

in the text, footnotes, addenda, and even interspersed in the answers to the problems, cover a wide variety of topics from Brønsted acid-base theory of dimensional analysis to the thermodynamics of rubber elasticity.

In summary, this is a most interesting text which should find its widest use as a supplement or problem book, or as the perfect text in a liberal arts honors course.

RUBIN BATTINO
Illinois Institute of Technology
Chicago

Mechanisms of Inorganic Reactions

Jacob Kleinberg, symposium director. R. Kent Murmann, University of Missouri, Columbia, R. T. M. Fraser, and John Bauman, editorial committee. *Advances in Chemistry Series, No. 40.* ACS, Washington, D. C., 1965. vii + 266 pp. Figs. and tables. 16 × 23.5 cm. \$8.

This volume contains the proceedings of the 1964 Summer Symposium of the Division of Inorganic Chemistry (ACS) on the topic of the same name. The ten papers are research-oriented with some background in the nature of specific details from the literature. Each paper covers a single area; e.g., Chapter 4 by F. Basolo covers Substitution Reactions of Square Planar Complexes. For those readers who are seriously interested in mechanisms, the book will be of some interest. A review which discusses the book in a research context may be found in *Inorganic Chemistry* (5, 702 [1966]).

The usefulness of this book in a teaching context seems quite limited, and it appears worthwhile to review for *THIS JOURNAL* the applicability of this book as a text. Admittedly, however, this book was not designed as a text.

There is no general introduction to inorganic reaction mechanisms therein, and the individual papers assume a familiarity with the topic. Much of the book is taken up with the presentation of individual points of view on unsettled issues. The ten main papers are uneven in style, quality and clarity; by and large, they seem to be hastily written. The open-floor discussion sections are rambling and inconclusive as would be expected from a meeting of this type. A number of errors, both scientific and typographical, were noted. Also, there are many statements which lack the firm, factual foundation appropriate for a text. Some important subjects such as outer-sphere electron-transfer reactions, ligand field stabilization effects, and free radical reactions are not included.

I believe that the chemistry teacher who wishes to give his students something outside of the presently-limited number of textbooks on inorganic mechanisms would find it more profitable to pick sound research papers and reviews from the literature rather than to use this book as a text.

JOHN O. EDWARDS
Brown University
Providence, Rhode Island

Introduction to Mass Spectrometry and Its Applications

Robert W. Kiser, Kansas State University, Manhattan. Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1965. xii + 356 pp. Figs. and tables. 16 × 23.5 cm. \$10.50.

According to its preface the purpose of this book is to teach mass spectrometry to those who know very little or nothing about it. The background expected of the reader is a basic course in physics, rudimentary preparation in mathematics, and freshman chemistry. This is an exceedingly difficult assignment and the author has not succeeded.

The book is organized into three approximately equal sections dealing with instrumentation, chemical physics of ionization phenomena, and analytical and miscellaneous application. Although each section contains many items of interesting information, well-referenced, there is very little systematic exposition of particular topics. Many equations are presented without any derivation which might make them meaningful to readers having the expected background. Further, the book is filled to an irritating extent with numerical examples consisting of numerical substitutions into the preceding equations and carried out in great detail.

In the section on instrumentation there is no mention or introductory development of ion optics. The section on chemical physics of ionization phenomena contains both very elementary (and incomplete) verbal definitions of molecular ions, and a section starting with an (undervived) secular determinant based on an approximate form of molecular orbital theory.

In summary, this book can serve as a useful guide to the literature on the many aspects of mass spectrometry to which it alludes. However, it cannot be recommended as a text.

HENRY ROSENSTOCK
National Bureau of Standards
Washington, D.C.

Submicro Methods of Organic Analysis

Ronald Belcher, University of Birmingham, Great Britain. American Elsevier Publishing Co., Inc., New York, 1966. viii + 173 pp. Figs. and tables. 15.5 × 23 cm. \$10.

This is a superb contribution by one of the most eminent and distinguished professors and practitioners in the field of analytical chemistry.

Professor Belcher in this monograph has delineated a field of analysis that offers comparable ramifications to that opened by Pregl in his pioneering work in organic microanalysis. He and his co-workers over a period of the past 15 years have developed techniques for accurate analysis using sample weights in a 30–50 μg range. The achievements are even more remarkable when one considers that the average weight of a grain of sugar is 200 μg , and they are dealing with samples sizes one-eighth to one-fourth of this amount.

The submicromethods described represent a scaling-down operation of one-hundredth of the microscale. The advantages of such ultramicro methods are obvious to those who have only an extremely limited sample size for characterization.

The author describes the Oertling Q 01 balance which was especially developed for submicro assay. This is the cornerstone of all of the techniques described in the text. From all appearances the balance should serve its purpose admirably. Since gravimetric methods are generally unsuitable, the balance is used exclusively to weigh the original sample.

Because most of the methods are titrimetric (for greater precision), a goodly remainder of the foundation of the technique is dependent upon the burette employed. Professor Belcher recommends the use of a modified Agla micrometer syringe burette with a total capacity of 0.5 ml. with graduations of 0.2 μl .

Usually, visual indicators are used wherever possible as opposed to potentiometric measurements. Where no suitable titrimetric method was available, as in the arsenic and fluoride determinations, spectrophotometric procedures were employed. The oxygen-flask combustion was utilized for sulfur and halogen determinations, leaving only nitrogen to be determined via sealed tube decomposition.

Only carbon-hydrogen analysis requires highly specialized equipment in this new technique. The hydrogen analysis apparently was the real stumbling block in establishment of the whole scheme of submicro organic analysis. The carbon-hydrogen method which has been developed involves catalytic decomposition in an oxygen stream, trapping of the water and carbon dioxide at -80° and -196° , removal of excess oxygen and manometric measurement of the water and carbon dioxide.

The excellent method descriptions, the means of overcoming interferences, and the techniques for difficultly analyzable moieties would make this book of considerable value to any analytical chemist whether engaged in submicro, micro or macro organic analysis.

No utilization has been made in this text of the promising vapor chromatographic techniques for microanalysis. Undoubtedly, this is under consideration for future extensions of this excellent work.

ROBERT H. CUNDIFF
R. J. Reynolds Tobacco Co.
Winston-Salem, North Carolina

Introduction to Quantitative Ultramicroanalysis

I. M. Korenman, Gorkiy State University, U.S.S.R. Translated by *Scripta Technica, Inc.* Academic Press, Inc., New York, 1965. ix + 234 pp. Figs. and tables. 16 × 23.5 cm. \$9.50.

Essential when a tiny sample is all that one has, ultramicroanalytical techniques can often prove useful, rapid, and accurate,