BOOK REVIEWS

Instrumental Methods of Chemical Analysis. By GALEN W. EWING, Associate Professor of Chemistry, Union College, Schenectady, New York. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y. 1954. x + 434 pp. 16 × 23.5 cm. Price, $6.50.

This book, as stated by the author in the preface, is designed as a textbook for an advanced undergraduate course or a first-year graduate course in Analytical Chemistry. The book is divided into two parts: Part I on Principles, covers 351 pages; Part II on Laboratory Experiments, which includes directions for 33 experiments, covers 57 pages. After the introduction, the next four chapters (100 pages) are devoted to electrical methods which include conductance, e.m.f. measurements, voltammetry and electrodeposition. The next seven chapters (150 pages) deal with optical methods and would appear to be the strongest and most thorough section of the book. Comparatively short chapters on Radioactivity, Mass Spectrometry, Analysis of Gases and Thermal Analysis then follow. The latter chapters of this section discuss the Determination of Water, Extraction Analysis, Chromatography and Ion Exchange even though these techniques do not necessarily require instrumental methods of analysis. Each chapter includes a set of problems and a series of references which should greatly increase the value of this book as a text in an advanced course in Analytical Chemistry.

The experimental part of the book gives directions for a rather wide variety of experiments. Even though several of the experiments seem simple and somewhat superficial, there would appear to be an adequate choice of experiments for most courses that include laboratory work and where a minimum amount of equipment is available.

A Table of Standard Oxidation Potentials, a list of 350 Isotopes which includes those available from the U. S. Atomic Energy Commission, and a Greek Alphabet are given in the Appendix.

The book, as a whole, is written in a rather descriptive manner. There are numerous drawings and pictures of commercially available instruments. References to advanced theory and derivations are made but little rigorous treatment is found in the text. The book, therefore, would appear to be very useful for the non-analytical chemist but probably will be insufficient, in itself, for the chemist specializing in Analytical Chemistry.

PRINCETON UNIVERSITY
PRINCETON, NEW JERSEY CLARK E. BRICKER

A Manual of Paper Chromatography and Paper Electrophoresis. By RICHARD J. BLOCK, Department of Biochemistry, New York Medical College, New York, N. Y., and Director, Biochemical Laboratories, The Borden Company, Yonkers, N. Y., EMMETT L. DURRUM, Chief, Department of Pharmacology, Army Medical Service Graduate School, Walter Reed Army Medical Center, Washington, D. C., and GUNTER ZWEIG, Research Biochemist, Charles F. Kettering Foundation, Yellow Springs, Ohio, and Associate Professor of Chemistry, Antioch College, with the coöperation of RAYMOND LESTRANGE, WINSTON H. WINGERD and KATHRYN W. WEISS. Academic Press Inc., Publishers, 125 East 32rd Street, New York 10, N. Y. 1955. 484 pp. 16 × 23 cm. Price, $8.00.

The techniques of paper chromatography and paper electrophoresis are compiled and arranged in this book which is written as a manual for the growing number of investigators who employ these methods of analysis. The organization of the material is convenient and the descriptions of methods readable and explicit. The coverage of published material is quite extensive and probably as complete as it can be in such a rapidly developing field.

The section on paper chromatography (329 pp.) includes a short chapter on theory, two chapters on general and quantitative methods and nine chapters on specific procedures for various classes of compounds. These procedures include solvent systems for separations, methods of detection of compounds on paper, group and specific tests for identification and other pertinent material.

This section is an expanded revision of the 1952 manual on Paper Chromatography by Richard J. Block, Raymond LeStrange and Gunter Zweig (195 pp.). The two chapters on methods are changed but slightly with the addition of some calculations and tables. The chapters on procedures for various classes of compounds have all been expanded, some greatly, with the addition of more methods, tables and enlargement of existing tables. The bibliography for this section has also been increased more than twofold, and will serve as a very useful reference to original work. Simplification of the table of contents seems an improvement since there is an extensive subject index.

The newly-added section on paper electrophoresis (76 pp.) includes general theory, general and quantitative methods, two-dimensional techniques and continuous flow methods.

This book will be useful both to the novice who needs a guide to materials and methods for getting started, and to the experienced user of these techniques who may be looking for new ways of accomplishing some difficult analysis. In either case, this manual will serve as a starting point from which improvements can be made as the investigator gains experience. In fact, most workers with some experience in chromatography will find areas in which they know of improved techniques already in use that for reasons of triviality have never been published. Some methods in the manual will be found to be unnecessarily difficult or cumbersome. A case in point is a direction (p. 40) for making radioautographs that requires loading in complete darkness and a complicated foam-rubber and heavy plywood frame, when in actuality a safe-light (yellow filter) and simple, inexpensive cardboard medical X-ray film holder are sufficient. Other pieces of overly-complicated equipment appear from time to time in the methods chapters.

In the section on paper electrophoresis it would have been worthwhile to mention the work of Karler which has led to a commercially-available (Microchemical Specialties Co., Berkeley, Calif.) continuous electrophoresis apparatus.

Despite minor limitations, some of which are imposed by the young and rapidly-growing state of the subject, this book will be a valuable addition to any laboratory employing these paper chromatographic or electrophoretic methods.

RADIATION LABORATORY
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Annual Review of Nuclear Science. Volume 4. By JAMES G. BECKERLEY, Editor, United States Atomic Energy Commission, MARTIN D. KAMEN, Associate Editor, Washington University Medical School, and LEONARD I. SCHIFF, Associate Editor, Stanford University. Annual Reviews, Inc., Stanford, California. 1954. ix + 483 pp. 16 × 23 cm. Price, $7.00.

This volume follows the pattern established in the three preceding issues of the series in presenting a collection of summary papers on diverse topics connected with nuclear science. Several of the articles are particularly timely, for example Blewett's brief and clear description of Recent Developments in Proton Synchrotrons, and Pake's essay on Radiofrequency and Microwave Spectroscopy of Nuclei, a field in which rapid development continues. Each article should be interesting and valuable to specialists in the particular subject discussed; many readers who have a professional interest in nuclear physics or its applications will wish to own a copy of the book.

Chemists who have any direct concern with uses of isotopic tracers will find Inghram's paper on Stable Isotope Dilution as an Analytical Tool a clear and useful exposition. Those unfamiliar with the field may be surprised at the scope of the technique (Inghram lists 68 elements for which it is

applicable) and at the sensitivity of the method (in many cases 10^{-12} gram or better).

The article by Glendenin and Steinberg on Fission Radiochemistry deals with the yields of fission products from various nuclei which undergo fission with neutrons up to a few Mev. in energy or which undergo spontaneous fission. The authors discuss measurements made since 1949, including several determinations of improved accuracy, and work on the fine structure of the curve of fission yield *vs.* mass number. Their main concern is with details of these fission yield curves and with the modes of charge division in fission.

Manov contributes a paper on the Standardization of Radioactive Sources. After reviewing methods of standardization and improvements in methods, he presents in detail the situation on standard sources now available from the National Bureau of Standards—carbon-14, cobalt-60, iodine-131, phosphorus-32, radium-226, lead–bismuth-210, strontium-90 and thallium-204. He then discusses the nuclear information available on certain other radionuclides which he feels would be desirable standards—gold-198, iron-55, iron-59, sodium-24, tritium, chromium-51 and zinc-65. This article should prove of great value to all who have occasion to make accurate measurements of the strength of radioactive samples. It is, moreover, well and interestingly written.

Another article highly recommended for its general interest is that by Kohman and Saito on Radioactivity in Geology and Cosmology. As the authors point out, the geological ramifications of the occurrence of radioactivity in nature have been growing by leaps and bounds and there is an indication that it will prove convenient to recognize a separate branch of science under the name "nuclear geology." The authors review the properties of the "natural" radionuclides and their occurrence and distribution in nature. They then discuss the occurrence of "induced natural radionuclides"—*e.g.* carbon-14, tritium, beryllium-7. They thoroughly discuss the application of radioactivity to the measurement of geologic time and review the subject of radiogenic terrestrial heat. They then proceed to more cosmic questions and discuss briefly the "megascopic history of the earth" and the age of the elements and the universe. This is a fascinating article, with a staggering number of 592 references, most of them since 1950.

Perlman and Asaro give a comprehensive and critical presentation of data on alpha decay energies and lifetimes, discuss the systematic trends in these properties, and their relation to nuclear structure—subjects which their group at the University of California has been particularly instrumental in developing. This review will be appreciated by all workers in the field.

A chapter which should interest theoretical chemists is the one by DeBenedetti and Corben on positronium. This atom, composed of a positron and an electron, appears to be a definite, although evanescent, chemical species. Its exceedingly short lifetime is terminated by the mutual annihilation of its constituent particles; the entity is observed and studied through the annihilation radiation. By means of sophisticated counting techniques one can study many of the properties of this unusual atom, for example its *ortho-para* conversion as catalyzed by molecules with an odd electron. There is indication that positronium reacts with Cl_2 or Br_2 to form a positronium halide. In connection with these chemical effects, the authors remark "It appears from these studies that the formation and decomposition of positronium is related to the properties of the molecules of the surrounding gas; in a sense, it can be regarded as a chemical problem. . . . It would seem natural that the work should be continued by chemists, to whom positronium should present the challenge of a new element whose chemical properties have to be classified; and owing to its extreme simplicity, it may be an element of particular value for the understanding of the mechanism of chemical reactions and for the study of the nature of the chemical bond."

The other articles in the volume will probably be of less interest to chemists than those aforementioned. A series of three papers on nuclear particle detection (R. E. Bell; R. K. Swank; and J. Marshall) does, however, contain fascinating information on fast electronic circuits, characteristics of scintillator detectors for ionizing radiation, and on the use of Čerenkov radiation from high speed charged particles as a detection method. There are articles on Theories of Photonuclear Reactions (Levinger), Interactions between π-Mesons and Nucleons (Gell-Mann and Watson), Heavy Mesons (Dilworth, Occhialini, and Scarsi), and on the Penetration of Heavy Charged Particles in Matter (Uehling) most of which the reviewer found fairly hard going because of their theoretical language. The last mentioned, however, may repay the attention of those who are concerned with the chemical effects of ionizing radiations. Finally, there are two papers on Biochemical Effects of Radiation (DuBois and Peterson) and Vertebrate Radiobiology (J. F. Thomson) on which the reviewer feels unqualified to comment except to say that one's impression is that progress is being made, that a multitude of observations are being accumulated at a bewildering rate, and that there are many apparent contradictions and many matters of principle still to be resolved.

As to the readability of the various contributions, there continues to be some spread in the clarity, elegance, and general quality of exposition. However, this is doubtless unavoidable with such a large collection of topics and writers; and one cannot help but feel grateful to the authors and editors for their efforts in preparing this useful volume.

DEPARTMENT OF CHEMISTRY
BROOKHAVEN NATIONAL LABORATORY RICHARD W. DODSON
UPTON, LONG ISLAND, NEW YORK

Outline of Enzyme Chemistry. By J. B. NEILANDS, Department of Biochemistry, PAUL K. STUMPF, Department of Plant Biochemistry, and ROGER Y. STANIER, Department of Bacteriology, University of California, Berkeley, California. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1955. x + 315 pp. 15.5 × 23.5 cm. Price, $6.50.

The authors, in introducing this book as an introductory text in enzyme chemistry for beginning graduate students and research workers in fields other than enzymology, have wisely avoided the mistake of writing a broad coverage of enzymes. They have rather stressed the fundamentals, and the first half of the book is devoted to general properties which can be applied to enzymes generally.

The book is divided into four sections with twenty-five chapters. The first section is devoted to an introduction and general fundamental principles, including such topics as the history of enzyme chemistry, equilibria and ionization, isolation, purity criteria and characterization methods. The three chapters on isolation methods, criteria of purity and characterization are both well written and properly emphasized in this introductory text. Section 2 concerns a treatment of the physical chemistry of enzymes. The chapters are devoted to a classical but concise coverage of kinetics, action of inhibitors, effect of temperature, *p*H, energetics, oxidation–reduction and enzyme–substrate compounds. These topics which are frequently difficult for beginning graduate students are simplified and easy to follow. Part 3 classifies and describes types of coenzymes and enzymes. The authors have summarized the suggestions of a diverse group of enzymologists over the past few years in compiling a meaningful, timely, and useful classification system. One chapter is devoted to the discussion of respiratory enzymes. Part 4 deals with a study of the metabolic problems at the enzyme level. Some of the more classical metabolic systems are reviewed: glycolysis, hexose monophosphate shunt, tricarboxylic acid cycle, as well as oxidative phosphorylation and fatty acid oxidation. The last chapter by Roger Stanier on the synthesis of enzymes covers an area which cannot be ignored in modern enzymology. This excellent coverage serves as an ideal introduction to this phase of biochemistry.

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Substances Naturelles de Synthèse. Volume X. By LÉON VELLUZ, Docteur des Sciences Physiques. Masson et Cie, Éditeurs, 120 Boulevard Saint-Germain, Paris VI, France. 1954. 200 pp. 16 × 22.5 cm. Price, Broché 2300 fr.; Cartonné toile 2700 fr.

This book presents easily followed directions for the preparation of eight naturally occurring organic substances, such as D-glucosamine, listed in the index at the front,