

*Vorlesungen über Geschichte der Antiken Mathematischen Wissenschaften.* Band I. *Vorgriechische Mathematik* mit 61 Figuren. By O. Neugebauer. Berlin, Springer, 1934. xii+242 pp.

The most amazing discoveries in the history of science are presented in this account of pre-Grecian mathematics. Up to this time, Egyptian papyri of considerable extent as to length and contents have been completely translated and explained. The Rhind or Ahmes Papyrus has been subjected to the most careful study as a result of advances in Egyptology and two treatises on this early historical record have appeared recently. The contents of an earlier document, the Moscow Papyrus whose existence was first really made known in 1917, have been made accessible to historians through translation only within five years. The records of Babylonian mathematics had revealed no more than certain facts about notation, a geometry of mensuration, the simplest arithmetical and geometric progressions, and other notions of the most elementary kind.

And now come these investigations with the revelation beyond the shadow of a doubt of a development of algebra by the Babylonians which raises them to the rank of real mathematicians. Fortunately records of different epochs are at hand so that this algebra is seen as a step in a growth through a long period of time. The author devotes four chapters to the role of numbers in Babylonian mathematics and to the complete number system on which their entire structure rests. It is a position system with 60 as the base and the arithmetical technique set up for whole numbers and fractions is as simple as the present day decimal system. The acceptance then of such a number system led easily to developments in other directions. Irrational numbers, and new facts in geometry appear. Among the topics treated so convincingly in this work are the solution of linear equations in more than one unknown, solution of quadratic equations, cubic equations, not yet completely understood, biquadratic equations. A single symbol is used for a concept or idea in general writing, and so it is a natural step to make use of such a symbol in algebraic problems.

Most impressive is the claim of the author with respect to the appearance of the "proof" in mathematics. To the Greeks has hitherto been given the great distinction of providing the first deductive proof in any science. This has, indeed, differentiated Grecian from pre-Grecian mathematics. This distinction must now be set aside. If a "proof" consists of a series of logical steps leading from one statement to another, then the Babylonians had a "proof." It is impossible to believe that such a complicated system of formulas as are used in the solution of certain problems (given in this work) could have been arrived at empirically.

Only passing reference can be made to the evidence that this mathematics is entirely distinct from that needed for temple and state and must have been taught in special schools; and to the growing conviction that the Arabian algebra was the outgrowth of a Babylonian algebra rather than Greek or Hindu.

This is the first time that an attempt has been made to give a complete presentation of the history of mathematics before the Greeks. Most of the chapters have already appeared in whole or in part in *Quellen und Studien zur Geschichte der Mathematik* published at intervals since 1928, and some of the