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.

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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.

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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-