Chapters III. and IV. are devoted to an extended discussion of the Zeeman effect and of the propagation of light in a body composed of molecules. In concluding, the author remarks on the inadequacy of the theory in its present state, and cites the experiments of Wood on sodium vapor, and those of Humphreys and Mohler indicating the shifting of spectral lines by pressure, as beyond the power of the present theory to explain.

In chapter V. optical phenomena in moving bodies are considered. Fresnel's classical work in this connection is reviewed, likewise Stokes's theory of aberration with Planck's well-known amendment. The theory of electrons is applied to the deduction of Fresnel's coefficient. The Michelson-Morley experiment is discussed, and its negative results explained on the assumption of the Fitzgerald-Lorentz shortening effect. The negative results of Rayleigh and of Brace in looking for double refraction due to the Fitzgerald-Lorentz shortening effect are explained on the author's theory of corresponding states for a fixed and moving system. Abraham's results on the energy of a moving electron are discussed. The question of form of the moving electron is also considered; and the difficulty is brought out of reconciling the rigid spherical electron of Abraham, or the electron deformed by motion into an ellipsoid having the original volume, proposed by Bucherer and by Langevin, with the experiments of Rayleigh and of Brace on double refraction in moving bodies. The author's well-known electromagnetic equations for a moving system are derived, and the interpretation which has been given to his results by Einstein in the theory of relativity is clearly brought out.

Even the non-mathematical reader will not find unusual difficulty in reading this book. For the text itself is devoid of intricate mathematical proofs. Those who are interested in following through the analysis involved in the demonstrations of the formulæ employed in the text are referred at the appropriate times to the mathematical notes at the end of the book. Throughout, the reader meets with the usual clear methods of exposition so characteristic of all the author's writings. The book is in English and published by the firm of B. G. Teubner, Leipzig.

A. P. WILLS

Taschenbuch für Mathematiker und Physiker. Unter Mitwirkung von FR. AUERBACH, O. KNOPF, H. LIEBMANN, E. WÖLFFING, u. A. herausgegeben von FELIX AUERBACH. 8vo, pp. xliv + 450. Leipzig und Berlin, Teubner. 1909. 6 Marks.

While the chemists, astronomers, engineers and other professional orders have long possessed pocket manuals for handy reference, a similar convenience has not been provided for mathematicians and physicists. The present little volume supplies this want in a considerable degree, and compresses into a small space a remarkable mass of useful information. The "Taschenbuch" will be issued annually, with constant variation of subjects treated so as to cover eventually as wide a range as may be desirable. The first volume, for 1909, has been delayed by circumstances incident to a new undertaking, but future issues are expected to appear early in each year.

A brief notice of Kelvin's work, accompanied by a portrait, opens the volume. There follow a calendar for the year 1909, several useful tables of astronomical, geographical and other constants, and four-place tables of logarithms, trigonometric and hyperbolic functions, squares and Bessel functions. These conclude the introduction, pages i–xliv. The body of the manual is divided between Mathematics, pages 1–160; Mechanics, pages 161–203; Physics, pages 204–350, and General Chemistry, pages 351–369. Later come lists of mathematical and physical journals and of recent publications, a necrology, the roll of teachers in the higher German institutions of learning and a good index of the volume.

Subjects reserved for treatment in later issues are indicated in the text. Under Mathematics are at present included the fundamentals of arithmetic, theory of numbers, algebra, determinants, theory of groups, infinite series, differential and integral calculus, definite integrals, differential equations, calculus of

variations, theory of functions, elliptic functions, geometry and trigonometry, analytic geometry of plane and space, differential geometry, probabilities, calculus of errors, quaternions and vector analysis. Under each of these and other topics is a brief summary of the subject, often containing items that are not elsewhere so easily found.

Mechanics and Physics cover a wide range: Lagrange's equations, spherical harmonics, graphical statics, work and energy, hydrodynamics, elasticity, heat, sound, light, electric units, laws and measurements, electromagnetism, induction, hysteresis, Maxwell's theory, etc. Numerous tables accompany the text.

In arrangement and style the "Taschenbuch" reminds one of Pascal's "Repertorium of Higher Mathematics." It is, however, only about one third as large, and in mathematical content only one ninth. All references have been excluded under the heavy compression. But every mathematician and physicist will find it a useful book to have about, for it will often save searching through a library for an elusive item.

F. N. Cole

Vergleichende Anatomie der Wirbeltiere. Dr. Robert Wiedersheim. Seventh edition. Pp. 936, 476 figures, one plate. Jena, Gustav Fischer. 1909.

The rapid growth of this book, which now contains nearly a thousand pages and costs between five and six dollars, has transformed it from a text-book into a reference work. As such it will without doubt be as indispensable as in previous editions. It retains, however, much the same character as before.

It is pleasing to an American to note the large recognition of American work, but one regrets that in one or more instances the facts are recorded in footnotes only.

The text is brought up to date by the addition of new material on almost every page and certain sections are essentially rewritten, as for example, the discussion of the lymphatic system, which is more than twice as large as before. The chapter upon the skull has grown the most owing to a large degree to the introduction of more figures of chondrocrania. The section upon myology ought, it seems to the writer, to have received more attention than it has had. The subsection upon the electrical organs certainly ought to have been rewritten so as to embody recent discoveries. The sections upon the central nervous system, sense organs and the respiratory system have expanded about equally. The discussion of the peripheral nervous system is but slightly longer, but it has been largely rewritten and is greatly improved.

The sixty new figures are well chosen. A considerable number of illustrations which have appeared in several editions could well be dispensed with, and the printing of many of the old figures in colors has added little if at all to the usefulness or beauty of the book.

The bibliography has been thoroughly revised, a very large number of new titles have been added, and, owing to the omission of many of the older or less important titles, there has been only a small increase in size.

This edition can be heartily commended.

Leonard W. Williams

Lectures on the Experimental Psychology of the Thought-Processes. By Edward Bradford Titchener. New York, The Macmillan Company. 1909. Pp. xi + 318.

In these lectures, originally delivered at the University of Illinois in the spring of 1909, and now published with an appendix containing valuable notes and references, Professor Titchener presents a résumé and criticism of a much-debated recent development in experimental psychology—an attempt to extend the experimental method to the processes of thinking. The extended series of articles which are chiefly considered—though contributions by other psychologists receive due notice—have emanated from the pupils and colleagues of Professor Külpe at Würzburg. The principal names are Marbe, Watt, Ach, Messer and Bühler, and the dates run from 1901 to 1908. Many other writers, whose work or views bear on the problem, are considered in the notes or in the two introductory lectures.

The early experimental psychologists considered the higher intellectual processes too