



Astronomy 350L

(Fall 2006)



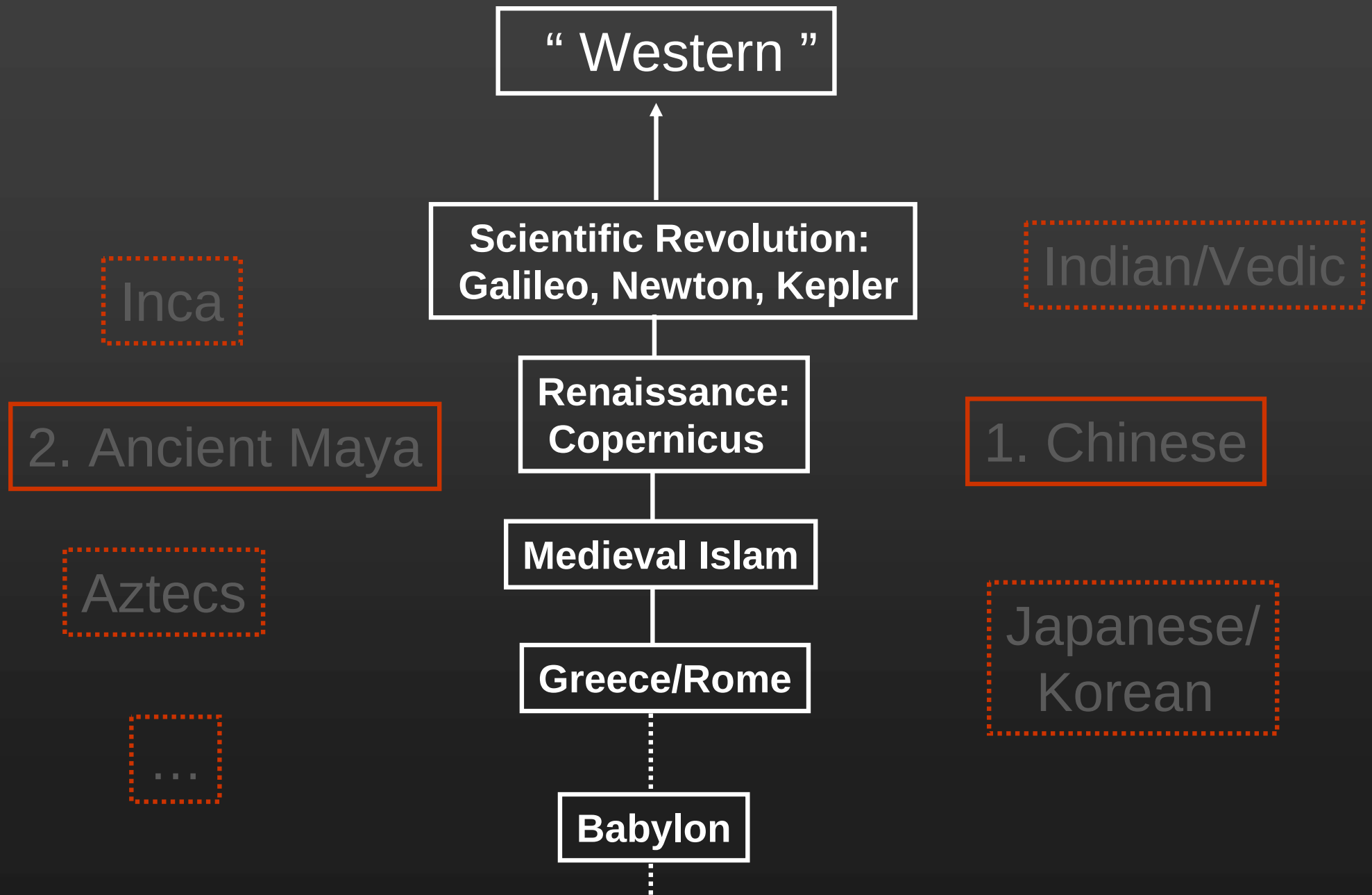
The History and Philosophy of Astronomy

**(Lecture 5: Alternative Views:
China, Mayan Astronomy)**

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TA: Jarrett Johnson**

The University of Texas at Austin

Different Traditions of Astronomy

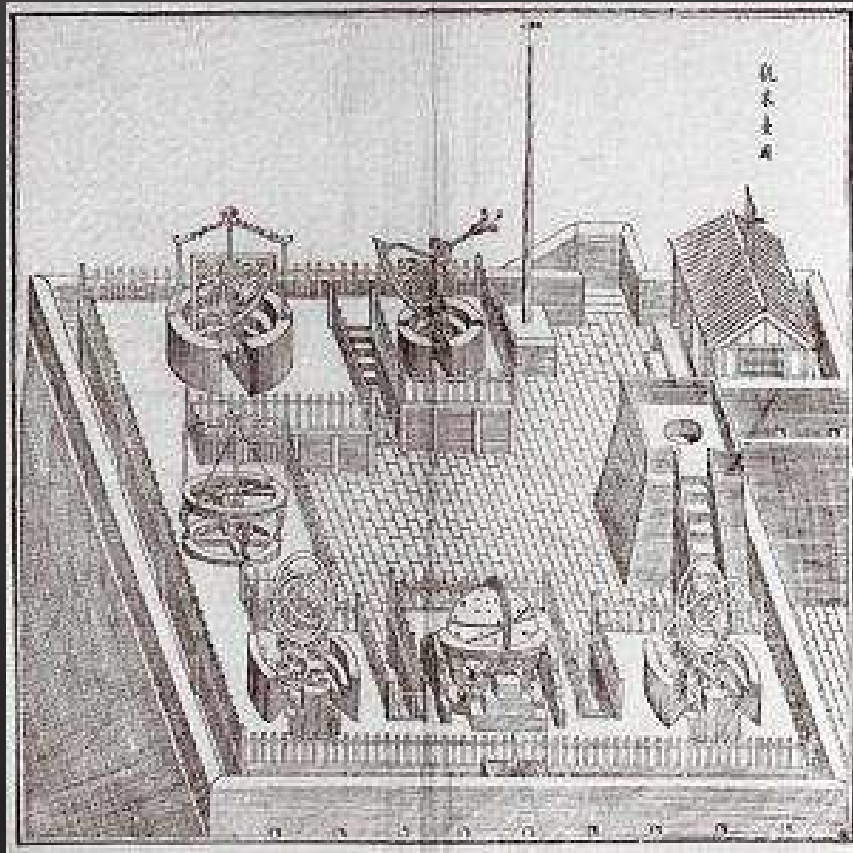


Chinese Astronomy: Very Brief Introduction



Chinese astronomy à vital importance to the State!

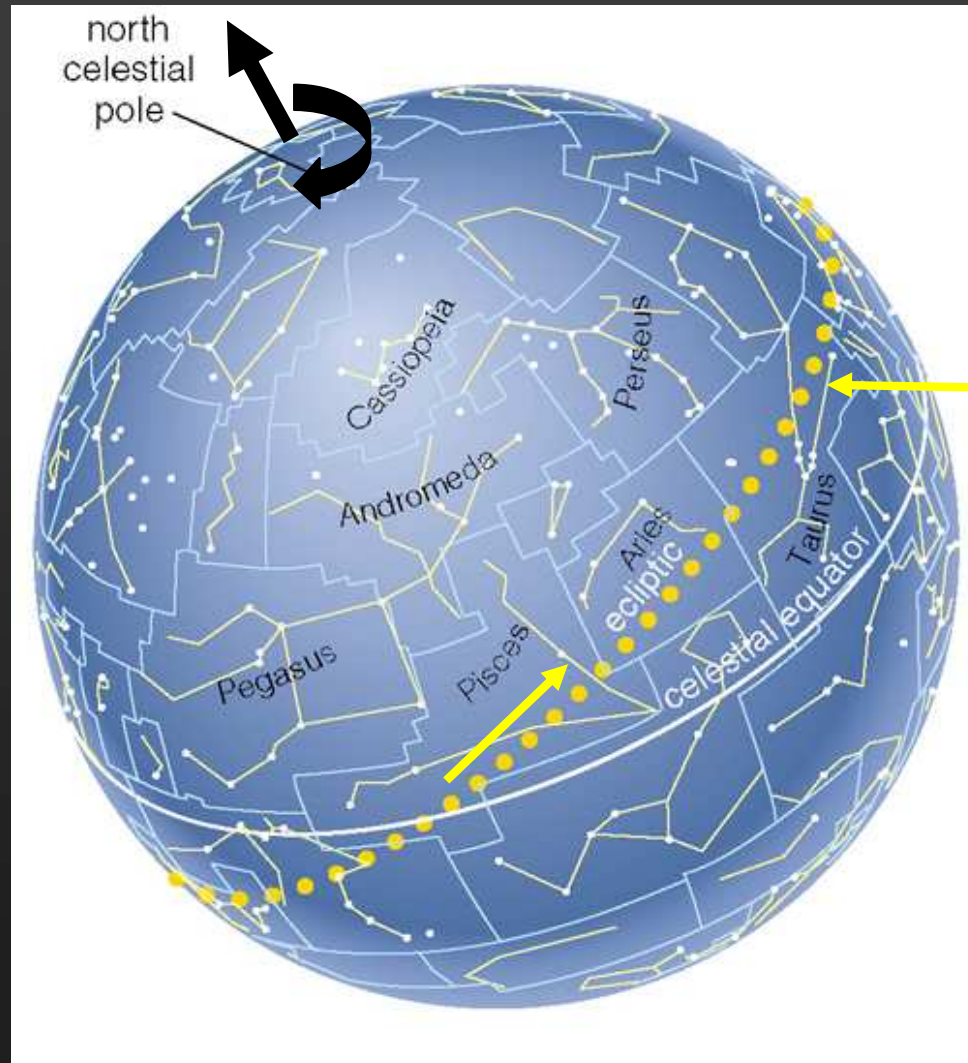
Chinese Astronomy: Very Brief Introduction



Armillary Sphere

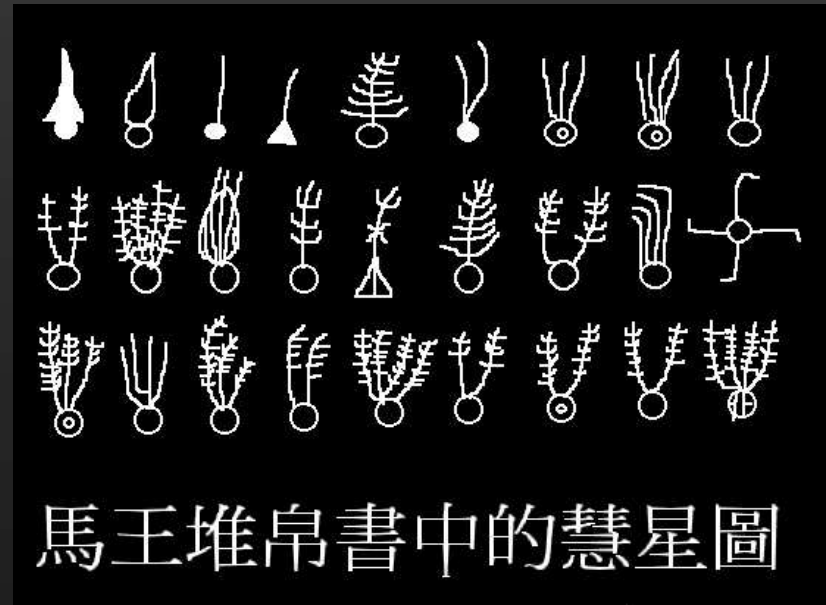
Chinese astronomy à very sophisticated!

Earth-Sun motion on Celestial Sphere:



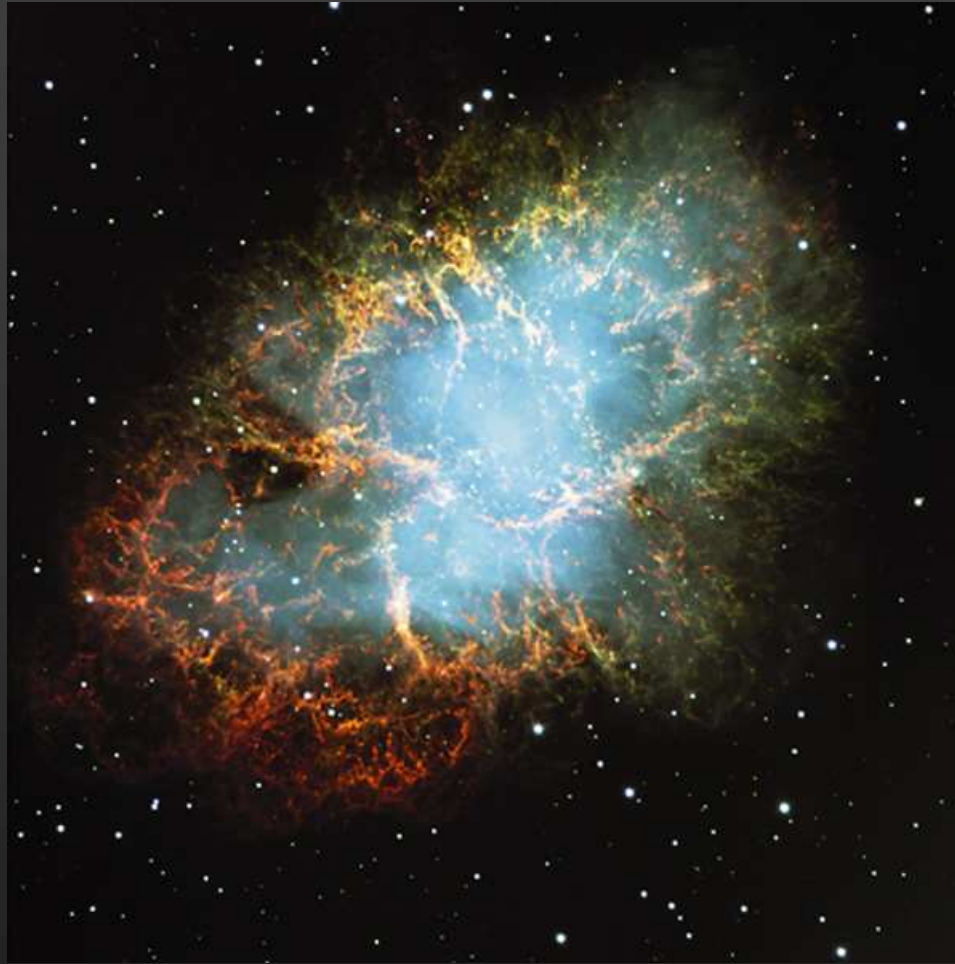
Sun moves
along ecliptic
once a year!

Two branches of Astronomy

[illegible]

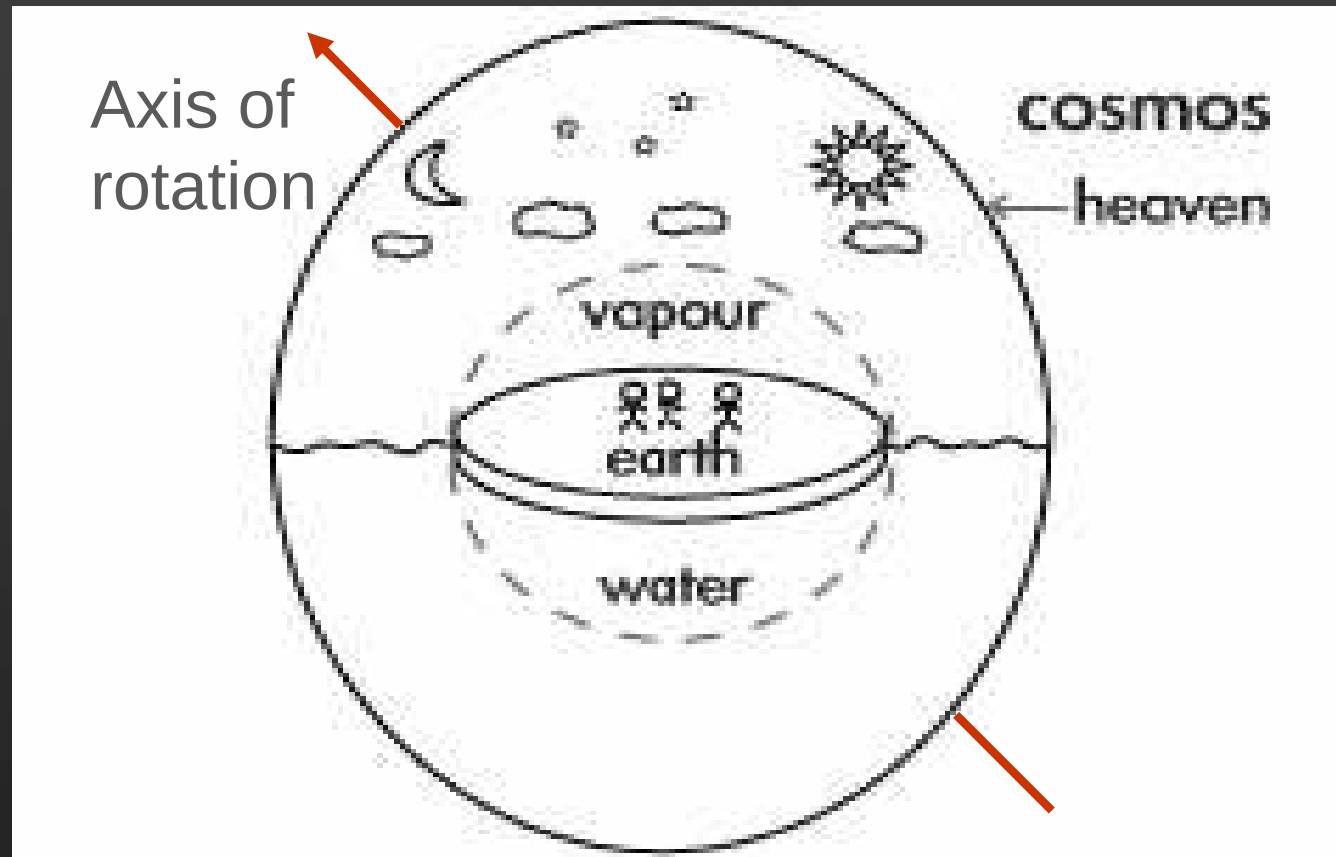
(e.g., comets)

Yang Wei-Te's 'Guest Star' of AD 1054



Guest Star = Supernova Explosion
- unobserved in Medieval Europe

Chinese Model of the Universe



Inhabited world is at center of universe
- flat Earth

The Ancient Maya

à Classical Period: ~ 200 – 900 AD



Tikal



Maya à obsessed with time and astronomy!

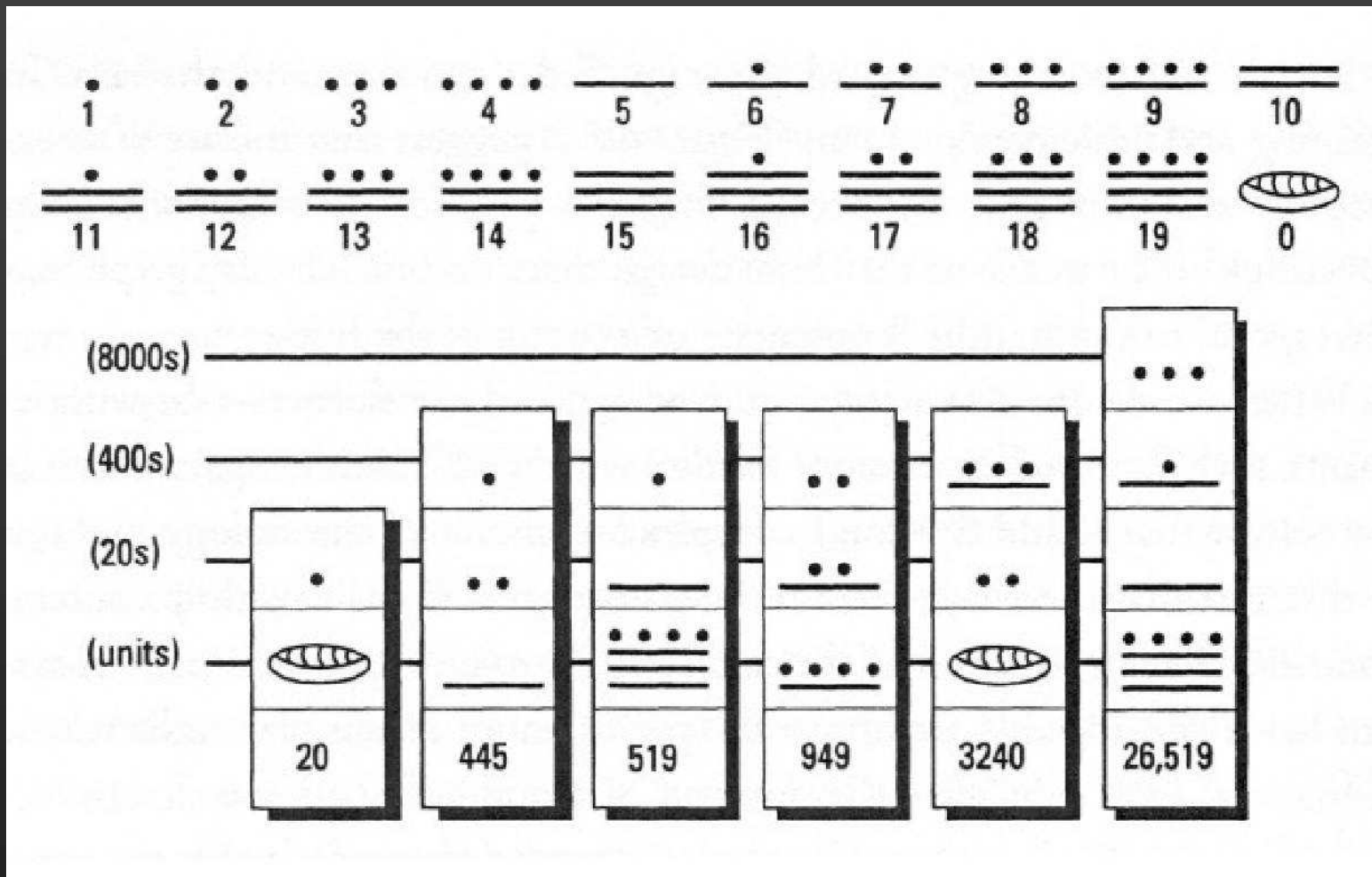
Maya Hieroglyphic Writing

Carved Limestone Stelae



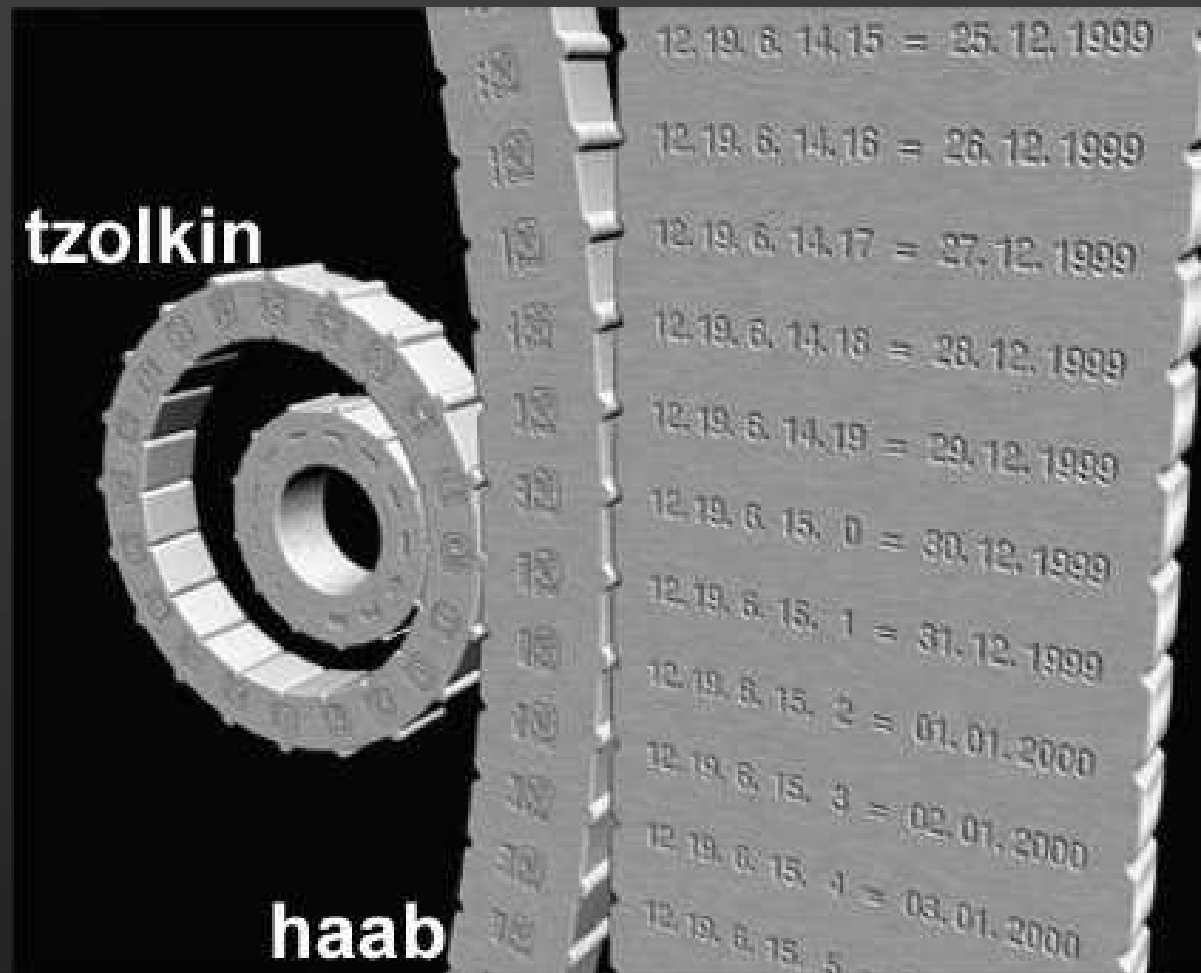
- Maya writing deciphered only quite recently (> 1970s)
- Decoded first: number system and calendar

Maya Number System



- base 20 (vigesimal)
- place-value system, includes “zero”

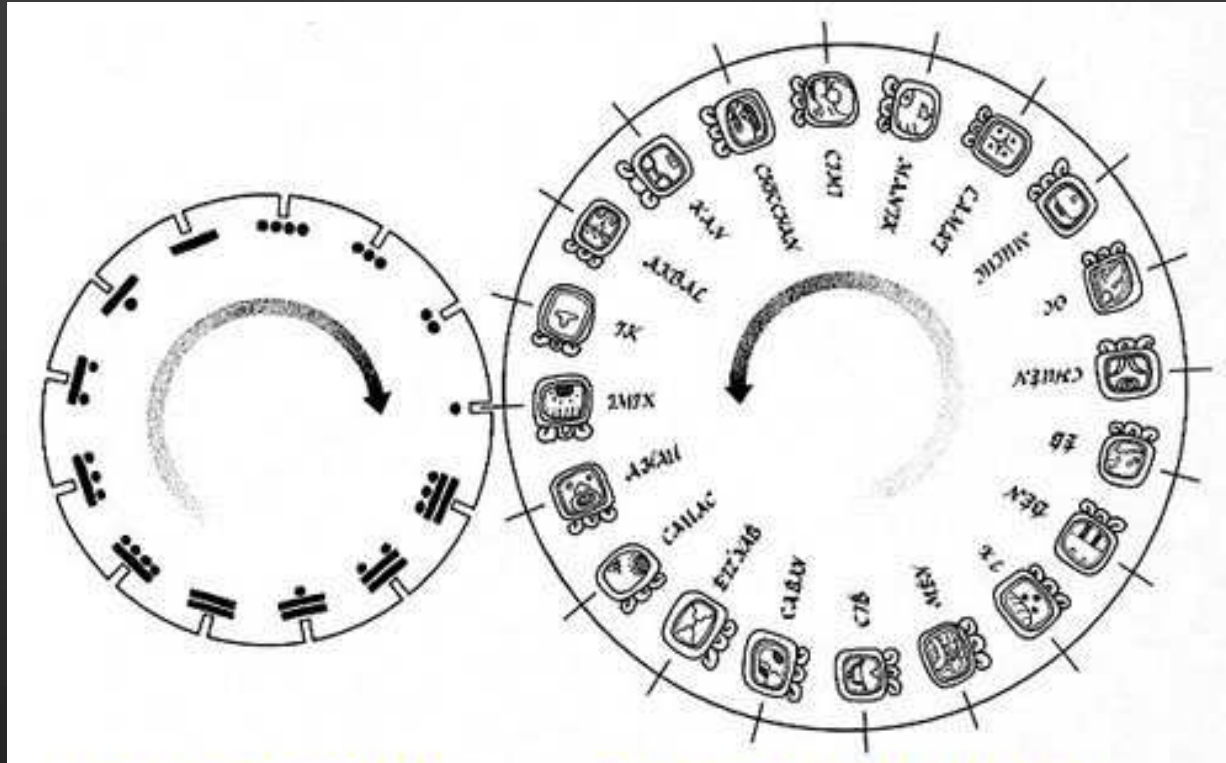
Maya Calendar



- highly complex
- cyclical (recurring) and linear elements

Maya Calendar

- 1st cycle: Sacred Round (*Tzolkin*)



- 20 name glyphs + 13 numbers = 260 days
- no direct astronomical significance

Maya Calendar

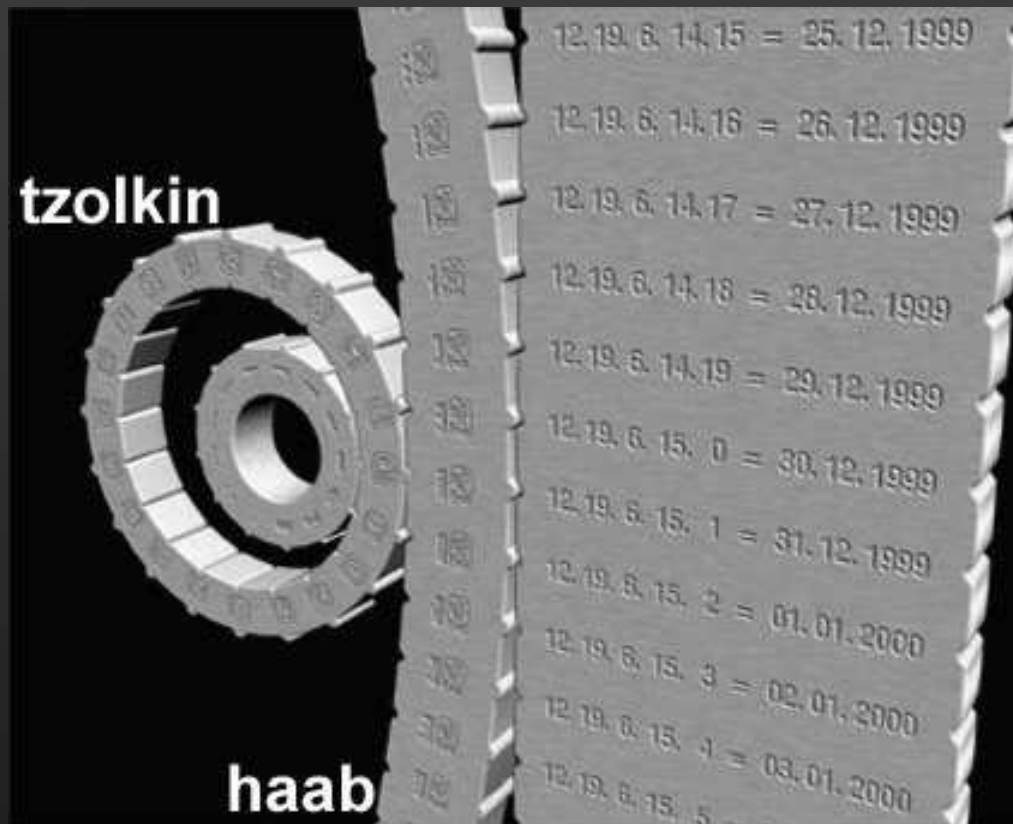
- 2nd cycle: Vague Year (*Haab*)



- 18 “months” of 20 days + 1 month of 5 days = 365 days
- based on solar (seasonal) year

Maya Calendar

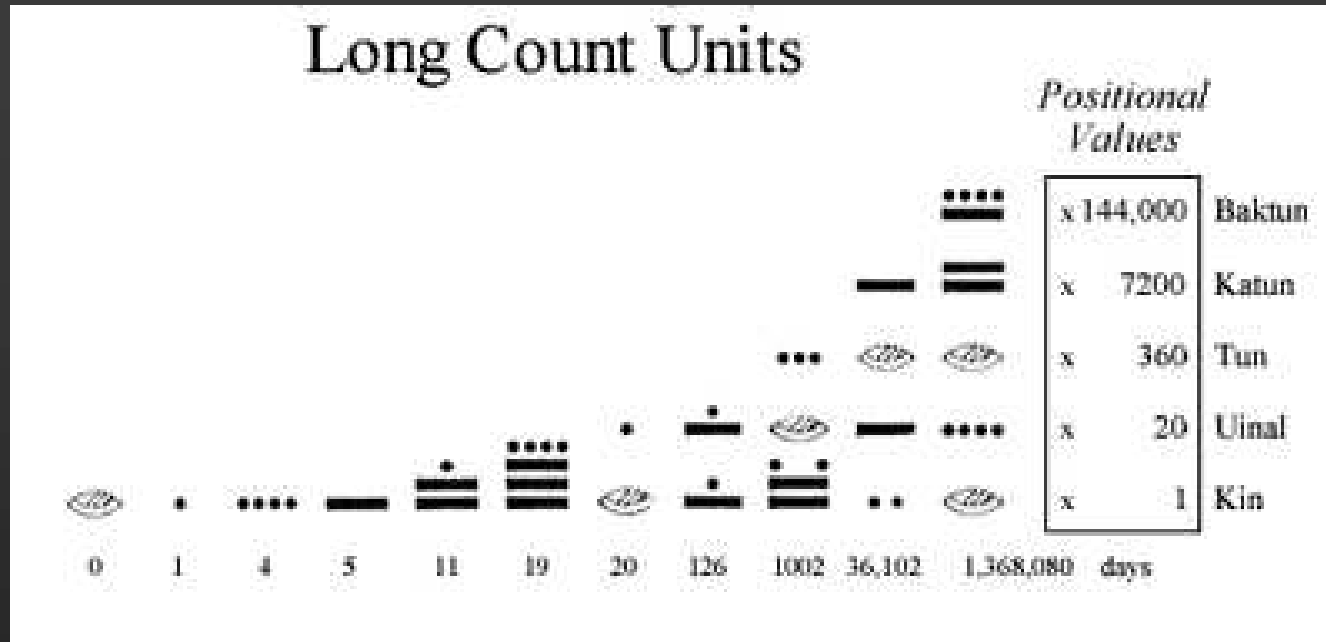
- cyclic vs linear:



- Same combination of tzolkin and haab date (e.g., 1 Imix 4 Mac) recurs every 52 years!
- How to measure longer time periods?
à Long Count!

Maya Calendar

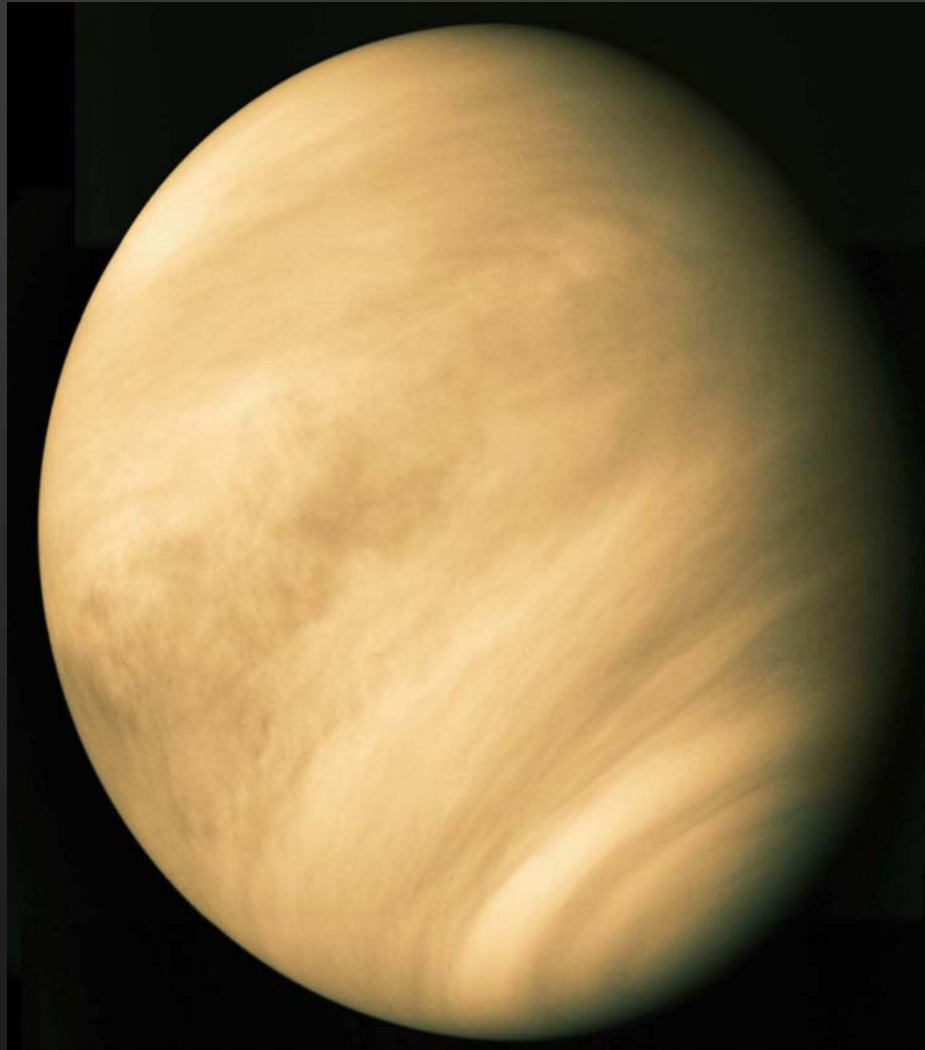
- Linear series: Long Count



- general format: xx.xx.xx.xx.xx
- first day = origin of time (universe)=0.0.0.0.0
à Aug. 13, 3114 BC (Gregorian)
- last day (= end of time?) = 13.0.0.0.0
à 2012 AD

Maya Astronomy

à Obsession with Venus



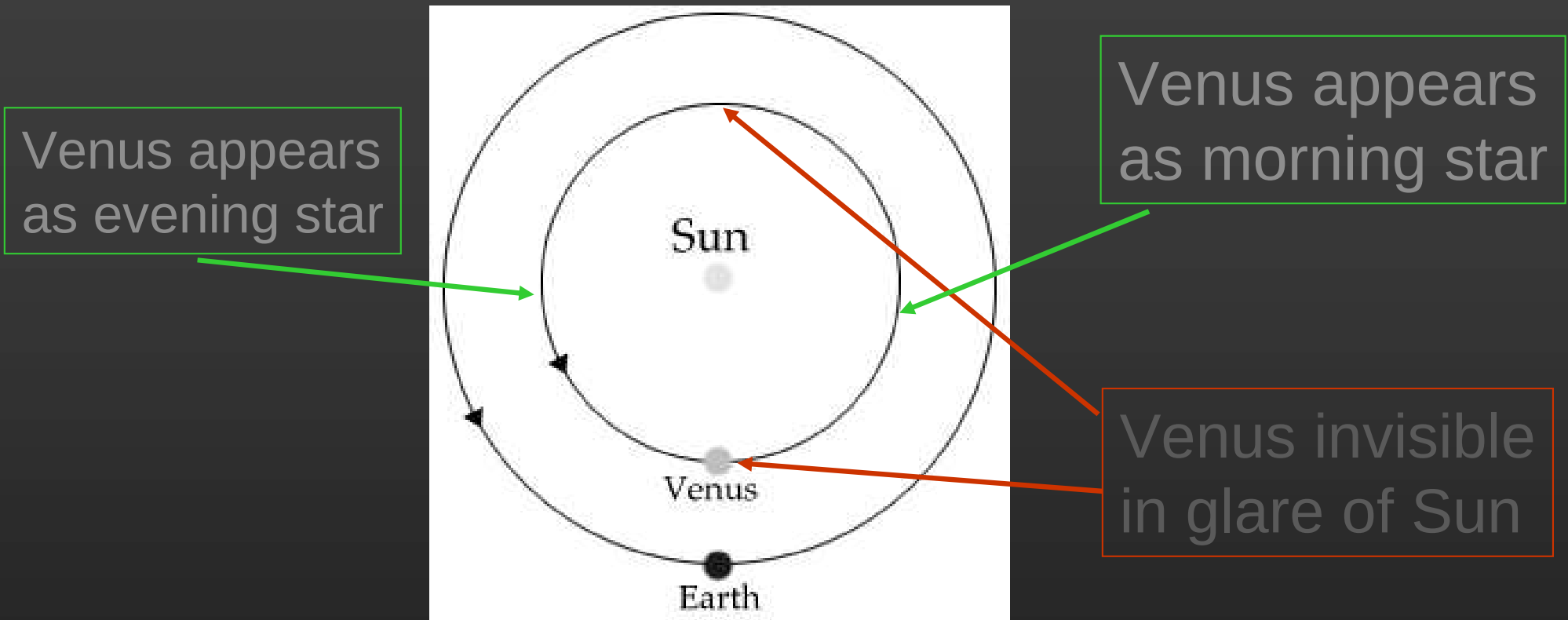
Mariner 10 Image of Venus

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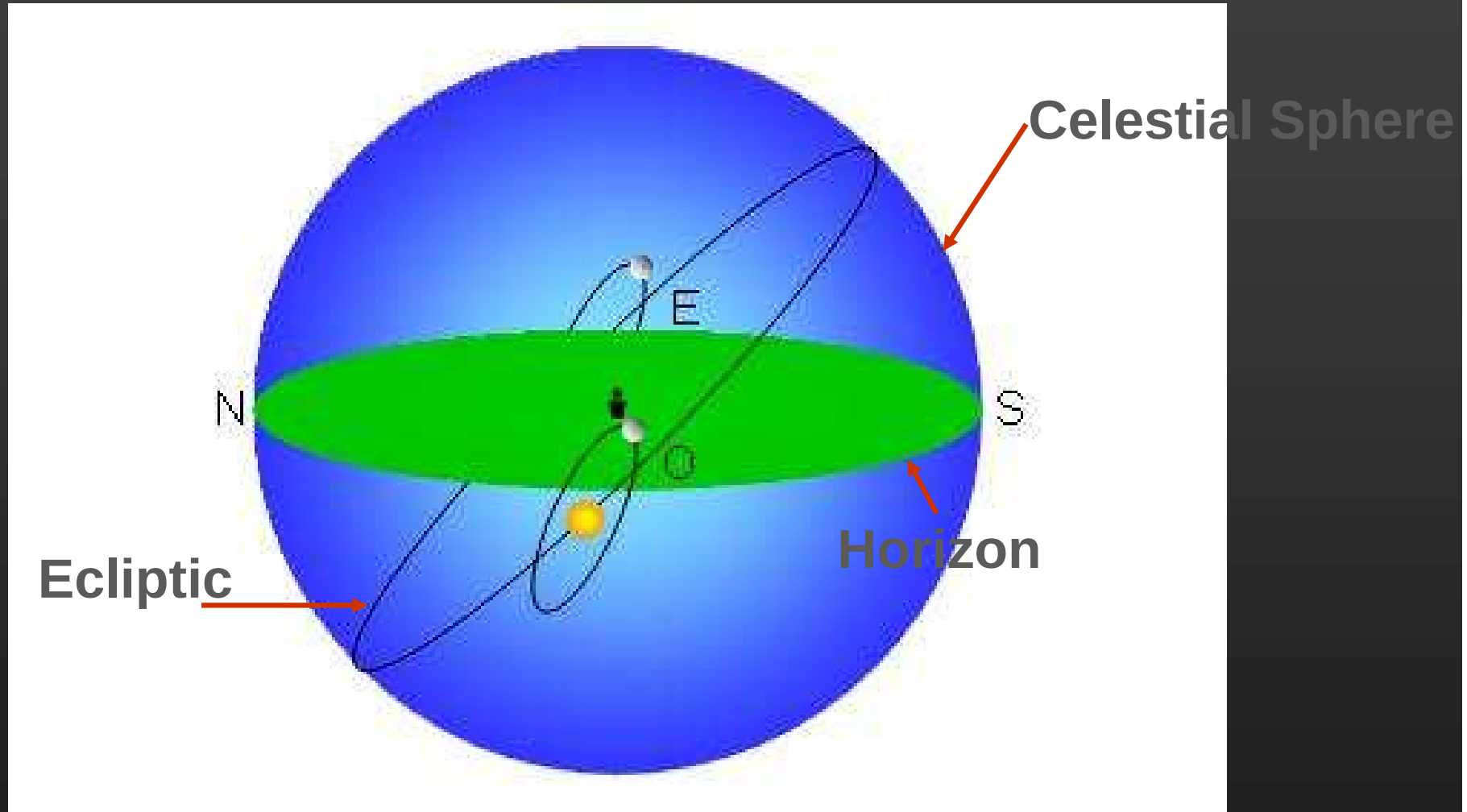
= Kukulcan

Venus Astronomy: The Basics



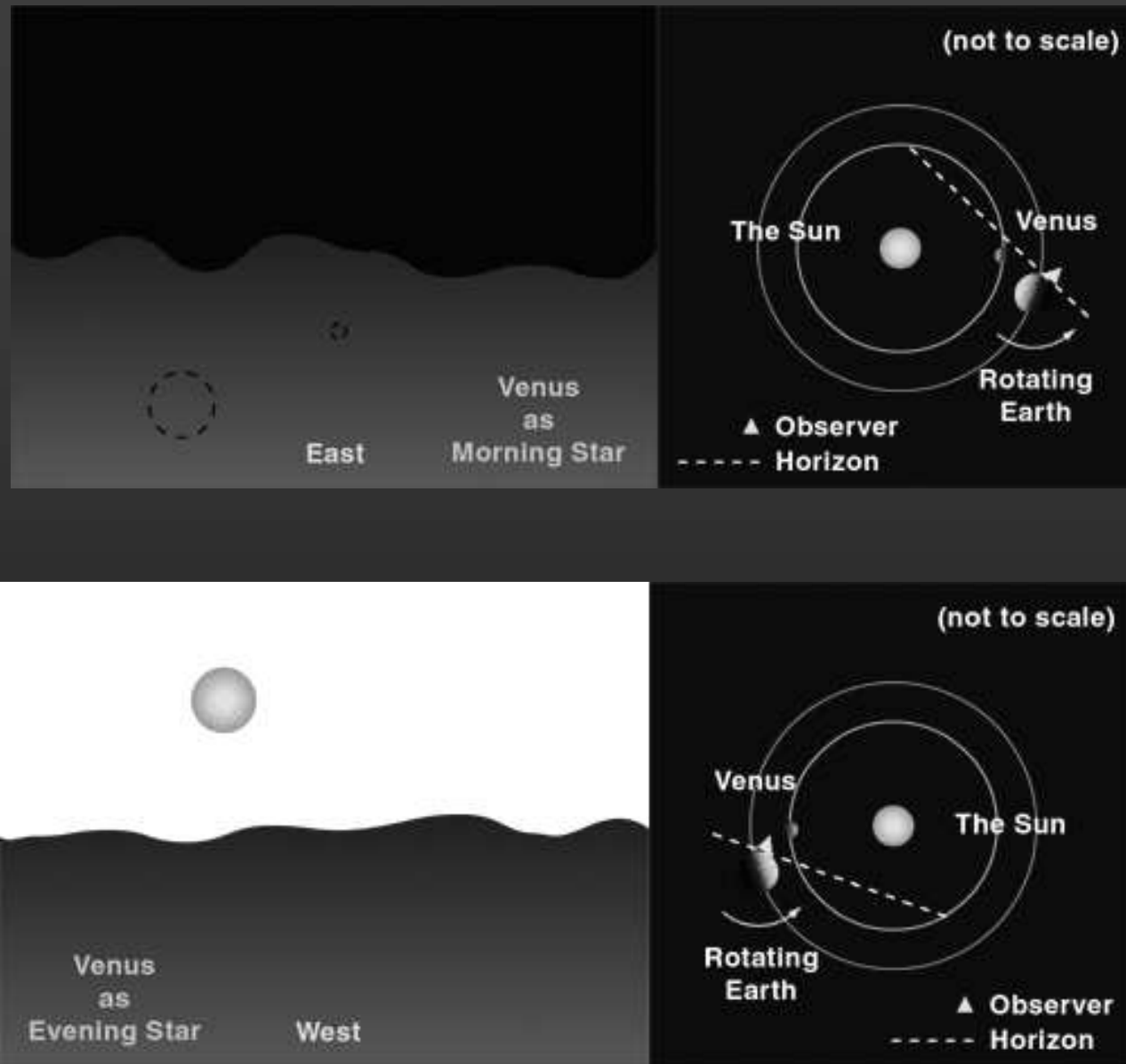
- invisible -- morning star – invisible – evening star
8 days + 263 days + 50 days + 263 days
= 584 days (synodic period)

Venus Astronomy: The Basics



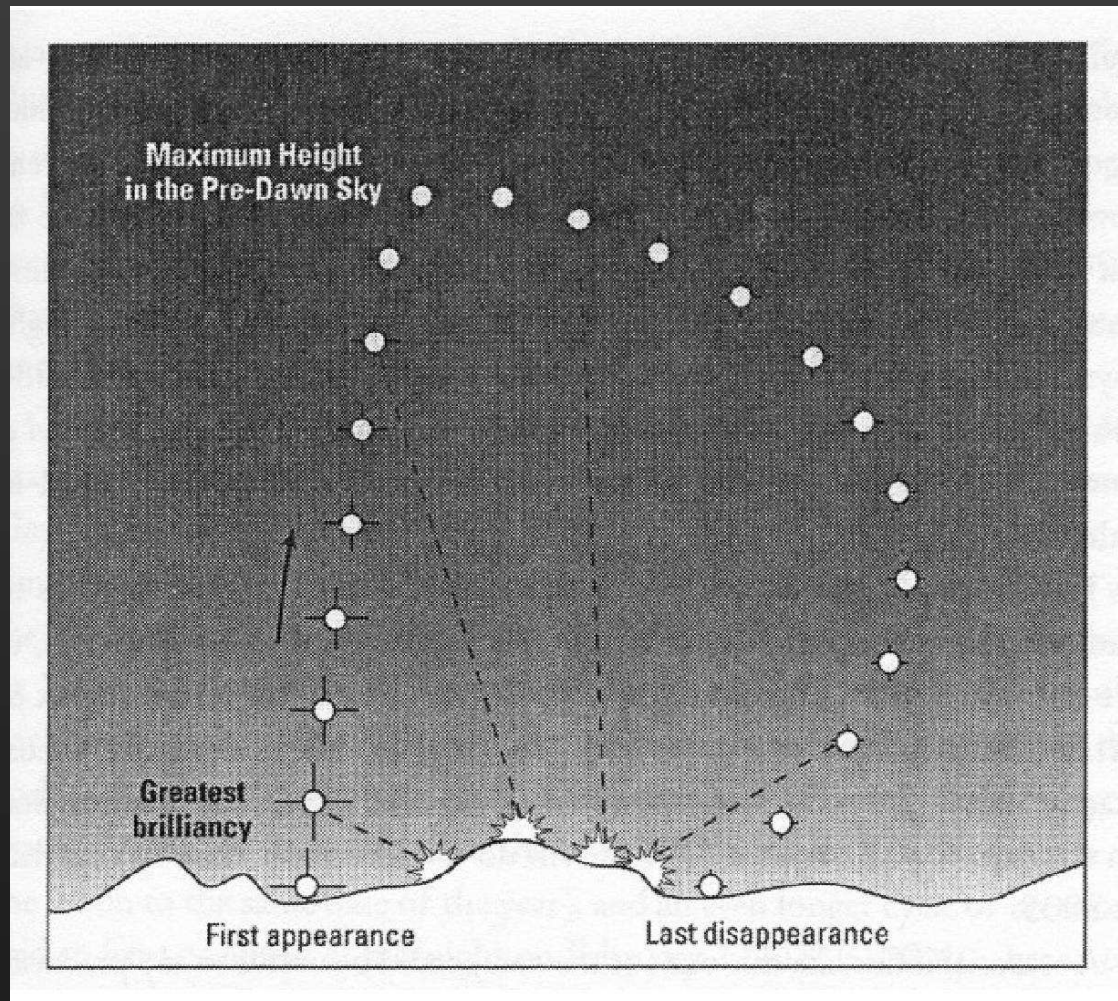
- Venus appears always close to Sun!

Venus Astronomy: The Basics



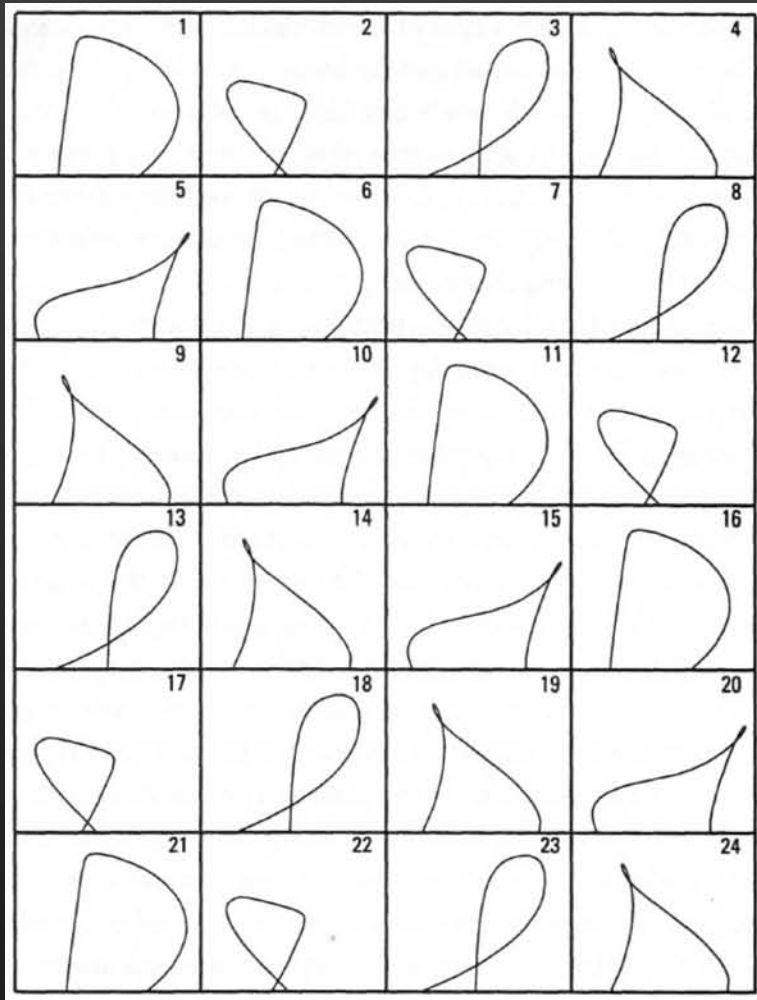
Venus Astronomy: The Basics

- Morning star: Characteristic pattern of heliacal rising



Venus Astronomy: The Basics

- Morning star: Characteristic pattern of heliacal rising



- 5-fold symmetry (five repeating patterns)
- Q: Why is that?
- A: $584 \times 5 = 365 \times 8$

Book of Mayan Astronomy: The Dresden Codex



- One of only 4 surviving Maya codices
- Contains Eclipse Tables and Venus Tables

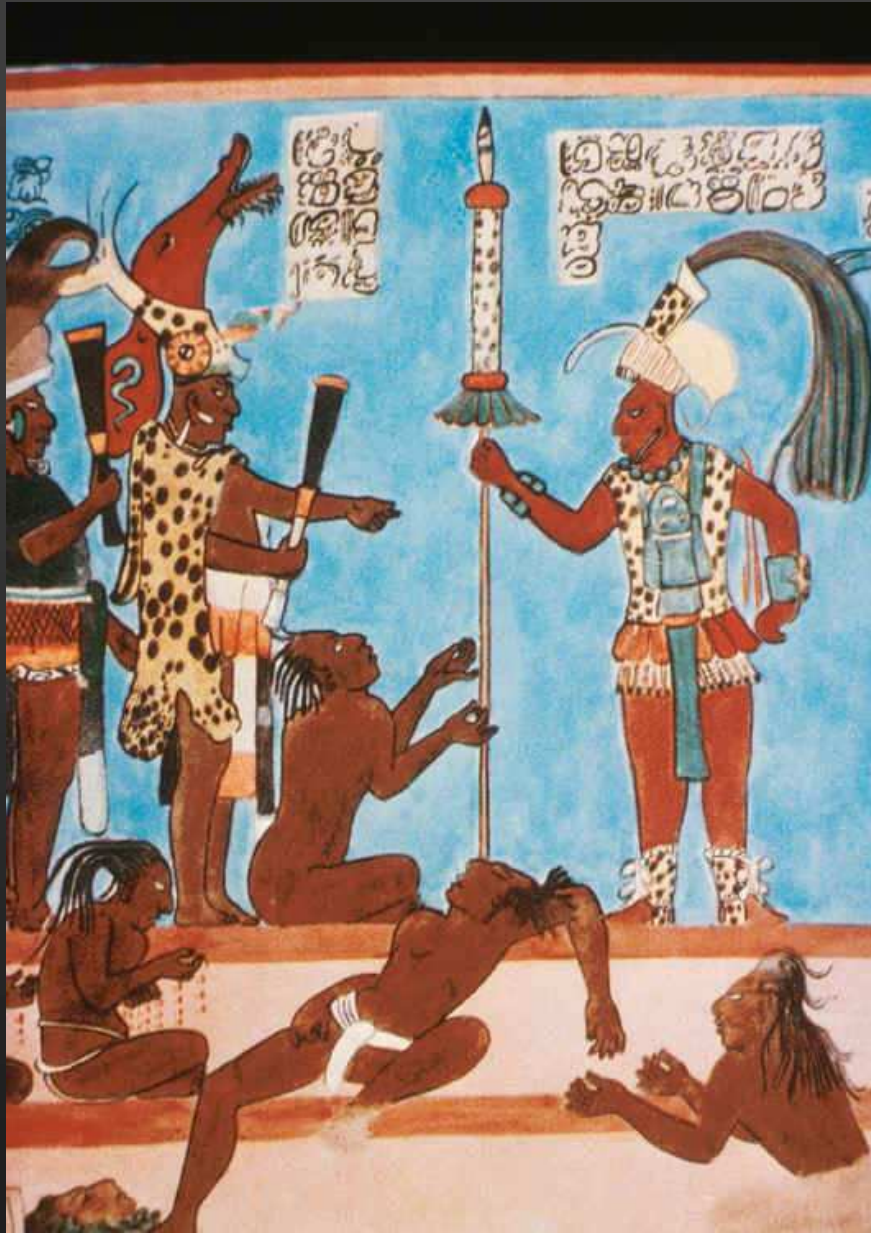
Dresden Codex: Venus Tables



$$236 + 90 + 250 + 8 = 584$$

(morn. star- ...- even. star -- ..)

Maya Venus Worship and Warfare

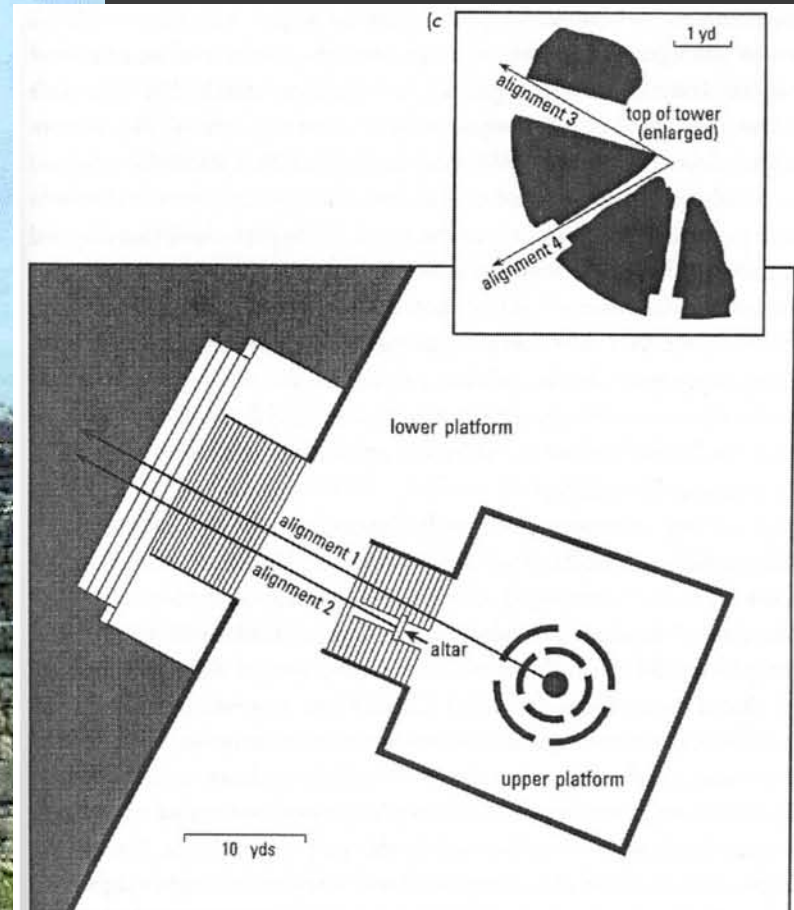


(Mural at Bonampak)

- Mayan rulers timed their attacks according to the motion of Venus
- Celestial events were of the utmost importance
- astronomy = religion

Astronomy and Maya Architecture

à Alignment astronomy again!



(Caracol at Chitzen Itza)

Astronomy: Alternative Views

- Traditions, independent from Western astronomy:
 - E.g., Ancient China, Ancient Maya
 - fundamentally different views of the cosmos
- Ancient China:
 - astronomy integral part of state bureaucracy
 - search for unusual celestial occurrences (comets, novae...)
- Ancient Maya:
 - obsessed with astronomy and timekeeping
 - crucial role of Venus's motions
 - à governs Maya warfare
 - Dresden Codex = *The book of Mayan astronomy*