The first edition of Professor Volkmann's book was reviewed in this BULLETIN, volume 4 (1898), page 355. What was said there will apply very well to the new edition. It seems superfluous, then, to do more than indicate very briefly the changes that have been made in the new edition. What in the first edition was the first lecture has in the second been incorporated in the closing lectures. The new edition begins with a historical retrospect on the development of science and its conceptions. A section on the subjective and objective elements in knowledge has been added, as well as an appendix containing two earlier papers of the author giving an appreciation, from the philosophical point of view, of the Newtonian system of mechanics. The book closes with a complete bibliography of the author's philosophical writings and very complete author and subject indexes.

J. W. YOUNG.

Repertorium der höheren Mathematik. Zweite Auflage, erster Band, erste Hälfte, herausgegeben von P. EPSTEIN. xv+527 pp. M. 10. Zweiter Band, erste Hälfte, herausgegeben von H. E. TIMERDING. xvi+534 pp. M. 10. Leipzig, B. G. Teubner, 1910.

THIS work is called a second edition of Pascal's Repertorium of Higher Mathematics.* It is, however, in many respects, a new work. The text has been thoroughly revised and greatly augmented. The half which has already appeared is nearly equal in size to the whole of the first edition. We are also informed (volume I, page viii) of a change in the purpose of the work. The aim of this edition is to give the reader, "a systematic survey of the total field of mathematics, based on genuine understanding."

As a further conspicuous departure from the original edition, which was the work of a single author, the editors have secured, as authors of the individual chapters, men particularly interested in the subjects covered by them. In the part of the work that has appeared, the authors are: in analysis, Hans Hahn, Alfred Loewy, H. E. Timerding, Paul Epstein; in geometry, J. Mollerup, H. Liebmann, H. Timerding, L. Heffter, G. Guareschi, M. Dehn, F. Dingeldey, L. Berzolari, G. Giraud, E. Ciani, H. Wieleitner. It is interesting

* A review of the first volume of the original Italian edition will be found in this BULLETIN, vol. 5 (1899), pp. 357–362.

to notice that, for the volume on geometry, the editors have secured several Danish and Italian authors. "The decrease of interest in geometry in Germany," we are told (volume II, page vi), "made it seem impossible to do otherwise."

In method of presentation, the authors have followed the first edition quite closely. They have endeavored to present in the clearest and concisest manner possible the principal theorems, formulas, definitions, and concepts of each of the subjects treated. Proofs are usually suppressed, but are sometimes indicated briefly. In references to the literature this work is a great improvement on its predecessor. The references are now always ample for further study of the main topic under discussion, but they will even yet, in some cases, be found inadequate by the reader whose interest is temporarily centered on an individual theorem.

The choice of subject matter is usually to be commended. Increased emphasis is laid, in the first volume, on the algebraic-group-theoretic chapters, and, in the second, on the chapters on the foundations of geometry. Other chapters, as, for example, those on differential and integral calculus and the calculus of finite differences, are given about the same space as in the first edition. The chapters on the calculus of probabilities and mathematical instruments have been omitted.

Related topics are in some cases insufficiently correlated. As an instance, we may cite the discussion of invariants of ternary cubics and quartics, in volume I, with the discussion of cubic and quartic curves in volume II. This inadequate correlation leads, at times, to unnecessary repetitions. A wider use of cross references would have been helpful.

The statements made are usually clear, concise, and accurate. There are occasional ambiguities, such as the failure to indicate clearly, in volume II, page 398, lines 15–27, whether the statements made are true for all quartics, or only for non-singular ones. There are also some errors. In the last theorem on page 158 of volume I, the $n + 1$ given functions should be of the same degree. The theorems in volume II, page 381, lines 11–14, and page 385, lines 27–30, are false. The theorem stated in volume II, page 406, lines 25–27, fails if the net contains precisely one or two double lines. The correct statement of this theorem should not have been omitted from Chapter XVII.

The publication of the rest of this Repertorium has been delayed far beyond the time originally set. Its appearance will be awaited with interest by mathematicians who have learned the usefulness of the part already published.

C. H. SISAM.

Elements of the Differential and Integral Calculus. By Professor A. E. H. LOVE. Cambridge University Press, 1909. 207 pp.

STARTING with the thesis that " the principles of the differential and integral calculus ought to be counted as a part of the intellectual heritage of every educated man or woman in the twentieth century, no less than the Copernican system or the Darwinian theory," Professor Love has put together in the eleven chapters of this small volume, the fundamental notions of analytic geometry and of the calculus, as well as some of their applications. The whole has been presented in such a way as not to require even as much knowledge of algebra and trigonometry as might reasonably be expected of a sophomore in an American college. In fact, Chapter VII, on Trigonometric functions, begins with an exposition of radian measurement, followed by a definition of sine and cosine. A review of the laws of indices and the interpretation of negative and fractional exponents precedes the discussion of the derivatives of general powers. Needless to say that no attempt is made to give a proof of the existence of a limit of $(1 + 1/n)^n$ as n increases indefinitely. By computing the function for a series of rapidly increasing values of n, the existence of the limit is made plausible.

An appendix of 25 pages is devoted to the discussion of the graph of the linear function, limits, indices and logarithms, the exponential limit, the mensuration of the circle and radian measure, trigonometric limits, and mechanical units. In this way the more ambitious reader of the book is given an opportunity to get a more rigorous treatment of some of the subjects treated more superficially in the text. The method for the calculation of e given in the appendix seems unnecessarily long to the reviewer.

The style of the book is very clear and it would seem that anybody of medium intelligence ought to be able to understand the leading principles of the calculus by a perusal of this text. The illustrations and applications are rather