



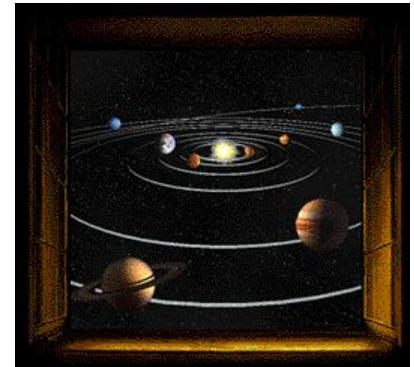
Take a trip around the Solar System

*Baxter's Guide
to the
Solar System*

1

What's in our Solar System?

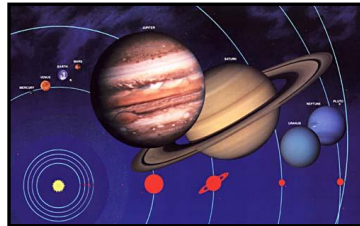
- 1 Sun
- 8 Planets (170 Moons)
- 5 Dwarf Planets
- 1 Asteroid Belt
- Various
 - Comets
 - Meteoroids
 - Asteroids
 - Left over debris (Kuiper Belt)



2

Before we start exploring, let's talk about distances

- The distances between most objects in space are huge, and mind boggling.
- Because of the vast distances in space we use 2 measurements.



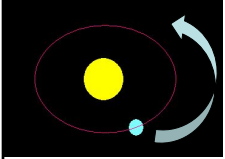
3

Astronomical Unit

- When we talk about distances inside the solar system:
 - **Astronomical Unit** (AU) : distance between the Earth & the sun or 93 million miles.

4

Need to know terms:



- **Revolution:** how long it takes a planet to go around the sun.

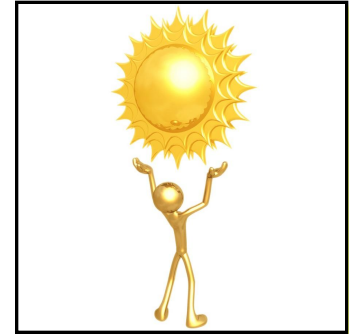


- **Rotation:** how long it takes a planet to turn once on its axis.

5

Light Year

- **Light Year:** the distance light travels in one year or 6 trillion miles



Trivia: The Sun is so far away that light from the sun takes 8 minutes to reach the Earth, at LIGHT SPEED.

6

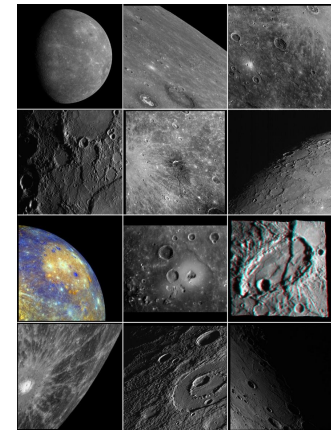
Let's Take a Tour

First Stop...
Mercury

7

Mercury ♀

- Mercury is the innermost planet, & it is a little bigger than our moon.
- It is 0.387 AU from the sun or 23 million miles!
- We know very little about the planet. Two spacecraft have visited.
 - 1975 Mariner 10 flew by three times.
 - The latest mission to Mercury is the MESSENGER mission. It began orbiting Mercury in 2011.

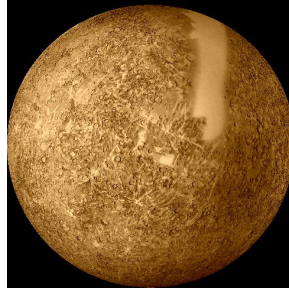


Picture from NASA Messenger Mission

8

Mercury Fast Facts

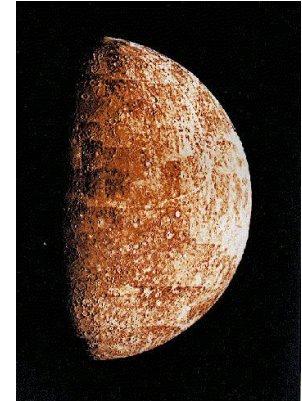
- Rotation = 58.65 days
- Revolution = .24 years
- Surface is covered with craters.
- It's interior is similar to Earth, but has a large core, thin mantle & brittle crust.
- Temperature Range – Most extreme of any planet -334°F to 840°F
 - *The side that faces the sun extremely hot, side that faces away from sun extremely cold.*
- Very thin atmosphere that is constantly being destroyed the solar wind.



9

Why is it named Mercury?

- In Roman mythology [Mercury](#) is the god of commerce, travel and thievery, the Roman counterpart of the Greek god [Hermes](#), the messenger of the Gods.
- The planet probably received this name because it moves so quickly across the sky.



10

Let us travel 39 million miles
or .33 AUs and learn about

Venus

11

Venus

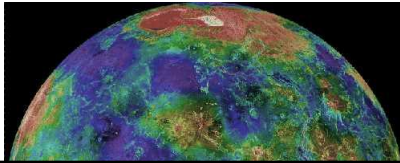
- Venus is known as Earth's twin because they are similar in size, and is closest to the Earth.
- Venus is known as the morning, or evening star because it is usually the first "star" that can be seen in the evening and the last to be seen in the evening.



12

Venus Fast Facts

- Rotation = 243 Earth Days
- Revolution = **224.7 Earth days**
 - What does this mean for Venusians? Well, a day on Venus is longer than its year!
- Surface is covered with 1600 volcanoes, mountains, canyons & valleys. 65% of its surface is covered with smooth plains.



13

Venus Facts Continued...

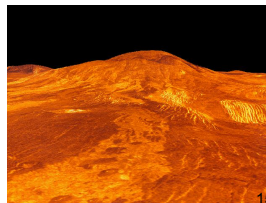
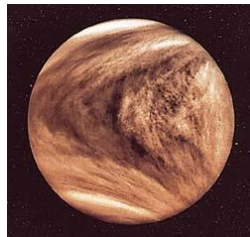
- It is difficult to study, because of its atmosphere.
 - Venus is covered in thick, dense clouds of sulfuric acid (this is the same acid that you can find in battery acid).
 - It's atmosphere is heavy, 90 times heavier than Earth's.
- Average Temperature : 855°F
- Interior similar to Earth



14

Why is it named Venus?

- Venus (Greek: Aphrodite) is the goddess of love and beauty. The planet is so named probably because it is the brightest of the planets known to the ancients.
- With a few exceptions, the surface features on Venus are named for female figures.
 - For example: One of the highland plains is named Aphrodite Terra, and a mountain is named Frejya Montes.



15

Let us travel 25 million miles or .28 AUs and learn about

Earth

16

Earth

- Third planet from the sun.
- **THE ONLY PLANET KNOWN TO SUPPORT LIFE!**
- It was not until the time of Copernicus (the sixteenth century) that it was understood that the Earth is just another planet.



17

Earth Fast Facts

- Rotation = 23.93 hours
- Revolution = 365.26 days
(Notice the .26 days, we have an extra day every 4 years to compensate or a Leap Year)
- 71% of Earth's surface is covered in Water. Earth is the only planet in the solar system that has LIQUID water.
- Temperature Range :
-128° F to 136° F



18

Satellites

- The Earth has one moon.
- The diameter of the moon is about one quarter of the diameter of the Earth.
- It is the only astronomical object other than Earth that humans have stepped foot on.
- Called Luna by the Romans or Selene by Greeks.



Image credit: Lunar and Planetary Institute

19

Why is it named Earth?

- Earth is the only planet whose English name does not derive from Greek/Roman mythology.
- Name comes from the Old English word: *eorthe* which meant ground or soil.
- *Many cultures have named Earth*
 - Romans: Tellus – goddess of the Earth
 - Greek : Gaia or Mother Earth (Terra Mater)



20

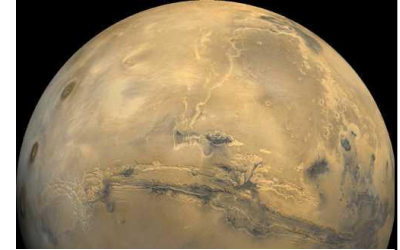
Let us travel 35 million miles or .52 AUs and learn about

Mars

21

Mars

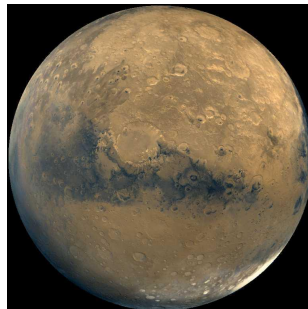
- Mars is known as the red planet.
- This is because the soil has oxidized or rusted.
- It is half the size of Earth.
- U of A is leading the Phoenix Mission to Mars
- ASU has instruments on both Mars rover and is home to the Mars Space Flight Facility



22

Mars Fast Facts

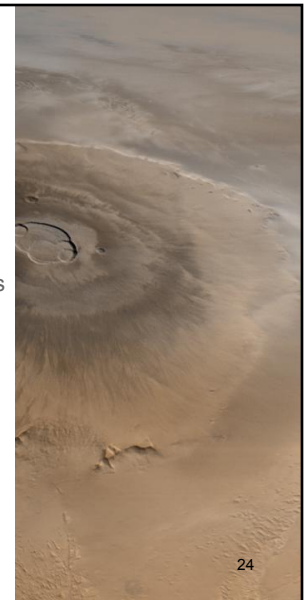
- Rotation: 24.6 hours
- Revolution: 1.88 years
- Atmosphere:
Thinner than Earth by 99%.
- Temperature:
-200°F to 32° F



23

Mars' Surface

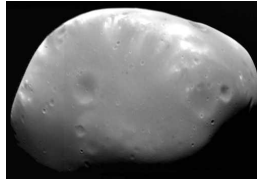
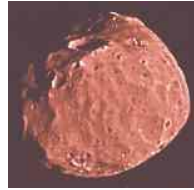
- Dry & Rocky
- Permanent Ice Caps at both Poles
- Has tremendous dust storms that sometimes cover the entire planet.
- Has many interesting features:
 - Olympus Mons, an extinct volcano, which rises 75,000 ft above the surrounding plains and is the highest known peak in the Solar System. (By comparison, Mt. Everest is only 29,029 FT)
 - Valles Marineris is a giant canyon that runs about 2,500 miles (LA to NYC is 2700 miles!) across the surface of the planet and reaches depths of 4 miles (for comparison, the Grand Canyon is not more than 1 mile deep).



24

Mars's Satellites

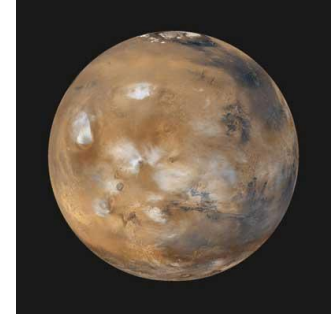
- Mars has two small moons.
- Phobos, which means fear.
- Deimos, which means panic.
- They were probably asteroids that were pulled into orbit around Mars.



25

Why is it named Mars?

- Mars (Greek: Ares) is the god of War. The planet probably got this name due to its red color (blood = red)
- Mars is sometimes referred to as the Red Planet.
- The name of the month March derives from Mars.



26

We have now left the Inner Planets

- Planets are closer together in the inner solar system than in the outer solar system.
- The four inner planets are Mercury, Venus, Earth, and Mars.
- They are called the “Terrestrial” planets because they all have rocky crusts and dense mantles & core.
- In many ways they are like our own planet Earth.
- The term *Terrestrial* comes from the word *terra*, the Latin word for Earth.



27

Let us travel 400 million miles or 3.68 AUs and learn about

Jupiter

28

Oh No.... We've hit an asteroid field!

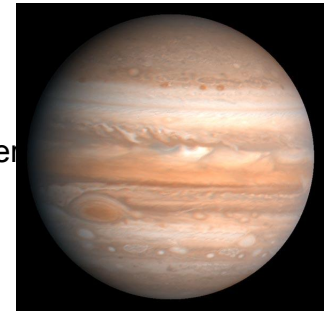


- More than 100,000 asteroids lie in a belt between [Mars](#) and [Jupiter](#).
- These asteroids lie in a location in the solar system where there seems to be a jump in the spacing between the planets.
- Scientists think that this debris may be the remains of an early planet, which broke up early in the solar system. Several thousand of the largest asteroids in this belt have been given names

29

Jupiter

- Jupiter is the 4th brightest object in the night sky.
- It is the 5th and largest planet.
- Ancients referred to Jupiter as the wandering star.
- It has been visited by six spacecraft and is frequently photographed by the Hubble Telescope.



30

Jupiter Fast Facts

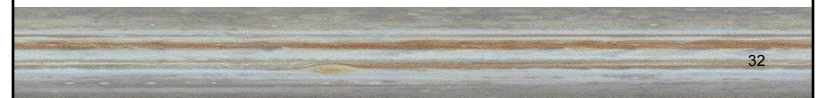
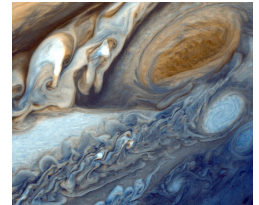
- Rotation: 9.8 hours
- Revolution: 12 years
- Surface: Does not have a solid surface, the atmosphere just gets denser the farther you go.
- Temperature: -101°F at Cloud tops



31

Jupiter's Atmosphere

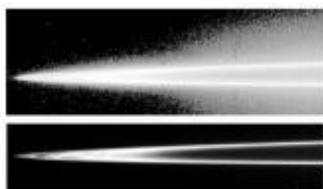
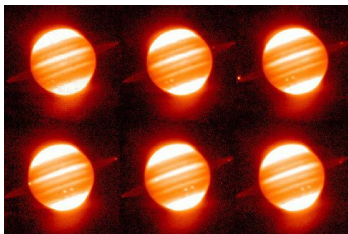
- Jupiter is a giant ball of gas & liquid.
- The planet's "surface" is composed of dense red, brown, yellow, and white clouds. The clouds are arranged in light-colored areas called zones and darker regions called belts that circle the planet parallel to the equator.
- Its best known feature is probably the Great Red Spot, a storm larger than Earth



32

Rings

- Jupiter has three, dark rings which consist of fine rocks.



33

Jupiter's Satellites

- Jupiter has 63 known satellites.
- Jupiter's moons are named for other figures in the life of Jupiter (Zeus) -mostly his numerous girlfriends.



34

Galilean Moons

- Jupiter's four largest moons are known as the Galilean Moons.
- They were discovered by Galileo in 1610 and was a key piece of evidence that proved the Earth was not the center of the universe.
- Io, Europa, Ganymede, and Callisto, are among the most interesting of all solar system moons, particularly Io, with its active volcanism, and Europa with the possibility of a water environment friendly to life.



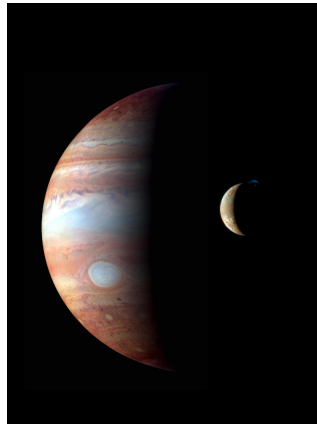
35



36

How did Jupiter get its name?

- Jupiter (a.k.a. Jove; Greek Zeus) was the King of the Gods, the ruler of Olympus and the patron of the Roman state.
- Zeus was the son of Cronus (Saturn).



37

Let us travel 158 million miles or 4.33 AUs and learn about

Saturn

38

Saturn

- Saturn is the sixth planet from the Sun and the second largest.
- Saturn is visible without using a telescope, but a low-power telescope is needed to see its rings.



39

Saturn Fast Facts

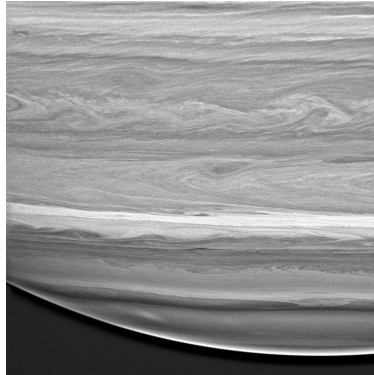
- Rotation: 10.67 hours
- Revolution: 29.5 years
- Surface: Does not have a solid surface, but could float in water because it is mostly made of gas.
- Temperature: Cloud Tops -274°F



40

Saturn's atmosphere

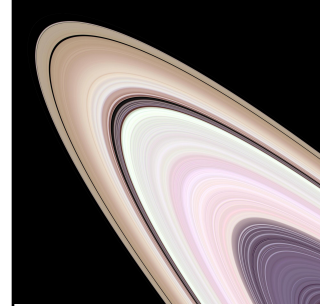
- Like Jupiter, it's atmosphere has bands of swirling gas and wind.
- It frequently has storms that are similar to Jupiter's Great Red Spot, but unlike it they form and dissolve.



Picture from the European Space Agency
41

Rings

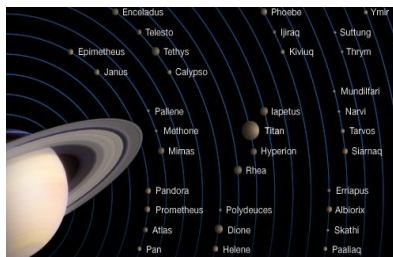
- It has four main groups of rings and three fainter, narrower ring groups. These groups are separated by gaps called divisions.
- Each of these ring groups are made of thousands of smaller rings.
- They are made mostly of ice chunks (and some rock) that range in size from the size of a fingernail to the size of a car.
- Although they are 25,000km in diameter, they are very thin, only a km or so from top to bottom. (Less than 1/2 a mile.)



42

Saturn's satellites

- Saturn has 54 named moons.
- Saturn's moons are named after the Greek mythological creatures called Titans which are primordial, giant gods.
- However, because they ran out of names related to Titans, they began naming the moons after Norse, Gaelic, and Inuit gods.



43

Saturn's satellites

- The Cassini space mission has discovered some exciting facts about some of Saturn's moons.
- Titan, the largest moon, has a thick atmosphere and rivers & lakes of liquid methane.



44

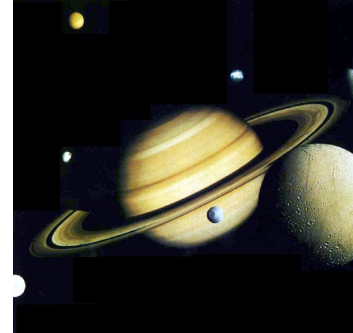
More Moons



- Iapetus has two sides of remarkably different brightness.
- Rhea may have its own faint rings.
- A giant crater on Mimas makes it look like the "Death Star" from the Star Wars.
- Hyperion is shaped like a garbage can.
- Prometheus and Pandora are called the "shepherd moons" because they herd particles into Saturn's "F" ring

45

Saturn Myth



- In Roman mythology, Saturn is the god of agriculture, justice, and strength.
- His Greek counterpart was Cronus and was the son of Uranus and the father of Zeus (Jupiter).
- Saturn is the root of the English word "Saturday"

46

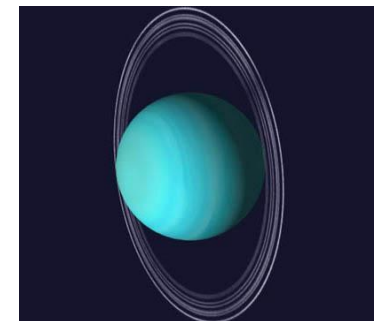
It is a whopping 19.19 AU's away from Earth!
That is 1.7 BILLION MILES!

Uranus

47

Uranus

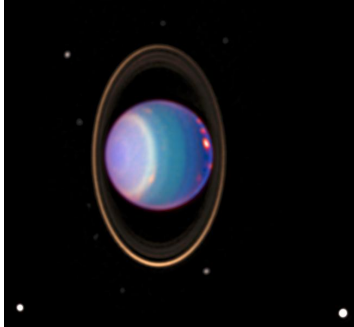
- 1st, let's get one thing straight...the pronunciation! It is not
 - "your anus"
 - "urine us"
- Avoid embarrassment & giggles, pronounce it correctly as Your in us.



48

Uranus

- Uranus is the seventh planet from the sun in our solar system.
- Uranus' blue color is caused by the methane (CH_4) in its atmosphere; this molecule absorbs red light.
- It rotates on its side and so half the time one pole is toward the sun and then the other making each of the four seasons last about 20 years.
- Uranus rotates backwards! (Clockwise!)



49

Uranus Fast Facts

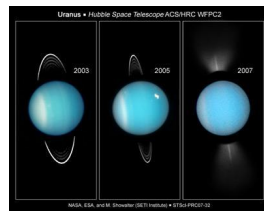
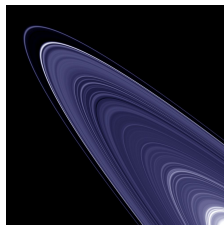
- Rotation: 17.24 hours
- Revolution: 84 years
- Surface: Does not have a solid surface. Has a core of methane ice surrounded by hydrogen & helium.
- Atmosphere: 83% hydrogen, 15% helium and 2% methane. Like Saturn & Jupiter have bands of clouds that rotate around.
- Temperature:
At cloud tops -328°F



50

Uranus Rings

- Uranus has a complicated ring system.
- It is made of 10 major rings, which are surrounded by belts of fine dust.



51

Uranus Satellites

- Uranus's moon deviate from the Greek/Roman nomenclature. Instead all the moons are named after characters in plays by Shakespeare & Pope.
- It has 27 named moons.
- Tatiana is the largest of its moons, and is named after the Fairy Queen in a *Midsummer's Night Dream*.



Uranus Myth

- William Herschel discovered the planet in 1781. He wanted to name it after his patron & king, King George III.
- The name he wanted was the **Georgium Sidus**" (the Georgian Planet)
- But, another astronomer suggested in 1850, and in order to conform to the Roman/Greek nomenclature theme, that it was to be named Uranus.



53

Uranus Myth

- Uranus is the ancient Greek deity of the Heavens, the earliest supreme god.
- Uranus was the son and mate of Gaia the father of Cronus (Saturn) and of the Cyclopes and Titans (predecessors of the Olympian gods).



54

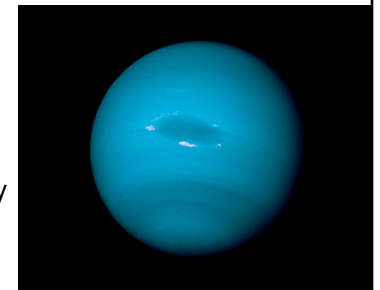
It is a whopping 30.07 AU's away from Earth!
That is 2.82 BILLION MILES!
It took the Voyager Spacecraft 12 YEARS to reach it!

Neptune

55

Neptune

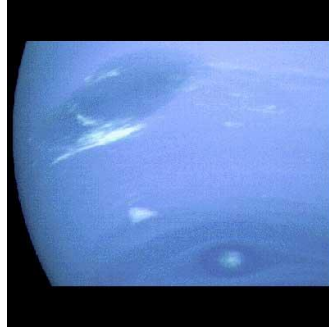
- Neptune is the eighth planet from the sun in our solar system.
- Neptune cannot be seen using the eyes alone.
- Neptune was the first planet whose existence was predicted mathematically.
- Neptune's blue color is caused by the methane (CH_4) in its atmosphere; this molecule absorbs red light.



56

Neptune Fast Facts

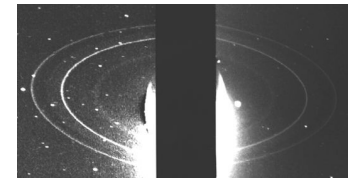
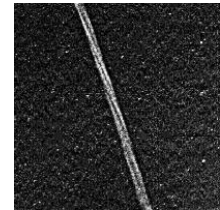
- Rotation: 17.24 hours
- Revolution: 165 years
- Surface: Similar to Uranus
- Atmosphere: Neptune's atmosphere shows a striped pattern of clouds. This cloud pattern is very similar to that of Jupiter and Saturn.
- Neptune even has a Great Dark Spot similar to Jupiter's Great Red Spot.
- Temperature: Cloud Tops -346° F



57

Neptune's Rings

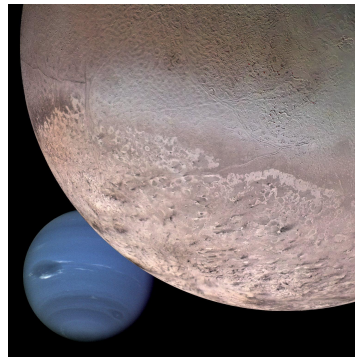
- Neptune also has 4 main **rings**.
- One of the rings appears to have a curious twisted structure.
- Instead of being composed of ice, they are composed of dust & rocks, making them dark because they do not reflect light as well.



58

Neptune's Moons

- Neptune has 13 moons, 8 of which have been given names.
- The two largest moons of Neptune are Triton and Nereid.
- Triton is the Roman name for Poseidon (Neptune) son, and Nereid the name for mermaids, thus keeping with the oceanic theme.
- All the moons are named after oceanic characters in Greek mythology.



59

Why is it called Neptune?

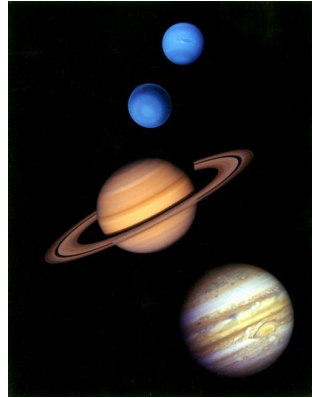
- In Roman mythology [Neptune](#) (Greek: [Poseidon](#)) was the god of the Sea, and earthquakes.



60

We have just left the Gas Giants behind!

- The outer solar system (the planets beyond Mars) are called the Gas Giants.
- These planets are HUGE!
- Jupiter alone is 318 times bigger than our Earth!



61

Wait a minute...what about Pluto????

Dwarf planets, Planetoids, and one stricken planet.

62

Why is Pluto not a planet?

- In 2006, the IAU created definitions of both what a planet is and isn't. Those space objects that weren't a planet but weren't moons or asteroids were given a new definition, dwarf planet.
 - Both planets and dwarf planets orbit the [Sun](#), **not** other planets (in which case we call them moons).
 - Both must be large enough that their own gravity pulls them into the shapes of spheres; this rules out numerous smaller bodies like most asteroids, many of which have [irregular shapes](#).
 - Planets clear smaller objects out of their [orbits](#) by sucking the small bodies into themselves or flinging them out of orbit. Dwarf planets, with their weaker gravities, are **unable** to clear out their orbits.

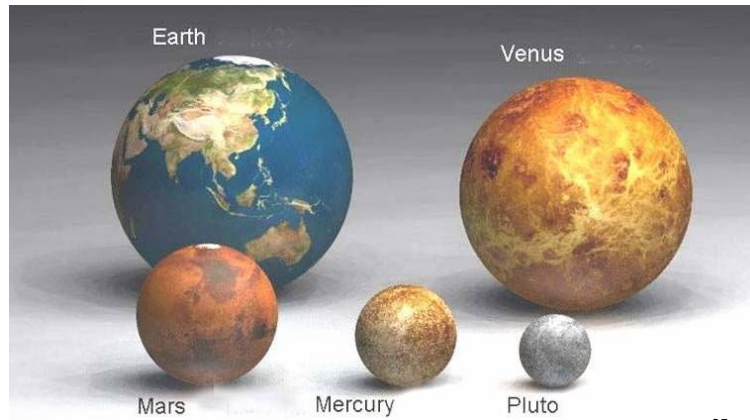
63

Dwarf Planets

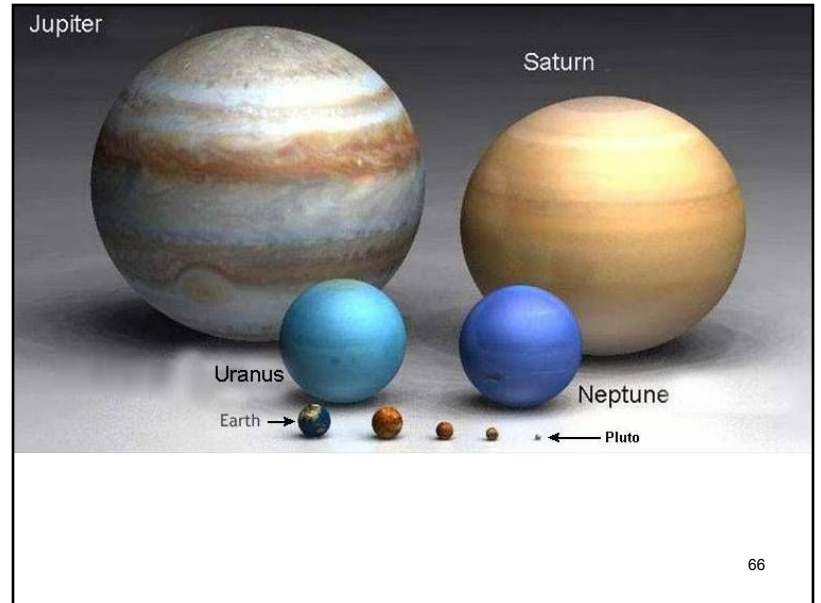
- There are five dwarf planets:
 - Pluto
 - Ceres
 - Eris
 - Makemake
 - Haumea



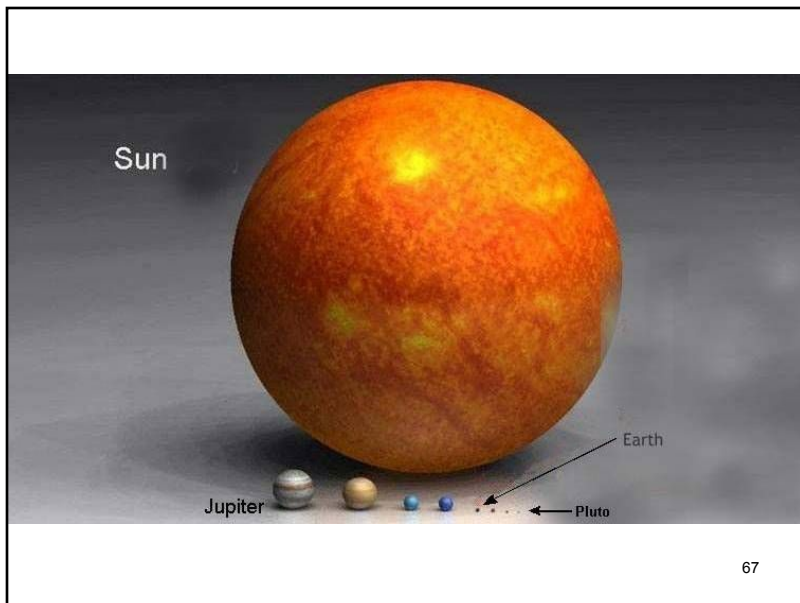
Let's put our solar system in perspective....



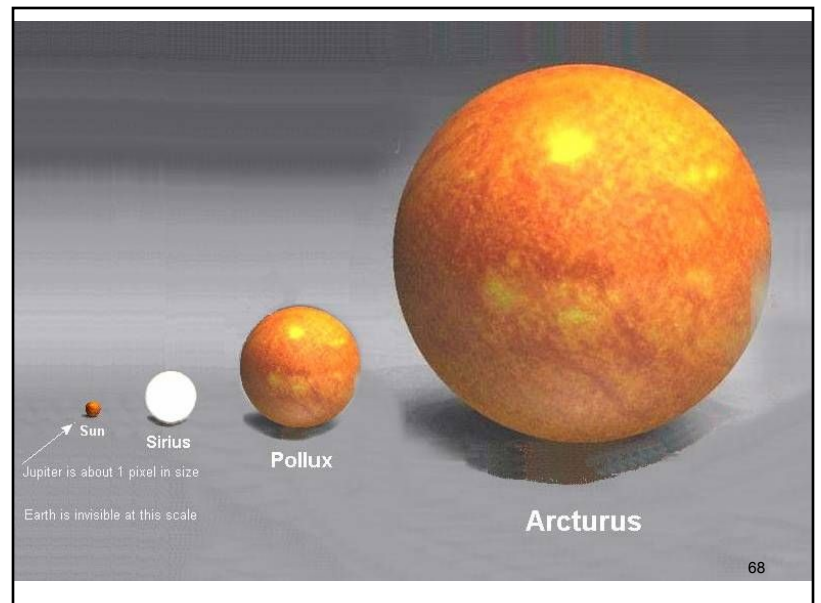
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66

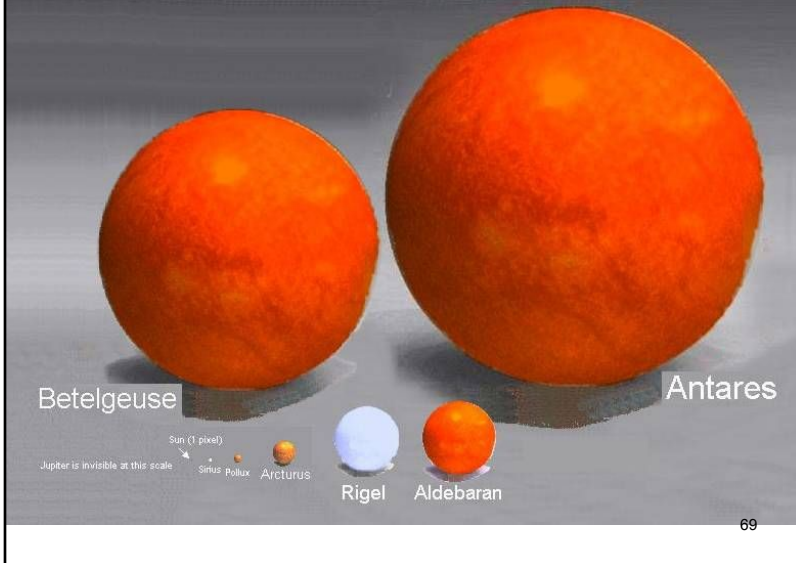


67



68

Antares is the 15th brightest star in the sky. It is more than 1000 light years away.



Bibliography

- [Nine Planets](#)
- [Windows to the Universe](#)
- [NASA World Book](#)