aminosugars in the biological environment, the second to the chemistry of the aminosugars. In the first part, the distribution of the mucosubstances in tissues and in fluids, the enzymic degradation of the aminosugar-containing substances, the properties and distribution of aminopolysaccharides are discussed. This part points out the enormous development of the field of aminosugars in recent years. These sugars are found in various high molecular substances like hyaluronic acid, chondroitin sulfuric acid, heparin, chitin, blood group substances, serum mucoproteins, bacterial polysaccharides or in small molecular compounds, antibiotics, products of metabolism, etc. We are to be grateful to the authors for the vast amount of time and effort spent on the survey of so many large fields.

The second part is devoted to the chemistry of the aminosugars and their various derivatives. As compared with the chemistry of other biologically important monosaccharides, like glucose, it is rather limited and much progress is expected in the future, especially in the realm of synthesis. The authors have given an excellent review of the progress up to date. The book is very easy to read and clearly written, with an excellent classification.

The development of science in the last few decades presents a real problem of communication and has given birth to a series of specialized reviews, like the various "Advances," where a specialist can discuss at length the particular phase of a problem. Unfortunately, however, many a year elapses, usually, before the neighboring fields are covered. It is the function of a treatise to fill the gap and to establish the correlation between those various phases of a problem. This requires a very critical mind and, at the same time, a vast knowledge, theoretical and practical, of the work discussed. The reviewer doubts that these ends were achieved in the review of so vast a field as the one selected by Kent and Whitehouse. What was still possible thirty years ago in a relatively small field for Levene is not possible any more today. However many good points there may be in this compilation, there are too many defects for the reviewer not to feel compelled to mention them.

Some original work is not mentioned, as for instance the preparation of a crystalline salt of chondroitin sulfate by Einbinder and Schubert (p. 74), or the isolation of aminosugar-containing mucosubstances from serum by Winzler and by Schmid (p. 125). No critical evaluation of various modifications of a technique is given, for example, in the use of the methylation procedure in the elucidation of the structure of aminopolysaccharides (p. 62). The authors have not avoided the danger of stating as a fact what has only been advanced as a tentative explanation in an original work. For example, no clear evidence has ever been presented for the presence of 1,4-linkages in chondroitin sulfate (p. 82), no 2,4-dimethylglucuronic acid and 3,6-dimethyl-2-amino-2-deoxy-D-glucose have ever been isolated from methylated hyaluronic acid (p. 106) and this last compound has never been differentiated from its 4,6-dimethyl isomer by periodate oxidation (p. 208); it is extremely doubtful that hydrolysis of a glucuronidic linkage can occur in presence of Dowex-50 alone (p. 61). The reviewer is of the opinion that it is unfair to workers in the field to present startling statements, in disagreement with the concepts accepted at the present time, without referring to published work. The reviewer has in mind specifically the presence of glucosamine in chondroitin (p. 241) and the importance of the furanoside form in the immunological and enzymic properties of mucopolysaccharides (p. 229). The reason for publishing analytical data on various hyaluronic acids, where the purest contain 10% and the most impure contains up to 50% of impurities (p. 105) is not understandable when there exist in the literature data for much purer specimens.

Words or names are misspelled, for example halogeno (p. 194), Krunkenberg (p. 74), Chang (p. 8, ref. 5), Marbet (p.

248, ref. 26) and some formulas are incorrect; on p. 29, uridine phosphate and galactose + phosphate for uridine triphosphate and galactose 1-phosphate, on p. 156, *O*-methyl-L-tyrosine; on p. 223, second formula and on p. 272 the three formulas of the third sentence. In addition, articles are incorrectly referred to and statements are not supported by the experimental evidence. The values reported for the periodate oxidation of methyl *N*-acetyl-*D*-glucosaminide are in fact those of the oxidation of *D*-glucosamine (p. 193). The entering of groups in 2,3,1,6-dianhydro- $\beta$ -*D*-talose, takes place in axial positions 2 and 3 (following Fürst and Plattner's rule), because it has been shown that the C-6 group is in axial position (configuration 1C of Reeves) (p. 196). No decarboxylation has been demonstrated during the oxidative degradation of *D*-glucosamine by ninhydrin (p. 204). The synthesis of 3,6-di-*O*-methylglucosamine has not been described in the paper referred to, but in a publication not referred to (p. 222). Addition of ammonia to methyl 2,3-anhydro-4,6-benzylidene- $\alpha$ -*D*-alloside gives the 3-amino-3-deoxyglucoside, in a 1% yield, the 2-amino-2-deoxyaltroside derivative being obtained in an over 60% yield (p. 270), whereas the possibility of anhydro formation accompanying the replacement of the tosyl group by the amino group in methyl tri-*O*-acetyl-3-*O*-tosyl- $\beta$ -glucoside is in fact proved by the synthesis of the 3-amino-glucose derivative from both 2,3- and 3,4-anhydromethylallosides (p. 271). An incomplete check has shown the numbering of 13 references to be incorrect or absent. These inaccuracies mar a time-consuming and worthwhile work. It is to be hoped that a revised edition will correct what seems to be due to hasty work.

Despite its faults, the book of Kent and Whitehouse has its place on the shelf of all interested in connective tissue, blood group substances, bacterial polysaccharides, or more simply, in the chemistry and biochemistry of the amino-sugars. The authors have done an interesting job of correlating thoughts in many fields and have pointed out future lines of research.

MASSACHUSETTS GENERAL HOSPITAL  
BOSTON 14, MASSACHUSETTS

ROGER W. JEANLOZ

**The Chemistry of Synthetic Dyes and Pigments.** American Chemical Society Monograph Series. Edited by H. A. LUBS, Organic Chemicals Department, E. I. du Pont de Nemours and Company. Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y. 1955. XIV + 734 pp. 16.5 × 23 cm. Price, \$18.50.

The last pre-war comprehensive treatise of synthetic dyes was Fierz-David's "Künstliche Organische Farbstoffe" (1926, supplement 1935) which, though not free of errors, was excellent from the didactic point of view. The last book in the English language was Thorpe-Linstead's "The Synthetic Dyestuffs" (1933) which, however, was much less complete than Fierz-David or Lubs. The "Colour Index" is obsolete and the last supplement to Schultz' "Farbstofftabellen" is also 16 years old. Thus the decision of the Editors of the American Chemical Society Monograph Series to fill this gap is welcome. The more so since, unfortunately, dye chemistry is not being taught at our universities and since we do not appreciate in this country that the dye industry has provided and is providing a reservoir of organic chemicals useful in many other branches of the synthetic industry. Under H. A. Lubs as Editor the book has been written by 19 experts from the staff of the du Pont Company.

The first very good chapter "Benzene Intermediates" (A. C. Stevenson) describes the fundamental reactions; while basing the factual information heavily on BIOS and FIAT reports, modern theories have been injected and the chapter is entirely up-to-date. The customary use of sulfuric acid in the manufacture of *N,N*-dimethylaniline should have been mentioned. The second equally good chapter "Naphthalene Intermediates" (H. M. Parmelee) deals with the substitution reactions and with specific important azo intermediates. More space should have been devoted to the process for making 3-hydroxy-2-naphthoic acid.

The third chapter deals with "Azo Dyes." S. N. Boyd discusses diazotization and coupling, H. E. Woodward cotton, wool and solvent-soluble dyes, J. F. Laucius disperse azo dyes. This is a well done and very readable treat-

ise of a somewhat dry subject. The reviewer missed the neutral dyeing metal complexes (Perlon Fast Dyes, Carpracils etc.). The chapter on "Azoic Dyes" (4, C. W. Maynard, Jr.) is excellent, as far as it goes. However, the preparation of the less common azoic bases, stabilizers and coupling components is not described and the reader would not find it in chapter 1 either.

The next chapter "Miscellaneous Dyes" (5, S. E. Kraehler) suffers from an illogical arrangement of otherwise well written sections. The closely related diarylmethane, triarylmethane, xanthene, acridine dyes and the indamine, indophenol, azine, oxazine, thiazine dyes should have been kept together and not separated by such extraneous subjects, as, *e.g.*, nitro, quinoline, thiazole dyes. Homolka's commercially important New Fuchsine process is not mentioned. Fur and hair dyes would have deserved some space. The chapter on "Sulfur Dyes" (6, N. M. Bigelow and O. Stallman) is excellent.

The large chapter (7) on "Anthraquinone Dyes and Intermediates" (comprising nearly one-third of the book) starts with a rather condensed section (F. B. Stilmar and M. A. Perkins) dealing with the intermediates. Among the methods for manufacturing anthraquinone the reviewer missed the catalytic vapor phase oxidation of anthracene. The section on anthraquinone acid dyes (E. C. Buxbaum) is easy to read and provides a good and complete survey. The section on disperse dyes (C. F. Belcher) is rather brief. The damage caused by "gas fumes" is mentioned, but this so-called gas-fading is not described and the gas not identified. The short section on metallizable dyes (E. C. Buxbaum) fails to deal adequately with alizarine: the important history of the first synthesis of a naturally occurring dye is not given, the names of Graebe and Liebermann appear only in the references, the oxidative fusion of silver salt is not discussed. The use of boric acid in the Bohn-Schmidt reaction should have been mentioned.

It is in the excellent and long section on vat dyes (M. A. Perkins, F. B. Stilmar, M. S. Whelen) where this book attains its greatest usefulness and almost perfection. The reviewer would have omitted "almost" had the authors devoted more space to the important Jade Green (this popular name appears only in parentheses). Nawiasky's superior synthesis of isoviolanthrone going through the di-3-benzanthronyl sulfide should have been more emphasized. A section on the conditioning of vat dyes would have been welcome. But otherwise a very great material has been presented in a clear and concise form and this section on vat dyes alone makes the work a "must" on the bookshelf of the dye chemist. The chapter on "Indigoid Dyes" (8, A. J. Johnson) gives a very good condensed summary. The structure of Tyrian Purple was elucidated by Friedländer and not by Baeyer.

The chapters on "Phthalocyanine Pigments" (9, N. M. Bigelow, M. A. Perkins) and "Phthalocyanine Dyes" (10, W. S. Struve) have been kept somewhat out of proportion largely on purpose, and give a very complete picture of this relatively new field. The authors should not have hesitated to mention the trade name "Monastal Blue" under which copper phthalocyanine was first put on the market. In chapter 11 E. R. Allen discharged with remarkable skill the difficult task to cover on 36 pages the entire field of "Organic Pigments." The structures of phospho-tungstic and -molybdic acids, now well established by X-ray studies, should have been indicated in the section on permanent toners.

The chapter on "Color and Chemical Constitution of Dyes" (12, D. Graham) is a concise and modern treatment of the subject. It will be of greatest use to those who are familiar with the important dye structures; for the average reader references to other chapters would have been helpful. A list of "Common Names of Dye Intermediates" (13) and a quite complete "Critical Bibliography" (14, both by C. W. Maynard) are very useful and conclude the work.

The reviewer missed a chapter on "Optical Bleaches" which have attained considerable importance, particularly in our country. The choice of the trade names was by necessity somewhat arbitrary and not consistent. Whatever criticisms have been offered should not detract from the great value of this book, evidently the result of thorough, expert work. The print and the generous illustration by formulas are excellent; the price is adequate.

1049 KENYON AVENUE  
PLAINFIELD, N. J.

HANS Z. LECHER