Alexandrian Greek Mathematics, ca. 300 BCE to 300 CE

After Euclid had codified and extended earlier mathematical knowledge in the *Elements*, mathematics continued to develop – both as a discipline in itself and as a tool for the rational investigation of the physical world. We shall read about the measurements of the size of the Earth by Eratosthenes (and others) by means of Euclidean geometry. Principles of optics and mechanics were established and mechanisms were designed and built using mathematical principles. The concepts of conic sections and tangents to curves were discovered and exploited. Trigonometry began and was used to calculate the distance from the Earth to the Moon and to the Sun, and other facts of astronomy were derived. It was still necessary to make *observations* and collect them in tables, but the underlying *general principles* were sought.

Some of the important names of the period are Archimedes, Apollonius (conic sections, circles), Aristarchus (astronomy), Diophantus (number theory), Eratosthenes, Heron (areas, approximations), Hipparchus (plane and spherical trigonometry), Menelaus (geometry, spherical trigonometry), Pappus (geometry), and Claudius Ptolemy (trigonometry, astronomy). We shall consider some of their accomplishments.

Why is it that unlike the study of the history of law or drama or geography, the study of European mathematics before the Dark Ages focuses exclusively on the Greeks?

Eventually, Hellenistic Greece lost its control of the far-flung territories and Rome ascended. During the centuries of the flourishing and fading of the great Roman empire, almost no new mathematics was created. (Roman numerals did provide a better notation for doing integer arithmetic than did the Greek alphabetic cipher numerals, and they remained in use until late in the Medieval period.) Indeed the Romans took pride in not knowing much mathematics or science or the principles underlying technology, and they cared not at all for original research. As far as they were concerned, all of the mathematics necessary for practical work had been developed in earlier times and what was needed for Roman technology, such as the volume of water passing through a cylindrical aqueduct, had been written up by the Greeks. The Romans were not given to intellectual speculation, and in those militaristic times, it was not very safe to ask “why?” In the thousand years of the Roman empire there was not one Roman who could be called a mathematician.