

workers who, while they may be experts in their own fields of study, have no specialized knowledge of radioactive theory and technique. A general knowledge of elementary physics is the only qualification which is assumed." Whitehouse and Putman have succeeded admirably in their purpose and also have produced a book which many specialists, teachers and students of nuclear science will find useful.

The scope is indicated by the eight chapter titles: Nuclear reactions applied to the production of artificial radioactive isotopes (15 pp.); modes of nuclear disintegration (32 pp.); properties of the radiations (40 pp.); the production of radioactive isotopes (51 pp.); detection and measurement of the separate particles (72 pp.); gross effects of the radiations (49 pp.); some applications of radioactive isotopes (69 pp.); the manipulation of radioactive material [remote handling, avoidance of contamination, health physics considerations] (31 pp.). An abridged table of isotopes, 37 pp., is included as the principal appendix. There are adequate indexes.

The presentation is simple, clear and quantitative throughout, with many useful formulas. There are a few oversimplifications, but in general the authors have been unusually successful in combining rigor with simplicity. The most noticeable omission (a deliberate one) is an almost complete absence of information on chemical techniques involved in the preparation and manipulation of radioactive isotopes. As the authors point out, radiochemical techniques are described in other books to which reference is made in the text. A minor disadvantage is the fact that little material published after 1950 is covered. Since the preface and forward were written in mid 1951, one wonders why publication was delayed until late 1953.

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Methoden der organischen Chemie. Vierte Auflage. Band II—Analytische Methoden. By EUGEN MÜLLER (Editor). Georg Thieme Verlag, Diemershaldenstrasse 47, Stuttgart, Germany. 1953. xxii + 1070 pp. 18 X 26.5 cm. In moleskin gebunden DM 139, (Vorbestellpreis DM 125.10).

The general plan of this work was outlined in the review of Volume VIII, which was the first volume of this important revision of the well-known "Houben-Weyl" to appear (THIS JOURNAL, 75, 3613 (1953)). Volume II, the second now available, deals primarily with chemical methods of analysis of organic compounds. In general, both qualitative and quantitative methods are discussed, and macro, semimicro and micro procedures are given. Ultramicro methods are only mentioned.

Analysis for the elements takes up 240 pages. The section dealing with functional groups is the largest and amounts to 438 pages. Sections of less than 70 pages each are devoted to gasometric methods, determination of melting and boiling points, thermal analysis of molecular compounds, chromatographic analysis, and analysis of solvent mixtures. Presumably physical methods other than those in the present volume will appear in Volume III.

Those familiar with the last edition of twenty years ago know that the aim has been to provide a summary of the practical methods of organic chemistry, and the editors and authors of this revision have tried to be selective rather than all-inclusive. However, several methods usually are described for a given element or functional group. The more important procedures are given in sufficient detail to be used without reference to the original literature, whereas other useful methods are described briefly and a reference is given. Occasionally as on p. 620, the concentrations of reagents are not given. Although it is probable that concentrations in this instance are not critical, the lack of definite specifications always leaves the user in doubt. Each section indicates the date through which the literature has been reviewed, this being at least up to 1952 and often up to 1953.

As with Volume VIII most of the contributors are employed by the German chemical industry, although no technical methods of analysis are included. Over half of the book is written by H. Roth of the Badische Anilin und Soda-fabrik and the remainder by twenty other contributors, over half of whom are industrial chemists.

There is little in this volume to criticize adversely. Confronted with an increasingly insurmountable mass of chemical literature, the chemist has come to depend more and more on compendia. However, the number and size of review publications and reference works is reaching the point where even keeping up with these condensations is difficult. It would seem to be in the interest of all concerned to avoid duplication as much as possible. Several excellent books on quantitative analysis for the elements are available and one may question the necessity of duplicating such material in this revision. Similarly, the 39 pages devoted to chromatography cannot take the place of numerous standard works on the subject. Since other technical methods of analysis have been omitted, one questions the desirability of including the chapter on the analysis of solvent mixtures.

As to the mechanical features of the book, only a few typographical errors were noted, and the illustrations appear to be newly drawn and up-to-date with the exception of the Van Slyke apparatus on p. 689. Although the bibliographies on pages 782 and 984 are in alphabetical order according to author, those on pages 710 and 909 are in neither alphabetical nor chronological order. A few checks made on the index indicate that it is inadequate. Under the first general entry for "Ester," p. 931 refers to the detection of cellulose nitrate in solvents. There is no general entry for the detection of esters but only one for the detection of esters of monocarboxylic acids as the β -hydroxyethylamides, although five other procedures are given in the text. There is no entry for the estimation of esters. The only entry is under "esterzahl, Mikrobestimmung," although the text gives also a macro method. The single reference under "Esterverseifung" relates to the saponification of esters in solvent mixtures. Although one well may question the necessity for an entry for color reactions, if such an entry is given it should list all references to the subject. Such is by no means the case. As an example, under "Farbreaktion auf Phenole" are entries only for the color reactions with iron chloride and nitrous acid, but numerous additional reactions are given in the text. The best way to find material in the volume appears to be to make use of the extensive tables of contents. Unfortunately they precede each section instead of being collected at the front of the book.

This volume is without question the outstanding work on the analysis of organic compounds. The appearance of this revised and completely rewritten edition of Houben-Weyl is another indication that German chemists are resuming their former role as the foremost compilers of chemical literature. Although one welcomes the fact that outstanding industrial chemists have been permitted by their employers to give their time to this work, one cannot but be uneasy about the minor role that organic chemists of the academic profession have played in the volumes of this work that have appeared to date.

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Neutron Optics. By D. J. HUGHES, Brookhaven National Laboratories, Upton, Long Island, New York. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1954. vii + 136 pp. 13.5 X 20.5 cm. Price, \$2.50.

In this period of rapid scientific progress, there are two opposing demands for scientific literature. On the one hand, there is always the demand for a comprehensive treatise on a given subject for specialists working in it. On the other hand, there is also a demand for a concise summary of the subject for those who wish to keep pace with progress outside their particular fields. In the field of neutron optics, Dr. D. J. Hughes, formerly of the Argonne National Laboratory and now of the Brookhaven National Laboratory, has done an excellent job for both. Having written a chapter on the topic in the "1953 Annual Review of Nuclear Science," he has now completed a book on the same subject. Since the subject matter is relatively new, the book is not voluminous. However, it contains all essential features of basic principles and significant experiments.

The book deals primarily with physical optics, because geometric optics has not been developed fully in either theory

or practice. After Davisson and Germer's experiment, the wave nature of other corpuscular particles, such as the neutron, was automatically an established fact long before the advent of modern nuclear chain reactors which have since provided collimated thermal neutron beams of "high" intensities. The study of such well-known optical phenomena as diffraction, refraction, reflection and polarization followed naturally. It is to be noted that because the wave lengths of thermal neutrons are of the order of 1 Å., all optical properties dealt with here are related primarily to atomic spacings rather than nuclear spacings. The latter are not fully developed and perhaps can be better studied by using high energy protons rather than neutrons.

The analogy of neutron optics to electromagnetic wave optics makes the subject simple to treat and to understand. In many respects, the optics of neutrons supplements that of X-rays. On the other hand, because of the unique features of neutrons, other phenomena are manifested which result in many significant applications.

After reviewing the basic principles involved and pointing out the similarities and differences between neutron and electron optics, the author proceeds with a detailed treatment of experimental methods. As in the theory, much of the technique used in X-rays and standard optics has been transferred to this field. For example, the experimental method of neutron diffraction for powders is practically identical with that of X-rays. New techniques have also been developed, of which a notable example is the mirror reflection method. At present, this art is unavailable to many potential users because experimental neutron optics still suffers from relatively low intensity of neutron beams and unusually high cost of a reactor.

Following the treatment of the experimental methods, the author discusses the three most important fields of application. The first is in the field of nuclear physics and is related to nuclear interactions. Coherent cross sections of various nuclei may be determined by diffraction and mirror reflection methods. The coherent amplitudes for neutrons and protons when combined with other nuclear constants yields information on the triplet and singlet ranges. The agreement of the singlet range with the proton-proton range gives support to the idea of charge independence of nuclear forces. The mirror reflection method also allows accurate study of scattering of neutrons by electrons, thus revealing information on their interaction.

The second application of neutron optics is in the determination of the structure of matter. This may overshadow the nuclear applications. The costly installation and low intensity of neutron beams immediately suggest that neutron diffraction should be used only for problems not amenable to X-ray methods. One such problem is the location of hydrogen in the structure of various materials such as H_2O , NH_4Cl , KHF_2 , hydrides of alkali metals, and of Zr, Th, and others. Other than the location of very light and heavy elements, neutron diffraction methods facilitate the study of compounds or alloys of similar atomic weights or of materials of different isotopic proportions. Thus, the superlattice structure of $FeCO$ is easily determined. Other unique features relate to the study of gases, liquids, and cold worked alloys. Because of the similarity of neutron mass and atomic mass, the energy exchange with the lattice vibrations in a solid (absorption or emission of phonons) results in appreciable change in neutron energy. Thus, the study of inelastic scattering of cold neutrons should reveal information on the spectrum of lattice vibration.

The third and really unique application of neutron optics is concerned with the phenomena resulting from the magnetic scattering of neutrons. This is a field in which X-rays are completely useless. The book outlines the basic principles involved as well as various methods of probing magnetic structure. A typical example is the determination of the antiferromagnetic structure of MnO and similar materials. The structure of magnetic domain may be advantageously studied by using polarized neutrons.

In the case of optical-, microwave-, mass- and β -spectroscopies, X-ray and electron diffraction, and magnetic resonance, the capabilities of these new phenomena and techniques initiated by physicists have been utilized greatly by chemists in their ever-vigorous efforts of understanding and improving the living as well as the material world. It is very probable that neutron optics soon will be added to this notable list of analytical tools.

The author's own pioneering researches and contributions

in neutron optics have assisted his natural talent for lucid exposition in making this book easy to understand and pleasant to read.

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Vitamins and Hormones: Advances in Research and Applications. Edited by ROBERT S. HARRIS, Professor of Biochemistry of Nutrition, Massachusetts Institute of Technology, Cambridge, Massachusetts, G. F. MARRIAN, Professor of Medical Chemistry, University of Edinburgh, Edinburgh, Scotland, and KENNETH V. THIMANN, Professor of Plant Physiology, Harvard University, Cambridge, Massachusetts. Academic Press, Inc., Publishers, 125 East 23rd Street, New York, N. Y., 1953. ix + 356 pp. 16 X 23.5 cm. Price, \$8.50.

The general character of this series is too well known to require special description. This year's volume (XI) contains the cumulative index of volumes VI through X as well as eight essays or reviews, some of which are of more than ordinary importance. Mapson's review on the function of ascorbic acid in plants points out that while there are several enzymatic systems for both the reduction and oxidation of ascorbic acid, it is still not known whether any of these carry a quantitatively significant part of the respiration of the living plant. Meiklejohn has presented a colorful essay on ascorbic acid, particularly in the animal with especial reference to its relation to the adrenal. This is by no means the usual review but is an almost step by step indictment of present foolishness in physiological and biochemical research. While not always exactly fair and well balanced, and certainly not free from prejudice, it is on the whole salutary and serves as an efficient method of presenting particular and selected types of information. Something of the same flavor of doubt and question of the validity, if not the good sense, of current experiment and viewpoint is to be found in the review by Nicolaysen and Eeg-Larsen on vitamin D who conclude that with respect to the mode of action of this substance all that is known for sure is that it promotes the absorption of calcium and even this may be dependent upon the species studied. The condensed and valuable review of Gross and Pitt-Rivers on the biochemistry of the thyroid, covering the rapid and important developments represented by triiodothyronine, points to somewhat the same situation. These essays are not either petty fault-finding or dull recital of mistakes, but are a stock-taking of progress in complex and difficultly approachable areas.

Zubirán and Gómez-Mont point out that the symptoms of undernourishment are not attributable to any single dietary deficiency and that a generally deficient diet affects every function of the organism, endocrines included. This report is more directly experimental than the others in this volume and presents clinical and laboratory evidence that malnutrition leads to decreased function in the gonads, the adrenals and the pituitary, and possibly in the thyroid. The laboratory counterpart is found in the review by Ralli and Dumm on the relation of pantothenic acid to adrenal function.

With respect to the adrenal steroids themselves, this volume contains a comprehensive review by Djerassi on the synthesis of cortisone and related steroids which especially notes the variety of starting materials now available for such syntheses. This volume contains a stimulating essay by Deane and Seligman on the cytology of the adrenal steroids under a restrictive title called "Evaluation of Procedures." The essay itself is much more important than its title implies. After interesting descriptions of the development, the methodology and the criticisms, a great deal of information is presented on the results of such methods, and it is clear that if it should be demonstrated that what the histochemists now call steroids are not such in fact, the remarkable correlation of the histochemistry with the physiological activity of the organs is, of itself, a valuable contribution.

The papers contained in this volume comprise quite significant contributions to the area covered and make volume XI one of the best in the series.

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