

TABLE I
SPECIFIC ACTIVITY OF THE DIACETATE

Sample	Mg. counted	DPM tritium/mg.	DPM C ¹⁴ /mg.
A	5.01	75	20.4
B	3.28	125	23.1
C	2.88	131	19.4

Sample B: the filtrates of the recrystallizations of A were combined, vacuum sublimed, and recrystallized once from methanol, m.p. 232–233°. Sample C: the toluene of B was distilled off under high vacuum, and the 2,5-diphenyl-oxazole was removed by vacuum sublimation. The THE diacetate remaining was vacuum sublimed and recrystallized once from methanol, m.p. 232°.

The radiocarbon and tritium were then counted

in a liquid scintillation counter¹⁵ capable of counting the pulses due to the carbon-14 and tritium at the same time. Then the pulses due to tritium were screened out and only those coming from the carbon-14 were counted. The tritium counts were obtained by difference.¹⁶ The specific activities were calculated and are shown in the table.

(15) The instrument was developed for us by the Packard Instrument Co., La Grange, Illinois.

(16) Details regarding the method of counting both carbon-14 and tritium in the same sample will be published later.

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BOOK REVIEWS

Energy Transfer in Hot Gases. Sixth Conference, U. S. Bureau of Standards. By the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. 1954. iii + 126 pp. 15 × 23.5 cm. \$1.50.

The 50th anniversary of the Bureau of Standards was celebrated in part by a series of 12 conferences devoted to different aspects of the Bureau's program of fundamental and applied research. The present volume consists of a rather noteworthy set of 16 papers presented at the sixth of these conferences devoted to consideration of radiation and energy transfer processes occurring in hot gases. As may be anticipated the subject is of current interest to scientists working in what are normally considered quite separate fields and this diversity is represented by contributions from many well-known authorities in such fields as photochemistry, spectroscopy, combustion, fuels, kinetics, astrophysics and aeronautics. What is most impressive, however, is not the diversity represented by these authors, but rather the way in which a common interest has so effectively integrated their different disciplines into an impressive attack on some very difficult and important problems of molecular dynamics.

The first paper by A. G. Gaydon on "Processes of Electronic Excitation in Relation to Flame Spectra" provides an excellent introduction to the remainder of the volume. It summarizes very nicely the excitation processes occurring in flames and their relevance to the problems of flame temperature measurement. In a later paper, S. S. Penner has reviewed the theoretical background involved in the infrared emissivity of diatomic gases. B. Lewis adds a very interesting paper on the theory of flames with particular emphasis on empirical models which have been successful in accounting for combustion waves. A brief paper by B. Karlovitz presents an interesting treatment of turbulence in flames and an important application to heat transfer from such flames.

One of the important problems in flames is, of course, the measurement and interpretation of temperatures and there are a number of very stimulating experimental papers on this subject by R. H. Tourrin, G. A. Hornbeck and R. C. Herman, H. P. Broida, S. S. Penner and M. Gilbert and D. Weber, G. H. Dieke and H. M. Crosswhite, S. Silverman and W. S. Benedict and E. K. Plyler. Among these, the first one and the last two are of particular interest because of the use of the rather new techniques made available from infrared work.

P. J. Dyne discusses some of the problems of identification of radical and molecular species responsible for emission in fluorescence and discharges. Closer to the chemical viewpoint is a very interesting discussion of flame induced chemi-

luminescence at interfaces by J. R. Arthur and D. T. A. Townend. Quite spectacular H₂-F₂ flame experiments are described by R. H. Wilson, Jr., J. B. Conway, A. Engelbrecht and A. V. Grosse. This reaction appears to give the hottest flame yet recorded (4300°K.).

The last paper by H. K. Sen represents an attempt at a new explanation of the anomalous temperature observed in the photosphere and chromosphere of stars, based on the existence of shock waves in these regions.

This brief volume represents an important contribution to a rapidly growing and important field. Many of the interesting phenomena are still only partially understood and there is still disagreement about some of the basic data. Nevertheless, to workers in the field this will be for some time a stimulating and useful presentation and the Bureau is to be commended for making these papers conveniently available at reasonable cost.

In conclusion the reviewer wishes to make clear to the lay reader that despite its origin and title, the present volume is not a discussion of the political atmosphere in our nation's capitol.

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The Biochemistry of the Nucleic Acids. 2nd Edition. By J. N. DAVIDSON, D.Sc., M.D. (Edin.), F.R.I.C. Gardiner Professor of Physiological Chemistry in the University of Glasgow. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1954. viii + 200 pp. 11 × 17 cm. Price, \$2.25.

This pocket-sized Methuen Monograph offers the only modern summary of the status of the rapidly expanding body of information about nucleic acids, and fulfills the author's promise of a book for "chemists who wish to know something about the biological aspects of the subject, and of biologists who wish to learn a little about the chemical aspects." It emphasizes the biological and metabolic aspects of the subject, particularly on a cellular level. The important changes in concepts of the composition and structure of the polynucleotides, the many developments relating deoxyribonucleic acids to chromosomal material and the multitude of views on the possible functions of ribonucleic acids are all clearly presented. It is as up to date as is practical and the usefulness has been increased in this edition by placing the bibliographies after each chapter. The next edition could be improved by the inclusion of an author index, and by some distinguishing mark on its spine to differentiate it from previous editions. The concise, but re-

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.

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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. Zachariasen 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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