

stants is in error owing to the necessity of a theoretical correction unknown at the time of the measurement, thus requiring readjustment of all of the constants. One obtains a dramatic illustration of the processes through which this 1955 best set of constants is already following the path of its predecessors into obsolescence, which is as it should and must be.

Then, on starting the second article, "Quantum Mechanics of One- and Two-Electron Systems", by H. A. Bethe and E. E. Salpeter, one has the immediate impression that "this is for the ages" (or what passes for the ages in physics). Its progenitor, written by Bethe for the famous Vol. 24/1 of the original *Handbuch*, served as the standard reference in this field for 24 years; the new version may well hold up as long.

Actually, the above comparison is not really fair. The article on the Fundamental Constants contains, in addition to the best values as of 1955, a history of the precision measurement of atomic constants and a detailed description of the theory and application of the least squares method, as well as a skillful and well-reasoned exposition in defense of the periodic determination, by such methods, of a set of "best values" despite the likelihood that, owing to the dependence of the interpretation of experiments on a vast body of experimental and theoretical knowledge, some as yet unknown, these best values may well turn out not to be the true values.

The article of Bethe and Salpeter follows, more or less, the pattern used by Bethe in the original. It is a tribute to the original version that so much of the new article bears such a close resemblance to the old one, even after a quarter of a century and notwithstanding the accumulation of a vast quantity of additional measurement, particularly of the fine- and hyperfine structure of H- and He-like atoms, and of the development of the new techniques of quantum electrodynamics for their interpretation. The inclusion of this new material, both in the sections on the atomic energy levels and on the interaction with radiation, has compelled the omission of some of the calculational details contained in the original, as well as the sections on the H and He molecules and molecular ions. Nevertheless, with its 350 pages crammed with practically all that is known about the subject, it is a monumental work.

Atoms II. Vol. 36 of *Handbuch der Physik*. Edited by S. Flügge. 424 pp. Springer-Verlag, Berlin, Germany, 1956. DM 88.00 (if part of series DM 70.40). Reviewed by R. B. Lindsay, Brown University.

This is the second volume on atoms in the new edition of the *Handbuch der Physik*. It contains four articles as follows: 1) "Quantenmechanik der Atome" by F. Hund (108 pages), 2) "Statistische Behandlung des Atoms" by P. Gombás (121 pages), 3) "Theory of Atomic Collisions" by H. S. W. Massey (75 pages), 4) "Excitation and Ionization of Atoms by Electron Impact" by H. S. W. Massey (100 pages). As the titles

indicate the first two articles are in German and the last two in English.

The new edition of the *Handbuch* or *Encyclopedia* is to appear in 54 volumes, and the volume under review is the second in a series of three on atomic and molecular physics. It leans rather heavily on Volume 35, which deals with the fundamentals of the quantum mechanics of atoms, and is followed by Volume 37 on molecular structure and properties.

All three authors of Volume 36 are noted authorities in atomic physics and their contributions are written with great care and clarity. The reviewer was particularly impressed by the extremely detailed and thorough treatment of Gombás, whose article is the most completely documented of the four in the volume. The relations between the Thomas-Fermi atom and the self-consistent field of Hartree are developed in detail and are expressed in numerous diagrams. Almost half of the article is devoted to a wide variety of applications of the statistical treatment of atomic systems.

The article of Hund is a small-scale treatise on atomic quantum mechanics and covers most of the ground usually found in such texts. The emphasis on symmetry properties and group theory is indeed unusually thorough and rewarding. As one might expect from the author's own interests there is a good deal on the vector model.

The first article by Massey reminds one to a considerable extent of the well-known text by Mott and Massey, brought up to date. The treatment is fundamental, but there are many references to the recent literature since 1950. The second article is really a continuation of the first with more emphasis on the experimental study of collision cross sections. There is an interesting section on astronomical applications, e.g., the solar corona and gaseous nebulae.

The general appearance of the volume reflects the high standards of book production which have always been maintained by the publisher. It is a pity that the price of the volume puts it out of the range of most students of physics, who will in general be forced to content themselves with library copies.

Annual Review of Physical Chemistry. Vol. 7. Edited by H. Eyring. Associate Editors, C. J. Christensen, H. S. Johnston. 503 pp. Annual Reviews, Inc., Palo Alto, Calif., 1956. \$7.00. Reviewed by J. Hilsenrath, National Bureau of Standards.

The 7th volume in this series contains much of interest to physicists particularly in the fields of quantum and statistical mechanics, spectroscopy and molecular structure, the solid state, cryogenics, nuclear magnetic resonance, and equation of state.

New chapters include Ion Exchange, Combustion and Flames, and High Temperature Chemistry which replaces 3 chapters which do not require annual review. In the remaining 18 chapters which appear annually, a number of the reviewers have exercised their prerogative to confine their review to specialized areas.

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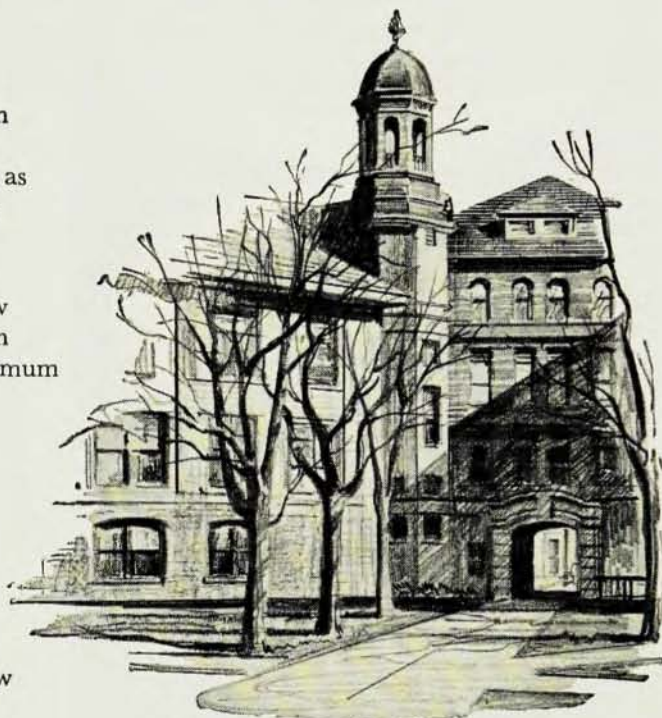
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Thus we find under Cryogenics a discussion of the third law of thermodynamics, the liquid helium temperature scale, and anti-ferromagnetism; under Heterogeneous Equilibria and Phase Diagrams, emphasis on vapor-liquid equilibrium of organic substances; under Quantum Theory, an extensive discussion of crystal field theory; under Polymers, a treatment of rates of initiating of polymerization in homogeneous vinyl polymers; under Thermochemistry and Thermodynamics of Substances, a summary of developments in the equation of state at very high pressures and temperatures; under Solid State, a discussion of point imperfection in metals and properties of germanium and silicon; and under Magnetic Resonance, emphasis on electronic and nuclear magnetic resonance. The remaining chapters provide broad coverage under such general headings as: Solutions of Nonelectrolytes, Statistical Mechanics, Radiation Chemistry, Kinetics of Reactions in Solutions, Kinetics of Reactions in Gases, Isotopes, Surface Chemistry and Catalysis, Molecular Electronic Spectroscopy, Rotation Vibration Spectroscopy, Experimental Molecular Structure, and the three new chapters cited earlier.

The representation on the reviewers' list of Universities of Oxford, Cambridge, Leeds, Sheffield, Liverpool, and Tokyo is indicative of a welcome trend toward a truly international review publication.

Physical Chemical Techniques. Vol. II of Physical Techniques in Biological Research. Edited by Gerald Oster and Arthur W. Pollister. 502 pp. Academic Press Inc., New York, 1956. \$12.80. Reviewed by J. G. Hoffman, Roswell Park Memorial Institute.

Books on physical chemistry are usually big, thick and have over 800 pages. By contrast this book has 478 pages covering nine chapters on selected techniques pertinent to biological research. Each chapter is (as the preface states) "a comprehensive introduction to the field and, in conjunction with the extensive bibliography, should inform the reader of the scope of the technique and its potentialities for his particular research".

There are many different physical chemical techniques in the borderlands of biological research. Therefore, it is interesting to see the editors' choice of the most important ones, which are: Tracer Techniques: Stable and Radioactive Isotopes, Measurement and Properties of Ionizing Radiations, Sedimentation, Diffusion, and Viscosity, Surface Film Techniques, Absorption and Chromatography, Electrophoresis and Ionophoresis, Electrical Potential Differences, Magnetic Methods, X-ray Diffraction and Scattering.

The first and third volumes of the three-volume series have a wealth of how-to-do-it information of which this volume has somewhat less, perhaps because of the magnitude of the subjects undertaken. For example, there is a section under Ionizing Radiation entitled: "The Mechanism of Radiobiological Action" to which are devoted less than two pages. This permits only a