Earth & Space Science

Unit 2 Lecture 2 – Parts of the Solar System

The order of the Planets

- Mercury
- Venus
- Earth
- Mars
- Jupiter
- Saturn
- Uranus
- Neptune

Distance of the Planets

	Planet	D(A.U.)	Orbital Pd. (yr)	Rot. Pd.	Discovered	Rings	T/J
Inner SS	Mercury	0.39	0.24	58^{d}	–	N	T
	Venus	0.72	0.62	243^{d}	–	N	T
	Earth	1.00	1.00	24^{h}	–	N	T
	Mars	1.52	1.88	25^{h}	–	N	T
	(minor planets = asteroids)				1801		
Outer SS	Jupiter	5.20	11.86	9.8^{h}	–	Y	J
	Saturn	9.54	29.46	10^{h}	–	Y	J
	Uranus	19.18	84.01	15^{h}	1781	Y	J
	Neptune	30.06	164.79	17^{h}	1846	Y	J
	Pluto/ Charon	39.44	247.70	6.4^{d}	1930	N	T

Comets

- Small celestial objects, made of ice, gas, dust, and a small amount of organic material
- As comets approach our Sun [within about 450 million kilometers (280 million miles)], they heat up and the ice begins to sublimate (change from a solid directly to a gas).
- The gas (water vapor, carbon monoxide, carbon dioxide, and traces of other substances) and dust forms an “atmosphere” around the nucleus called a "**coma**." Material from the coma gets swept into the tail.

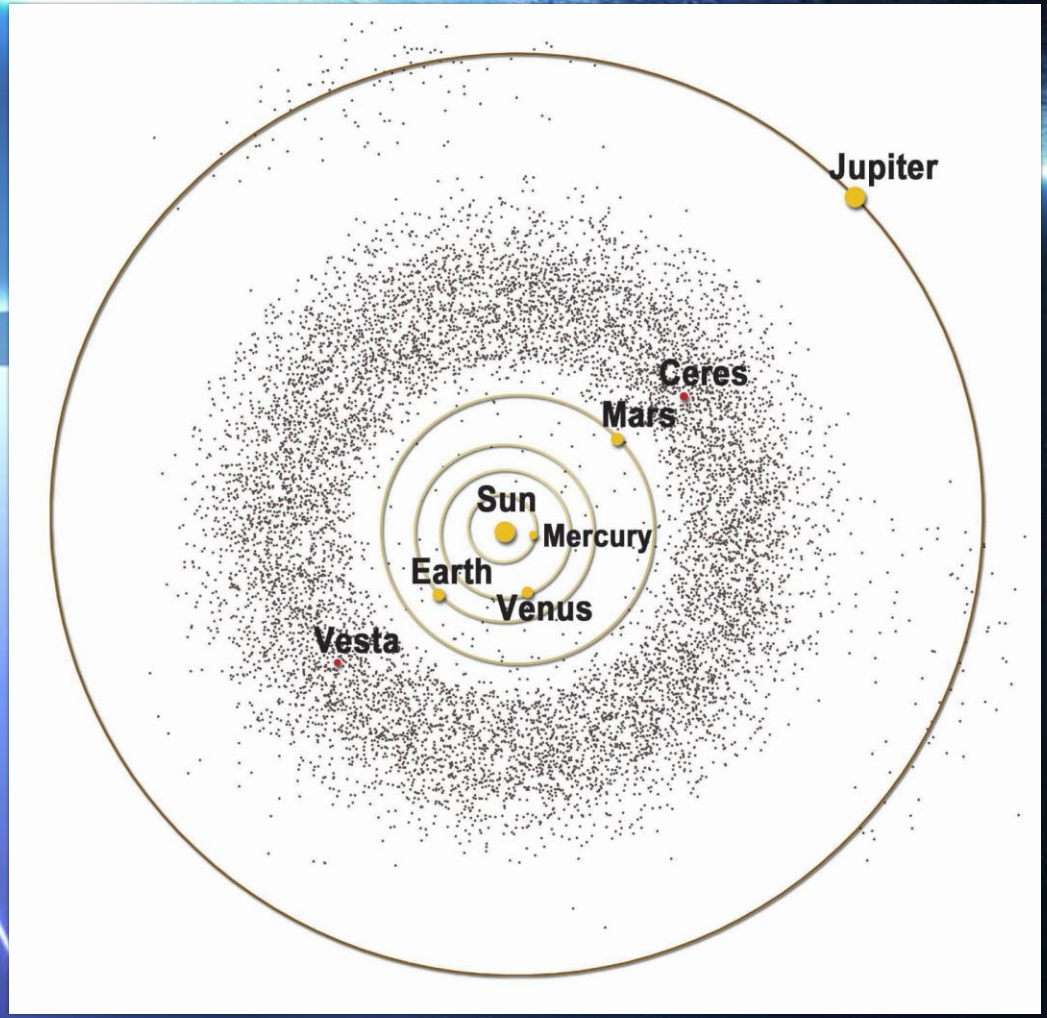
Comets (cont.)

- As comets move close to the Sun, they develop **tails** of dust and ionized gas. Comets have two main tails, a **dust tail** and a **plasma tail**.
- The dust tail appears whitish-yellow because it is made up of tiny particles — about the size of particles of smoke — that reflect sunlight. Dust tails are typically between 1 and 10 million kilometers (about 600,000 to 6 million miles) long.
- The plasma tail is often blue because it contains carbon monoxide ions. Solar ultraviolet light breaks down the gas molecules, causing them to glow.
- Plasma tails can stretch tens of millions of kilometers into space. Rarely, they are as long as 150 million kilometers (almost 100 million miles). A third tail of sodium has been observed on Comet Hale-Bopp.

Asteroids

The Asteroid Belt

- Located between Mars and Jupiter
- Early in the life of the solar system, dust and rock circling the sun were pulled together by gravity into planets.
- But Jupiter, the largest planet, kept a number of the pieces from coalescing into another planet. Instead, its gravity disrupted the formation process, leaving an array of unattached asteroids.

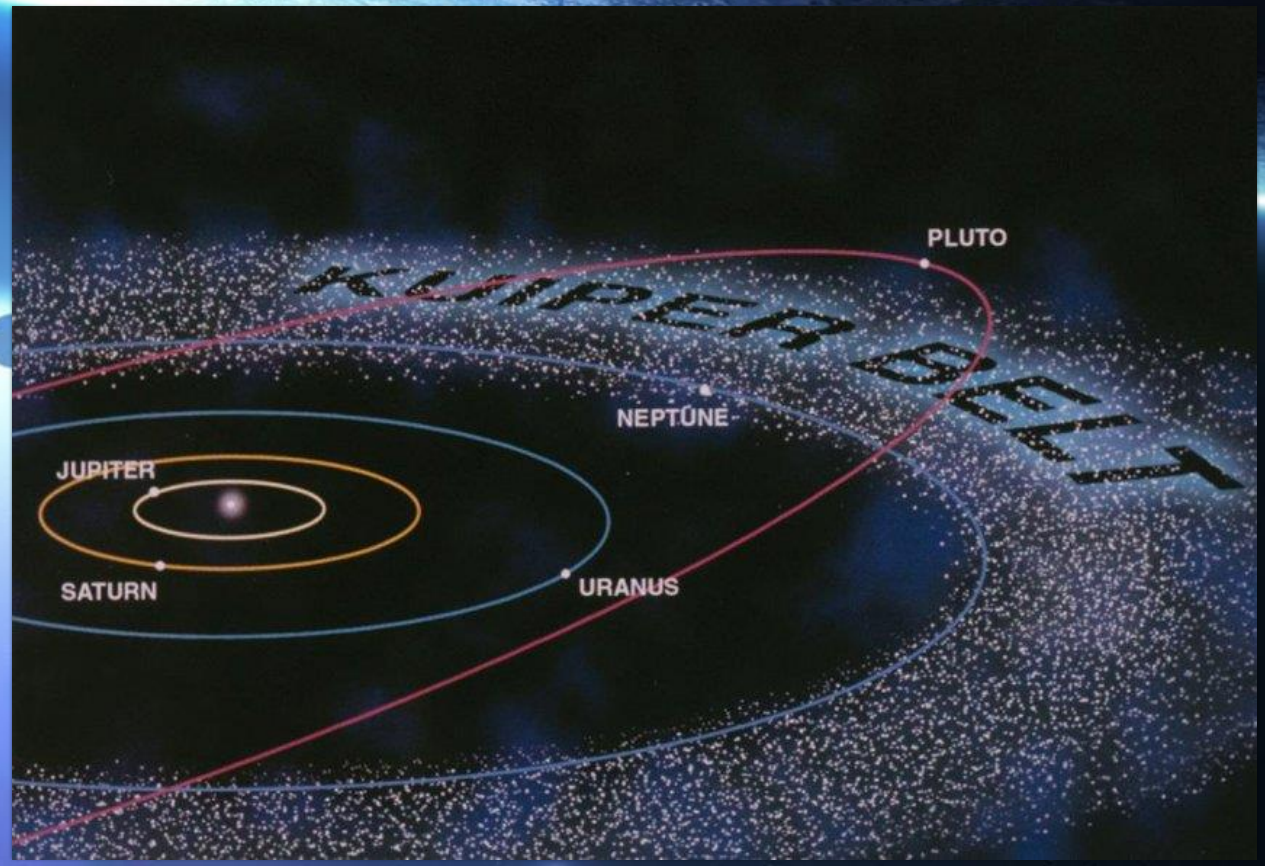


The Asteroid Belt (cont.)

- The Main Belt once contained enough material to form a planet nearly four times as large as Earth.
- Jupiter's gravity not only stopped the creation of such a planet, it also swept most of the material clear, leaving far too little behind for a planet of any size to form. Indeed, if the entire mass of the Main Belt could somehow create a single body, it would weigh in at less than half of the mass of the moon.

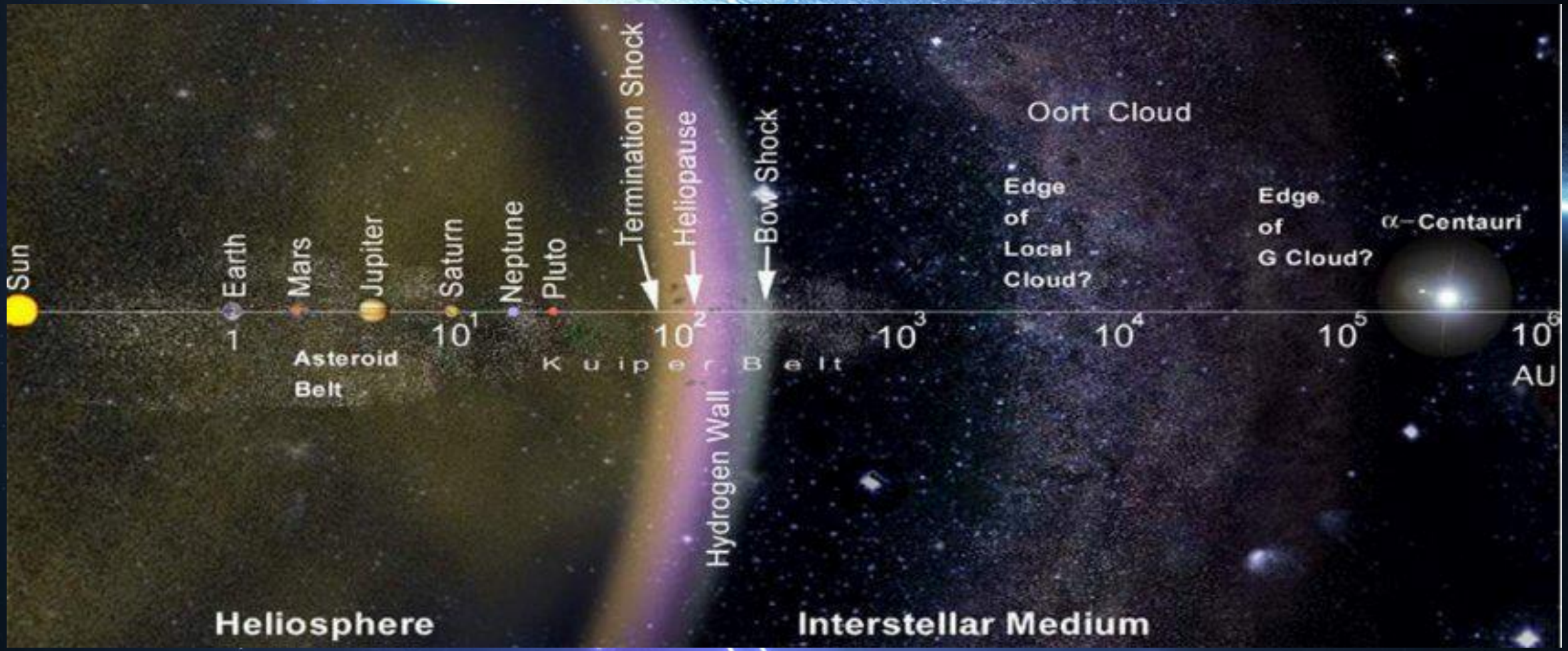
The Kuiper Belt

- The Kuiper Belt is a disc-shaped region of icy objects beyond the orbit of Neptune -- billions of kilometers from our sun.
- Pluto and Eris are the best known of these icy worlds. There may be hundreds more of these ice dwarfs out there.
- Short-period comets (which take less than 200 years to orbit the Sun) originate in the Kuiper Belt.
- There may be are hundreds of thousands of icy bodies larger than 100 km (62 miles) and an estimated trillion or more comets within the Kuiper Belt.



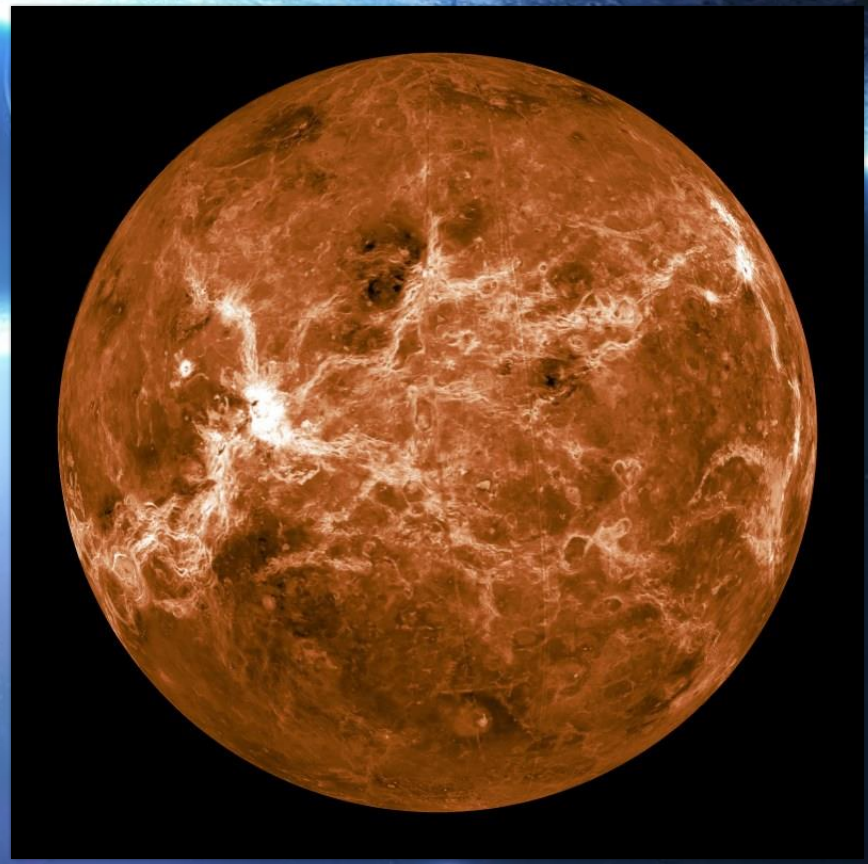
The Oort Cloud

- The Oort Cloud is a spherical shell, occupying space at a distance between five thousand and 100 thousand AU.
- Long-period comets (which take more than 200 years to orbit the sun) come from the Oort Cloud.
- The Oort Cloud may contain more than a trillion icy bodies.


Sun
Earth
Mars
Jupiter
Saturn
Neptune
Pluto
Termination Shock
Heliopause
Bow Shock
Oort Cloud
Edge of Local Cloud?
Edge of G Cloud?
α–Centauri
1
10^1
10^2
10^3
10^4
10^5
10^6
AU
Asteroid Belt
Kuiper Belt
Hydrogen Wall
Heliosphere
Interstellar Medium

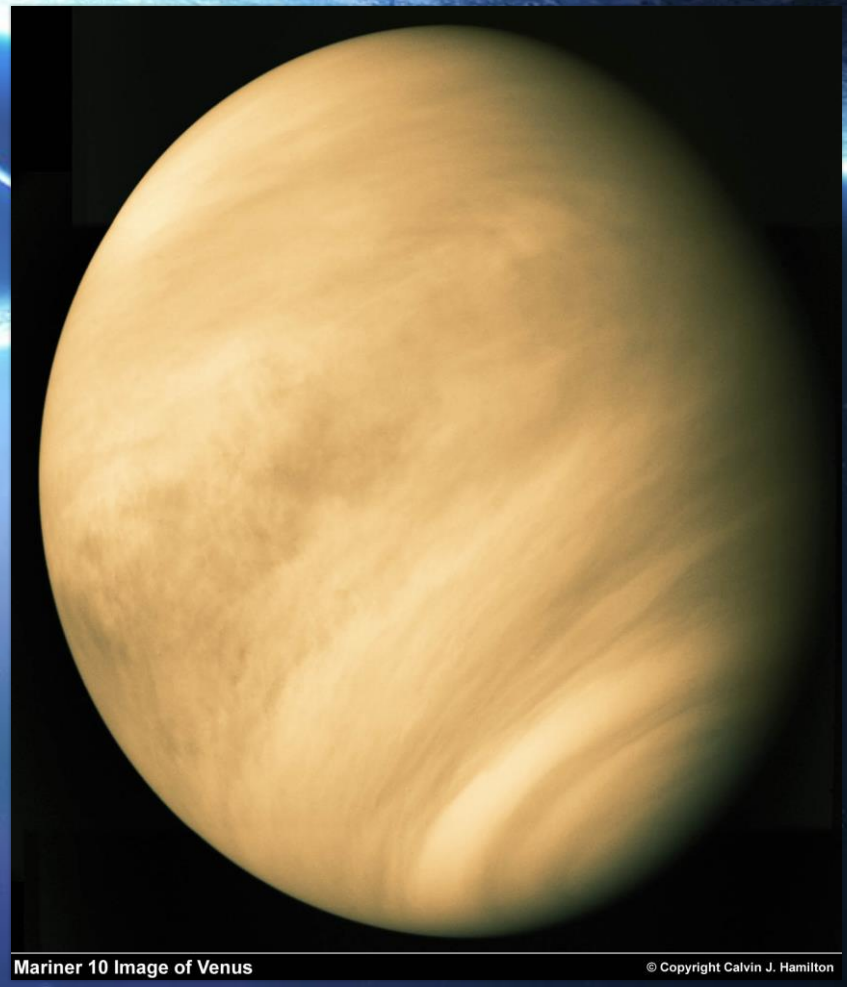
Mercury

- Closets Planet to the Sun (0.39 AU)
- Fastest planet to orbit the Sun (87.97 Earth Days)
- Surface Extremes 430°C to -180°C
- A rock like planet similar to that of Earth except proportionally it has a larger metallic core which makes it unusually more dense



Venus

- 2nd planet from the sun (0.72 AU)
- Hottest Planet 464°C
- Has the closest orbit to that of a true circle
- Similar in Mass to Earth
- A rock type planet similar to that of Earth with a very heavy carbon dioxide atomosphere

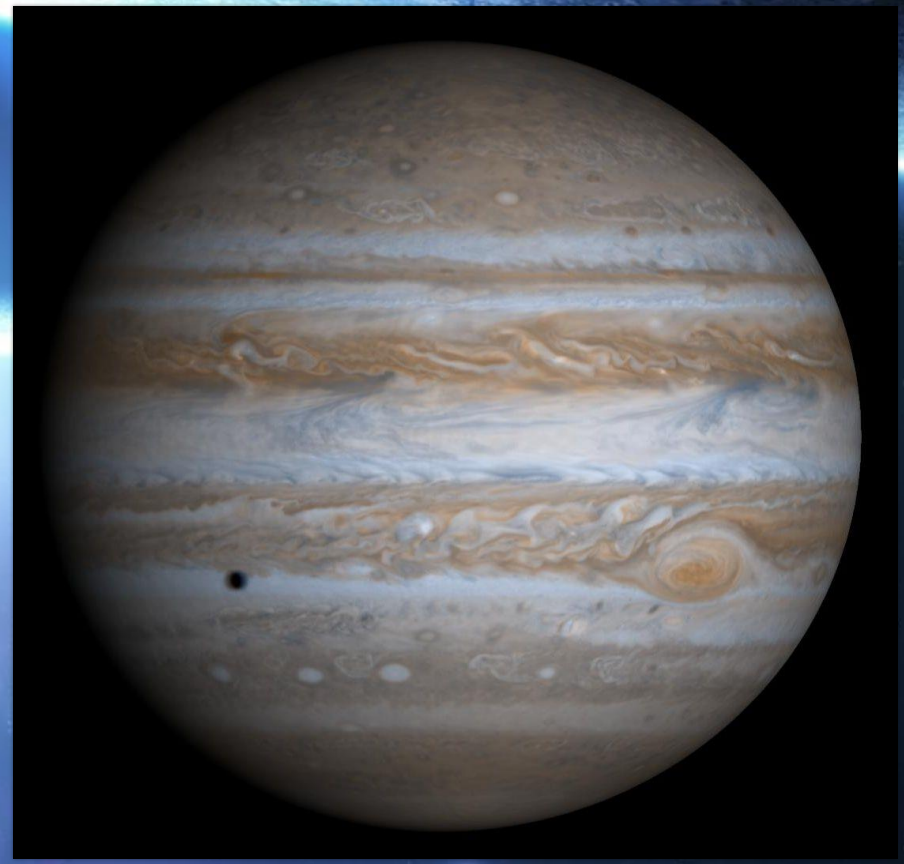


Mars

- 4th planet from the Sun (1.5 AU)
- Takes 687 Earth Days to orbit the Sun
- Mars's gravity is 1/3 that of Earth's meaning that a person would weighing 120 pounds on Earth would weigh 40 pounds on Mars.
- Has a very thin atmosphere because of the Sun stripping it away over time
- Is a rocky planet similar to Earth in composition, a good possibility to have water or have had water.

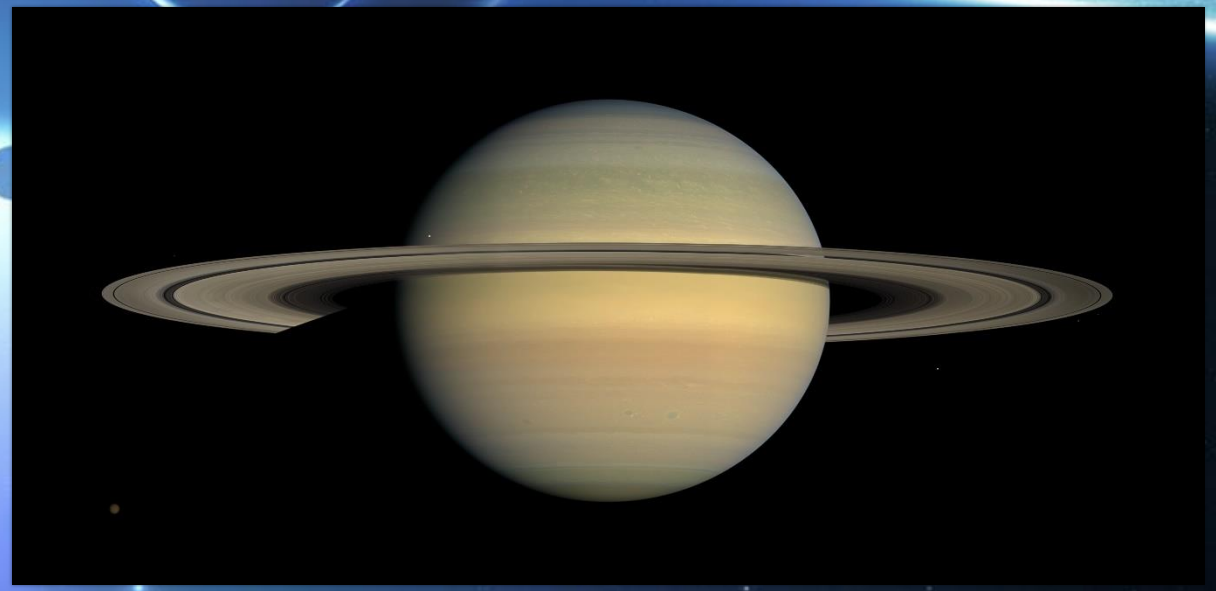
Jupiter

- The largest planet in the solar system
- 5th planet from the Sun (5.2 AU)
- Takes nearly Earth 12 years to orbit the Sun
- Has 1 planetary ring and 66 known moons
- May have been the reason that we have life on Earth (it attracted a lot of the comets)
- Has a large visible storm called "The Great Red Spot"
- Mainly made up of hydrogen and helium



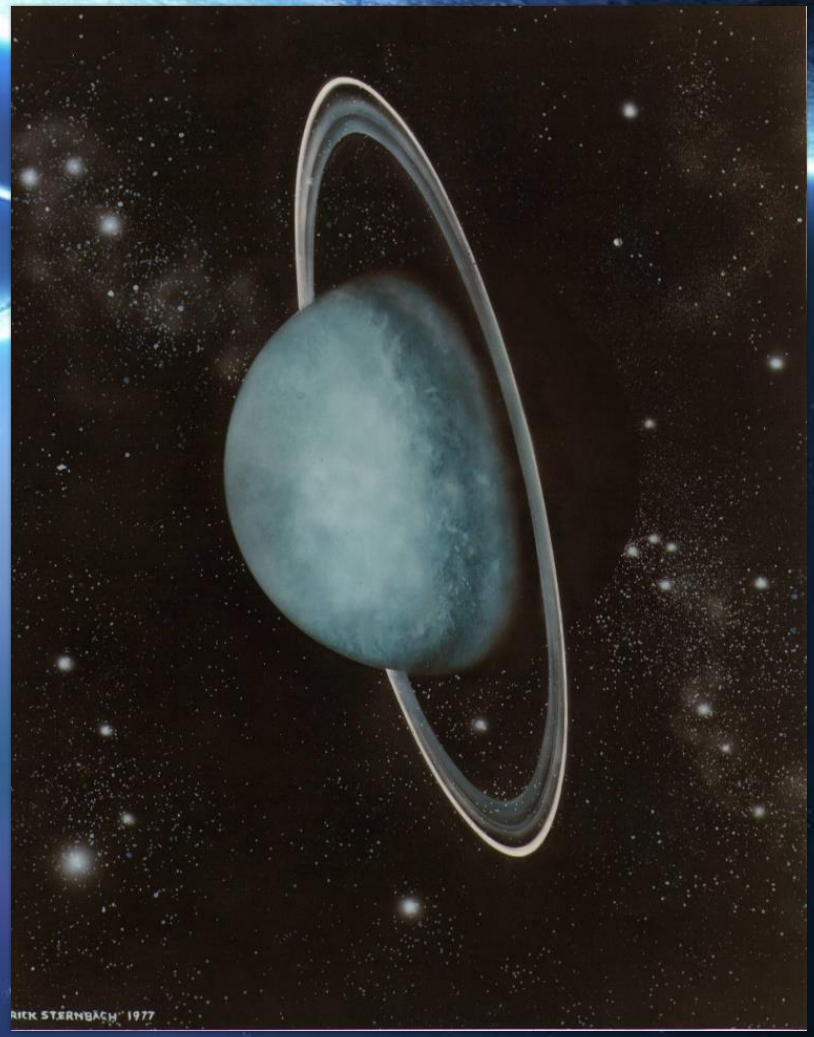
Saturn

- Sixth from the Sun (9.5 AU)
- 3 major Rings (several less-dense rings)
- 62 known Moons
- Density of the planet is <1, this means it would float on water
- Is mainly made up of hydrogen and helium, but it likely has a rock and ice mixture concentrated in a dense central core



Uranus

- Seventh from the Sun (19.2 AU)
- 27 known moons
- Has 13 narrow rings
- Its diameter is less than ½ of that of Jupiter or Saturn
- Atmosphere is primarily hydrogen and helium
- The of a ratio of rock, ices, and gases; gasses and ices are mixed evenly and the rocky core is small or non existent



Neptune

- 8th planet from the Sun (30.1 AU)
- 13 known moons & 6 rings
- Is almost Uranus's twin, except it is slightly smaller in diameter because it density is slightly greater
- Atmosphere is primarily hydrogen and helium
- Is the most dense of the Gas Giants; because of this it may have more melted ices and rocky material in its core.
- The "Great Dark Spot" seen by voyager is a storm similar to that of Jupiter's