

pair of FMNH· radicals¹⁴ at the cross-over point in terminal oxidation in biochemical systems.¹⁵

A number of significant possibilities stem from our preparation of the radical (1). The factors stabilizing free radicals and the reactivity of free radicals may now be examined with simpler radicals than heretofore possible. Pyridinyl radicals represent a new class of chemical reagents for which there is little direct analogy. The procedures described in this communication are clearly applicable to a whole variety of quaternary salts, including those derived from heterocyclic rings, phosphines, arsines, sulfides, etc. Experiments designed to test some of these implications are now underway.

(14) Q. H. Gibson, V. Massey and N. M. Atherton, *Biochem. J.*, **85**, 369 (1962).

(15) E. M. Kosower, "Molecular Biochemistry," McGraw-Hill Book Co., Inc., New York, N. Y., 1962, p. 226.

The physical properties of such stable free radicals as well as the theoretical problems posed by their stability will also be of much interest. All of these matters will be reported in full publications at a later time.

Acknowledgment.—We thank Prof. William D. Closson, Chemistry Department, Columbia University, for assistance and Prof. Paul C. Lauterbur of this department for helpful discussions.

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RECEIVED APRIL 19, 1963

BOOK REVIEWS

The Interpretation of NMR Spectra. By KENNETH B. WIBERG, Yale University, and BERNARD J. NIST, University of Washington. W. A. Benjamin, Inc., 2465 Broadway, New York 25, N. Y. 1962. vii + 593 pp. 19 × 27 cm. Price, \$25.00.

With the wide-spread availability of spectrometers, the interpretation of high-resolution nuclear magnetic resonance spectra has become the concern of a large number of organic chemists. The authors of the present book use the word "interpretation" in a rather narrow sense. Thus, the extremely important problem of obtaining chemical and structural information is completely omitted. What is dealt with is the problem of obtaining chemical shifts and especially coupling constants from a spectrum, with the important proviso that the spectrum, or a part of it, must belong to one of the categories found in this volume.

The book is essentially a compilation of theoretical spectra, calculated and printed with the aid of a computer, for systems involving up to five spins and with selected values of chemical shifts and coupling constants.

The spectra are presented in two ways: (a) tables of line positions and intensities, and (b) a visual representation where crosses are used to indicate band positions and intensities, with a fixed width for each line. The representation is effective if not aesthetically pleasing.

The greater part of the book is concerned with the following important spectra: ABX and ABC, A₂X₂ and A₂B₂ (including cases with two different AB or AX coupling constants). The well known and relatively simple AB, AB₂, AB₃, AB₄ and A₂B₃ cases take relatively few pages.

The ABC system is split up into a number of different sections, depending on the relative chemical shifts of A, B and C. With ν_A and ν_B at -3 and $+3$, respectively, results are given for (A), $\nu_C = +3$; (B), $\nu_C = +4$; (C), $\nu_C = +5$ and (D), $\nu_C = +7$. One other case (E) has $\nu_A = -6$, $\nu_B = 0$ and $\nu_C = +6$. Altogether about five hundred spectra are given, with different combinations of coupling constants, including negative ones, in the range of 1 to 18.

There is about the same number of A₂B₂ spectra, all with $\nu_{AB} = 6$, and with coupling constants similar to those mentioned above.

Each set of spectra has a short, but invariably excellent introduction on its particular characteristics.

While this is undoubtedly a valuable book, a number of important criticisms must be made. One is the remarkable absence of cases with one coupling constant equal to zero in the lengthy list of ABC and A₂B₂ spectra. The only cases where zero J 's are given are completely trivial ones such as in the AB_n systems. A second is the duplication which occurs in the AB₂ spectra and the ABC spectra (case A) with $J_{AB} = J_{AC}$. Indeed, it would appear that little effort has been made to weed out unnecessary spectra. For example, many of the A₂B₂ spectra with large J_{AB} 's are of the uninformative "skyscraper" type. A book of half the size would have been as useful and much cheaper.

In spite of the mass of information about line positions and intensities published with each spectrum, the captions to the spectra do not mention chemical shifts explicitly. This is a most annoying feature, especially in the ABC spectra. One either has to remember the chemical shifts for cases A to E mentioned above or continuously refer back to a difficultly-found table in the text.

Although this book was published rapidly, it does not include any reference to recent work on the analysis of spectra, particularly the use of computers to obtain converging solutions from a set of experimental parameters.

In spite of its shortcomings, the book should prove useful as an aid in the analysis of n.m.r. spectra.

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Ergebnisse der Alkaloid-Chemie bis 1960 unter besonderer Berücksichtigung der Fortschritte seit 1950. By PROFESSOR DR. HANS-GÜNTHER BOIT, Humboldt University, Berlin. Akademie-Verlag G.m.b.H., Leipziger Strasse 3–4, Berlin W 8, Germany. 1961. x + 1082 pp. + unbound supplement of viii pp. 18 × 24.5 cm. Price, DM 140.

From the title of this volume and that of a previous one, Fortschritte der Alkaloid-Chemie seit 1933 (1950), one may deduce that Professor Boit has set himself the valuable but unenviable task of publishing a monograph surveying developments in the chemistry of alkaloids every ten years. At least one implication in this initial deduction is not quite correct. This new book does not simply take the previous one as a point of departure; it is, rather, a complete and self-contained review of the state of alkaloid chemistry to the end of 1960. The emphasis is upon those elucidations of structure, those transformations, those alkaloids newly discovered since 1950. But ample space is allotted to that earlier material necessary for a reference work, so that the discussion of any particular family of substances is complete even if the central members of that family have been known for a long time.

The volume is divided into 59 chapters and two supplements, with three indices. The chapters cover the alkaloids divided into families in the traditional way by structural similarity. Each chapter contains: (1) a brief introduction to the family by discussion of salient features of the principal members; (2) a substantial table listing all known members of the family, with melting point, optical rotation, melting points of selected derivatives, all known plant sources, and recent references for each entry as appropriate; (3) the discussion, substance by substance, of the chemistry new since 1950. The material covered is diverse: new transformations of well known substances, reports, however incomplete, of new alkaloids, and full presentations of degradative and synthetic studies leading to structures and solutions to stereochemical problems. For example, the complex chain of degradation and synthesis of fragments that led to the structures of cevine and its congeners is allotted more than seven pages. The two supplements, one bound with the volume and one inserted afterward, are for the purpose of making coverage of the literature as complete up to the publishing date as possible—they cover those developments in 1960 and a few in 1961 that are omitted from the main body of the text, and the larger supplement has references to the pages elsewhere in the book where the same substance is discussed. The three indices index the contents under the divisions plants and plant products, animals and animal products, and chemical compounds. It is unfortunate that there is no author index; however, it may have