5.2. Euclid

Note. In this section we discuss the very little that is known about the life of Euclid of Alexandria (circa 325 BCE–circa 265 BCE). Eves summarizes what is known about Euclid in one sentence (see page 141): "Disappointingly little is known about the life and personality of Euclid except that he was a professor of mathematics at the University of Alexandria and apparently the founder of the illustrious and long-lived Alexandrian School of Mathematics."

An imagined likeness of Euclid from Rafael's "The School of Athens" (1509–1511) from the Wikipedia webpage on Euclid (accessed 7/15/2023)

Note 5.2.A. To put a little more details on the source of this information, we turn again to *A Commentary on the First Book of Euclid's Elements* by Proclus Diadochus (circa 411–April 17, 485). This was also the source for our Supplement. Proclus's Commentary on Eudemus' *History of Geometry*. We quote from

Glenn Morrow's translation *Proclus: A Commentary on the First Book of Euclid's Elements* (Princeton University Press, 1970). On pages 56 and 57 Morrow has:

> "Not long after these men [Hermotimus of Colophon and a student of Plato, Phillippus of Mende] came Euclid, who brought together the *Elements*, systematizing many of the theorems of Eudoxus, perfecting many of those of Theaetetus, and putting in irrefutable demonstrable form propositions that had been rather loosely established by his predecessors. He lived in the time of Ptolemy the First, for Archimedes [287 BCE–212 BCE], who lived after the time of the first Ptolemy, mentions Euclid. It is also reported that Ptolemy once asked Euclid if there was not a shorter road to geometry then through the *Elements*, and Euclid replied that there was no royal road to geometry. He was therefore later than Plato's [427 BCE–347 BCE] group but earlier than Eratosthenes [275 BCE–194 BCE] and Archimedes, for these two men were contemporaries, as Eratosthenes somewhere says. Euclid belonged to the persuasion of Plato and was at home in this philosophy; and this is why he thought the goal of the *Elements* as a whole to be the construction of the so-called Platonic figures."

Note 5.2.B. The absence of information of Euclid's life has lead to some speculation. Jean Itard in his *Les livres arithmétique d'Euclide* ["The Arithmetic Books of Euclid"] (Paris: Hermann, 1962) gives three possible scenarios concerning Euclid:

 (i) Euclid was an historical character who wrote the Elements and the other works attributed to him.

(ii) Euclid was the leader of a team of mathematicians working at Alexandria. They all contributed to writing the 'complete works of Euclid', even continuing to write books under Euclid's name after his death.

(iii) Euclid was not an historical character. The 'complete works of Euclid' were written by a team of mathematicians at Alexandria who took the name Euclid from the historical character Euclid of Megara who had lived about 100 years earlier.

These statements of Itard's ideas are from the MacTutor biographical webpage on Euclid (accessed 7/16/2023). The MacTutor page seems to advocate the first (and traditional) scenario, while observing that "there is little doubt" that Euclid founded a school of mathematics at Alexandria (as Eves states).

Note. This chapter concentrates on Euclid's most influential book (likely the most influential mathematics book ever), the *Elements*. However, several other books by Euclid are known, some of which still exist:

The Data. This concerns elementary geometry and may be thought of as elementary exercises in analysis.

On Divisions. This is a book on divisions of plane figures. This work is lost in Greek but has been discovered in the Arabic.

The Porisms. This contains 38 lemmas and 171 theorems. A "porism" is something between a theorem and a problem: it deals with something already existing, as a theorem does, but has to find it (eg. the center of a circle).

The Conics. This is lost, but is said to have consisted of four books and was used by Apollonius.

The Phaenomena. This is an astronomical work and is still extant.

The Optics. Copies still exist.

Elements of Music. This is a work credited to Euclid, but no longer exists.

The list is based on Chapter 2, "Euclid's Other Works," of Thomas Heath's (150 page) Introduction to his *The Thirteen Books of Euclid's Elements*, Translated from the Text of Heiberg, with Introduction and Commentary, Volume I, 2nd edition (Cambridge University Press, 1908 and 1925). Heath's three volume translation will be the main reference for most of the rest of this chapter. In Section 5.8. Euclid's Other Works we give more details on Euclid's other books.
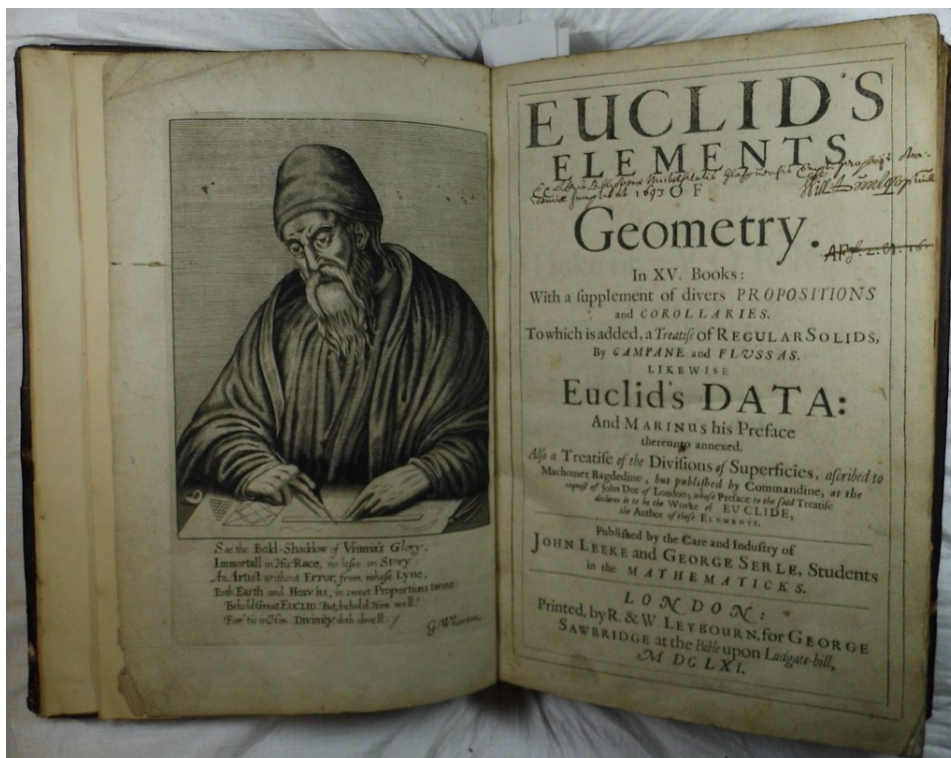
The frontpiece of a 1661 edition of the *Elements* printed by R. & W. Leybourn, for G. Sawbridge, London. This is a commonly circulated image of Euclid. This image is from flickr.com (accessed 7/16/2023)

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