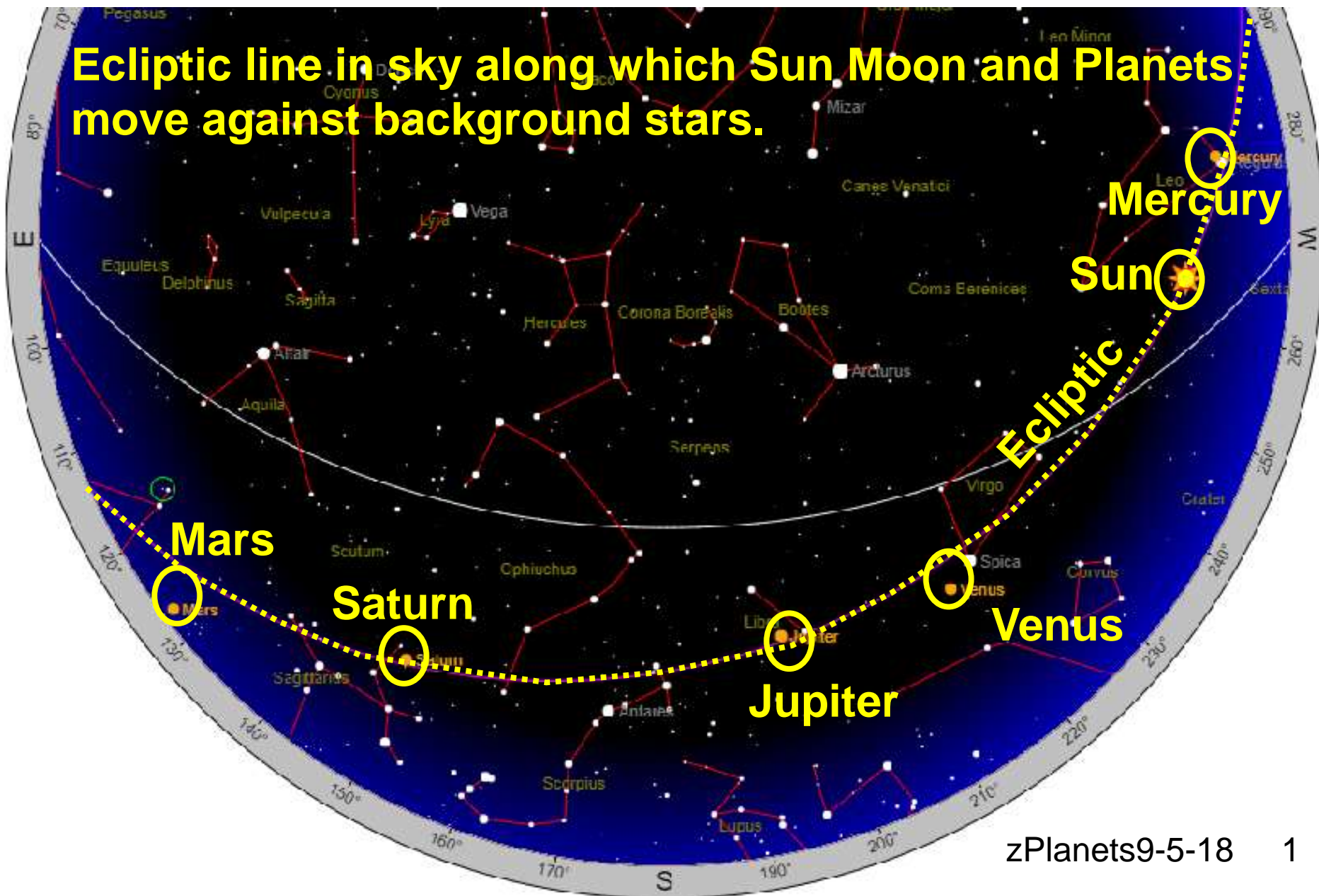
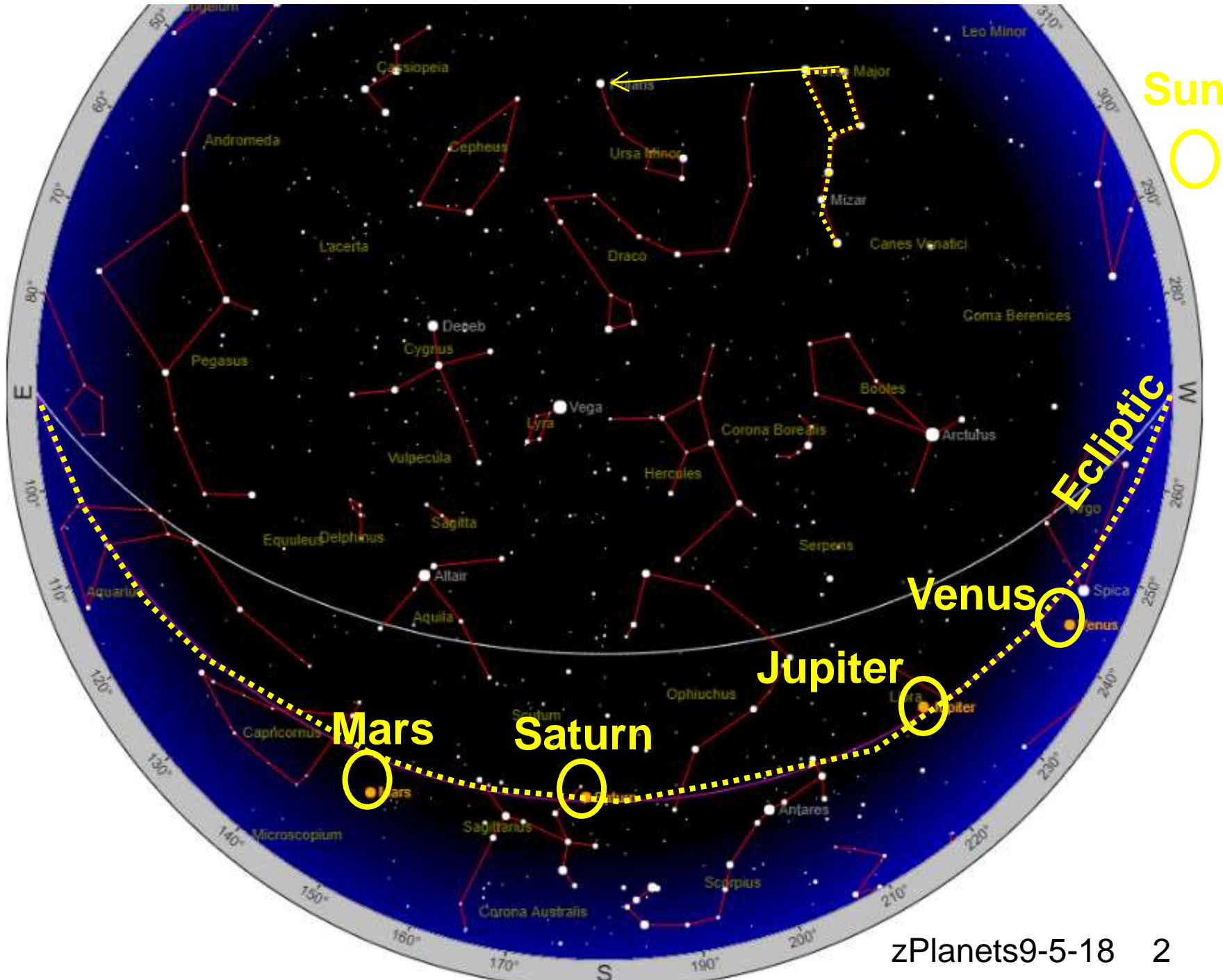


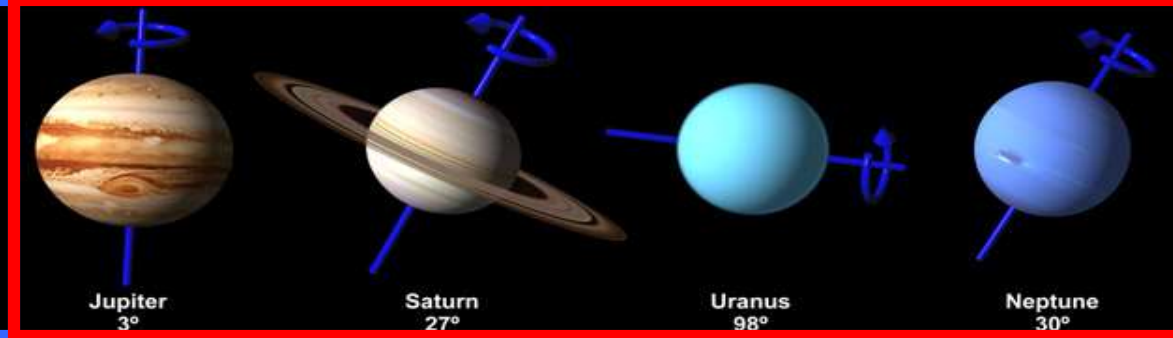
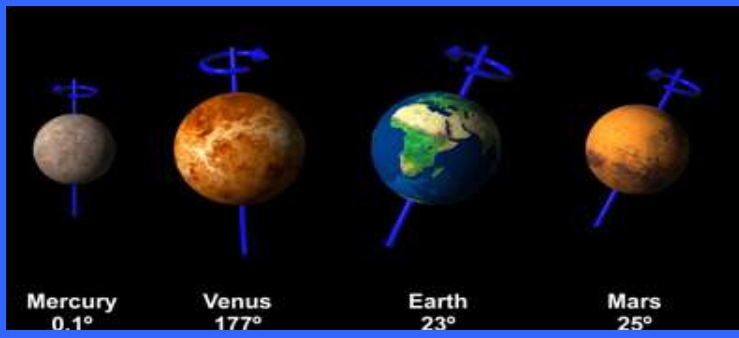
Year Month Day - + Hour - + Minute - +

Ecliptic line in sky along which Sun Moon and Planets move against background stars.

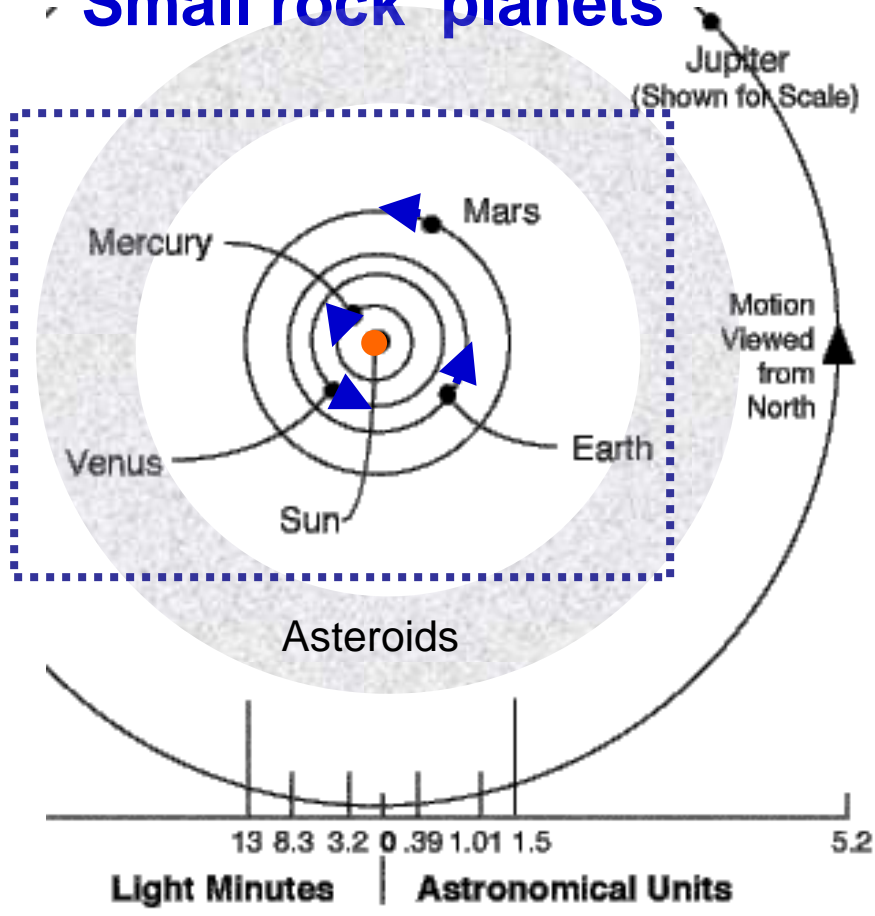




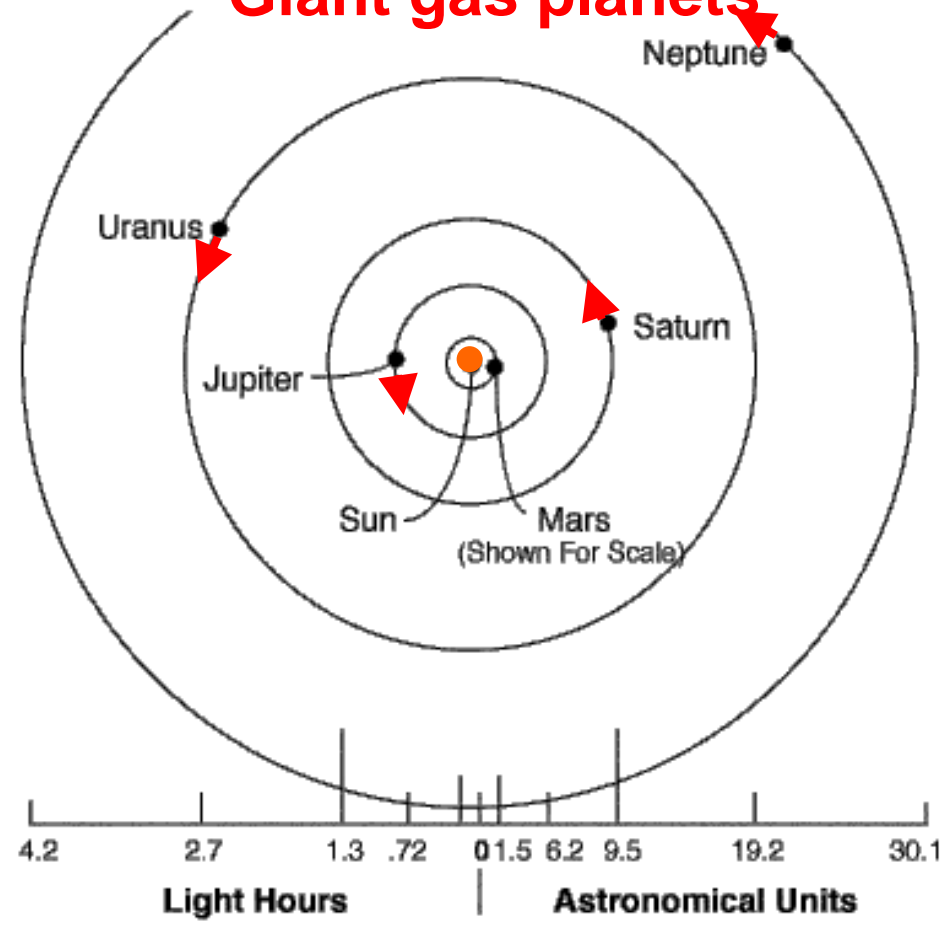
zPlanets9-5-18 2



Small rock planets



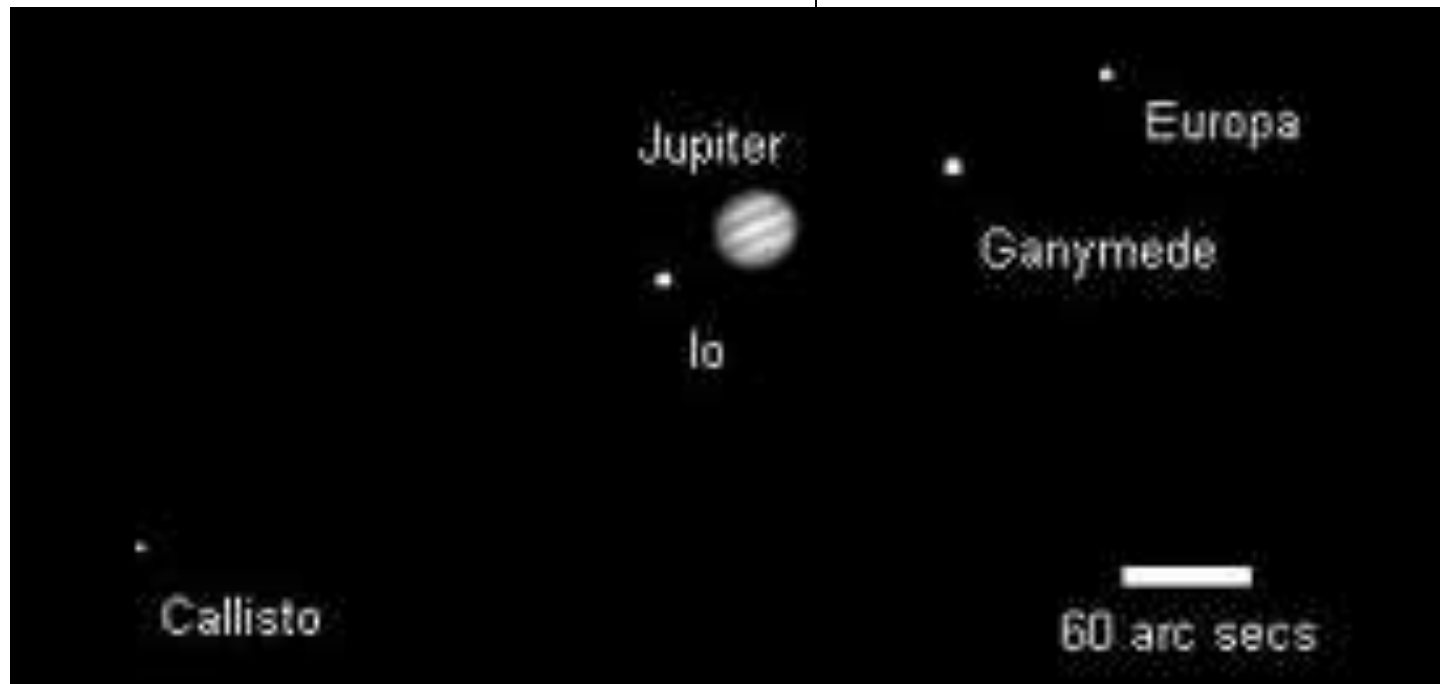
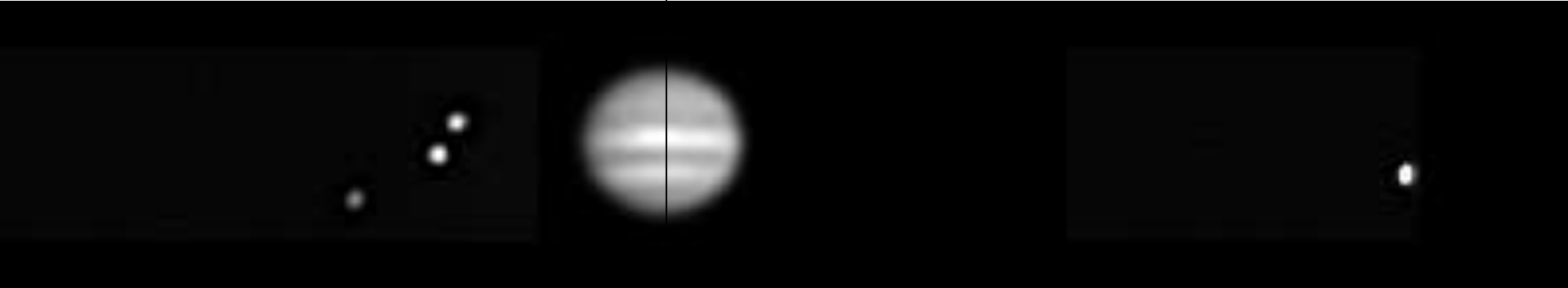
Giant gas planets



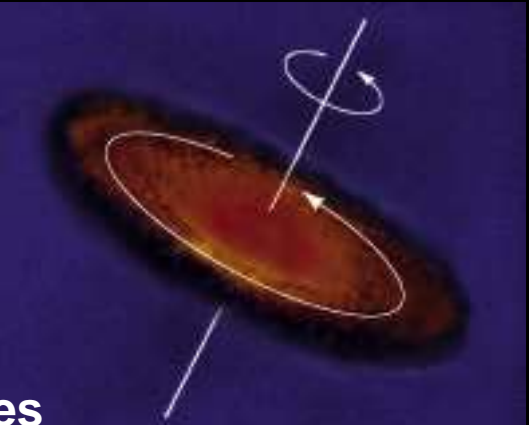
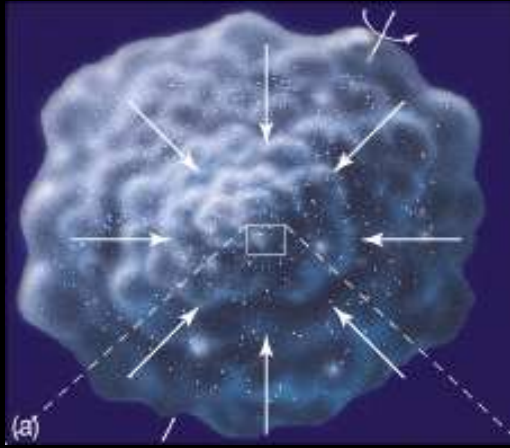
Note : all rotate the same direction

Even moons all rotate the same direction

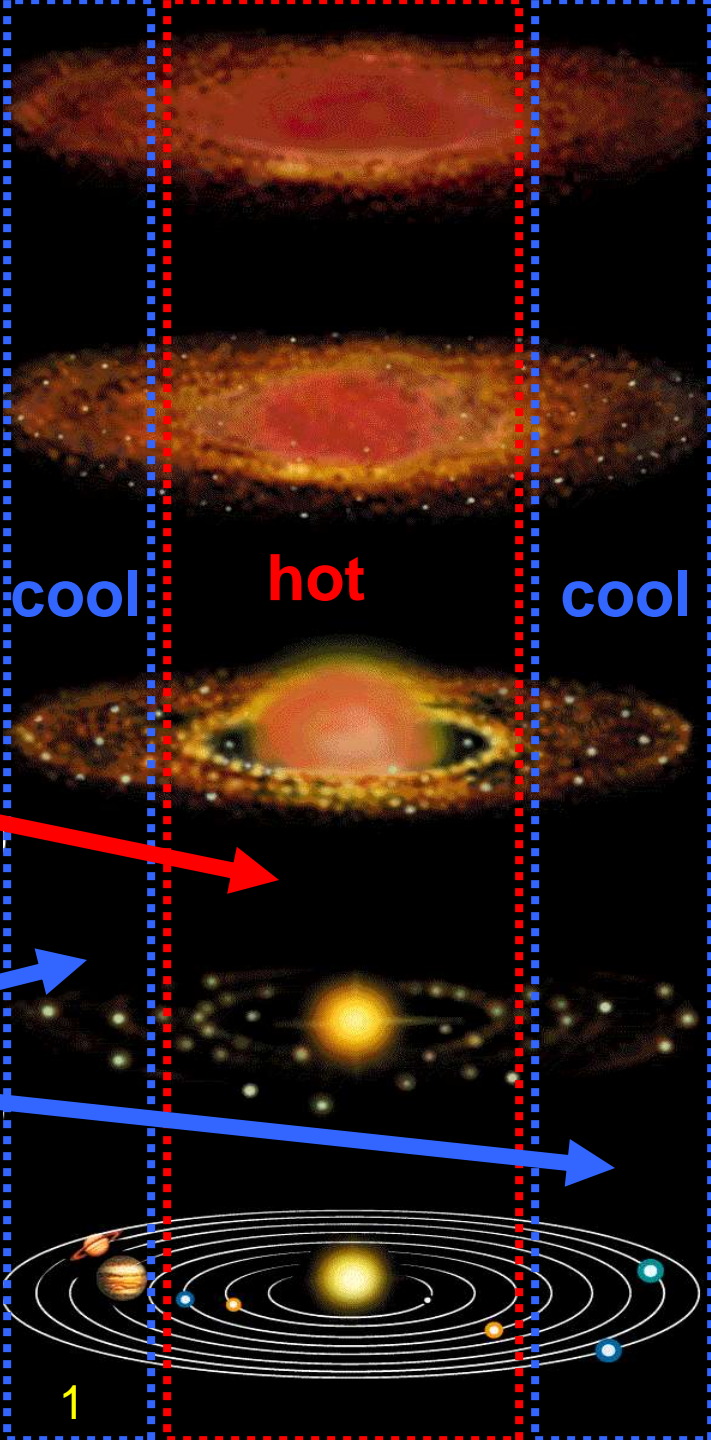
Jupiter & moons
Io, Europe, Ganymede, Callisto



Sun/solar system- gravity causes cloud to collapse



Rotation of cloud causes pancake shape of solar system



cool

hot

cool

In hot inner part rocks and metals condense

In cool outer part ices H and He condense

Solar system rotation from the cloud rotation

Why pancake shape ?

“ to keep rotation constant” [Angular Momentum]

Measure quantity of rotation

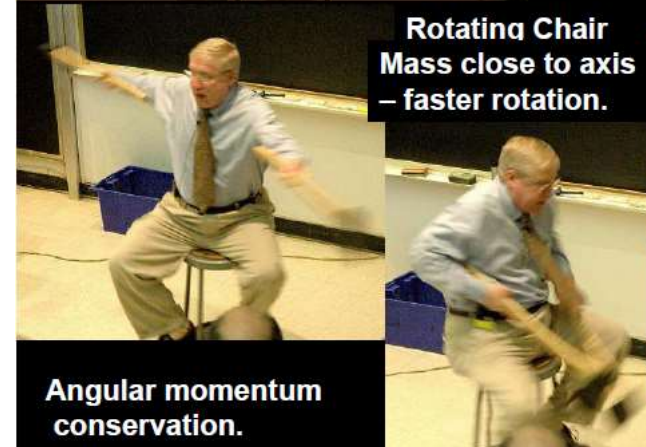
$$L = m r v$$

L: angular momentum

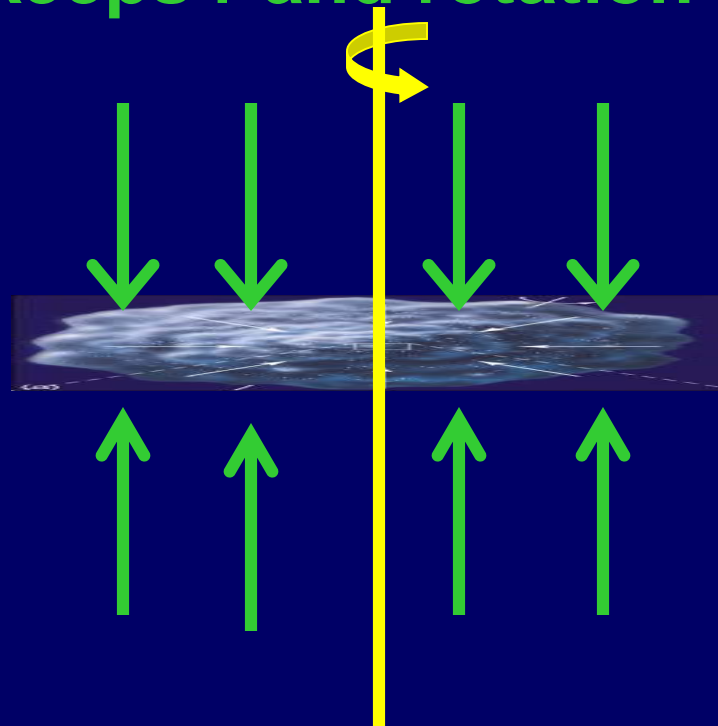
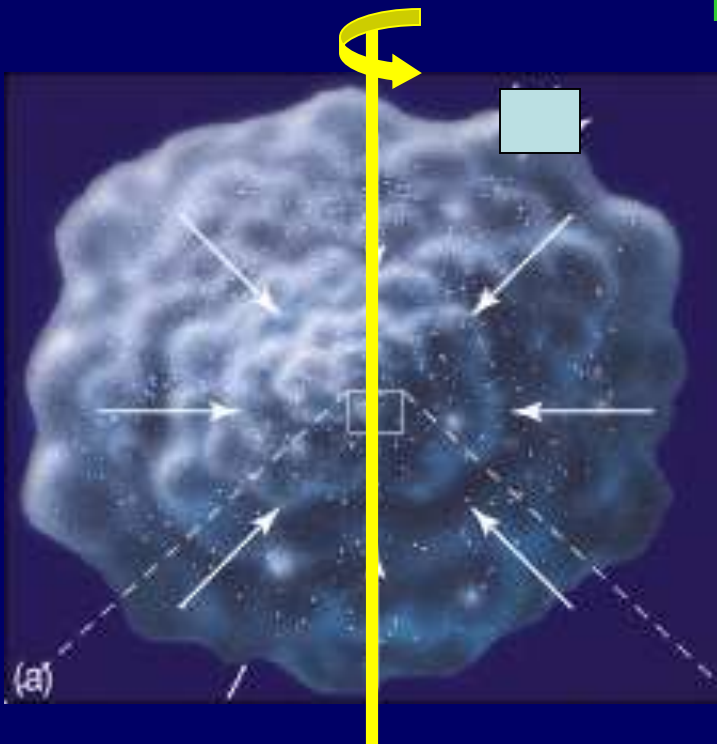
m: mass v: speed

r: distance from rotation axis

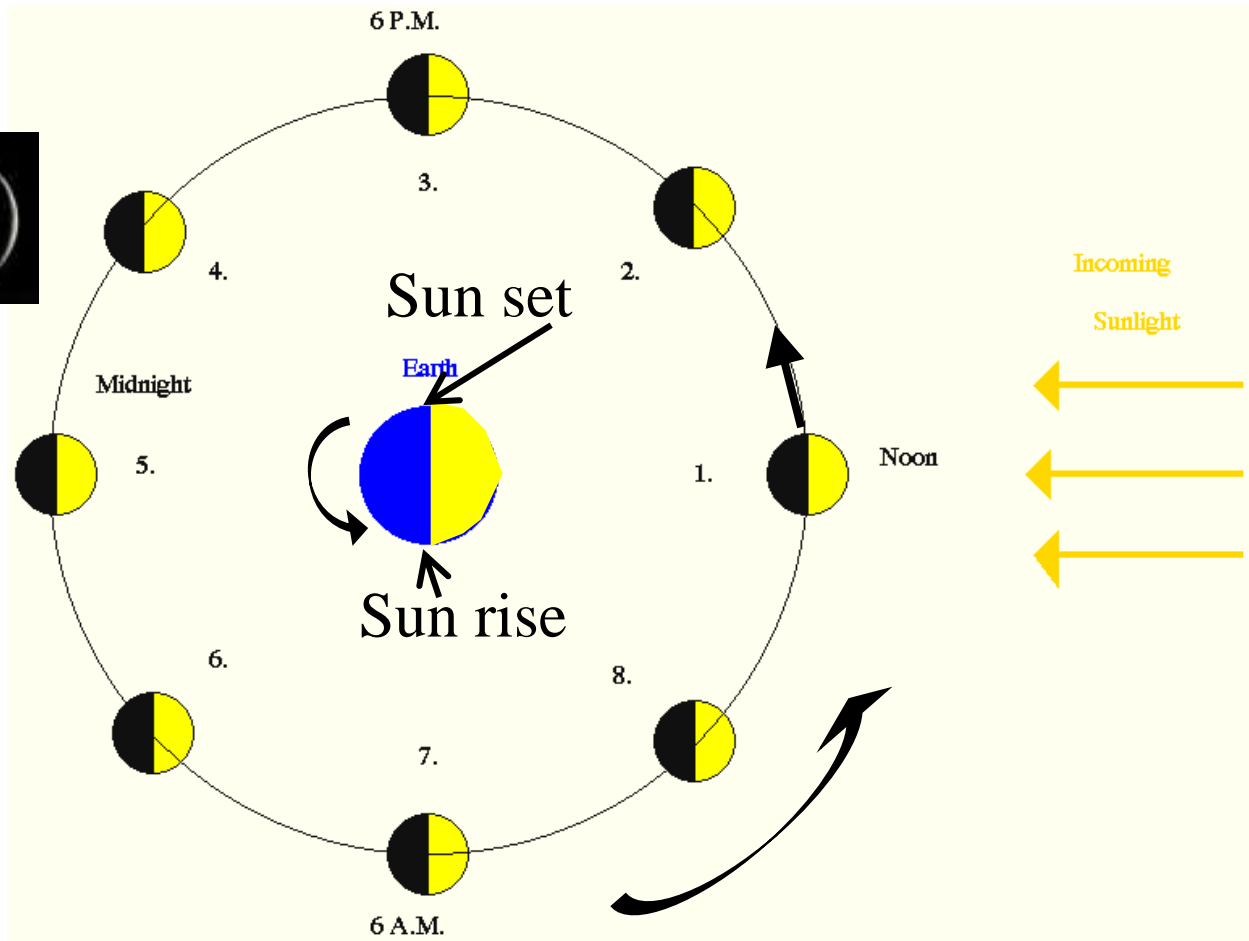
(r is very important)



Collapse in this direction
keeps r and rotation constant



Lunar Phases



1

2

3

4

5

6

7

8

New Moon

Waxing Crescent

First Quarter

Waxing Gibbous

Full Moon

Waning Gibbous

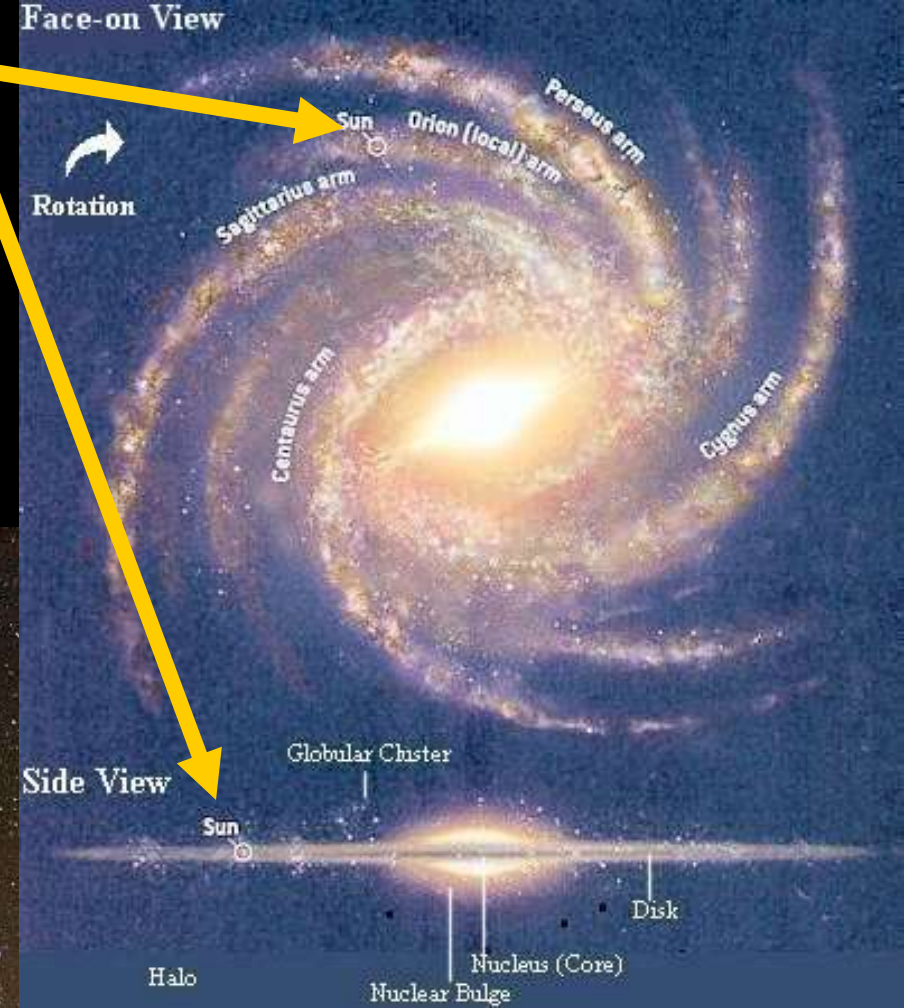
Last Quarter

Waning Crescent

Our Galaxy "The Milky Way"

Sun

Flat Spiral Galaxies: illustrate angular momentum conservation in collapsing cloud.

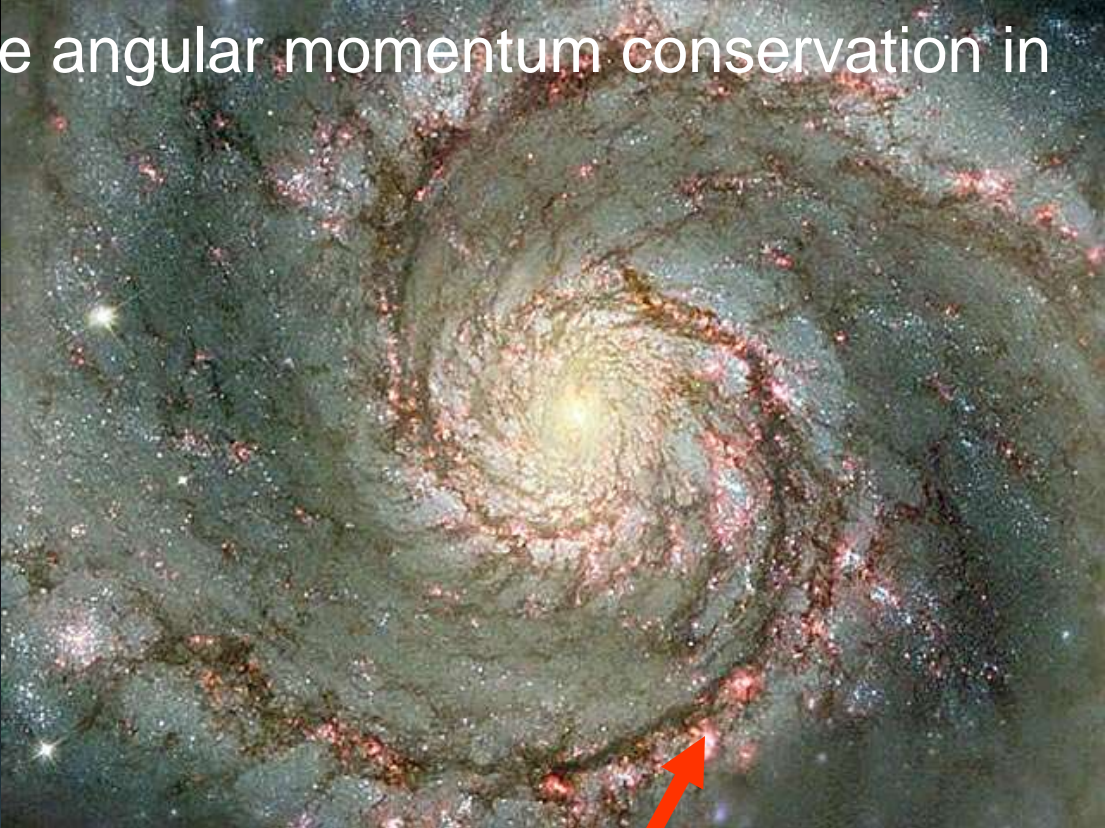


Andromeda Galaxy

Flat Spiral Galaxies: illustrate angular momentum conservation in collapsing cloud.



Flat Spiral Galaxies: illustrate angular momentum conservation in collapsing cloud.



M51 "Whirlpool"
Galaxy

**Emission
Nebula
(red H line)**

Flat Spiral Galaxies: illustrate angular momentum conservation in collapsing cloud.



SOLAR ECLIPSE

SUN, MOON, AND EARTH
LINE UP WITH THE MOON IN THE MIDDLE



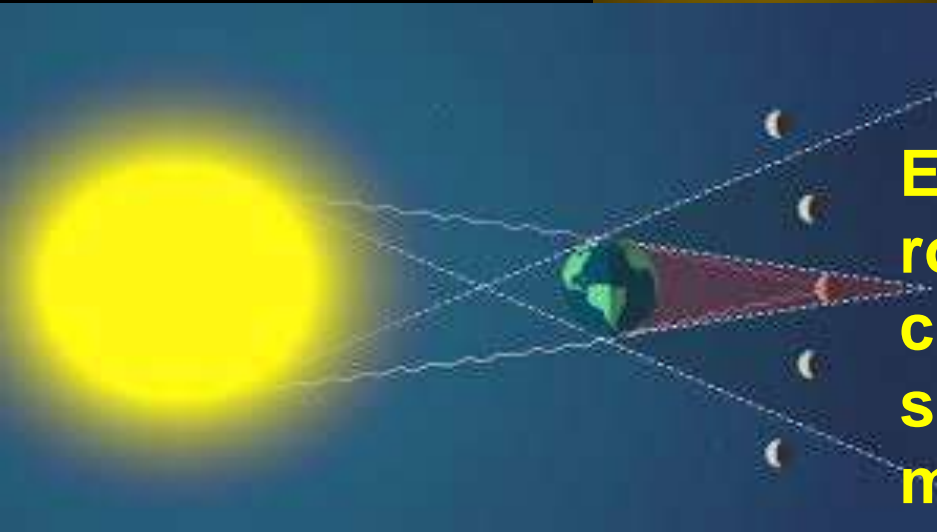
FULL SHADOW
(UMBRA)

PARTIAL SHADOW
(PENUMBRA)

MOON

EARTH

MOON'S ORBIT



Eclipses also reminds us that rotating cloud gravitationally collapses to a pancake shaped solar system. (same for planet-moon systems)

