

~~PTOLEMY ENCYCLOPEDIA~~

Claudius Ptolemaeus

G.J. Toomer

Best evidence of life - 3 observations in Almagest
26 March 127 → 2 Feb 141

Emperors Hadrian, Antoninus
flourished in Hadrian → Aurelius

"Ptolemaeus" descended from Greek or Hellenic
ancestors

"Claudius" Roman citizenship

Almagest - relatively early

Planetary Hypotheses - later, w/ changes

Alexandria - good source, but diminished

Almagest: μαθηματικὴ σύνταξις

mathematical compilation

→ became informally the greatest compilation
(Greek)

Arabic → ἡ μεγίστη → "al-majisti"

→ "almagesti"

→ "almagestum"

Med. Latin

Assumes only Euclidean geometry &
some astronomical terms

mathematical preliminaries

→ theory of motion of everything

For each: type of phenomena that must be accounted for

proposes a geometrical model
derives parameters from obs.

constructs tables → position, motion,
event for a given
date

Some history:

Astronomical observations in Greece 5th BC
solstice dates

early 3rd Aristyllus and Timocharis in
Alexandria → positions?
events

not systematic

Babylonian data 8th BC became available
Eudoxus knew, but on it used

↳ eclipse mens.

Ptolemy says H: no planet model

<Almagest>

Books I and II - preliminaries

Aristotle's: sphere of fixed stars revolves
around central, stationary,
spherical Earth
revolving E-W

Geometry - chord

own chord tables

Calculated ϵ $23;51,20^\circ$, $H: 23.855$

→ ^{table} declination of sun as function of longitude
↳ necessary to calculate rising times

^{tables} arcs of ecliptic as function of latitude

→ length of day for given date & latitude
(astronomy)

Babylon III Solar Theory

Compared observations of equinoxes & solstices
w/ H and Meton, confirmed H calculation
of tropical year. $365 \frac{1}{4} - \frac{1}{300}$

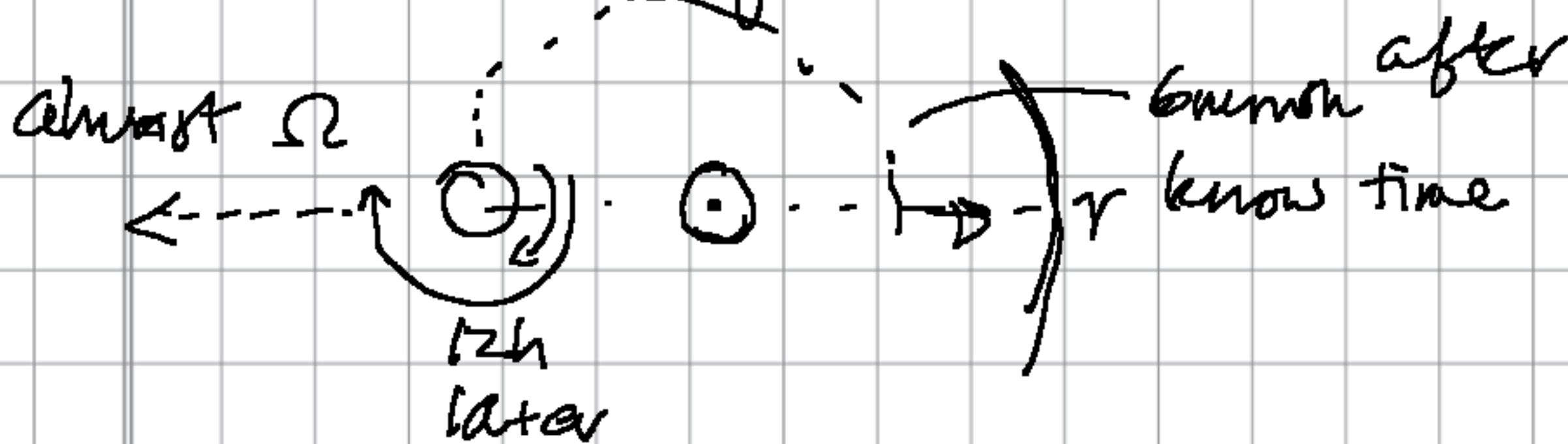
actually $\frac{1}{128}$ matters
(copied H?)

→ agrees w/ H

Equinox: H knew times of E & S to $\frac{1}{4}$ day.

Eq: when δ of sun = 0° (did measurements)

S: when δ of sun = 23.5° | few days before and



Books IV and V Lunar Theory

need 3 parameters for lunar theory
time it returns to same longitude, latitude,
velocity

Pt credits H, but really B's

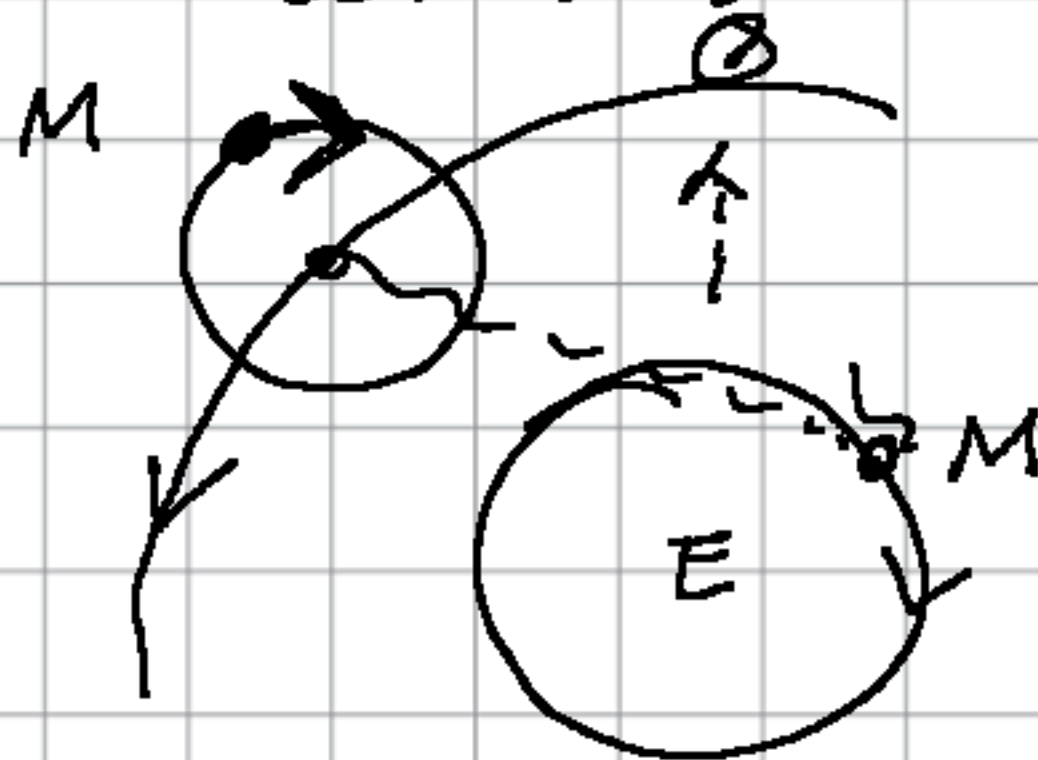
Uses epicyclic model (pretending 1 anomaly)

- get size of epicycle from 3 Eclipses
solar theory gives S's true longitude
during Lec. 180° different gives Moon's
known times between eclipses

→ get size epicycle in terms of the
defect distance

Book V Pt on lunar Theory

"Crank mechanism"



pushes and
pulls epicycle

table

longitude exactly
eclipses still work
BUT Moon's distance
is WILD

eclipse theory requires parallax

Book VI eclipse theory

tables - Lunar and Solar eclipses

Books VII and VIII Fixed stars

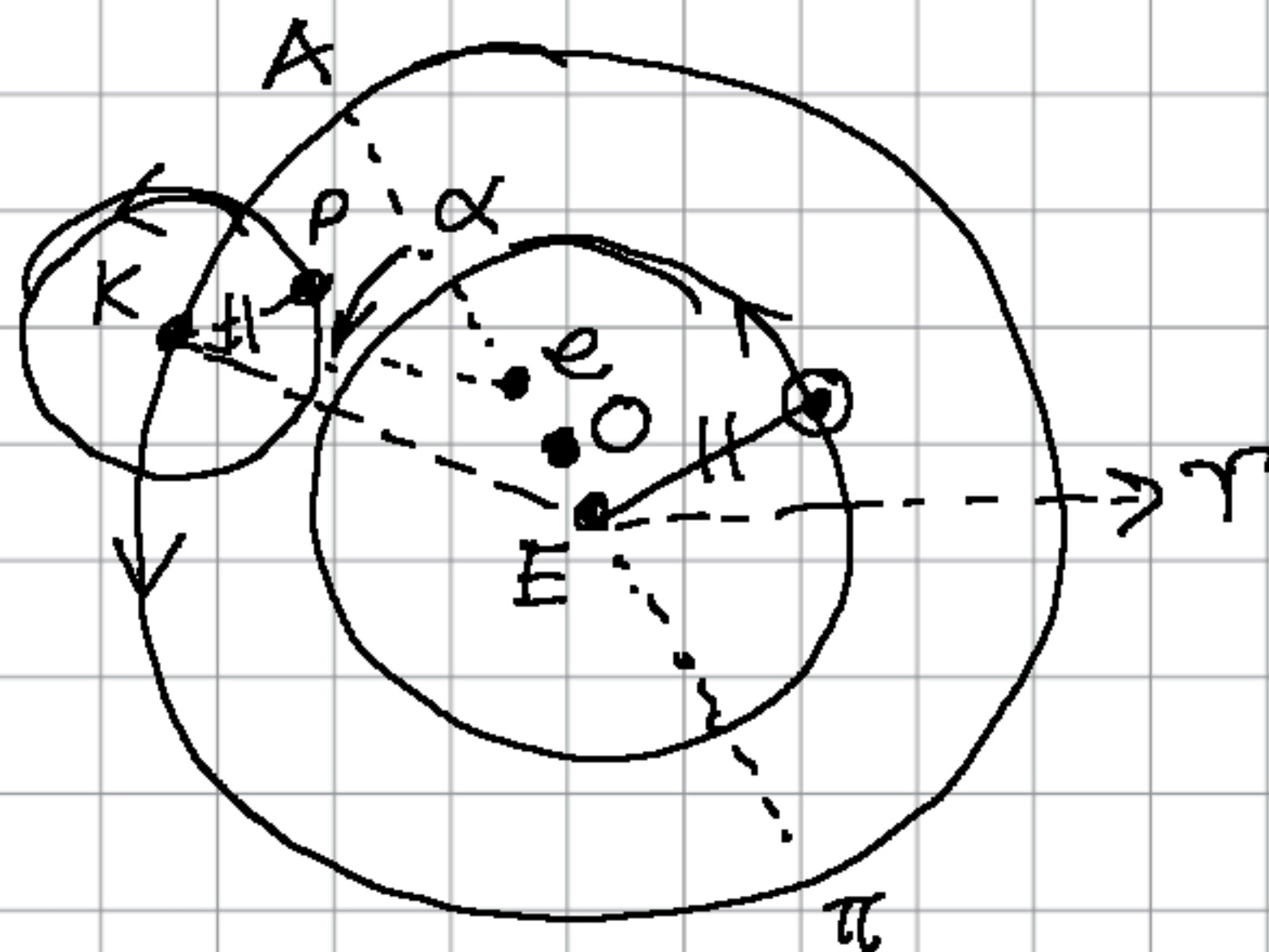
need star coordinates to observe planets
confirms H's precession, but stars
move about the pole E-W $\approx 1^\circ/100y$
(actually $1^\circ/70y$)

$$\left(\frac{70y}{10}\right) 360 = 25,200y \text{ around}$$

Bulk of work is 1022 stars in 48 const.
and mag 1-6

didn't just take H and add 2.40° long. to
H.

Books IX through XIV Planetary theory,
outer planets:



- e eccentricity
- E center of def.
- ⊙ center of def.
- α constant angular speed around
- e equant

Book XII tables
XIII planetary latitudes

Planetary Hypotheses

2 Books. I survives in Greek → distances
I & II in Arabic translation → parameters

Beyond Almagest — physical description
updates parameters...
changes models for planetary latitudes
"physical"
BI proposes how absolute distances are



from start used ordering: M, M, V, S, M, J, S
admits it's arbitrary
parameters of each planet determined indep.

From E, the least distance of V = greatest
distance M₁ and so on
planetary spheres are touching
no space

from Moon — hot traps
accident: greatest V = least Sun from
other way.

→ calculates each to the stars.

Astrology

Geography 8 books

maps w/ long/lat for
many places

Optics

reflection and refraction
color inherent

monocular / binocular vision
experiment

His philosophy is Aristotelian

mathematics

mechanics

Handy Tables

Almagest - Greek → Arabic ~ 800

Arabic → Latin 1175 Gerard of
Cremona

(in Sicily 1160 unkn.)