Panchang:
Indian Calendar System

Ashutosh K Gupta

Indian Culture

~~Mysterious~~ ~~Divine~~ ~~Supernatural~~

But we are…

Just another pretty smart ancient civilization

That's it!

Why they needed a calendar?

Food

↓

Grow crops

↓

Predict weather

↕

Weather synchronous calendar

Fact:

Indians observed that time period of sun's position w.r.t. stars is equal to time period of weather

Units to represent Calendar!

Let's see what natural time periods they had.

- Sun's position w.r.t. stars.(365.256 363 051 days)
- Equinox (365.242 189 67 days)
- Moon's position w.r.t. stars. (27.321 582 days)
- Moon's phases. (29.530 588 days)

Problem:

Time units can only have **integer ratio** but above time periods are real numbers ☹

Solution:

Use variable lengths for time units.

Example: Year length in Gregorian calendar (365/366 days).

Panchang: Day/Month/Year

- Day : sunrise to sunrise
- Month : full moon to full moon
- Year : 11/12/13 months

Goal:

Average year length = 365.256 363 051 days

Trick:

Increment only when you observe an event in sky.

(Not the way we do in Gregorian calendar)

Day

- Sunrise to sunrise
- Day has a name according to moon's phase at the time of sunrise.

- Two weeks in a month of 14/15 days each:
  - Bright week
  - Dark week
- A month = 29/30 days

Fact for Indians:

• 7-days week in modern *Panchang* is not part of original one.

• French weekday names: **Lun**di, **Mar**di, **Mercr**edi,,……
Hindi weekday names: **Som**war, **Mangal**war, **Buddh**war…

• Indians believed that there are 9 planets, not 7!

Months

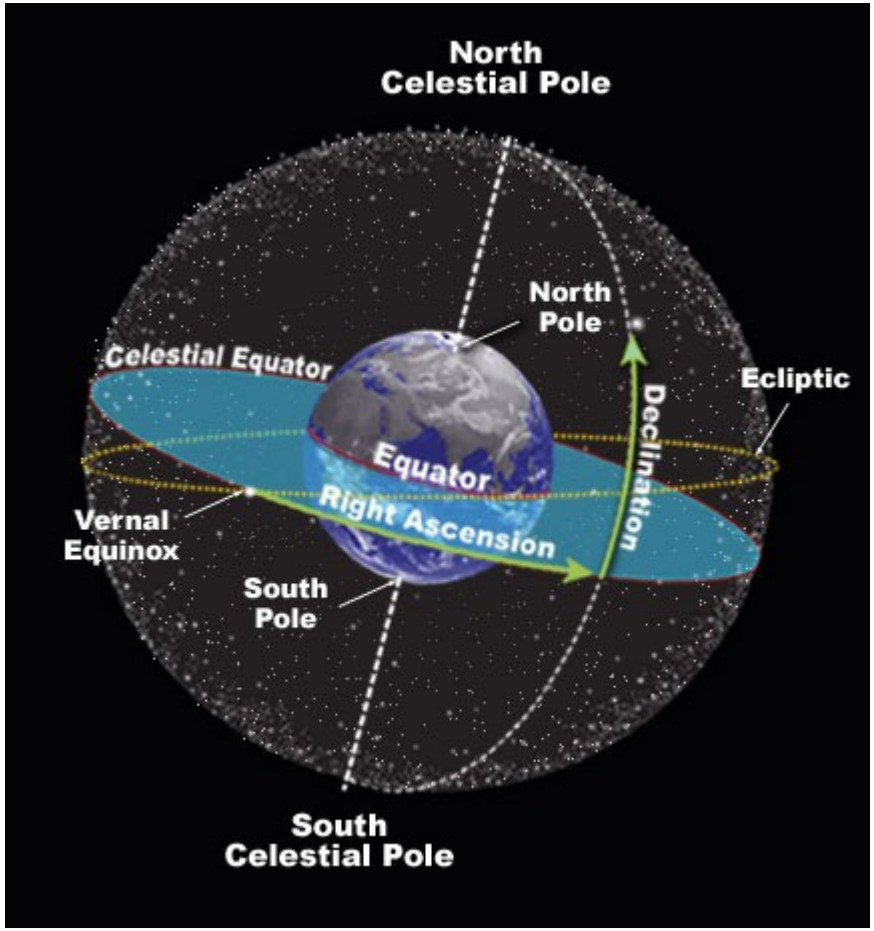
- There is a sequence of 12 names for months.
- Each month is given a name
  - *noName (Adhik-masa)*
  - name
  - (name1,name2)
- One naming cycle is a year.

Fact:

These month names are originally the names of 12 stars (*Nakshtras*).

Some details about our sky(1)

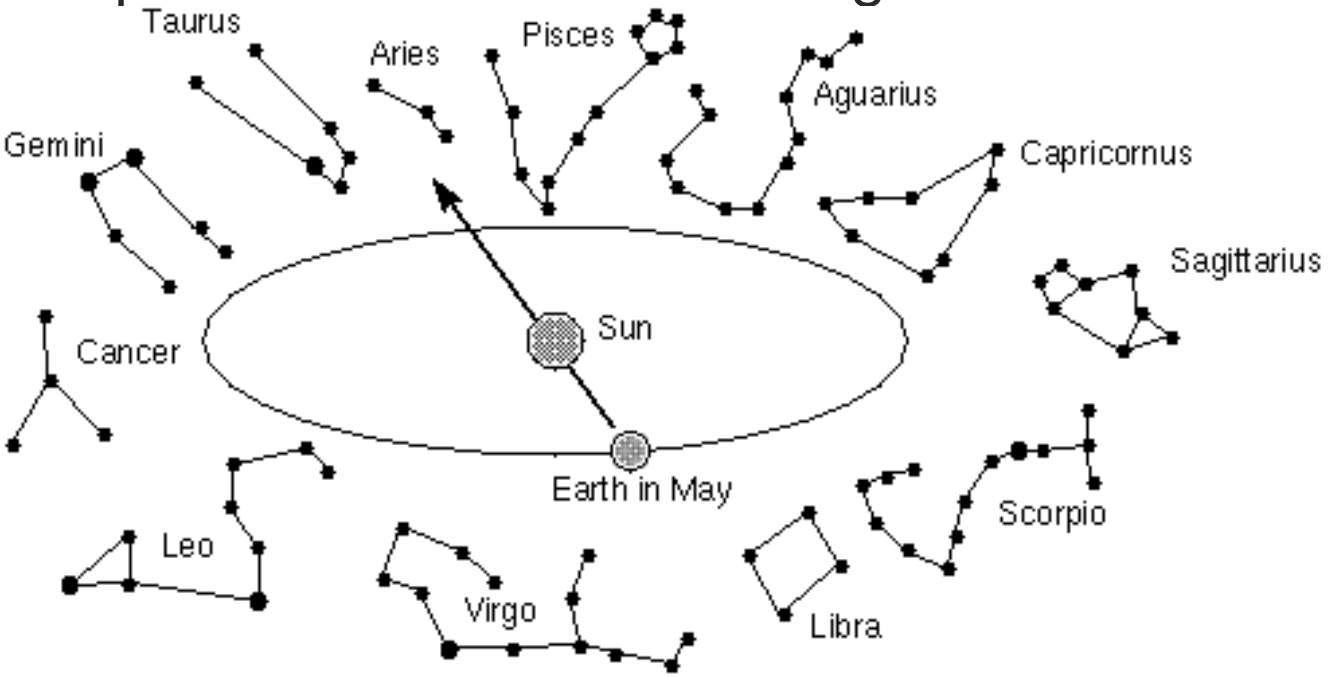
- All the stars are stationary w.r.t. each other (Approx).
- Observing from earth, they create a virtual reference spherical map.
- Sun's path in the celestial sphere is called Ecliptic.



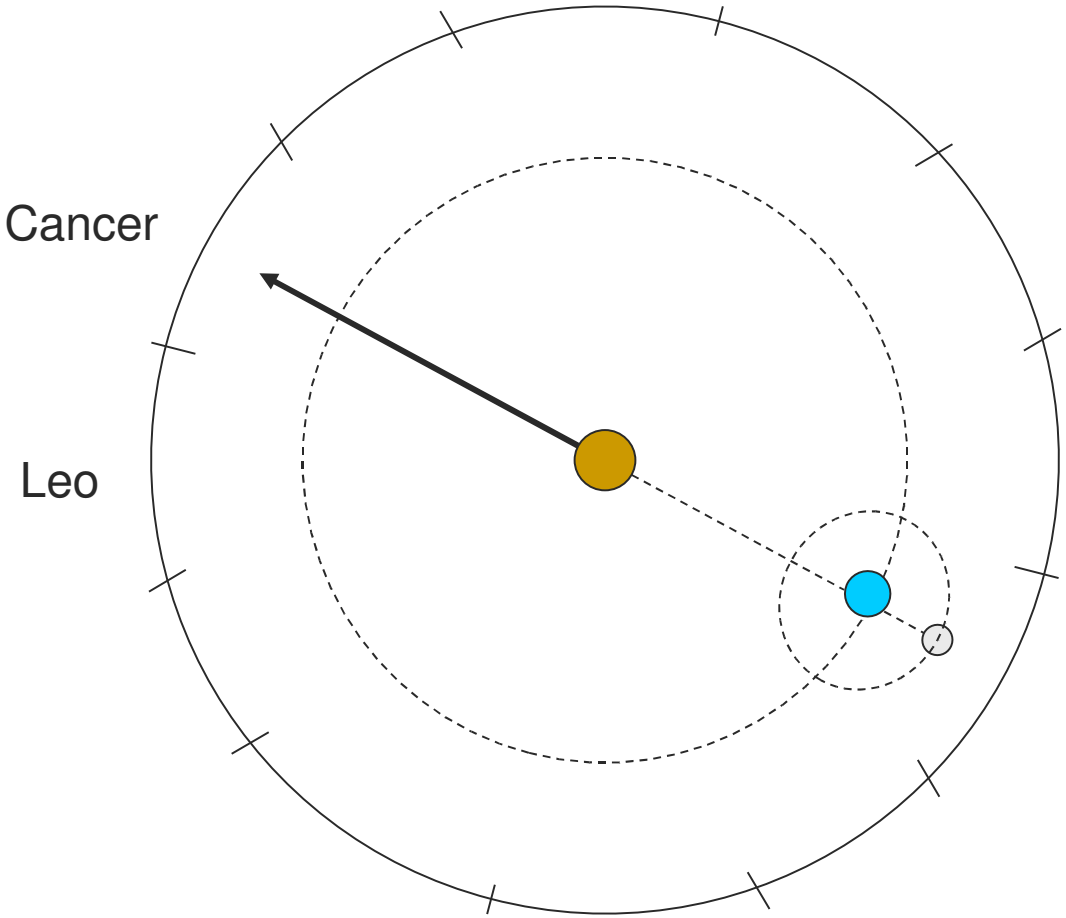
Celestial Sphere

Some details about our sky(2)

- Sun moves with respect to celestial sphere in a circle.
- Indians/Greeks divided this circle in 12 parts.
- These parts are known as Sun signs/Zodiacs.



Naming of Months



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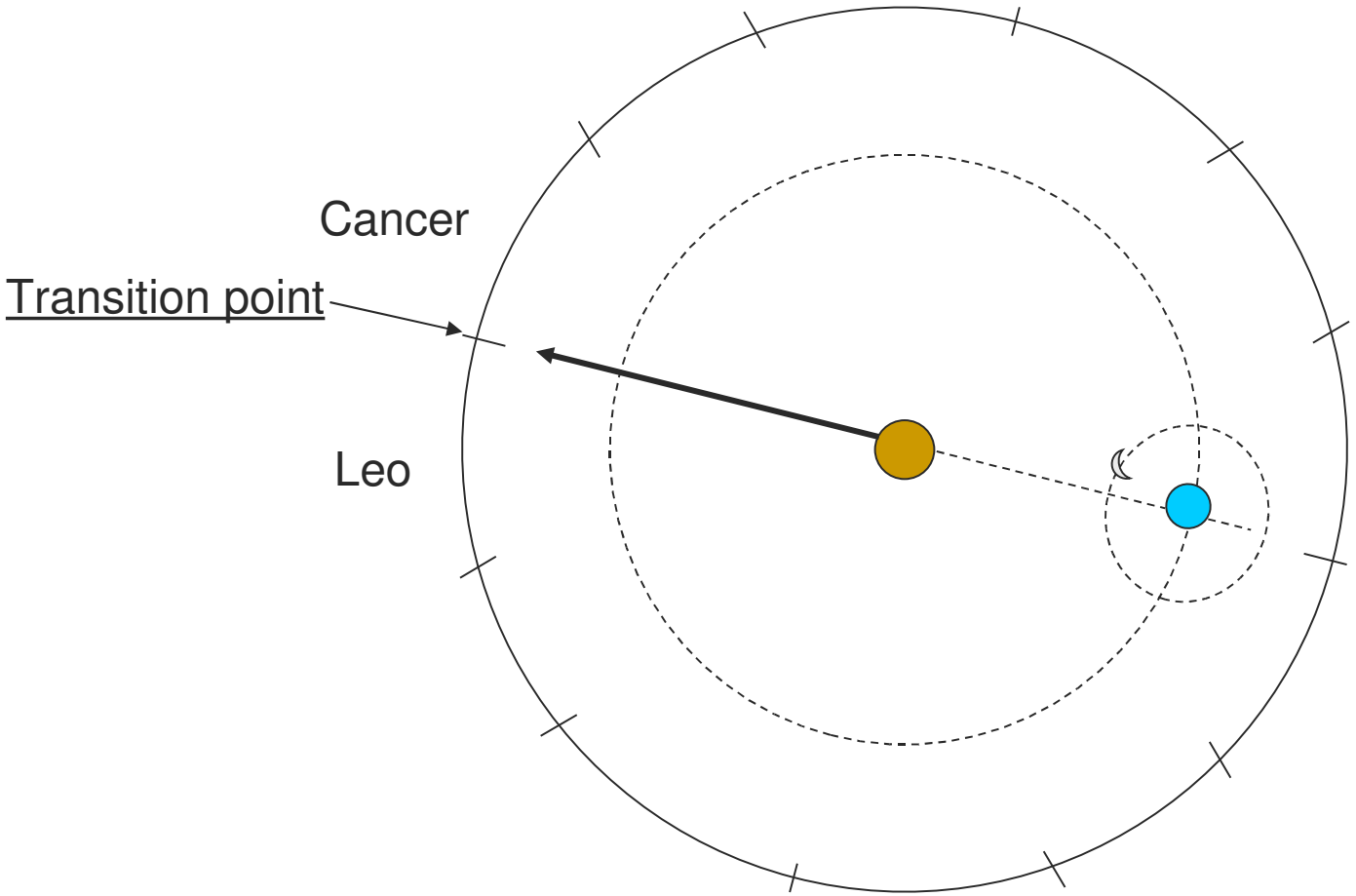
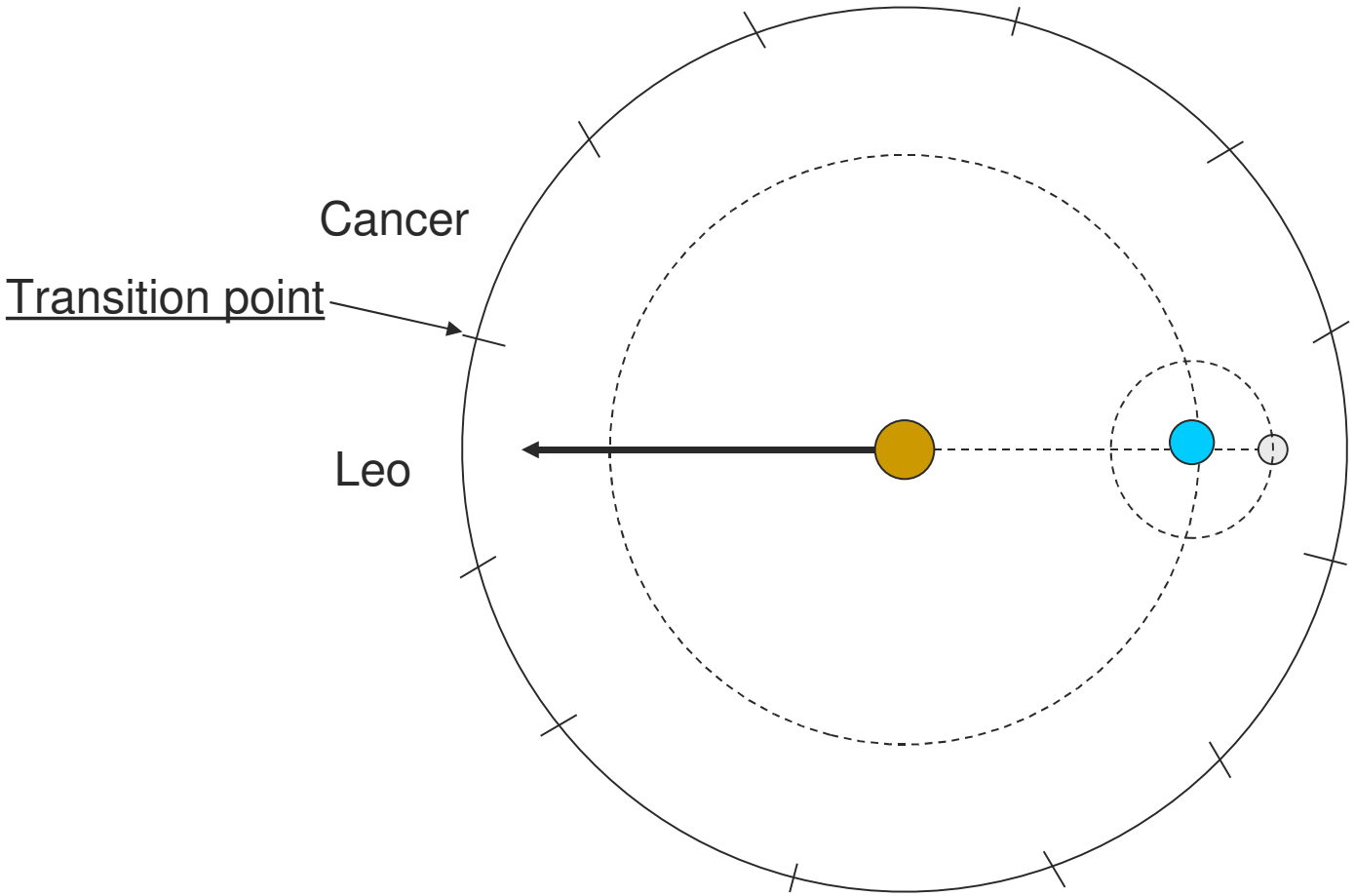


A month name is associated with each transition point.

Naming of Months



A month name is associated with each transition point.

Year

- Naming of month
  - No transitions = *noName (Adhik-masa)*
  - One transition = name
  - Two transitions = (name1,name2)
- 1 year = 11/12/13 months
- This way they add 7 extra lunar months in 19 years (Gregorian Calendar).

$$(12*19 + 7)*29.530 \approx 19*365.2425$$

Fact:

Your 19th birthday will occur on same day according to both *Panchang* and Gregorian Calendar.

Complicated calendar!!

- One of the few soli-lunar calendar
- Once you know the rules, you can calculate date by yourself.
- Good for ad-hoc community.
- Pointless for organized community.
- Good in predicting weather.
- Cool math!!

Fact:

They made a little mistake. ☺

Time period of weather = Time period of equinox

Reference

- Ancient Indian Astronomy , S. Balachandra Rao.
- Indian Mathematics & Astronomy ,Rao, S. Balachandra

Sawal??