The Author Index and Subject Index occupy about ten pages.

To sum up: Professor Miller has written a valuable, original, and very entertaining book, containing much out-of-the-way information difficult of access elsewhere. It deals only with pure mathematics, and in this field emphasizes considerably the subjects of groups, theory of numbers, and theory of equations. While the treatment is often, perhaps necessarily, scrappy (by reason of its "synoptic" nature) it has been shown above that the separate sections do not always treat the subject with the breadth to be expected in a volume designed to guide a student to "points from which he can overlook domains of considerable extent." Either the amateur or the professional mathematician must find much of interest within its covers, however, and the work is heartily recommended.

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## SHORTER NOTICES.

*A History of Elementary Mathematics with Hints on Methods of Teaching.* By FLORIAN CAJORI. New York, The Macmillan Company, 1917. viii + 324 pp. Price $1.75.

Two of the most unsatisfactory literary labors that members of our guild are called upon to undertake are first, the publication of a new edition of an old work, using plates of many years' standing; and second, the review of an edition prepared under such circumstances. Probably the most severe critic of the work in hand is Professor Cajori himself, and if he had been free to do so he would undoubtedly have revised the work more radically than most of his readers would or could undertake to do. The book was written more than twenty years ago, and the world knows more about the subject than it did at that time; it has found better ways of overcoming certain difficulties in the matter of presentation of material; and it has the problem of a history of mathematics better in hand.

125 and 272 (add to index) differs from the index form; for Graup, page 161, line 4 from bottom, read Graap; for McMahon, page 293, read MacMahon.

Here and above the slips or errors are practically all of somewhat minor importance. As a whole Professor Miller's work is exceedingly accurate.

Professor Cajori's later contributions to the subject, such as those on Oughtred, the slide rule, and the calculus, are of an entirely different type from those embodied in the book under review. This is due not merely to the fact that they are intended for more mature readers; it is due quite as much to the fact that they are the product of a hand that has acquired new cunning and of a mind that has developed new powers.

It is therefore manifestly unfair to review this book as if it had just been written, and the proper course would seem to be to call attention to the changes actually made in the plates and to a few of the problems which have to be met by all who engage in historical writing and which are suggested by this work. The book has been a guide to many who, in the last two decades, have begun their study of the history of mathematics, and such a record is in itself a happy criticism.

Most of the misprints in the first edition have been corrected, although the elimination of such errors is not complete. Less attention has been paid to the correction of dates, a difficult problem at best. The impression that Ahmes wrote in hieroglyphics (page 23) still remains, as does the one that the subtractive principle of notation originated with the Romans (page 8), and the one that Hypsicles and Ptolemy were contemporaries (page 28), but perhaps slips of this kind should be considered charitably in an introductory work.

The additions of chief importance relate to the Maya zero (page 18), the history of logarithms (pages 164–166), the dollar sign (page 223), and certain modern movements in the teaching of elementary mathematics (pages 287–309). Of these, the second is particularly welcome as answering, at least negatively, the question of the originality of Speidell in the matter of the natural logarithms. While the invention of such logarithms is not definitely placed, a step has been made by Professor Cajori towards doing so. The fourth of the leading additions is also welcome, for it sets forth various features of modern geometry that have developed since the first edition of the work appeared. Certain recent developments in teaching, such as the Perry movement and the work of the International Commission and of various American associations, are also mentioned briefly but with sufficient clearness for the information of teachers.

The work is, therefore, something besides a mere reprint, and will serve a good purpose not only for those who are

beginning their reading in the history of mathematics but also for those who are interested in the teaching of the subject.

As to the general questions suggested by the work, three may profitably be considered: First, how shall Oriental names be transliterated? If we take the Suter list as given in the Abhandlungen zur Geschichte der Mathematik, which is certainly the most scientific one that has been worked out in mathematics, we run into such a difficulty as that of the sound denoted by the English J. In this respect the scheme is not convenient for English, French, and Spanish readers. If this is settled, what shall be the method adopted for Chinese names? Shall Chu be Chou, Tschu, Tscheou, or Chiu, and shall we have the Yih King, the Yi Ching, or the I Ching as the title of a well-known classic? The same difficulty arises with respect to the languages of India, and indeed of all countries not using the Latin letters. In the case of countries where these letters are used, we can easily fix a satisfactory rule, namely, to spell the name as was most commonly done by the individual, as in the case of Widman and Pacioli (not Widmann and Paciuoli), leaving the pronunciation to be determined by the reader's linguistic powers. The question is not an easy one to answer when transliteration is necessary, and Professor Cajori would be among the first to agree that he has not seriously attempted to meet it.

A second question that arises relates to the sequence of topics. Shall a book of this kind be written with a respect to general chronological sequence, or shall it rather consider the question of the sequence of subjects? Do we wish to know what was happening in the thirteenth century, for example, or do we wish to have placed before us the growth of such topics as numerical calculation, algebraic symbolism, and the like? It is no adverse criticism of the work in hand to say that the former plan is generally followed in the first part of the book, and the latter in that part which relates to the last three centuries. For the purposes in view, this is possibly the best plan. The question is, however, a difficult one to answer in planning such a book.

A third question relates to source material. How much material of this kind may properly enter into a book for beginners? The question has been raised of late years by many teachers of history and is a serious one. For example, the hieroglyphics on page 23 are not from Ahmes, but does this

detract from their value? The cubic on page 228 is not given as it is in Cardan's work; but again, is it therefore less valuable to such as will read this book? It is probable that the question cannot be definitely answered as to how much material of this kind should be given, and probably there is a fair basis for argument as to how exactly it should be reproduced.

In view of the fact that no history of mathematics has ever been written that has not been subjected or could not be subjected to severe criticism with respect to its statements, as witness Eneström's perennial criticisms of Cantor, it will hardly be expected that Professor Cajori's latest edition will, under all the circumstances of its publication, be found to be without flaw. It is, however, interesting to see that the work has been found to be so helpful as to warrant this partial revision. Readers may be pardoned if they join with the author in the regret that a radical revision was impossible for reasons that are apparently commercial.

DAVID EUGENE SMITH.

*A Text-Book on Practical Mathematics for Advanced Technical Students.* By H. LESLIE MANN, B.Sc., A.R.C.Sc. Longmans, Green and Co. (New York), London, 1915. xi + 487 pp. Price $2.10 net.

As is the case with many texts of this type, the material and its arrangement are determined by some restricted need and the personal preference of the author. This text, we are told, is based on the work of the senior students at the Woolwich Polytechnic, following the line of the author's lectures there to the students in mechanical and electrical engineering during the past nine years. Though based on the work of the seniors, "the book is meant to cover a two or three-years' course" assuming "a knowledge of the fundamental principles of algebra, trigonometry, and mensuration, and the use of logarithms and squared paper."

The arrangement will be likely to impress all teachers of mathematics and most teachers of engineering in America as rather reverse in portions of the book to their accustomed order. In several places we were given the sensation of moving backward into the subject. We cannot see what personal preference led to the scrappy, unsystematic treatment of algebra covering seventeen full pages, eight of which are devoted to approximations and applications of approximate