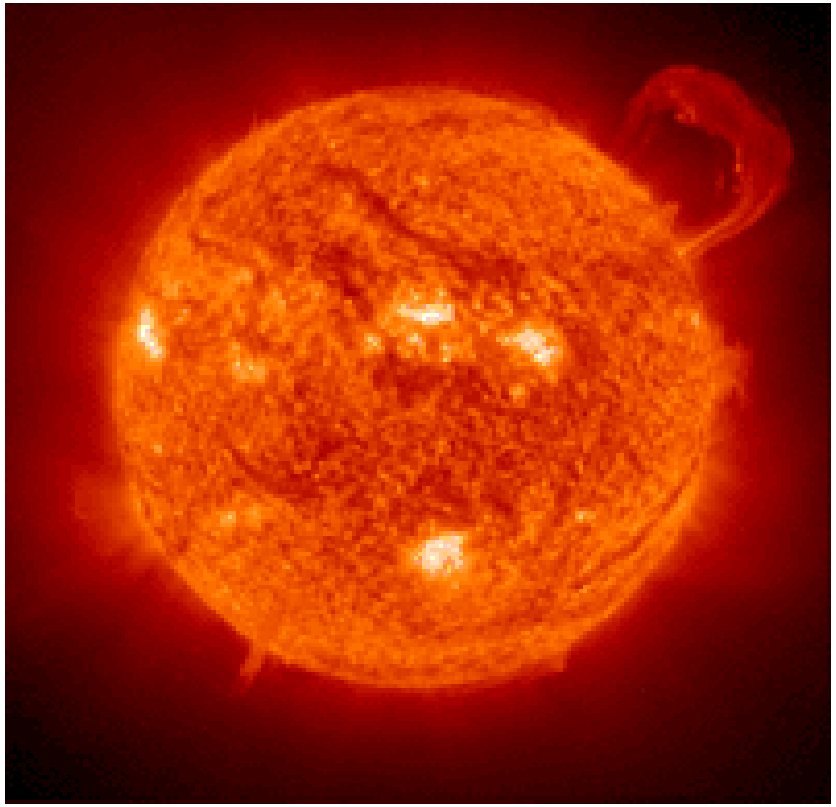
Solar System

Solar System: inventory

- Sun 99.85% by mass
- Planets 0.1 % by mass
- **Satellites** ("moons") **and Rings** of planets
- **Asteroids** ("minor planets", small *rocky* bodies orbiting the Sun)
- **Comets** (small *icy* bodies orbiting the Sun)
- **Meteoroids** (rocky or metallic bodies smaller than 1 m)
- **Dust** (very small particles)
- **Solar Wind** (ionized gas escaping the Sun)

Our star: the Sun



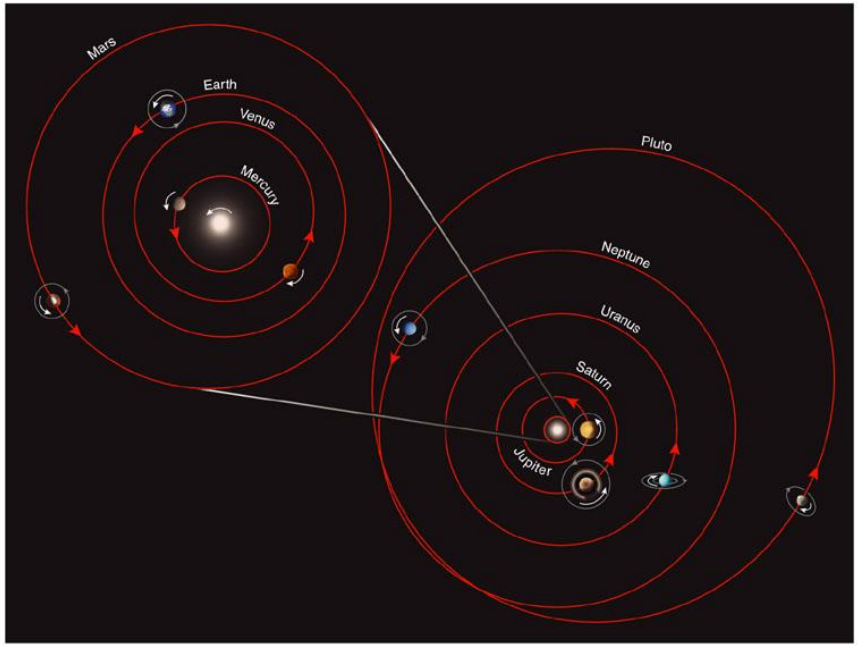
The Sun is a star at the center of our Solar System

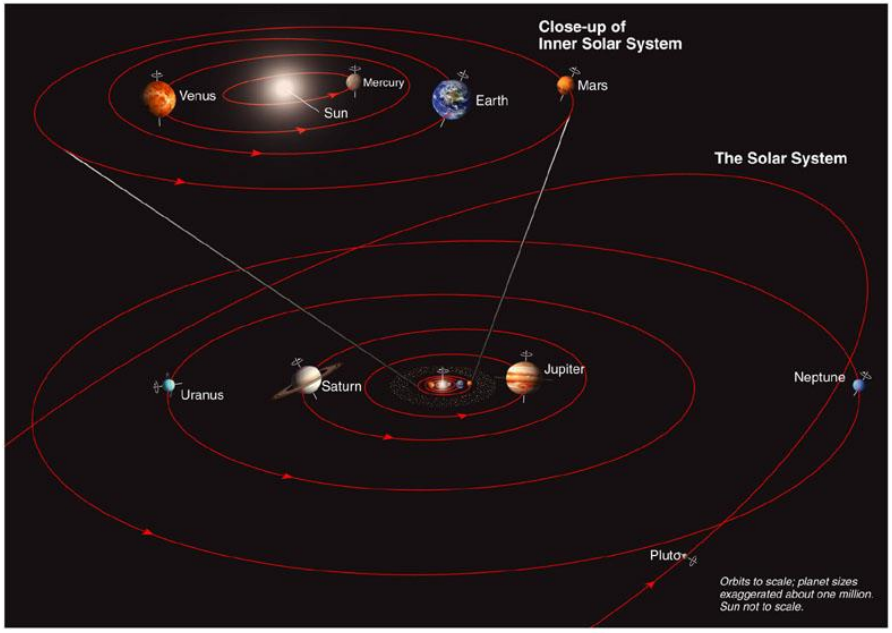
- The Sun is estimated to be **4.5 billion years old**.
- It is **333,400 times more massive** than the Earth.
- It is **99.85% of all the mass** of the Solar System.
- **Core** temperature: ~**28 million °F**
- **Surface** temperature: ~**10,000 °F**
- It takes **several hundred thousand years for light to escape** from the dense core and reach the surface.
- The Sun generates energy equivalent of **100 billion tons of TNT** (*famous explosive*) exploding **every second**.
- It **supports all life on Earth**.

General Characteristics of Major Planets

All eight major planets have nearly circular orbits.

All orbits are within 10 degrees of Earth's orbital plane.





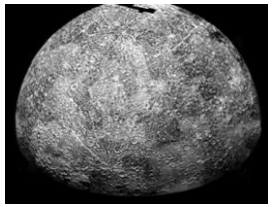
All planets *revolve* in the same direction.

All except Venus *rotate* in the same direction.

Definitions and Units

- **Day** time it takes for a planet to complete one rotation about its axis
- **Year** time it takes for a planet to complete one orbit around its star
- **<surface T>** average temperature at the planet's surface
- **°C ("degrees Celsius") = (°F-32)×5÷9**
- **1 km ("kilometer") = 0.62 miles**

Terrestrial Planets



1. MERCURY

"Smallest planet"
Craters

1 Year on Mercury = 88 Earth days
1 Day on Mercury = 58.6 Earth days
<surface T> = 117°C day/ -170°C night
<distance from the Sun> = 58 million km
Number of moons = 0

3. EARTH

"The Blue Planet"
Water
Life

<surface T> = 15°C
<distance from the Sun> = 150 million km
Number of moons = 1

2. VENUS

"Sister planet"
CO_2 atmosphere
Hottest planet

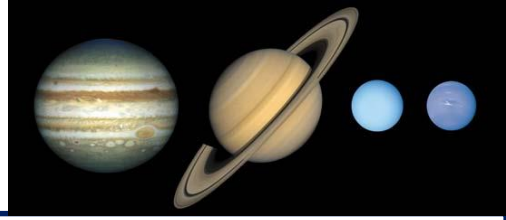
1 Year on Venus = 225 Earth days
1 Day on Venus = 243 Earth days
<surface T> = 460°C
<distance from the Sun> = 108 million km
Number of moons = 0

4. MARS

"Red planet"
Polar ice caps
Dust storms

1 Year on Mars = 687 Earth days
1 Day on Mars = 24.6 hours
<surface T> = -63°C
<distance from the Sun> = 249 million km
Number of moons = 2

Jovian Planets



5. JUPITER

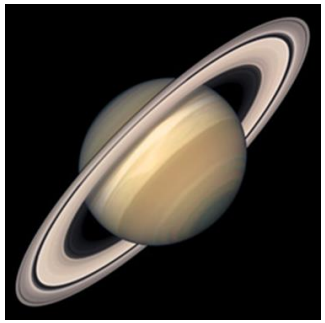
Gas Giant

"Largest planet"

Giant storms

Fastest rotation

1 Year on Jupiter = 11.9 Earth years
1 Day on Jupiter = 9 hours 55 minutes
<distance from the Sun> = 778 million km
<T>=-110°C Number of moons = 69 !



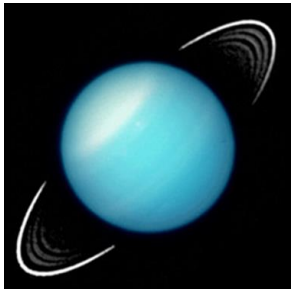
6. SATURN

Gas Giant

"Ring planet"

Metal-rock core?

1 Year on Saturn = 29.5 Earth years
1 Day on Saturn = 10 hours 33 minutes
<surface T> = -140°C
<distance from the Sun> = 1457 million km
Number of moons = 62+

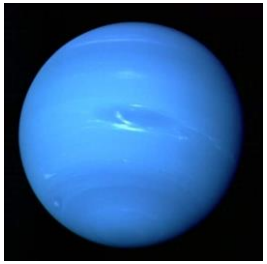


7. URANUS

Ice Giant

42 years long summer

1 Year on Uranus = 84 Earth years
1 Day on Uranus = 17 hours 14 minutes
<surface T> = -197°C
<distance from the Sun> = 2870 million km
Number of moons = 27



8. NEPTUNE

Ice Giant

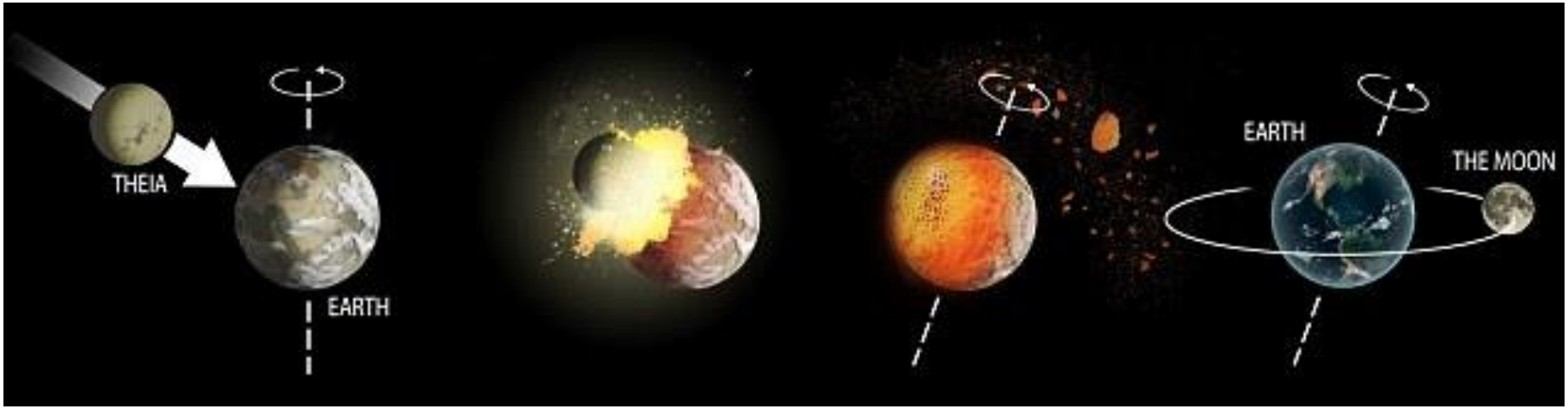
Fastest winds

Coldest planet

1 Year on Neptune = 164 Earth years
1 Day on Neptune = 16 hours 6 minutes
<surface T> = -201°C
<distance from the Sun> = 4498 million km
Number of moons = 14

Formation of our Moon

The Giant Impact Hypothesis



- Suggests that the Moon formed out of the debris left over from a collision between Earth and an astronomical body the size of Mars, approximately 4.5 billion years ago, about 20 to 100 million years after the Solar System coalesced.
- The colliding body is sometimes called Theia.
- Mystery: Earth and Moon have almost identical composition which is difficult to explain within the Giant Impact Hypothesis…