Book Reviews

Chemical Reactions in Shock Waves. By EDWARD F. GREENE, Department of Chemistry, Brown University, and J. PETER TOENNIES, Physikalisches Institut der Universität, Bonn. Academic Press Inc., 111 Fifth Ave., New York, N. Y. 1964. xvi + 352 pp. 15.5 × 23.5 cm. $11.00.

Although the laboratory shock tube still represents a somewhat novel tool, and although it is still evolving, it has reached maturity of a sort, as witnessed by the recent symposium at the Naval Ordnance Laboratory commemorating 25 years of shock-tube research. It is therefore not premature to find books being written about shock tubes and their applications, though it is perhaps a bit much to have five books in English published over a period of 4 years. These include the Methuen monography by Wright (1961); the Pergamon volume edited by Ferri (1961); the Methuen–Wiley book by Bradley (1962); Chapman and Hall's book by Gaydon and Hurle (1963); and the volume under review by Greene and Toennies (1964), published in the United States by Academic Press and in England by Edward Arnold.

However, the first two of these do not attempt to be comprehensive, though they are interesting and useful. Bradley, Gaydon and Hurle, and Greene and Toennies all were writing simultaneously so there is a good deal of overlap in the basic material on properties of shock waves, design and performance of shock tubes, and techniques of measurement as presented in these three books. The surprising thing is to find how different the remaining portions of the books are, reflecting the particular interests of their authors and their thoughts on matters of importance to their intended readers. In fact, it is the opinion of this reviewer that anyone who is seriously concerned with shock waves, fast reactions, relaxation phenomena, and high-temperature processes should have all three in his library.

A comparison of the three books finds Bradley the most detailed in consideration of ionization, light emission, and chemical reactions; Gaydon and Hurle devote the most attention of the three to temperature measurements, spectroscopy, and ignition of detonations by shock waves; while Greene and Toennies have the most breadth, including an outstanding coverage of the literature and some particularly well-conceived tabular summaries of experimental findings that occupy about one-third of the book.

For those who are already familiar with the 1959 edition of Greene and Toennies, published in German, it should be noted that this 1964 edition is much more than a translation into English; it is a very extensively revised work. It retains the excellent organization of the first edition, but the contents have been thoroughly modified to reflect recent advances. One indication of this is the author index, which contains more than 900 names, roughly three times as many as the first edition. Despite this extraordinarily complete coverage of publications in a relatively short book, it is not a mere bibliography. It is critically written, it is concise (perhaps a little too much so), and it is highly informative. The publishers deserve thanks for an attractive format, while the authors merit very high praise for the contents of this important volume. (The British edition appeared before the U. S. edition. It is identical in content and format and costs approximately $2.00 less.)

Howard B. Palmer

Department of Fuel Science, The Pennsylvania State University
University Park, Pennsylvania

Structure Elucidation of Natural Products by Mass Spectrometry. Volume II. Steroids, Terpenoids, Sugars, and Miscellaneous Classes. By HERBERT BUDZIKIEWICZ, Research Associate, Stanford University, CARL DJERASSI, Professor of Chemistry, Stanford University, and DUDLEY H. WILLIAMS, Research Associate, Stanford University. Holden-Day, Inc., 728 Montgomery St., San Francisco, Calif. 1964. x + 306 pp. 19 × 26 cm. $10.50.

This book is the second and apparently terminal volume of "Structure Elucidation of Natural Products by Mass Spectrometry." Volume I dealt with mass spectra of alkaloids[1]; Volume II (which begins with Chapter 17) treats the other important classes of natural products whose mass spectra have been studied, devoting six chapters (116 pages) to steroids, two chapters (44 pages) to terpenes, one chapter each to amino acids and carbohydrates (20 and 38 pages, respectively), and three other chapters (56 pages total) to such diverse compounds as macrolide antibiotics, fatty acid esters, polycyclic quinones, and various oxygen heterocycles. Partisans of the latter classes may demand equal time, but insufficient evidence seems available at present to warrant extensive treatment, whereas the exhaustive studies on steroids by the Djerassi–Budzikiewicz group invite summary. As a bonus an appendix provides a condensed version of Lederberg's "Computation of Molecular Formulas for Mass Spectrometry" (also Holden-Day, San Francisco, 1964).

The present volume benefits from the virtues of the first volume of "Structure Elucidation of Natural Products by Mass Spectrometry" and suffers from some of the same vices. Its overriding virtue is its attempt to summarize for the organic chemist interested in mass spectrometry the present state of the art in this exceedingly active field. It succeeds, thanks to the remarkable speed of publication (less than four months—a somewhat shorter time than for an average journal article), which assures that the material is not out of date at its publication. The book is also valuable in calling attention to portions of the field needing further investigation owing to insufficiently characteristic fragmentation patterns or discrepancies in published spectra (as on p. 226). Many of the difficulties and discrepancies pointed out by the authors have been the subjects of more recent investigations in their laboratory and elsewhere—better labeling of steroidal ketones by the thioketal method, direct sample introduction of carbohydrates, etc.

Curiously, the very currency of the material treated is one of the book's weaknesses as well as its great strength. Progress is so rapid in mass spectrometry that a volume of this sort is certain to be outdated in two years. Instrumental advances such as direct sample introduction, high resolution mass spectrometry, element maps, computerization are not reflected in the present volume but will demand coverage in any future review. In addition, opinion is changing or at least vacillating in regard to the value of detailed fragmentation mechanisms. Students will probably find the detailed notations of the present volume helpful but may be confused by the zigs and zags of the party line, as when the authors reconsider in their Introduction the problem of representing properly mass spectral fragmentations and reach conclusions modified from those of Volume I: homolytic bond cleavage is now represented $C^{\frown}C$ instead of $C^{\supset\subset}C$; instead of $[\ ]^+$ a radical ion is now shown $[\ ]\cdot^+$.

The book is remarkably free of typographical and factual errors, although inevitably some can be found (as on pp. 177, 213, 218, and 245). A welcome improvement in Volume II over Volume I is the authors' increased reliance on metastable ion peaks as evidence for fragmentations.

This reviewer finds the two volumes of "Structure Elucidation of Natural Products by Mass Spectrometry" of considerable immediate value, but hopes the authors will either revise and expand the present volumes periodically or that they will extend the series (perhaps in the manner of the Fiesers' "Current Topics in Organic Chemistry") with periodic reviews of significant advances or changes in the field. It seems lamentable to terminate the series now just as mass spectrometric facilities are being generally available.

Kenneth L. Rinehart, Jr.

Department of Chemistry and Chemical Engineering
University of Illinois, Urbana, Illinois 61803

(1) Reviewed in *J. Am. Chem. Soc.*, **86**, 5373 (1964).

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