dent should know the things contained in this book before he enters the university. This makes the volume interesting, as it shows us what is considered a good university preparation in Italy. This is not so different from our own ideas, but many of the subjects here treated we reserve for a course in college algebra. However, many conceptions which we teach in college algebra or at a later period the Italian student gets before he begins his second course in algebra for which the present book is intended. Some of these conceptions are interval, independent variable, inverse function, geometric representation of a function, and sequence of numbers.

The book contains seven chapters the titles of which will sufficiently indicate the contents: Calculus of combinations; Continued fractions; Analysis of indeterminates of the first degree; Inequalities and systems of inequalities; Discussion of equations and problems and equations of second degree; Finite and continuous functions, limits, indeterminate forms; Maxima and minima, discussion of functions. The book also contains an appendix on geometrical conics. Each chapter closes with an excellent set of problems.

Ordinarily the Italian student devotes much more time to the study of elementary mathematics than the American student. But as here indicated, the time is not spent in anticipating college work, as is often done by preparatory schools in this country, but is devoted to doing more thoroughly the ordinary elementary work.

The presentation shows the author to be a master. But the general appearance of the book from the publisher's point of view would not be considered good in this country.

C. L. E. MOORE.

*College Algebra.* By H. L. RIETZ and A. R. CRATHORNE. New York, Henry Holt, 1909. xiv + 261 pp.

THE introduction to this text is concerned with the reasoning in the transition from numerical to literal quantities. Addition and multiplication are regarded as fundamental operations and no attempt is made to define them. Their laws, including their commutative, associative, and distributive properties, are given as assumptions. Subtraction is then defined with reference to addition, and division with reference to multiplication. The algebraic use of these four operations including the laws of real indices is discussed in some detail in the same chapter. The

student's attention is also called to the fact that proofs are quite different from definitions and assumptions, a distinction which he should understand and appreciate at this stage of his mathematical study.

The second chapter provides for a brief review of the student's previous knowledge of algebra. It contains a number of exercises on algebraic reduction, including parentheses, complex fractions, factoring, and radicals. The application of these principles is illustrated in a list of examples calling for the evaluation of a number of builders' and engineers' formulas. The practical nature of these and many subsequent examples is one of the noticeable and commendable features of the book. Chapters three and four take up functional notation, graphs, and equivalent equations. Following this, determinants of the second and third orders are introduced for the purpose of solving systems of linear equations. A more detailed discussion of the elementary principles of determinants is given near the close of the book.

Chapters six to twelve inclusive deal with quadratic equations, maximum and minimum values of quadratic functions of the form $ax^2 + bx + c$, inequalities, mathematical induction, variation, progressions, and complex numbers. The theory of equations is next taken up in a manner worthy of the student's careful attention. One criticism, however, might be offered concerning the article on Horner's method. The graph of the function is emphasized in a way that leads the reader to think of it more as a means of obtaining results than as an interpretation of them. The latter part of the book discusses logarithms, infinitesimals, limits, series, undetermined coefficients, permutations, combinations, probabilities, and determinants.

While recognizing the book as an excellent one for college work, the reviewer offers a few criticisms. In example 13, page 84, $a_m$ must be positive. The sentence in line 7 from the bottom of page 168 might better be made to read "any *finite* number of variables. The use of the word limit in case (*c*), page 171, is scarcely justified by the author's definition of a limit. The phrase, "If from some point on" in article 135, page 178, is not clear to a person unacquainted with the intended meaning. The expression "$-102$" in line 4, page 180, might better be omitted; the sentence is complete and expresses the desired meaning more accurately without it. The theorem in article 141, page 188, should read "if each term is

*numerically* less." The answer given to example 17, page 213, is incorrect. There are a few typographical errors such as $(2n + 1)$ instead of $(2n - 1)$ in example 2, page 87, but they are so trivial as to give no serious trouble and the book as a whole is quite free from them. J. V. McKELVEY.

*Das Prinzip der Erhaltung der Energie.* Von MAX PLANCK. Zweite Auflage. Leipzig, B. G. Teubner, 1908. xvi + 278 pp.

AMONG the many series of books published under some collective title, one which is at the same time scientific and to a certain extent suited to intelligent popular consumption is Wissenschaft und Hypothese. It is the German translation of Poincaré's La Science et l' Hypothèse, which has the position of volume I and which apparently has given its title to the whole series. Other volumes which have already appeared are Poincaré's La Valeur de la Science (translated), Lipps's Mythenbildung und Erkenntnis, Bonola's Die nichteuklidische Geometrie (from the Italian), G. Darwin's Ebbe und Flut (from the English), Hilbert's Grundlagen der Geometrie, Picard's La Science moderne (translated), and Planck's Das Prinzip der Erhaltung der Energie. From these titles it will appear that the series does not consist chiefly of books written especially for it, but is made up at least in large part of works already written in one language or another and assembled (after translation if need be) into one group. Indeed, some of the volumes were already several years old when the series was started, and among the oldest is Planck's which now celebrates the attainment of its majority with a second edition.

Of such well known and acknowledged value and interest is Planck's discussion of the historical development of the principle of the conservation of energy, of the formation and proof of the principle, and of the different kinds of energy, that little need be said of this second edition, which is in no essential way different from the first. The development of science in the last quarter century has offered much that might be added to the book, but has disclosed nothing that need be taken from it. To this statement one possible exception may be taken in view of Minkowski's recent presentation of electromagnetic and mechanical theories from the point of view of the principle of relativity. In the fundamental matrices which Minkowski sets up, the energy is but one element of many and has no apparent invariance or predominating importance! E. B. WILSON.