a very noteworthy contribution to the study of sources in the history of mathematics.

DAVID EUGENE SMITH.

A First School Calculus. By R. WYKE BAYLISS. London, Longmans, Green and Company, 1915. xii + 288 pp.

THE pedagogical method used in this book is distinctly different from any found in the usual elementary calculus text. The author, a mathematical master at a boys' preparatory school in England, aims to teach the calculus to the youths by means of the question and answer method. Simple and definite questions on concrete problems concerning matter supposedly familiar to the youthful students are used to develop and fix the fundamental principles of the calculus. There are 180 pages of questions and suggestions; the answers to these cover 100 pages.

An equivalent of a meager high school course in mathematics seems sufficient as a prerequisite. Much of the work could be done orally; a private student might make considerable headway by using the text. Graphical work is minimized and included almost entirely among the answers.

No attempt is made to introduce rigor in the derivation of formulas. For example, the formulas based on the exponential function are developed from a practical consideration of the rate of increase of a sum of money placed at compound interest (continuous)—a concept with which all the students are supposed to be familiar. Or they are advised to draw a figure and use this to derive a formula. Or tables of trigonometric functions may be used to get average rates of increase and thus lead to general formulas. All of which, thoroughly rough and ready, seems like substituting a butcher's cleaver with a fairly dull edge for the scalpel in a surgical operation.

In the integral calculus much time and labor is saved by the following definition of integral: "We have seen that the symbol $D^{-1}f(x)$ denotes the expression for the *amount* of a quantity when its rate of increase is denoted by $f(x)$. The *amount* $D^{-1}f(x)$ is called the **integral** of the function $f(x)$." After which formulas may be applied in large chunks. And there is an everlasting amount of formal differentiating and integrating to be done.

The evaluation of the definite integral is arrived at through the summation process common to most calculus texts. Much smoother sailing is evident when areas, volumes, centroids and moments of inertia are found.

Needless to say, the law of the mean, extended law of the mean, various forms of remainders and their like are decidedly not included in the chapter on the expansion in series, nor are the various degrees of convergence considered. As the author puts it ". . . there are 'pinnacles' and 'caverns' which only the experienced mathematician should explore."

The concluding chapter is headed The Borderland of Discovery. In other texts this is labeled Approximate Integration.

There is throughout the book much material of a rough and ready nature, which is well worth while and of great service in illustrating the fundamental principles of the calculus; there is certainly lacking the close reasoning which only the use of the method of limits can assure the calculus. The question and answer method might work well with a very limited number of students, though they would certainly have to be English because all units used are intensely British; but, with all the answers given in detail, we doubt very much if even the most conscientious students might not too often be tempted to "look in the book and see."

ERNEST W. PONZER.

Mathematische Abhandlungen, Hermann Amandus Schwarz zu seinem fünfzigjährigen Doktorjubiläum am 6. *August* 1914 *gewidmet von Freunden und Schülern.* Berlin, Springer, 1914. Portrait, viii+451 pp.

THIS volume forms an imposing testimonial to the influence on the development of modern mathematics of the research and teaching of Schwarz. Of the thirty-four papers contributed by his friends and former students, a majority deal with subjects and methods brought out by him. It is impossible, within the limited space of this review, to do full justice to the rich contents of this volume, so that the reviewer must confine himself to mentioning a few of the papers which have been of particular interest to him, while regretting the necessity of passing in silence many noteworthy contributions.

C. Carathéodory gives a simplification of his former proof in the *Mathematische Annalen*, volume 72, of the most general existence theorem in conformal representation, and establishes