tures that are difficult to describe in words. Although Ackerknecht, whose pictures are mostly of objects in a museum, comes much closer (and shows more originality in his approach), neither author is wholly successful in relating his text to the pictures. In Starobinski's book, this may be related to the fact that the "picture research" is credited to another person.

The serious student will find both works of some value as additional sources of some excellent pictures, the photographs of early instruments being particularly valuable for comparison with the illustrations and descriptions given in the contemporary texts. But both volumes are guilty of a fault that is all too common in picture books—inadequate documentation of sources. Those who wish a comprehensive view of the history of medicine will continue to use books in which the text is what counts.

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New Mathematical Library

Episodes from the Early History of Mathematics. Asger Aaboe. Random House, New York, 1964. x + 133 pp. Illus. Paper, $1.95; cloth, $2.95.

The number 13 is very appropriate for this volume in the New Mathematical Library series. The excellent collection of which it is the most recent (and possibly the best) number is intended for extracurricular use by superior high school students, but it is also highly appropriate reading for laymen. The material in number 13 is pitched nicely at the level intended, with clarity of exposition equal to that of its predecessors in the series; and the volume is especially welcome, for its history is as accurate as its mathematics is understandable. All too often the little mathematical history that does make its way into works on the secondary school level is tarnished by half-truths—or worse; but such is not the case here. Aaboe took his doctorate under Neugebauer, and he has read widely and deeply, with the result that in this book he has combined mathematics and history of comparable soundness, without a show of profundity. Elementary geometry and trigonometry suffice for comprehension of the themes undertaken, but the material is considerably removed from the routine topics characteristic of textbooks at this level.

The reader is properly warned in the title not to anticipate a systematic history, for the author has adopted a "block-and-gap" approach in which a limited number of "episodes" are explored in some depth. In the first episode, Aaboe describes Babylonian mathematics, with particular reference to place-value notation and its use in algebraic and geometrical problems, including the solution of quadratic equations and the use of the Pythagorean theorem. The episode closes with a brief account of the Mesopotamian table of Pythagorean triads (Plimpton 322) and with a reminder that, apart from some geometry, the Egyptians "did not get past elementary arithmetic."

The author's second episode is "Early Greek mathematics and Euclid's construction of the regular pentagon." Aaboe is appropriately cautious about contributions traditionally ascribed to Thales and Pythagoras, and he emphasizes the "critical reaction" that set in after Zeno had propounded his paradoxes and the existence of incommensurable line segments had been disclosed. The algebra that Greece had adopted from the Babylonians was reformulated in the geometric garb later definitively presented in Euclid's *Elements*. The solution of quadratic equations, for example, was now a problem in the "application of areas," rather than one of "finding a number."

The third and least unified of the four episodes (and in some ways also the least successful) is entitled "Three samples of Archimedean mathematics." Here for the first time Aaboe allows biography and legend to obtrude into an otherwise mathematically oriented account. Following his brief summary of the life and principal works of Archimedes, the author focuses attention on the Syracusan's trisection of an angle, his construction of the regular heptagon, and the application of his "mechanical method" in the discovery of the volume and surface area of a sphere. These aspects are well presented, but two questions come to mind in this connection: (i) Are the trisection and the heptagon (minor works which have come down through the Arabic) well adapted to the purposes of the series? (ii) Is not the section **3.3**, on modern criteria of constructibility, something of an anachronism as far as this volume is concerned?

The last of the four episodes is a tightly woven summary of Greek trigonometry, as found especially in Ptolemy's *Almagest.* Methods used in the construction of tables and in applications to the solution of triangles are described in admirably clear detail. In laudably relating the material to earlier contributions, it is pointed out that Ptolemy's value for $\sqrt{2}$ is the very same sexagesimal—1; 24,51,10—that is found in an old Babylonian tablet. Although there is no reference to the fact that the law of cosines appears in Euclid or that certain trigonometric inequalities were known to Aristarchus and others, the reader is reminded that trigonometry did not originate with Ptolemy (about A.D. 150). Such methods go back at least to the time of Hipparchus (about 150 B.C.), and it is quite possible that they were known to Apollonius. Aaboe also closes with a caveat that deserves close attention:

> It should be clear to anyone who has read this chapter that the commonly held notion that Greek mathematics is entirely geometrical is not quite correct. Greek mathematicians were perfectly capable of doing numerical work when they had to; indeed, one has to look far and wide to find Ptolemy's equal as a computer.

Intended as it is for student use (copies are available to elementary and secondary schools in the SMSG paperback series through the L. W. Singer Co., Syracuse, N.Y., at 90¢, to the teacher or the school), the book includes a small number of well-graded problems and a short list of admirably selected and critically evaluated "Suggestions for further reading." However, a book as well written as this one will inevitably find its way into hands far more numerous than those of schoolboys. It is recommended reading for all who delight in a thoroughly authoritative account of just how certain aspects of mathematics came about. Modern notations and language are used, but explanations are kept as close to the thoughts of the original creators as is consistent with ready comprehension by a reader today. We are far removed in space and time from the ancient cities of Babylon, Alexandria, and Syracuse, but that the gap can be bridged through superb exposition is effectively demonstrated in this book. The little volume is as high in value as it is low in price.

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