tioned, in the English edition. Curiously enough it required a French translation to mention Waring, who one time held the Lucasian professorship, and whose "identity" would seem to have merited the insertion of his name, at least, in such an English work.

Unfortunately for the best use of the book, there is no index, and the table of contents is not sufficient to make up for the omission. Of all works, one of this nature, to which a student must often refer for a single topic or name, should have a complete index covering both volumes.

It has been said that the translation is not much of an improvement upon that of the first volume. If any proof of carelessness is needed, a glance at the table of 117 errata discovered by the author himself should suffice. But he has by no means covered the list, for even the casual reader will find scores of others. For example, for logarihmotechnica (page 14) read logarithmotechnia, and on the same page for x^{m-n-1} read x^{mn-1} twice; for $1 - y'^2$ read $1 - y^2$ (page 28); in Américan, an English word, drop the accent (page 53); for $V^2{}_2$ read $V_2{}^2$ (page 54); for $\sin x + i \cos x$ read $\cos x + i \sin x$ twice on page 72, thus correcting an error that still exists in the fourth English edition, which has appeared since the translation, and on the same page change the date of De Moivre's death to 1754; spell the French for Edinburgh uniformly, both Edimbourg and Edinbourg appearing on page 73, and elsewhere; change Simpson's birth year from 1610 to 1710 (page 77); for "Arithmetic of lines" read "Arithmetic of sines" (page 82); for Englisch read English (page 89); for 1771 read 1781 (page 122). These are only typical of a considerable number of similar errors that will strike the reader, and they go to show how carelessly the work has been performed. We should be thankful for the added matter, but we might reasonably have hoped for a translation with a minimum instead of a maximum number of errors.

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Geschichte der Mathematik. I. Theil. Von den ältesten Zeiten bis Cartesius. Von Dr. SIEGMUND GÜNTHER. Leipzig, G. J. Göschen'sche Verlagshandlung, 1908. 8vo. 56 figures. viii + 427 pp. 9 Marks.

THE great interest manifested of late in the history of mathematics, evidenced by the fourth volume of Cantor, the enlarged form of the *Bibliotheca Mathematica*, the success of the *Abhandlungen*, the Encyklopädie, and the translations of Ball, assures a hearty welcome to a work like this of Professor Günther's. If the undertaking had been merely a rewriting of old material or a condensation of Cantor, it would not be without its value, but since it is the product of a man with the historical ability and the reputation of Dr. Günther it is certain to take rank as an authority in its field.

The work was undertaken originally in collaboration with Professor von Braunmühl, the plan being that the author of the present volume should carry the work to the middle of the seventeenth century, and von Braunmühl from there on. What the effect of the recent death of the latter may have on the success of the undertaking it is unpleasant to consider, but it is to be hoped that the manuscript of the second volume was completed before the world was deprived of the services of one whose history of trigonometry will remain a standard authority for a long time to come.

This first volume consists of twenty chapters, as follows: Number and measure as primitive concepts of mankind, Mathematics in Mesopotamia, Mathematics in Egypt, Mathematics in China and ancient India, The prealexandrian period in Greece Classical antiquity, Greek mathematics between Apollonius and Ptolemy, Roman mathematics, The decline of Greek mathematics, Byzantine mathematics, Mediaeval Hindu mathematics, The early Arab period, The later Arab period, The position of science in the Church and Court schools of the Christian middle ages, Leonardo of Pisa, Mathematical teaching and progress in the later middle ages, The reform period of Peurbach and Regiomontanus and their followers to 1500, General characteristics of the 16th and early 17th centuries, The arithmetical sciences between 1500 and 1637, and The geometric and mechanical sciences in the same period. The work is followed by an index of names, the general index being presumably, and meantime unfortunately, left until the close of the second volume. There is also a helpful bibliography of seven pages, far from complete but valuable to beginners.

The first thought that may occur to a reader will relate to the reason for writing such a work, in view of the rather extensive literature that we have already upon the subject. The question is answered, however, as soon as he begins to examine the book. For one thing, mathematical history has advanced since Cantor wrote his first two volumes, and new material is now available. This has been used sufficiently to be in itself a warrant for such a treatise. For example, Kugler's work of 1900 on the lunar tables of Babylon, Hilprecht's work on the Nippur excavations (1904, but not that of 1906), von Braunmühl's contributions, Tannery's latest articles — these and others of similar nature have contributed to make the book more up to date than any similar work available. Furthermore, greater seriousness of purpose and maturity of judgment characterize this history than are found in any other of the smaller treatises; that is to say, there is less of the anecdotal and more of the historical and mathematical than would appear in a work like Ball's, for example. On the other hand, the book has not the heaviness of Cantor, but preserves the readable style that is found in the author's other treatises.

In spite, however, of the fact that Professor Günther has given us the best elementary hand book of early mathematical history that has yet appeared, it is not without its points of weakness, partly from lack of sources, partly from errors of judgment. It seems unfortunate, for example, that one should attempt to write upon the history of Chinese mathematics without knowing more than the little given by Biernatzki, and by Biot in his translation of the Le Tcheōu Ly. To be sure the author mentions Wylie, but he has evidently never read his best contributions; while as to the works of Williams, Vissière, Knott, and Hyashi (and of course Endo's work in Japanese) he is apparently wholly ignorant. In the same line of bibliography one can readily understand that the author would be justified in omitting the older authorities if he thought best, but why he should mention Kaestner, for example, and omit Montucla, Libri, and Bossut, is not so easily explained. So in general, while the bibliography is helpful, it does not seem to be as complete as might reasonably be hoped, nor as well selected as it should be for its present extent. Had Vissière's excellent monograph been read, for instance, the too sweeping assertion about the antiquity of the swan pan (page 36) would not have been written, and had any serious study been made of the voluminous literature relating to the Yih-king more doubt would have been cast upon the Leibniz hypothesis with respect to the connection of the trigrams with a binary scale. The paucity of sources consulted is also manifest in the brief mention of Tschu schi kih (Chu Shi-ki) and his knowledge of the binomial coefficients. Now it is true that the work of this author appeared "bald nach 1300," more exactly in 1303, and that it was quite epoch-making, but it is best known for the use made of several monads (unknowns) in systems of equations, and for the ingenious symbolism for polynomials. He was only one of three great writers, nearly contemporary, who created a renaissance of mathematics in China about that time, the other two being Tsin Kew-chaou, who introduced the monad as the symbol for the unknown and who did very creditable work on higher numerical equations, and Li-yay Jin-King, neither of whom are mentioned.

What is here said concerning Chinese mathematics is merely typical. It is easy to see that Professor Günther has used the best of the common secondary sources, but that rarely has he gone to those that may be called primary. Thus on the Greek abacus, he assumes that the tradition of its common use is to be accepted, when as a matter of fact it is extremely doubtful, and with respect to the similar question in Rome he asserts that we have no examples of such an instrument extant, while we have several that may quite possibly go back to classical times. As to the early printed arithmetics he cannot have consulted many original sources. For example, Licht's work was published without date, but probably about 1500, and not in 1514 as he asserts; Stromer's work appeared in 1504, and in two editions before the first one cited; the date of the Protomathesis of Finaeus is more properly 1530–32 than 1532; Ringelberg's Opera (not Chaos mathematicum) appeared at Leyden (not Lyons) in 1531; Ciruelo's Cursus quatuor appeared at Paris as well as at Alcalá in 1516; Ramus's 1569 work was really entitled Arithmeticæ libri dvo: Geometriæ septem et viginti, and reference should be made to his earlier work of 1555; the Opuscula mathematica of Maurolycus was published at Venice instead of Palermo, in 1575; the first edition of Moya was 1562 instead of 1609, which makes quite a difference in the argument on page 343; Nuñez's work appeared in 1564, the 1567 edition being the second. This list is closed simply because it would be unprofitable beyond this point, and not because it could not be greatly extended. It shows that Professor Günther has been unfortunate in his secondary sources or careless in his use of primary ones.

Independently of such errors, however, the fact remains that the book is the best that we have of its particular type.

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