

form a little later. It is therefore with a personal pleasure that the reviewer calls attention to the pamphlet prepared by Sir Thomas L. Heath as a supplement to the well-known edition of the works of Archimedes that appeared in 1897.

The pamphlet has several advantages over the one prepared in 1909. In the first place the introductory note is more complete, having been prepared with the added information given out by Heiberg in 1910 in Volume I of his new edition of the text of Archimedes. Again, it is prepared with the wealth of learning that only Sir Thomas Heath or Professor Heiberg could bring to such a task. And finally, the translation of the text is from the Greek instead of through the German, and has the advantage of the author's profound knowledge of the idioms to be found in the works of the Greek mathematicians.

The chief value of the work lies in the fact that it sets forth the method followed by the great Syracusan in making his discoveries in mechanics, and to the testimony that it bears to the fact that Democritus instead of Eudoxus should be credited with the discovery that the volume of a pyramid or a cone is one third of the volume of the corresponding prism or cylinder.

A word of commendation should also be given to the clear way in which the translation has been arranged upon the page, so that, as in the edition of 1897, the eye easily follows the proof.

DAVID EUGENE SMITH.

*Didaktik des mathematischen Unterrichts.* Von Dr. ALOIS HÖFLER, O.O. Professor an der Universität Wien. Leipzig, B. G. Teubner, 1910. Mit zwei Tafeln und 147 Figuren im Text. xviii+509 pp. 12 Marks.

THE present day in the teaching of secondary mathematics, and in a less degree of all mathematics, is characterized by a spirit of unrest in every progressive country in the world. No one person is responsible for this state of affairs, and not very many leading names are connected with it. It is not a campaign carried on by field marshals in education or in mathematics; it is rather a mass movement without other leader than the *Zeitgeist*; it is democracy asserting itself against the old aristocracy of learning; it is often merely an effort to have things different, with no well-defined plan of having them better. This desire for change shows itself

in various aspects. In England it has recently been directed to the elimination of Euclid, with the result that matters mathematical are temporarily in a condition that can hardly be satisfactory to anyone. In America it often assumes the form of petty mathematics, ill arranged courses, or the hope that we may no longer have any mathematics whatever required in the high school. In France it shows itself in the effort to replace Legendre's geometry of congruence by a geometry of motion that seems at present more abstract and ill arranged than anything that has preceded it. And so, in all countries, we find this longing for something better, but often with the result that something worse appears. Now there is no doubt that, with the admission of the mass of boys and girls to high-school training, in place of a selected lot as in the past, we have to lower, temporarily at least, the general standard. This is sometimes interpreted to mean that the heart must be cut right out of secondary mathematics and that we are to have merely a little weak, diluted algebra and geometric drawing, with no serious work requiring sustained effort and logical reasoning. In particular it is often asserted that the Realanstalten, which appear with us as technical high schools and vocational schools of one kind or another, should have only mathematics that is immediately practical, the idea of the potentially practical being lost in the desire for the present need. Some go so far as to assert that mathematics should not appear as a science at all, but that when a real problem arises its solution should be effected and no other problems should be given.

This preliminary statement, long as it is, is necessary to an understanding of the need for a book like this by Professor Höfler. Written as the first one of a series of didactic manuals "für den realistischen Unterricht an höheren Schulen," it aims directly at the problem of improving the teaching of mathematics, and of giving to the science a firm basis, in the modern type of school. It is written with an earnestness of purpose that is gratifying to every teacher of the subject and that should be gratifying to everyone who has to do with the education of the youth, but that will not be at all appreciated by the type of mind that wishes to destroy instead of construct.

The work is divided into three parts. Of these the first has to do with the purposes and methods of mathematical instruction, and with modern questions of values and of topics

to be considered. For example, the question of the function concept, of "functionally thinking" in mathematics, is considered at much length. This question, of which we shall be hearing a great deal in the next ten years in the secondary schools of America, was first raised for such schools in France some time ago, chiefly by the late Professor J. Tannery, and was then taken up by Professor Klein and given a definite standing in Germany and Austria, whence it is making its way into other countries. What this innovation for our secondary schools means, why it is undertaken, and what purposes are supposed to be accomplished, are considered in this work, and should be carefully considered by all teachers before we tend to go to the extreme that usually characterizes our schools whenever a novelty is suggested.

The second part relates to the course of study, the characteristics of the successive stages of the pupil's progress, and the treatment of distinctive topics. It is always helpful, under the common accusation of superficial education that is advanced against us, to see with what thoroughness the Teutonic schools do their work. Hence a teacher of high-school mathematics can hardly find better reading in his field of activity than Professor Höfler's sections on topics like irrational and imaginary numbers, algebraic and transcendent numbers, the relation of mathematics to physics, and the introduction to the calculus.

The third part considers the relation of psychology, logic, and philosophy to mathematics. The significance of number, of space, of intuition in mathematical teaching, and of fundamental concepts, the relation of logic to mathematical proof, the interesting and not sufficiently appreciated question of "mathematical sophisms," and a review of mathematical values, are the leading features of the concluding part of the work.

We have great need of books of this type, and of those that have thus far appeared this is, to say the least, one of the best. The author does not show that familiarity with the literature of other languages that might reasonably be expected from one in his position and with his scholarship, or from a writer of such a treatise; but as a representative of the best Teutonic thought the work will long be recognized as a standard authority.

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