

markedly complete, coverage of the subject makes it immensely valuable to those wishing to become acquainted with the nucleic acid problem, and "must" reading for graduate students of biochemistry.

SLOAN-KETTERING INSTITUTE FOR CANCER RESEARCH
NEW YORK, NEW YORK GEORGE BOSWORTH BROWN

Microwave Spectroscopy. By M. W. P. STRANDBERG, Associate Professor of Physics, Massachusetts Institute of Technology. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1954. vii + 140 pp. 11 × 17 cm. Price, \$2.50.

Despite its general title this short monograph is designed to serve two limited purposes. The first of these is to discuss in a compact fashion the quantum theory of molecular rotation. Here the author assumes that the reader is familiar with the matrix methods of quantum mechanics.

The second objective of the author is to discuss briefly the experimental techniques of microwave spectroscopy with emphasis on those developed at the Massachusetts Institute of Technology.

This treatment of microwave spectroscopy will be found quite useful by those workers who already have a general familiarity with the subject and are looking for assistance in obtaining a fundamental understanding of the theoretical background. It is a valuable supplement to a more general discussion of the field such as the one found in the book by Gordy, Trambarulo and Smith.

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The Actinide Elements. By GLENN T. SEABORG, Department of Chemistry and Chemical Engineering and Director of Nuclear Chemical Research at the Radiation Laboratory, University of California at Berkeley, and JOSEPH J. KATZ, Senior Chemist, Argonne National Laboratory (edited by). McGraw-Hill Book Company, Inc., 330 W. 42nd Street, New York 36, N. Y., 1954. xxx + 870 pp. 16 × 23.5 cm. Price, \$11.75.

This volume is a comprehensive survey of the chemical and nuclear properties of the actinide elements actinium, thorium, protactinium, uranium, neptunium, plutonium, americium, curium, berkelium and californium. (Elements 99 and 100 had not been discovered at the time this book was written.) The survey has been brought up to date to about 1950, and in some instances to 1952 or 1953, and covers the literature in general. In addition much material from unpublished reports (Manhattan Project and more recent) is included. The tremendous amount of information compiled is well organized and systematically recorded. Liberal use is made of figures and tables, some of which present extensive compilations of thermodynamic, crystallographic and nuclear data.

The book contains twenty chapters, each written by men who have made major contributions to the fields they have surveyed. It is obvious that much careful work has been done in preparing the chapters, and the results are excellent. Each chapter is followed by references totaling approximately two thousand. Thus in addition to being a compilation of information, this book serves as a key to the literature for the actinide elements. This volume contains its own index and also an index to its companion volume "The Transuranium Elements."

Most of the book is devoted to the chemical properties of the actinide elements. The chemistry of each element is discussed individually, three lengthy chapters being devoted to plutonium chemistry. Included in the discussions are the preparation and properties of numerous compounds, oxidation-reduction reactions and the nature of ions and molecules in solution. Both thermodynamic and rate data are given, and where known the behavior of an element at both tracer and macro concentrations is discussed. Other chapters cover radiochemical separation, crystal chemistry, and optical properties of compounds of these elements.

About 110 pages of the book are devoted to the nuclear properties of isotopes of elements in the actinide series. The properties are summarized in tables, and brief accounts are given of the work done on each nuclide. Included is one chapter on the slow-neutron and spontaneous-fission properties of these heavy nuclides. Another 137 pages is used in a single chapter for a discussion of α -particle and fission measurements. This chapter is a detailed description of counting techniques and does not contain information about chemical or nuclear properties of the actinide elements.

There is abundant evidence and general agreement that the 5f level is filling in this series of elements. There is less agreement about where the filling starts and ends and how these elements should be arranged in the periodic table. Zachariassen in his chapter on the crystal chemistry of the 5f elements proposes a thoride series because of the prominence of the +4 oxidation state in compounds of the elements thorium through americium. Others have proposed a uranide series because of the similarity of the +6 states of uranium, neptunium, plutonium and americium. Seaborg in a separate chapter summarizes the evidence that the series of elements actinium through element 103 should be placed in the periodic table homologous to the rare earth or lanthanide elements. He emphasizes the chemical evidence for this arrangement, especially the stability in aqueous solution of the +3 oxidation state of the heavier members of the series. Curium(III), similar to gadolinium(III), is exceptionally resistant to oxidation and reduction, very probably because it has the stable electron configuration of a half-filled 5f level.

The printing and binding of this volume match those of the other volumes of the National Nuclear Energy Series. Only a few obvious misprints were noted.

The book will be of immense value as a reference source not only to those working with these elements but also to chemists and students in general who wish to learn more of this interesting new series. This volume is the most authoritative single source of information about the actinide elements.

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Biochemical Preparations. Volume 3. By ESMOND E. SNELL (Editor-in-Chief). John Wiley and Sons, Inc. 440 Fourth Avenue, New York 16, N. Y. 1953. viii + 128 pp. 15.5 × 23.5 cm. Price, \$3.50.

This volume, the third in the series, presents accurate and detailed procedures for the preparation of 24 substances of important biochemical interest. Of particular note is the emphasis upon enzymes and enzymatic transformations. Thus, directions are given for the preparation of two crystalline enzymes, ribonuclease and muscle phosphorylase. Seven compounds are included whose preparation involves the enzymatic transformation of a substrate. These are sodium α -ketoisocaproate, glucose-6-phosphate, L-kynurenine and the four isomeric isoleucines. Fermentative procedures are described for the obtaining of L-citrulline and D- and L-lactic acids. Three isolation procedures are described: diphosphopyridine nucleotide (DPN) from yeast, triphosphopyridine nucleotide (TPN) from liver and D-isocitric acid from leaves of *Bryophyllum calycinum*. Compounds prepared by the more conventional methods of organic chemistry include pyridoxamine and pyridoxal phosphates, protoporphyrin dimethyl ester, dihydroxyfumaric acid, oxalacetic acid, D-galacturonic acid, β -2,5-dihydroxyphenyl-DL-alanine, L- and DL-ornithine monohydrochlorides, L- and DL-citrullines, L- and D-penicillamines, elaidic acid and 2,4-dinitrofluorobenzene. Mention should be made of the fact that a summary of the properties and criteria of purity is given for each compound and, in the instances of enzymes and coenzymes, methods of assay are described.

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