

Alexandrian Mathematics

Egyptian contributions to science and mathematics did not end with the conquest by the Macedonian, Alexander the Great. Attracted by the great wealth and learning of Egypt, Alexander, in 322 B.C., ordered the construction of Alexandria, a city which became the intellectual center of the Greek speaking world. In Alexandria, the products and ideas of the city-states of North Africa, Asia Minor, Greece, India, and China mingled and took firm root on African soil. A great museum and library attracted the best scholars and educated many generations of Egyptian students.

It was in the fourth century before our era that Greek mathematicians developed the deductive, axiomatic method, establishing the logical foundation on which mathematics so proudly rests today. As Struik wrote, "This again may be connected with the fact that mathematics had become a hobby of leisure class which was based on slavery, indifferent to invention, and interested in contemplation."

Of course, no modern scholar has tried to belittle this great Greek accomplishment because it rested on an economic base of slavery. Contrast this with the case of Egypt, where slavery played a much lesser role. Yet Hollywood movies and popular texts claim that the greatness of the pyramid period is lessened because slave labor was used.

Up to the fourth century B.C., according to Neugebauer, Greek mathematics was similar to, and no doubt an outgrowth of Egyptian and Babylonian. He cautions that "if modern scholars had devoted as much attention to Galen or Ptolemy as they did to Plato and his followers, they would have come to quite different results and they would not have invented the myth about the remarkable quality of the so-called Greek mind to develop scientific theories without resorting to experiments or empirical tests."

It was in Egypt that Hellenistic mathematics reached its peak. Struik attributes the flowering of mathematics to the central position that Egypt occupied during the Ptolemaic period as the intellectual and economic center of the Mediterranean world. Who were the people of Alexandria? They were the African people of Egypt with a few immigrants from Greece, western Asia and neighboring African countries. Sarton reminds us that "Greek emigrants were too few in pre-Christian times and too little interested in science and scholarship to affect and change Eastern minds."

The ruling class, itself, was mixed from the first days of Alexandria because Alexander, the Macedonian, ordered his officers to marry and mix with the local population.

Nonetheless, although no pictures have come down to us of any of the great men and women of Alexandria, false portraits have been published which portray them as fair Greeks, not even sunburned by the Egyptian sun. This misleading practice is dried by George Sarton, in an article on "Iconic Honesty" in which this dean of science history declares, "I do not believe there is a single ancient scientist of whose lineaments we have any definite knowledge; thus to publish 'portraits' of Hippocrates, Aristotle or Euclid is, until further notice, stupid and wicked."

In the case of Euclid, best known of the Alexandrian mathematicians, there is not a shred of evidence to suggest that he was anything other than Egyptian. Euclid's fame is based on his thirteen major texts, *The Elements*, a strictly logical deduction of theorems from accepted definitions and axioms. For over 2,000 years these books dominated the teaching of mathematics to the delight of mathematicians and discomfiture of students. In a similar manner, *The Almagest*, written by another Egyptian, Claudius Ptolemy, c. A.D. 150, dominated astronomy until finally replaced by Copernicus' theory of a sun-centered planetary system, c. 1543.

The Almagest (the greatest in Arabic) contains in its thirteen books the foundation of spherical trigonometry, a catalogue of 1,208 stars and the epicycle system of an earth-centered astronomy. By some peculiar racial reasoning, Ptolemy is often described as Egyptian only because his work was of a practical, applied nature, differing in this respect from the strictly theoretical work of Euclid. The fact is that both were Alexandrians and therefore it is highly probable that they were Africans. In Ptolemy's time, Alexandria was already 400 years old and very much part of Egypt.

Of Heron, another Alexandrian who wrote *Metrica* on geometric measurement, and *Pneumatica*, a book about machines, Howard Eves says "There are reasons to suppose he was Egyptian with Greek training." Another great mathematician of that time, Diophantus, of Alexandria of the third century, continued the tradition of Egyptian algebra. His *Arithmetica* on number theory marks the author as a genius in his field and introduced brief symbols to simplify algebraic expressions (syncopation) in place of the long, wordy formulations then in use (rhetorical algebra.).

All of these Alexandria mathematicians wrote their books in Greek. Their use of Greek names makes them no more European than the use of English by Nigerians today changes that nationality. To this very incomplete list of

Egyptian mathematics who worked in Alexandria must be added Theon and his daughter Hypatia, whose memory still inspires women to become mathematicians."