

Chapter 5. Euclid and His Elements

5.1. Alexandria

Note. We left off in [Section 4.1. The Period from Thales to Euclid](#), Note 4.1.D, with the defeat of the Athenians by the Spartans in the Peloponnesian War in 404 BCE. In this section, we follow up on this history and pay particular attention to Alexander the Great and the founding of Alexandria in Egypt.

Note 5.1.A. An uneasy peace lasted until 395 BCE, when the Corinthian War broke out. Concern over Spartan dominance led the conflicts between the Spartans and their adversaries Athens, Thebes, Corinth, Argos, and the Persian Empire. The Spartan military was weakened, but Spartan dominance was not ended. The war ended in 387 BCE with the Treaty of Antalcidas which forces Sparta to cede control of Ionia and Cyprus to the Persian Empire. The Thebans (citizens of the central Greece city-state of Thebes) defeated the Spartans in the Battle of Leuctra in 371 BCE, making Thebes the dominant force in Greece (replacing Sparta, who had earlier replaced Athens). Between 356 BCE and 346 BCE, the Thebans fought another central Greece city-state Phocis (which included Delphi) in the Third Sacred War. Thebes called on Philip II (382 BCE–October 21, 336 BCE) of Macedon (or Macedonia; a region north of Athens and Thebes; see the image below) for help. The Macedonians responded and quickly unified the Greek city-states under Macedonian leadership. The unified areas were called the League of Corinth, which was formed in 338–337 BCE. Greece was now a part of Macedon. In 336 BCE, Philip II transferred power to his son, Alexander the Great (July 20/21,

356 BCE– June 10/11 323 BCE). The source for this note is the [Wikipedia webpage on the History of Greece](#) (accessed 8/18/2023).



Image from the [Wikipedia webpage on Macedonia](#) (accessed 8/18/2023)

Note 5.1.B. Alexander the Great or, more formally, Alexander III of Macedonia was born in Pella, Macedonia (near the Aegean Sea in north central Greece). As a child, he learned to read and write, and he developed a love of learning. His father hired Aristotle to tutor him when he was a teenager! He gained an appreciation of science from Aristotle and during his military campaigns, he included botanists and scientists to study the conquered lands. He was 20 when he became king of Macedonia in 336 BCE. As king, he first conquered rivals in the Greek and Macedonian regions. He began his invasion of the Middle East in 334 BCE. He went into northeast Africa, where he founded Alexandria on the Mediterranean coast of Egypt, near the Nile River delta, in 331 BCE. He invaded southwestern Asia as far as the Ganges River in India (where his army refused to continue further). On his

return, he conquered lands of the Persian Empire (see the map below for the route he took on his campaign). On May 29, 323 BCE Alexander organized a banquet, with much wine consumed, in celebration of the end of his campaign in India. He fell sick shortly after the banquet and on either June 10 or 11, 323 BCE Alexander died. He was at the palace of Nebuchadnezzar II, in Babylon. He was only 32 years old and has served as king of Macedonia for 13 years. The empire he established stretched from Greece to northwestern India. The sources for this note are the brief [National Geographic Education website on Alexander the Great](#) and (to a much less degree) the extensive [Wikipedia webpage on Alexander the Great](#) (accessed on 8/21/2023).

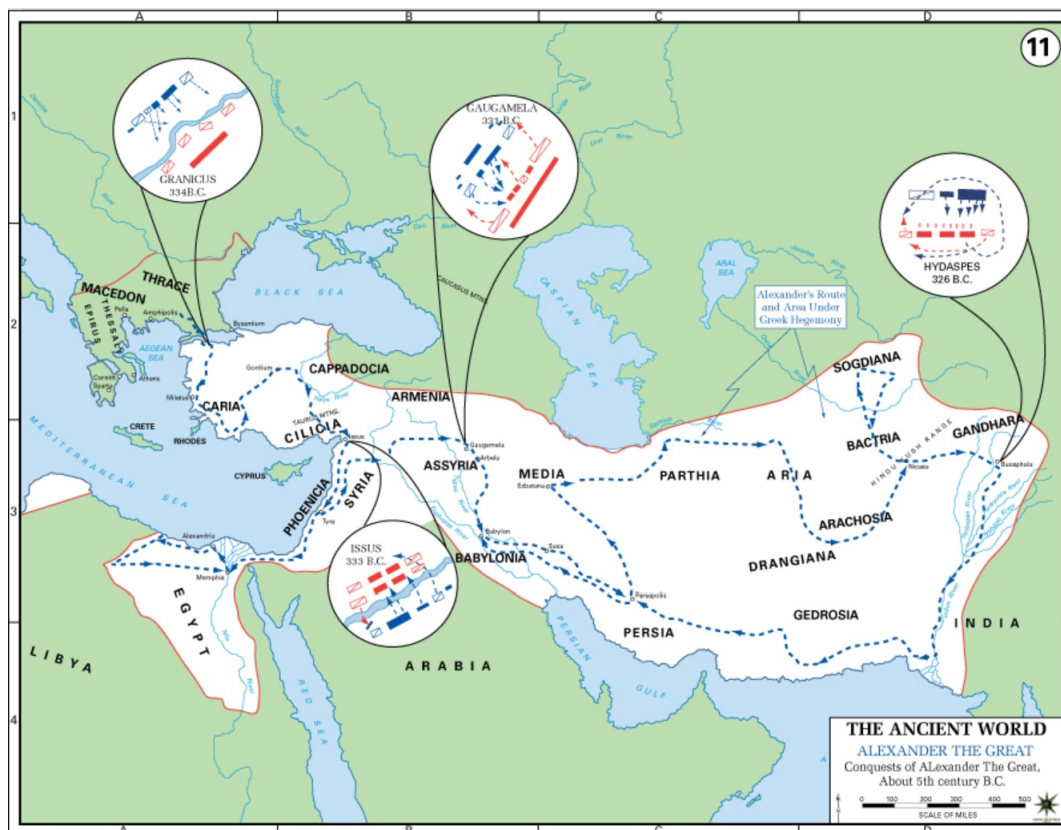


Image from the [World History Encyclopedia “Map of Alexander the Great’s Conquests”](#) webpage (accessed 8/22/2023)



The *Alexander Mosaic* from Pompeii, circa 100 BCE, from the [World History Encyclopedia webpage on Alexander the Great](#) (left) and Colin Farrell as Alexander the Great in the 2004 Warner Brother’s move *Alexander* (right) from the [Giant Freakin Robot website](#) (both accessed 8/21/2023).

Note 5.1.C. During his conquests, Alexander the Great founded a large number of cities (many of which he named “Alexandria”). In 331 BCE he founded the city of Alexandria on the westernmost branch of the Nile River delta. Details on the founding of the city vary. Alexander chose Dinocrates of Rhodes as the chief architect of the project. According to Eves (see Eves, page 140):

“It is said that the choice of the site, the drawing of the ground plan, and the process of colonization for Alexandria were directed by Alexander himself. . . In an incredibly short time, largely owing to its very fortunate location at a natural intersection of some important trade routes, it grew in wealth and became the most magnificent and cosmopolitan center of the world. By 300 B.C., it already had 500,000 inhabitants.”

A few months after formally founding the city, Alexander left for the East and never returned. He left Cleomenes in charge of the expansion of the city. Alexander’s

death in 323 BCE marks the beginning of the Hellenistic period (which lasted until the Romans conquered the Greek peninsula and islands in 146 BCE). Alexander's empire was partitioned up by some of his military leaders. There were empires in south-west Asia (the Seleucid Empire and the Kingdom of Pergamon), north-east Africa (the Ptolemaic Kingdom) and South Asia (the Greco-Bactrian Kingdom and the Indo-Greek Kingdom) (see the [Wikipedia webpage on the Hellenistic Period](#)). The Macedonian Greek general Ptolemy I Soter (circa 367 BCE–January 282 BCE) founded the Ptolemaic Empire in Egypt. (These Ptolemies are not to be confused with the Greek astronomer Claudius Ptolemy (circa 85 CE–165 CE) who we will see in [Section 6.5. Hipparchus, Menelaus, Ptolemy, and Greek Trigonometry](#).) He declared himself pharaoh of Ptolemaic Egypt around 305 BCE. He brought Alexander's body to Alexandria and created "Alexander's tomb" as a bit of a tourist destination. See the map below.



Alexandria 300 BCE to 100 BCE, from the [Wikipedia webpage on the Tomb of Alexander the Great](#) (accessed 8/22/2023)

He also personally sponsored Euclid and his work. It is Ptolemy I who is said to

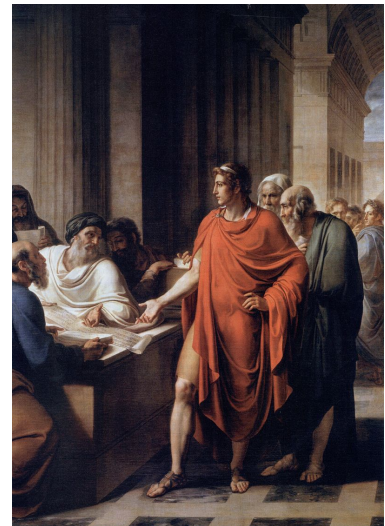
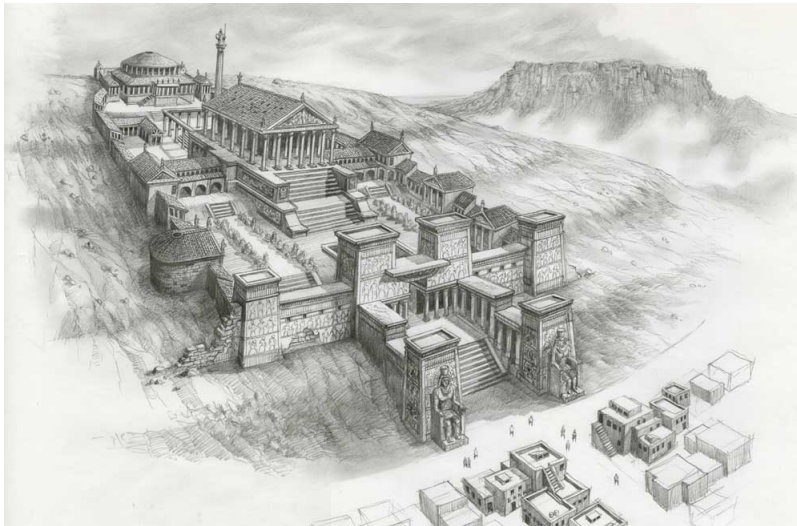
have asked Euclid if there was an easier way than the *Elements* to master geometry, to which Euclid replied that “there is no Royal Road to geometry” (see Note 5.2.A in [Section 5.2. Euclid](#)). He died in 282 BCE and was succeeded by his son, Ptolemy II Philadelphus (309 BCE–January 28, 246 BCE). Ptolemy I and Ptolemy II founded the Mouseion of Alexandria, which included the great Library of Alexandria. Ptolemy I commissioned the building of the Lighthouse of Alexandria (one of the “Seven Wonders of the World”) and it was completed under Ptolemy II. It was at least 330 feet tall and was one of the tallest man-made structures in the world for centuries. It was damaged by earthquakes in 956 and 1323, but survived in part until 1480. See the map above for its location.



Images from the World History Encyclopedia webpages on [Ptolemy I](#) (a bust of Ptolemy I housed in the Louvre) and [the Lighthouse of Alexandria](#) (accessed 8/22/2023)

The sources for this note are Eves and the Wikipedia webpages on [Ptolemy I Soter](#), [the Lighthouse of Alexandria](#), and [the History of Alexandria](#) (both accessed 8/22/2023).

Note 5.1.D. The Mouseion of Alexandria was set up by Ptolemy I and II circa 280 BCE to 270 BCE. The word *mousion* meant a place dedicated to the Muses (i.e., the goddesses of literature, science, and the arts). The Ptolemies intended to bring together some of the best scholars and to collect copies of all of the books known at the time. It did not mean to collect works of art or artifacts of history (works of art were displayed in the nearby Royal Palaces), but it is the root for our word “museum.” Eves refers to the “University of Alexandria” (page 140) but “Mouseion of Alexandria” is the correct term. It had an arcade of seats, communal dining room for socializing and sharing ideas, private study rooms, residential quarters, and lecture halls.



The Library of Alexandria from the [Crystalinks website](#) (left), and *Ptolemy Philadelphus in the Library of Alexandria*, by Vincenzo Camuccini (1813), from the [Wikipedia webpage on the Mouseion of Alexandria](#) (right).

These are imaginings, of course (both accessed 8/22/2023).

Many works known to have been in the Library of Alexandria have survived to today, going back as far as the works of Homer (circa 8th century BCE) and Hesoid (circa 8th or 7th century BCE). Work done at the Mouseion lead to the preserva-

tion and production of historical, literary, and scientific works that inspired future Western developments for centuries to follow. Euclid (circa 325 BCE–circa 265 BCE) headed the Alexandrian school of mathematics. Eratosthenes of Cyrene (276 BCE–194 BCE) was the head librarian under Ptolemy III Euergetes. He did work on literary criticism, philosophy, geography, and mathematics. We’ll discuss Eratosthenes in more detail in [Section 6.3. Eratosthenes](#). The mathematician Theon of Alexandria (circa 335 BCE–circa 405 BCE) is thought to be associated with the Mouseion. We will consider him again (along with his daughter, Hypatia) in [Section 6.10. The Commentators](#). The source for this note is the [Wikipedia webpage on the Mouseion of Alexandria](#) (accessed 8/22/2023). We pick up the story of the Mouseion and the Library again in [Section 6.1. Historical Setting](#).

Revised: 9/7/2023