



GREEK ASTRONOMY

LOCATING

A PHILOSOPHICAL AND PRACTICAL ASTRONOMY

THALES OF MILET (625 BC; 547 BC)

was the first to explain natural phenomena without divine intervention.

Thus he managed to predict an eclipse.

ANAXIMANDRE OF MILET (610 BC, - 546)

Prop B Cosed the first mechanical model of the universe.

The Earth is a cylinder. It is surrounded by pierced rings whose holes let in the exterior fire, thus creating the stars.

THE PYTHAGOREANS

For them, **astronomy became one of the four mathematical arts** together with arithmetic, geometry and music.

They were the first to propose a model in which the Earth was spherical, because the sphere is the "perfect volume".

Philolaus was the first to imagine the Earth in motion.

Eudoxus of Cnidus was the first to propose a geometric model taking reality into account. He tried to model the complex motion of the planets such as the retrograde motion of Mars.



Astronomical papyrus of Eudoxus

ARISTOTLE (384 BC, -322 BC)

Aristotle took no notice of observations.

His geocentric model is of a philosophical nature.

Aristotle divided the universe into two parts:

- **The sublunary world** (between the Earth and the Moon), imperfect and corruptible, composed of four elements: Earth, Water, Air and Fire.

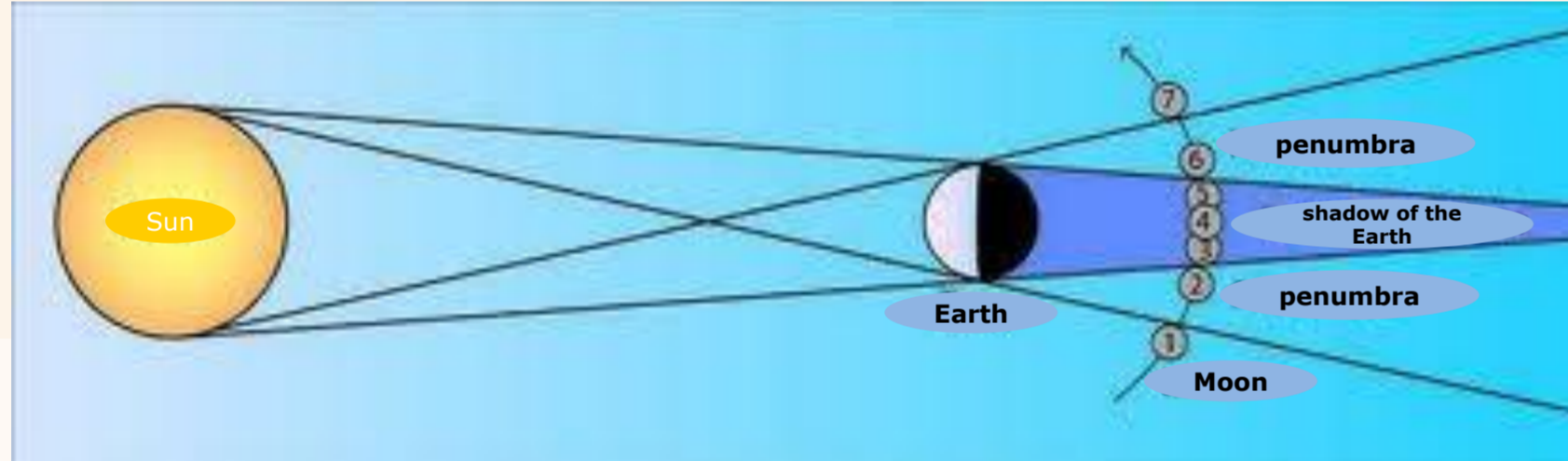
- **The supralunary world** (beyond the Moon), perfect and immutable.



The proof of Aristotle, by reductio ad absurdum, that the Earth is a sphere, illustrated in the cosmography of Apianus (1581)

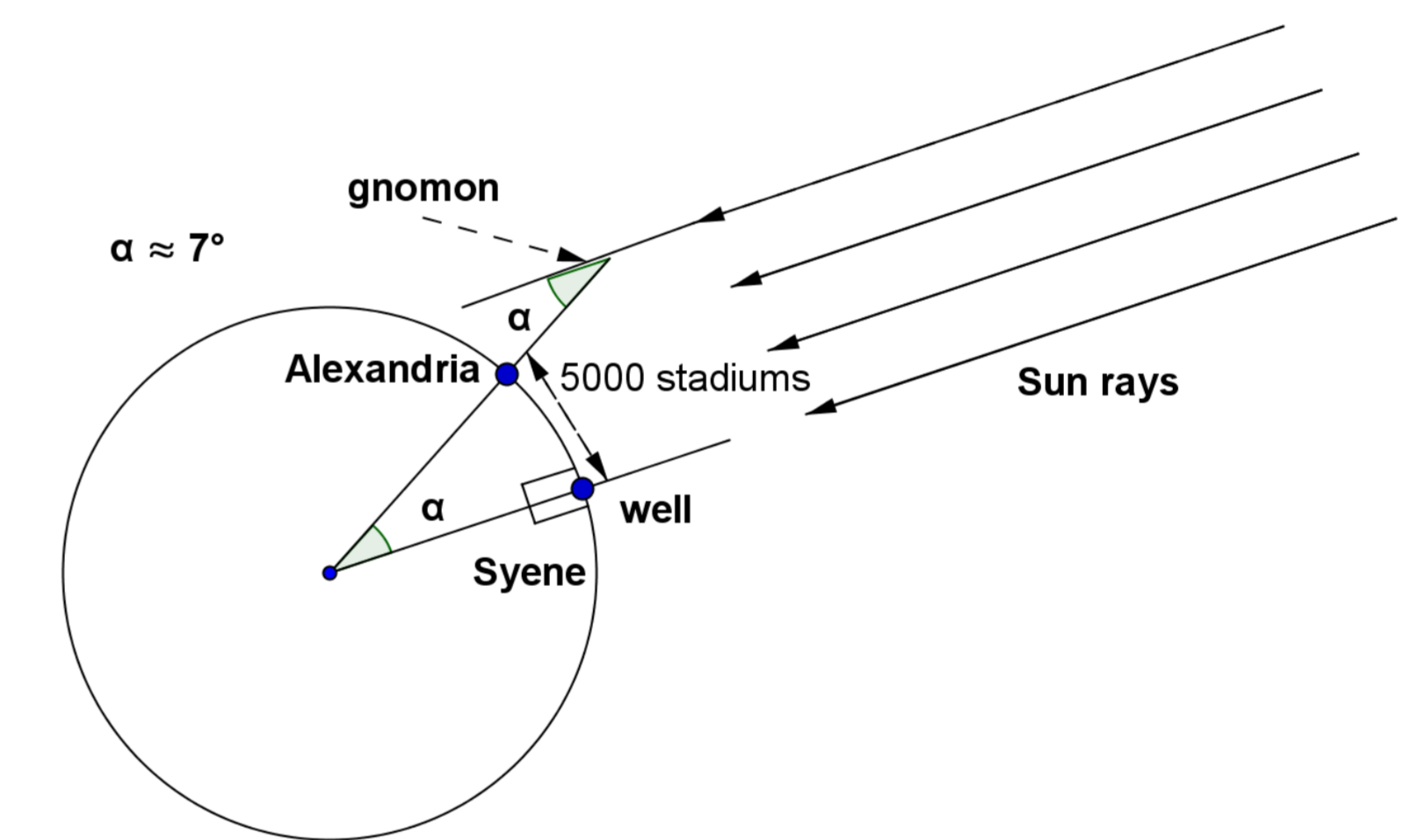
ARISTARCHUS OF SAMOS (310 BC, 230 BC)

calculated the distances Earth-Sun and Earth-Moon by observing an eclipse.



ERATOSTENES (276 BC, 196 BC)

calculated the diameter of the Earth by trigonometry and I



APOLLONIUS OF PERGAMUS (262 BC, 190 BC)

invented a new model taking better account of observations:

The planets turn on a small circle (the epicycle) itself turning on a circle (the deferent) that is slightly eccentric with respect to the Earth.

HIPPARCHUS OF NICEA (190 BC, 120 BC)

Discovered the striking precision of the Mesopotamian ephemerides.

We also owe some very important results to him:

- The discovery of the precession of the equinoxes (Earth does not turn in a circle, but like a top, returning to the same position every 25,800 years).
- The first catalogue of stars classified according to their brightness, a classification at the origin of our scale of decreasing magnitudes).
- A more precise calculation of the Earth-Moon and Earth-Sun distances than that of Aristarchus.

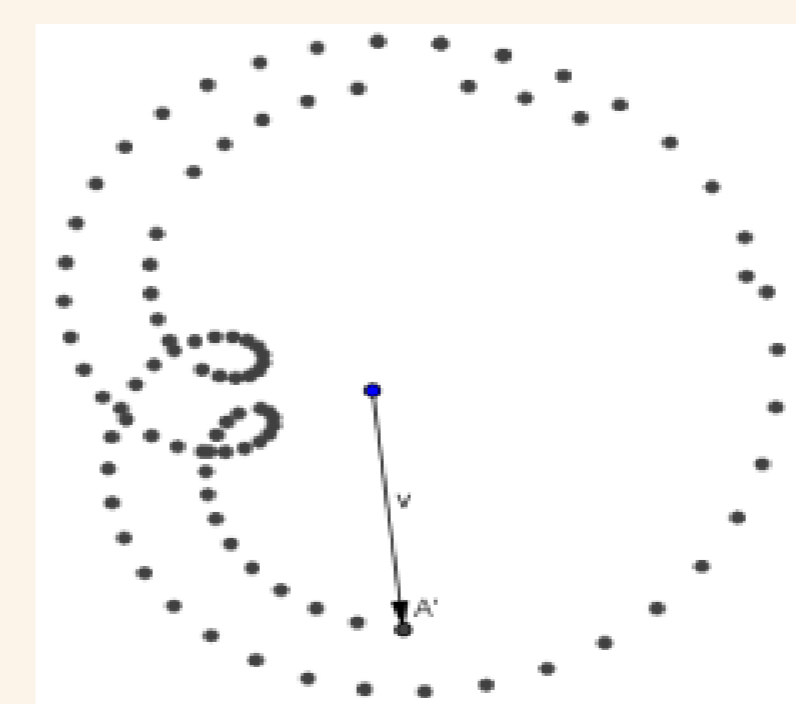
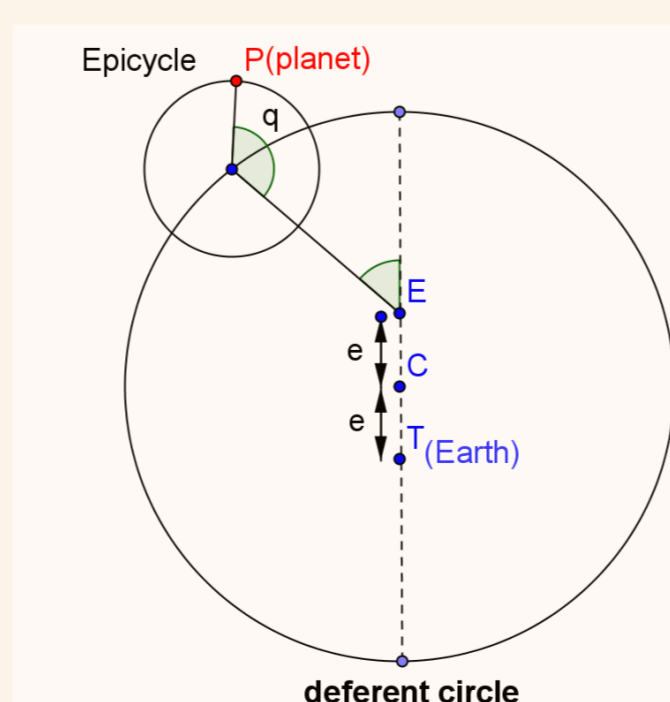
PTOLEMY(90, 168)

wrote a major work: **the ALMAGEST**

(The actual name, Almagest, is a deformation of the Arabic title)

Ptolemy perfected the previous models:

- ★ The Earth is not the center of the system.
- ★ The planet moves in a small circle whose center moves on the deferent circle.
- ★ Ptolemy thus explains the apparent retrograde motion of the planets that seem to go backwards and to describe loops.



The worldview of Ptolemy was considered valid until the 16th

- ★ The Almagest consists of 13 books:
- ★ In **books I and II** he sets out a philosophical and mathematical conception of the universe as well as the basics of trigonometry.
- ★ In the **book III** he describes the movement of the Sun (a circular path on a circle eccentric with respect to the Earth).
- ★ In **books IV to VII** he is interested in the movements of the Moon and adopts the principle of epicycles. Here he correctly describes eclipses.
- ★ In **books VIII and IX**: he draws up a catalog of **1022 stars organised into 48 constellations, specifying their position and magnitude.**
- ★ In **books X to XIII**: He is interested in the **planets: their size, their orbits, their retrograde movements, their heliacal risings and settings ...**



The Almagest translated into Arabic: manuscript dating from the start of the XIIIth century.