terone (IV), m.p. 207–208°, $[\alpha]^{25}D$ +236 ($CHCl_3$); *Anal.* Calcd. for $C_{21}H_{29}O_3F$: C, 72.38; H, 8.39; F, 5.45. Found: C, 72.19; H, 8.56; F, 5.44; cortisone 21-methanesulfonate was converted to 21-fluoro-4-pregnen-17α-ol-3,11,20-trione (V), m.p. 249–252°, $[\alpha]^{25}D$ +245 ($CHCl_3$); *Anal.* Calcd. for $C_{21}H_{27}O_4F$: C, 69.59; H, 7.51; F, 5.24. Found: C, 69.35; H, 7.29; F, 5.47; and hydrocortisone 21-methanesulfonate gave 21-fluoro-4-pregnene-11β,17α-diol-3,20-dione (VI), m.p. 240–242°, $[\alpha]^{25}D$ +145° ($CHCl_3$); *Anal.* Calcd. for $C_{21}H_{29}O_4F$: C, 69.20; H, 8.02; F, 5.21. Found: C, 69.30; H, 8.04; F, 5.29.

Preliminary physiological testing, kindly provided by Dr. W. W. Byrnes of the Upjohn Company, indicates that 21-fluoroprogesterone is a strong progestational hormone, being 2 to 4 times as active as progesterone in the Corner–Allen test when administered either subcutaneously or orally. In experiments carried out in the Ben May Laboratory by Dr. Charles Huggins, 21-fluoroprogesterone produced an inhibition of the uterotrophic and vaginal keratinizing action of estrone, equal to or greater than that observed[6] with 9α-fluoro-11β-hydroxyprogesterone.[7] The results of more complete physiological testing of the foregoing 21-fluorosteroids will be reported separately.

(6) C. Huggins and E. V. Jensen, *J. Exp. Med.*, **102**, 347 (1955).
(7) J. Fried, J. E. Herz, E. F. Sabo, A. Borman, F. M. Singer and P. Numerof, THIS JOURNAL, **77**, 1068 (1955).

THE BEN MAY LABORATORY
FOR CANCER RESEARCH, AND THE
DEPARTMENT OF BIOCHEMISTRY
UNIVERSITY OF CHICAGO
CHICAGO 37, ILLINOIS

PIA TANNHAUSER
RICHARD J. PRATT
ELWOOD V. JENSEN

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BOOK REVIEWS

The Alkaloids. Chemistry and Physiology. Volume V. Pharmacology. Edited by R. H. F. MANSKE, Dominion Rubber Research Laboratory, Guelph, Ontario. Academic Press, Inc., Publishers, 125 East 23rd Street, New York 10, N. Y. ix + 388 pp. 16 × 23.5 cm. Price, $9.50.

This book is the final volume in a survey of our knowledge of the alkaloids. It contains the following sections on the pharmacology of the alkaloids: "Narcotics and Analgesics" by H. Krueger (concerned principally with the analgetic effects of morphine and related compounds, as well as with drug addiction and the metabolism of morphine), "Cardioactive Alkaloids" by E. L. McCawley, "Respiratory Stimulants" by M. J. Dallemagne, "Antimalarials" by L. H. Schmidt, "Uterine Stimulants" by A. K. Reynolds, "Alkaloids as Local Anesthetics" by T. P. Carney, "Pressor Alkaloids" by K. K. Chen, "Mydriatic Alkaloids" by H. R. Ing and "Curare-like Effects" by L. E. Craig. In addition there are a five page section on "The Lycopodium Alkaloids" and a brief survey of "Minor Alkaloids of Unknown Structure," both written by R. H. F. Manske. This final section devotes a paragraph or two to what is known, both chemically and pharmacologically, of seventy-one minor alkaloids.

The present volume on pharmacology does not seem as useful a book as the four preceding volumes on the chemistry of the alkaloids. It suffers principally from two faults. First, the number of organ systems and types of action covered is fairly limited, only nine in number. Important topics such as central nervous system stimulants are not included. Second, the various pharmacological actions of an alkaloid are frequently presented in separate sections, since many alkaloids have actions on more than one organ system. For instance, quinine, cocaine and ephedrine are each discussed in four different parts of the book and still some of their important pharmacological actions are not included. Atropine is included in the discussions on "Respiratory Stimulants" and on "Mydriatic Alkaloids," but many of its more important properties are not discussed in any detail. Muscarine, pilocarpine and physostigmine, alkaloids which affect many organ systems, are discussed only as uterine stimulants.

However, the topics included are covered with satisfactory thoroughness, and the book should serve as a good reference for anyone interested in these particular phases of pharmacology. For the most part the sections are well written although one of the authors is rather dogmatic concerning several controversial topics. The volume contains a total of 1361 references as well as a subject index for volumes I-IV.

DEPARTMENT OF PHARMACOLOGY
UNIVERSITY OF ROCHESTER
ROCHESTER, NEW YORK

E. S. BOYD

Nuclear and Radiochemistry. Revised Version of Introduction to Radiochemistry. By GERHART FRIEDLANDER, Senior Chemist, Brookhaven National Laboratory, and JOSEPH W. KENNEDY, Professor of Chemistry, Washington University, St. Louis. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1955. ix + 468 pp. 15.5 × 23.5 cm. Price, $7.50.

This is the revised and up to date edition of Introduction to Radiochemistry first published in 1949 and written by the same authors. While the title has been changed to conform to a somewhat narrower meaning for "radiochemistry," the revised text will continue to fill the same needs as the original edition.

Like the earlier version, it is written as a textbook for the teaching of nuclear science to chemists and those in borderline fields. It is suitable for a graduate or advanced undergraduate course. Being also an excellent reference volume, it should be on the desk of anyone concerned with tracer techniques.

The revision contains more factual information than the earlier edition, largely in the form of additional graphs and tables.

The topics covered include: fundamentals of radioactivity, nuclear reactions (fission is treated more thoroughly than before), production of nuclear reactions and target chemistry, equations of radioactive decay and growth, nuclear states and a study of the several types of radioactive decay processes, interaction of various radiations with matter including biologically permissible doses and a new section on radiation chemistry, measurement of radiation and the statistical aspects of such measurements, techniques for the study of radionuclides, and applications of tracers to chemistry.

Chapters 12 and 13 are new. Chapter 12 deals with the fission chain reaction, types of nuclear reactors, nuclear power and the chemical processing and hazards connected with nuclear reactors. A section on military applications is included.

Chapter 13 is concerned with cosmic rays, the production of energy in stars, age determinations of the earth, of

minerals and of carbon specimens. The genesis of the elements and their cosmic abundance is also discussed.

Each chapter is followed by a large selection of problems. Many new ones appear in the present edition. From my own experience, over the past 5 years in teaching a course using the original edition I can say that the problems adequately cover the material. Only through the solution and the study of them can the student get the maximum benefit from the book.

The Appendix contains the following tables: useful physical constants and conversion factors, relativistic relations, thermal neutron cross sections, reaction cross sections for 14-Mev. neutrons, thick target yields for some nuclear reactions, some measured nuclear spins, and a table of nuclides that includes the latest information up to January, 1955.

There is more subject matter here than can be presented in a one semester three-hour lecture course. This was true of the first edition and with the approximately 50% increase in material in the present book, the instructor will have considerable latitude in the selection of topics.

The course could be taught with a light treatment of nuclear theory for those intending to use tracers in research. On the other hand, the text will be useful if the emphasis is to be more on the reactions of nuclei, the properties of the resulting species and the fundamentals of nuclear theory.

This book satisfies a very definite need and is in my opinion the best in the field.

DEPARTMENT OF CHEMISTRY
SYRACUSE UNIVERSITY BENJAMIN P. BURTT
SYRACUSE, N. Y.

Proceedings of the International Conference of Theoretical Physics, Kyoto and Tokyo, September, 1953. Edited by I. IMAI. Science Council of Japan, Ueno Park, Tokyo, 1954. xxviii + 942 pp. 21 × 28 cm. The price of the publication has been revised to U.S. $10.00 or equivalent, postage $1.00 extra (by surface mail). UNESCO Book Coupons will be accepted.

This comprehensive report of the proceedings of the first purely scientific international conference to be held in Japan has been very carefully prepared in that both the more formal papers and the quite informal discussions have been submitted to the participants for approval before publication. This necessarily means that much of the material has appeared elsewhere in more complete form, or has been superseded by more recent experimental or theoretical work. But the discussions and interchanges between the leading theoretical physicists of the world retain the utmost interest for student and research worker alike, containing as they do both the excitement of fresh discovery and the floundering in the face of unsolved puzzles which are rarely reflected in more formal scientific papers. Since the topics discussed range from field theory and elementary particle physics to solid state and low temperature problems, almost anyone interested in theoretical physics can profit by the look behind the scenes given in this volume, and gain an insight into the present state of the field that is hard to come by in other ways.

RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA H. P. NOYES
LIVERMORE, CALIFORNIA

Traité de Chimie Organique. Vol. XXIII. Edited by VICTOR GRIGNARD, Membre de l'Institut Prix Nobel, G. Dupont, Directeur de l'École Normale Supérieure, and R. LOCQUIN, Correspondant de l'Institut, Professeur á la Faculté des Sciences de Lyon. Masson et Cie, Éditeurs, 120 Boulevard Saint-Germain, Paris VI, France. 1954. xvi + 360 pp. 17.5 × 25.5 cm. Price, Broché 8.000 Fr., Cartonné toile 8.600 Fr.

This is the final volume of the twenty-three that comprise the Treatise of Organic Chemistry begun in 1935 under the direction of Victor Grignard. It is largely devoted to a 360-page index of the complete work, but includes a short (86-page) concluding section on heterocyclic compounds. This material, on quinazolines and purines, was originally planned as a part of Tome XX, but was postponed, for various reasons, until the present volume. Nearly sixty of the eighty-six pages deal with the purines, the remainder being devoted to condensed pyrimidine systems of other kinds. The presentation is succinct, the abundant references to the original literature serving to document the often allusive discussion in the text. The treatment, though terse, is thorough, and a great deal of information is contained in what has clearly been a carefully edited treatise.

The index has been assembled with care and with a view to endowing it with more than ordinary usefulness. The system upon which it is based is described in detail in an introductory section. The unique features of the index are largely supplementary and serve to increase the usefulness and flexibility of an index that is in the main conventional. Cross-references between systematic and trivial or commercial names are frequent, and each entry gives, so far as possible, an indication of the nature of the material to be found in the text.

The Treatise is a rich source of information for organic chemists and will undoubtedly find extensive use. At the time of its inception it had no counterpart in the chemical literature; and although in recent years there has begun to appear the "Chemistry of Carbon Compounds," comparable in many ways with this Treatise, the two works will complement each other.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF CALIFORNIA T. A. GEISSMAN
LOS ANGELES, CALIFORNIA

The Foreseeable Future. By SIR GEORGE THOMSON, F.R.S., S.C.D., Nobel Laureate, Master of Corpus Christi College, Cambridge. 1955. 166 pp. Price $2.50; Cambridge University Press, Cambridge, England. 1955.

"For I dipt into the future, far as human eye could see,
Saw the vision of the world and all the wonder that would be..."

These ringing lines of Tennyson keep coming to mind as the tale of this prescient little book majestically unfolds.

Sir George bases his predictions of scientific and technological advance for the reasonably near future on the purposefully conservative assumption that no new *basic* scientific principles will be discovered during this period. He lists the seven fundamental principles which underlie modern science as follows: Einstein's postulate that no material object or signal can travel faster than the velocity of light; the conservation of mass plus energy through the Einstein equation; the impossibility of creating an electric charge without making an equal one of opposite sign somewhere else; the impossibility of creating a magnetic pole without making an equal one of opposite sign somewhere in the same body; the Heisenberg uncertainty principle; the Pauli exclusion principle; and the second law of thermodynamics. It is fascinating to note that this list contains no axiom which may be described as purely biological. Is biology exempt except as it must conform to the laws of physics and chemistry stated above? Sir George thinks this is hardly likely, but feels the purely biological laws are as yet undiscovered.

The author goes on to discuss the scientific and technological developments that are highly probable, in many cases practically inevitable, being contained within these basic principles as the seed contains the future plant.

In the case of sources of energy, fission energy from uranium and thorium assure abundant energy for centuries even when fossil fuels are exhausted. If fusion energy can be controlled, as it probably will be, energy will be cheap and inexhaustible. Solar energy will also be harnessed for special uses and may possibly be another cheap and abundant source.

So far as materials are concerned, new methods of terrestial mining and recovery from the sea will develop to keep pace with avaricious demand. Materials such as metals, glass and plastics will be made much stronger, approaching their theoretical strengths which are at least ten times their presently attained strengths. Elements that are now used only seldom will find special and very important uses, as was the case with germanium for transistors.

For terrestial transport and communication the major problems of the present and future are not technological but sociological: nuisances such as parking, the rush hour and avoidable accidents. For non-terrestial travel we may