

THE STUDY OF HISTORY OF MATHEMATICS.

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One of the prominent elements in the present movement towards improvement in mathematical teaching is greater stress on the historical development of the subjects both in secondary and in advanced mathematics. This statement is supported by the highest possible authority. During the last international mathematical congress, held at Heidelberg in August, 1904, a resolution was passed in favor of creating university professorships of the history of mathematics and of introducing the notions of the history of science in secondary instruction. The same congress passed a resolution in favor of forming an international association of those who occupy themselves with the history of mathematics. Somewhat similar resolutions have been passed by other national and international organizations, in particular by the association of the teachers of secondary mathematics in Switzerland and by the second international congress of philosophy.

The main object of the present article is to give helpful suggestions to those who have not enjoyed the advantages of a good training in the history of mathematics but are anxious to make up the deficiency by private study. Our foremost suggestion is to study the sources of history whenever possible. Instead of reading the conclusions reached by others, draw your own conclusions and compare them with those which others have reached. It is harder to become thoroughly acquainted with a work than to accept the main results which a ripe historical scholar has reached, yet the former method will make you stronger and it will enable you to see tendencies which would almost certainly escape your notice if you depended on the opinions of others.

At the present time there are great obstacles in the way towards such a study of the history of mathematics. For instances, the main source of Egyptian mathematics is the "Mathematical Handbook of Ahmes," published in German under the title "Ein Mathematisches Handbuch der alten Aegypter" by A. Eisenlohr, second edition, Leipzig, 1891. As no English translation exists, those who do not read German have to be content with the very fragmentary extracts which are found in English histories or

journals.* It is to be hoped that the general interest in the history of mathematics will soon justify the publication in English of this very fundamental source of mathematical history.

In the history of Greek mathematics the English reader finds much less difficulty. Among the most useful sources are "The work of Archimedes," "Apollonius of Perga," and "Diophantus of Alexandria." These three works are edited by T. L. Heath and published by the Cambridge University Press. The last one is not a translation but it contains an appendix devoted to an abstract of the arithmetics and the tract on polygonal numbers of Diophantus. Those who read German will find the translation by Wértheim more helpful, especially since an appendix to this translation is devoted to the problems of the Palatine Anthology. The "Elements of Euclid" are so well known that it is perhaps not so essential to consult the exact translations but even here the spirit of elementary Greek mathematics can be most readily learned from the direct translations.

The study of Hindu mathematics should begin with "Algebra with arithmetic and mensuration from the Sanscrit of Brahme-gupta and Bhascara," translated by H. T. Colebrooke, London, 1817, while a great part of Arabian mathematics is most accessible in "The algebra of Mohammed ben Musa," edited by F. Rosen, London, 1831. This list could readily be extended but our aim is to assist in making a wise beginning in the study of the history of mathematics. After this is made the student can judge for himself in reference to most suitable literature. Let it be remembered that a thorough study of a few works is much more helpful than a superficial knowledge of many.

One of the main objects in the study of the history of mathematics is to acquire a keener appreciation of the difficulties which the various concepts offer to the beginner. These difficulties will appear most clearly in the vagueness of the early writers on the various subjects. The slowness with which various concepts developed among the scholars of the world is apt to make the teacher more sympathetic with the difficulties which the youthful mind has to encounter.

The beginner in the study of the history of mathematics will find it very helpful to read some elementary general works on the history of mathematics in connection with his study of origi-

*The most extensive of these were published in the October, 1905, number of this Journal under the heading, "The Mathematical Handbook of Ahmes."

nal works. Among such histories we would especially recommend to the English reader "A history of elementary mathematics," by Florian Cajori; "A short history of mathematics," by W. W. R. Ball; "A brief history of mathematics," translated by Beman and Smith. The first two are published by the Macmillan Company while the last is published by The Open Court Publishing Company. Those who read German would naturally prefer the classic work "Vorlesungen über Geschichte der Mathematik," by Moritz Cantor, which is published by Teubner.

One of the most useful aids to the study of the history of mathematics is the "Encyklopaedie der Mathematischen Wissenschaften mit Einschluss ihrer Anwendungen," which is in the course of publication by Teubner. The French edition of this work will be especially rich and reliable in historical references, judging from the part which has appeared and from the standing of the editors. When complete it will probably contain at least twenty-five volumes and hence it is too expensive for those who do not aim to make a comprehensive study of the subject. It is to be hoped however, that such a classic work will find a place in many of the school libraries so that the few who have sufficient energy and interest will not find their way blocked by a lack of opportunities.

If some one desires to make a very inexpensive beginning in securing literature on this history he can do so by procuring "A primer of the history of mathematics," by W. W. R. Ball. This little book of 150 pages is published by the Macmillan Company. The early history of mathematics in our own country is probably most accessible in "The teaching and history of mathematics in the United States," by Florian Cajori, published by the Bureau of Education, circular of information No. 3, 1890. The early history of mathematics in England may in a large measure be deduced from "A history of the study of mathematics at Cambridge," by W. W. R. Ball, published by the Cambridge University Press. Those who desire to keep in touch with the recent developments in the history of mathematics cannot afford to be without the journal which is exclusively devoted to this subject, viz: "Bibliotheca Mathematica," published by Teubner. As most of the articles in this journal are in German or French, the student who does not read these languages will find the journal of comparatively little use, but such a student has to be behind the times in nearly every line of learning.