Context

1. Observation (before light pollution)
2. Explanation
3. Model

Phaenomena

"**the things that appear**"

- regular, observable patterns
- explanation and model:
  - geometric mechanism
  - cause?

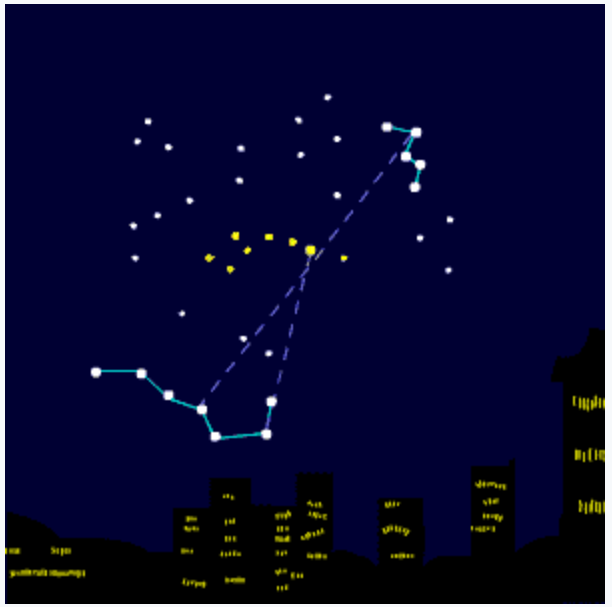
Observations

Time-lapse photograph:


Seoul
San Francisco
Shanghai
Los Angeles
Beijing
Chicago
Toronto
Atlanta
Boston
Helsinki
Moscow
Bangkok
Mexico City
Oslo
New Delhi
Miami
Dublin
Warsaw
Brussels
Bucharest
Mumbai
Rome
Barcelona
Istanbul
Dubai
Madrid
Athens
Riyadh
Bogota
Caracas
Lisbon
Cairo
Casablanca
Nairobi
Lagos
Sao Paulo
Rio de Janeiro
Johannesburg
Cape Town

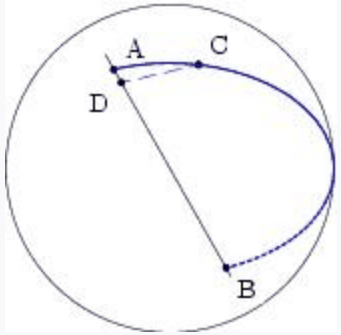
- Rome: 41.9° N

All stars in the "Big Dipper" are circumpolar at 41 N latitude:

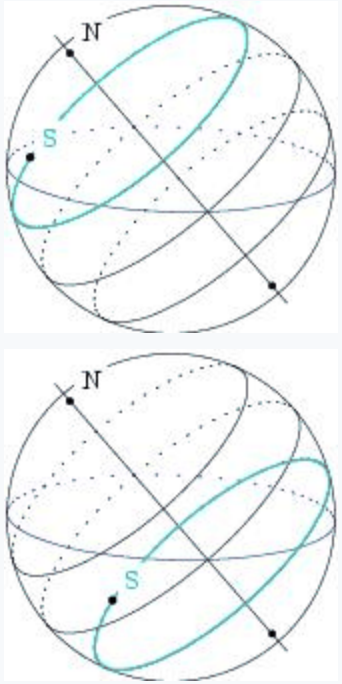


Model

The daily rotation of the kosmos

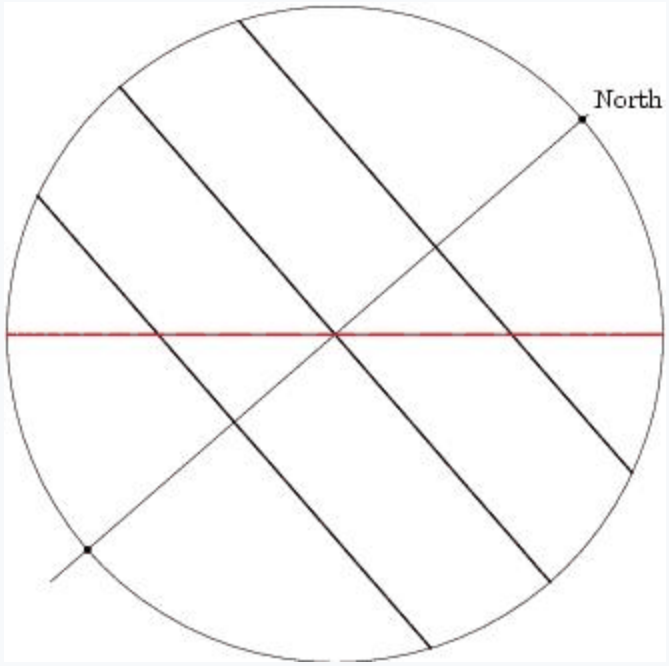


The annual motion of the sun



Model works at multiple scales simultaneously

Genius of Greek astro model: the horizon and arctic circles

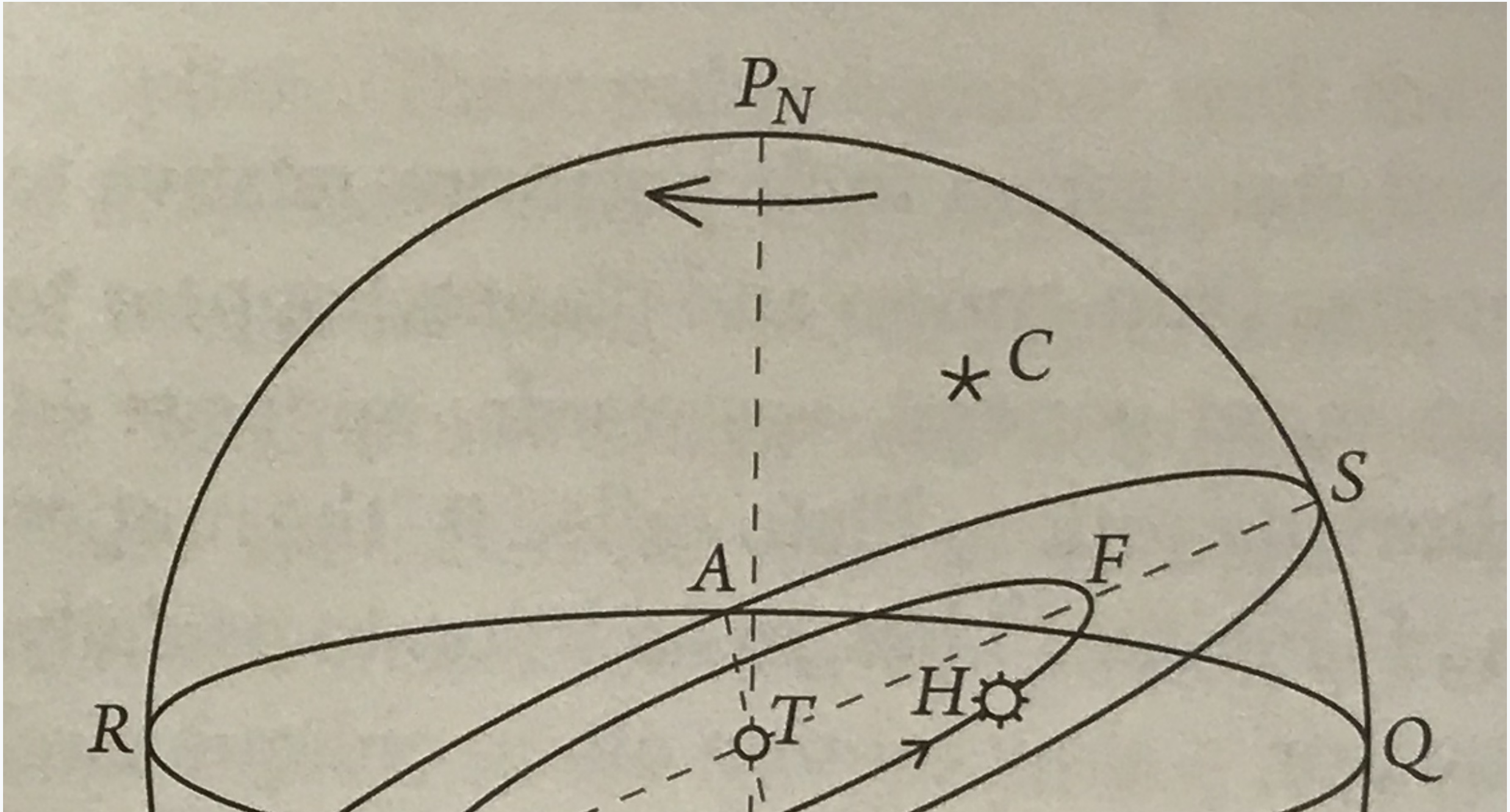


Prior points ("hypotheses")

Assumed by all Greek astronomy:

- the earth is a sphere
- the earth is lies at the center of the kosmos
- the earth is of negligible size compared to the size of the kosmos
- the kosmos, too, is spherical
- the kosmos revolves about an axis through its center (which is also the center of the earth!)

Diagram from reading:



Some features of this model

- **generalized laws**: "all objects tend toward the center of the universe"; "[eternal] heavenly bodies move at a uniform speed"
- specific observations provide evidence for testing hypotheses (e.g., the observed motion of the "fixed" stars supports the idea of the rotation of the celestial sphere)
- model can be analyzed mathematically (especially using geometric methods)

Preferences in explanation

- simplicity (jcircles)
- symmetry

Historical context

Earliest Greek scientific texts

ca. 300 BCE:

- Euclid, *Phaenomena*
- Autolycus of Pitane

Questions to ask about any text

- who wrote it?
- when was it written?
- who was the audience?
- what was the author's purpose?

For Tuesday

Ptolemy, *On the Criterion*

Compares science to lawcourt