treated are fewer in number and the whole method of discussion is radically different. At most universities of France a course in mathématiques générales is offered for students of physics, chemistry and engineering. Algebra, analytical geometry, analysis, and mechanics are here developed.* Largely as a preparation for such courses and to fill up lacunæ in connection with them, M. Sainte-Laguë's book was written. While rigor of presentation is not neglected, details in proofs are not always dwelt upon and practical applications of the various subjects are emphasized.

To contrast with Tannery, the first section (pages 1–81) treats of arithmetic; the next section (pages 82–202) of algebra, including derivatives; plane trigonometry, pages 203–234; under geometry (pages 235–399) the sub-headings are: lines and planes, parallels, spherical geometry, metrical relations, lengths, areas and volumes ("formule de Tchebitcheff" is used on page 347 and page 502 but this spelling is not sanctioned by either Cantor or *Bibliotheca Mathematica*), graphic constructions, descriptive geometry, methods in geometry; kinematics, pages 399–416.

At the end of every section are references to 500 exercises for solution (pages 417–470). These are mostly numerical and letters *A*, *B*, *C* indicate the degree of their difficulty. Then follow various numerical tables including one of logarithms (four place), formulas, etc. The whole concludes with an admirable "index alphabétique" as well as "table des matières" (pages 503–512).

Anyone somewhat familiar with the French educational system will find this volume of interest. In connection with both the theory and the problems there is suggestive material for early undergraduate college teaching.

R. C. ARCHIBALD.

Encyklopädie der Elementar-Mathematik. Angewandte Elementar-Mathematik. Zweiter Teil. Dritter Band. Zweite Auflage. Von HEINRICH WEBER und JOSEF WELLSTEIN. Leipzig und Berlin, Teubner, 1912. xiv+671 pp. 14 Marks.

* A representative treatment of the subject is given in E. Fabry's Traité de Mathématiques générales, 2e éd., Paris, 1911, and the key to the problems, Problèmes et Exercices de Mathématiques générales, Paris, 1910. The first editions of these books have been reviewed in the BULLETIN, vol. 15 (1909), pp. 395–399 and vol. 17 (1911), p. 320.

This second edition of the Elementary Encyclopedia has received such extensive additions that the third volume of the original appears in two parts. The first of these was reviewed in this BULLETIN, page 87 of the current volume. The second part, under consideration, contains the revised books entitled "Graphik" and "Wahrscheinlichkeitsrechnung." The first book has a new section on "Axonometrie und Perspektive." "Two new books have been added to meet the views of certain critics of the first edition: "Politische Arithmetik" and "Astronomie." Other changes are minor.

The third book includes the theory of interest and actuarial computations. The theory of interest is based upon compound interest, in the sense that simple interest is looked upon as an annuity in perpetuity. Only the elements of insurance are developed.

The fourth book deals with spherical astronomy and the calculation of orbits. The subjects considered are astronomical coordinates, determination of time, variations of stellar coordinates, observations with instruments, determination of latitude and longitude, and orbits.

The additions to this useful work will be welcome in many quarters. While one might criticize the proportional amount of space devoted to them, and to the other divisions of the book, such criticism would arise from purely personal views as to what applications are important, and would vary from person to person. The authors and editors are deserving of praise for the work taken as a whole.

JAMES BYRNIE SHAW.

A History of the Theories of Aether and Electricity from the Age of Descartes to the Close of the Nineteenth Century. By E. T. WHITTAKER. London, Longmans, Green, and Co., 1910. xiii+475 pp.

EITHER consciously or unconsciously, Whittaker must be imbued with a missionary spirit which leads him forth into dark places to enlighten them with opportune gospel. Three of his books, Modern Analysis (1902),* Analytical Dynamics (1904),† and this History, bear ample evidence to this.

We do not lack for works on the theory of functions, but

* Reviewed in the BULLETIN, volume 10, p. 351, by M. Bôcher.
† Reviewed in the BULLETIN, volume 12, p. 451, by E. B. Wilson.