contained in the granules ("Marsh factor"), adenosine triphosphate, and calcium and magnesium ions. Adenosine triphosphate has two functions: In rest it renders the muscle plastic and extensible, while in activity it makes the muscle contract, supplying it with energy by means of the splitting of its terminal high-energy phosphate bond. During contraction, Mg^{++} activates actomyosin, while in relaxation it activates the relaxing factor. In rest, Ca^{++} is bound to actomyosin, while it inactivates the relaxing factor during contraction. Major significance is attributed to the alternate binding and release of these two ions on the two sites in the chemical mechanism of contraction and relaxation.

The second chapter deals with the mechanism of muscular contraction. The author shows the inadequacy of earlier theories and takes sides with the "sliding theory," for which he offers a detailed chemical interpretation.

In the third chapter Weber deals with "the four mechanisms involved in the movement of cells." He shows that the mechanism of contraction found in muscle underlays various forms of motion in diverse cells but represents in no way the only mechanism found in nature. "Nature apparently made experiments with different mechanisms of movements," such as stretching and contraction of organelles by Ca^{++}, prevented or reversed by adenosine triphosphate, and stretching induced by adenosine triphosphate and other polyphosphates.

Not all researchers in this field will necessarily subscribe to Weber's views on all points. But even if the views expressed are at many points individual ones, they are interesting, Weber being one of the leading pioneers of muscle research. The personal touch makes the little book refreshing and interesting reading.

ALBERT SZENT-GYÖRGYI
Laboratory of the Institute for Muscle Research, Woods Hole, Massachusetts

Handbuch der Physik. vol. 5, pt. 1, *Principles of Quantum Theory.* S. Flügge, Ed. Springer, Berlin, 1958. 376 pp. Illus. DM. 90.

This volume of the *Handbuch* contains two articles. *"Die allgemeinen Principien der Wellenmechanik,"* by W. Pauli, is largely a reprint of an article that appeared in the previous (1933) edition; "Quantenelektrodynamik," by G. Källén, contains subject matter that, on the average, is less than a decade old.

Pauli's work remains a classic account of both wave and matrix mechanics for systems with a finite number of degrees of freedom. The deletion of the final sections, which contained a now inadequate introduction to, and critique of, quantum electrodynamics, is the only noteworthy change from the prior version. Because of the undiminished luster of the author's reputation, and because of the intrinsic virtues of the article, it will continue to attract serious students of quantum mechanics who wish to deepen their understanding of the subject beyond what is offered in the usual first course.

In the article on quantum electrodynamics, G. Källén describes the most impressive achievement of theoretical physics of the last decade. This has been the development of the theory of renormalization and its application to the interaction of the Maxwell field with the electron-positron field, permitting the extraction, from a mathematically meaningless theory, of physical predictions which have had a striking experimental confirmation. The account of the interaction of the two fields, the central theme of the work, is strongly influenced by the author's own contributions to the subject: a most careful application of the adiabatic hypothesis to the discussion of scattering processes and an early realization of the superiority of the Heisenberg picture (representation) for the definition of the concept of physical particle.

Nevertheless, the deduction of physical results follows well-established lines. The Dyson form of the S-matrix is developed briefly and applied to the simplest scattering processes. The discussion of the so-called radiative corrections, which embrace the new practical achievements of theory, is carried through by means of an effective current operator—almost the earliest satisfactory method applied to these problems—but the detailed calculations are simplified considerably by the fullest use of those analytic properties of the theory which follow from its "causal" character. The concepts of charge and mass renormalization are introduced, and such decisive tests of the theory as the corrections to the scattering of an electron by a Coulomb field, the anomalous electron moment, the Lamb shift and the hyperfine structure of hydrogen-like atoms, and the fine structure of positronium are calculated to lowest order. The results of higher order calculations are summarized, and the striking agreement with experiment is indicated.

The article concludes with a detailed presentation of the author's own most basic contribution to the subject, the development of a general theory of renormalization of mass and charge without the use of perturbation theory and his so far inconclusive attempt to establish the mathematical *inconsistency* of the renormalization theory.

The only conspicuous omissions from Källén's painstakingly constructed article are an account of Dyson's classic proof of the renormalizability of the S-matrix and the current postulational studies of the general structure of the theory along the lines laid out in part by the author himself. Presumably the latter will loom large in the so far elusive part 2 of this volume.

ABRAHAM KLEIN
Department of Physics, University of Pennsylvania

Proceedings of the International Symposium on Isotope Separation. Held in Amsterdam, 23–27 Apr. 1957. J. Kistemaker, J. Bigeleisen, A. O. C. Nier, Eds. North-Holland, Amsterdam; Interscience, New York, 1958. xx + 704 pp. Illus. $15.

Although the separation of isotopes has been of increasing interest in the last two decades, the first broad international conference in this field was held in Amsterdam in April 1957.

The papers presented there have been compiled into an excellent reference volume, nicely balanced between theory and practice. Many of those most actively engaged in isotope separation are among the contributors. Sixty-three papers are included; most of them are in English, a few are in French and German. At least 14 nations are represented.

This book is conveniently arranged in nine parts, as follows: "Chemical engineering" (four papers pertaining to plant processes); "Molecular interactions" (four papers on isotope effects); "Chemical exchange" (ten papers); "Electromigration" (six papers); "Distillation" (seven papers); "Thermal diffusion" (seven papers); "Diffusion" (nine papers); "Electromagnetic separation" (11 papers, two abstracts); and "Ultracentrifuges" (two papers).

Chemical exchange and electromagnetic separation receive the most attention, as would be expected, considering the success of these methods in producing a variety of useful quantities of isotopes. Workers on these methods have extended wartime progress, to the benefit of isotope separation and isotope application.

However, this comment is not intended to take any credit from the excellent original research done and reported in this book on other methods of isotope separation. It is good that this conference covered all methods so well.

Much progress has been made in the gaseous diffusion process, but security classification continues to obscure most of this technology.

This volume will be happily received by all those interested in or engaged in isotope separation. Such a complete com-

pilation of papers in this area may not appear again for many years.

The entire volume is well arranged and remarkably free from errors, in view of the number and geographical distribution of the contributors.

J. Kistemaker, the force behind the conference and in the preparation of these proceedings, has performed a valuable service for his colleagues.

C. P. KEIM
Technical Information Division,
Oak Ridge National Laboratory

Progress in the Chemistry of Organic Natural Products. vol. XIV. L. Zechmeister, Ed. Springer, Vienna, Austria, 1957. viii + 377 pp. $17.85.

In this most recent volume of the *Progress* series, Zechmeister has assembled seven chapters representative of fields of current interest; five of these deal with the chemistry of plant materials. Noteworthy is the steady increase in the amount of space devoted to biogenetic mechanisms—no longer an isolated area of fragile speculation.

"Acetylenverbindungen im Pflanzenreich," by F. Bohlmann and H. J. Mannhardt, reviews the methods of isolation, structure elucidation, and synthesis of a variety of acetylenes and polyacetylenes found in both higher and lower plants. The chapter closes with a detailed speculation on the biogenesis of this series and a description of the use of actylene compounds as a guide in plant taxonomy.

In "Neuere Ergebnisse auf dem Gebiete der glykosidischen Herzgifte: Zucker und Glykoside," C. Tamm presents recent work on the chemistry of the cardiac-active glycosides. Physical properties of the sugars and aglycones, as well as botanical sources of the glycosides, are presented in extensive tables.

The chemistry of hypericin and related polycyclic quinones is set forth in a chapter by H. Brockmann, "Photodynamisch wirksame Pflanzenfarbstoffe." These plant coloring matters sensitize grazing animals to serious irritation by sunlight. The interesting hypothesis that such compounds catalyze the photooxidation of proteins is discussed briefly.

In "Biosynthetic relations of some natural phenolic and enolic compounds," A. J. Birch summarizes the evidence derived from labeling and other experiments which permits an elaboration of the pathway from two-carbon fragments to complex cyclic compounds. By making use of a few chemical reactions known to be within the realm of enzymes, Birch is able to correlate the structures and biosynthesis of a wide variety of natural products, including phenols, coumarins, anthocyanins, lignin precursors, terpenoids, and tropolones.

H. Sobotka, N. Barsel, and J. D. Chanley have reviewed the chemistry, physiology, and pharmacology of "The aminochromes." The oxidation products of phenylethylamines have long been of interest as precursors of melanin pigments. The current research activity on the metabolism of adrenalin and aromatic amino acids, and on the pharmacological properties of these unstable quinones themselves, renders the chapter particularly timely.

A portion of the complex and fascinating chemistry of vision is reviewed in "Visual pigments," by R. A. Morton and G. A. J. Pitt. In addition to describing the chemistry of retinenes and rhodopsin, the authors have enhanced the value of the review by including a comparative survey of the eye pigments of nonmammalian species.

A final chapter by H. Brown, "The carbon cycle in nature," discusses the possible origins and the quantities, rates, and mechanisms of turnover of biochemical carbon. A number of phenomena are explained by the assumption that the earth was born with a reducing atmosphere which was gradually transformed to the present oxidizing atmosphere.

The high calibre of writing traditional to this series is maintained in the present volume, as is the quality of the paper and printing.

LOUIS A. COHEN
National Institute of Arthritis
and Metabolic Diseases,
National Institutes of Health

British Pharmacopoeia, 1958. Published under the direction of the General Medical Council. Pharmaceutical Press, London, for the Council, 1958 (order from Rittenhouse Bookstore, Philadelphia). xxvi + 1012 pp. £3 3s.

American readers familiar with the *United States Pharmacopeia* (*USP*), volume XV, will be perfectly at home with the *British Pharmacopoeia, 1958* (*BP*). The two compendia are similar in scope, content, and format. Both consist of introductory notices and definitions, several hundred pages of monographs running from acacia to zinc undecylenate (including names, descriptions, identification and assay methods, and the like), and detailed appendices on methods and materials. In both books the material is assembled with the assistance of committees drawn from pharmacists and physicians from universities and industry; the English use about twice as many committees as do the Americans.

A few of the minor differences may be interesting to American readers. The *BP* eliminates the salt of a drug when only one form is used; thus "Injection of neostigmine methylsulfate" becomes "Neostigmine injection." In expressing dosage the *BP* is somewhat less consistent than the *USP*. Some statements are brief, as for isoniazid: "0.1 to 0.3 g. daily in divided doses"; others are long, as for cyanocobalamin: "By intramuscular injection, controlling dose, 50 to 100 micrograms weekly, or more frequently if subacuate combined degeneration of the spinal cord is present; maintenance dose, 50 to 100 micrograms every two or three weeks." In the *USP* the usual dose and the range of doses are given separately, with therapeutic directions uniformly brief. A more important difference is the inclusion of a categorizing name or statement in the *USP* which informs the reader of the general action or type of the drug, and thus helps to identify a drug when its name alone does not bring recognition.

Neither book is a therapeutic guide for physicians. Rather both are books of standards and sources of pharmaceutical directions which list officially those drugs preferred in good medical practice.

WINDSOR CUTTING
Department of Medical Microbiology,
Stanford University

New Books

Administrative Medicine. Transactions of the fifth conference, 28–30 October 1956, Princeton, N.J., George S. Stevenson, Ed. Josiah Macy, Jr. Foundation, New York, 1958. 197 pp. $3.75.

Advances in Clinical Chemistry. vol. I. Harry Sobotka and C. P. Stewart. Academic Press, New York, 1958. 409 pp. $12.

Adventures in the World of Science. Charles Greeley Abbot. Public Affairs Press, Washington, 1958. 159 pp. $3.50.

Aircraft Communications Systems. J. H. H. Grover. Philosophical Library, New York, 1958. 135 pp. $6.

Bacterial and Mycotic Infections of Man. Rene J. Dubos. Lippincott, Philadelphia, ed. 3, 1958. 832 pp. $8.50.

The Biological Replication of Macromolecules. Symposia of the Society for Experimental Biology, No. XII. Academic Press, New York, 1958. 261 pp. $9.50.

Buildings for Research. An architectural record book. F. W. Dodge Corp., New York, 1958. 224 pp. $9.50.

Causes de la répartition des êtres vivants. Raymond Furon. Masson, Paris, 1958. 168 pp. Paper, F. 1000.

Clinical Neuroanatomy, Neurophysiology, and Neurology. With a method of brain reconstruction. Louis Hausman. Thomas, Springfield, Ill., 1958. 547 pp. $9.75.

Coccidioidomysocis. Marshall J. Fiese. Thomas, Springfield, Ill., 1958. 253 pp. $9.50.

Cosmic Electrodynamics. J. W. Dungey. Cambridge Univ. Press, New York, 1958. 192 pp. $6.

Discussions on Child Development. A consideration of the biological, psycho-