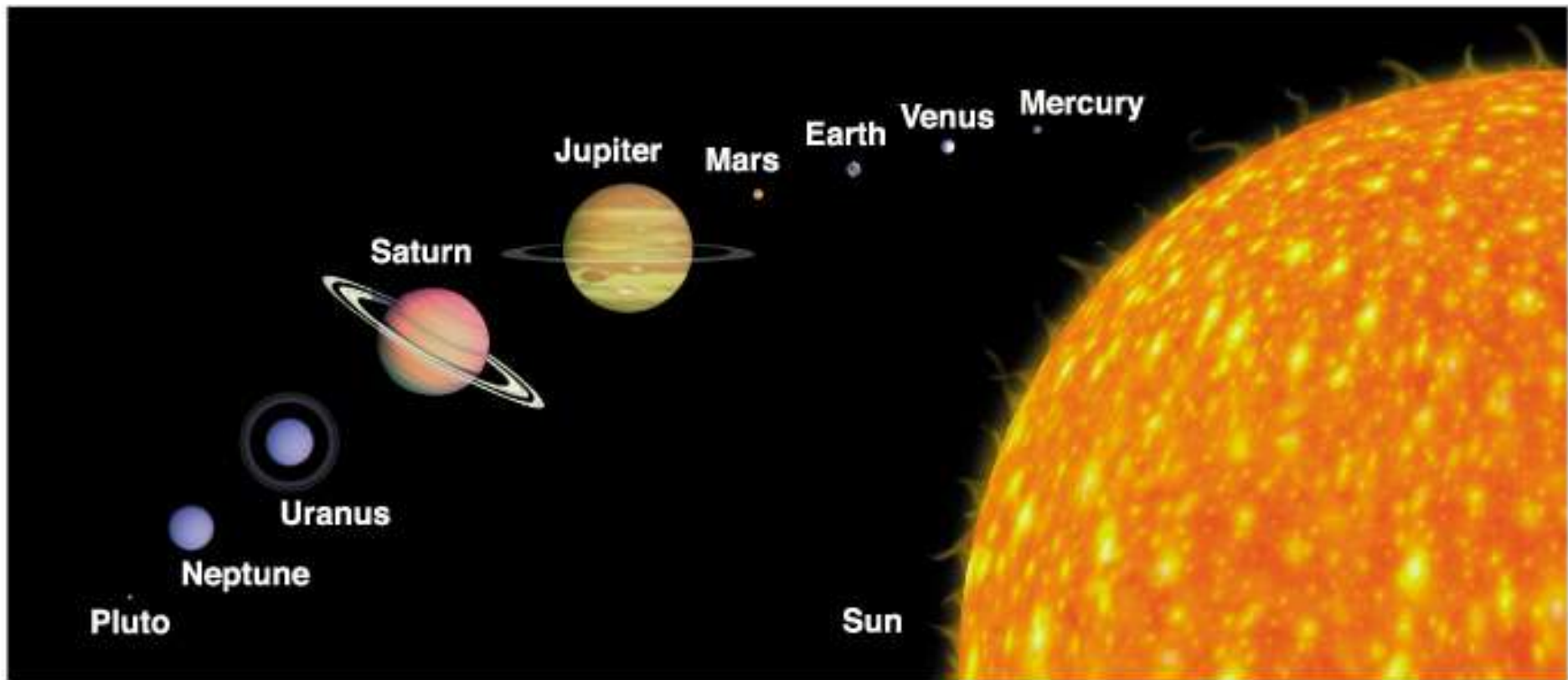




Our Solar system



Motion of the planets



- Our solar system is made up of the sun and the 9 planets that revolve around the sun
- Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune & Pluto (maybe?)

Sun

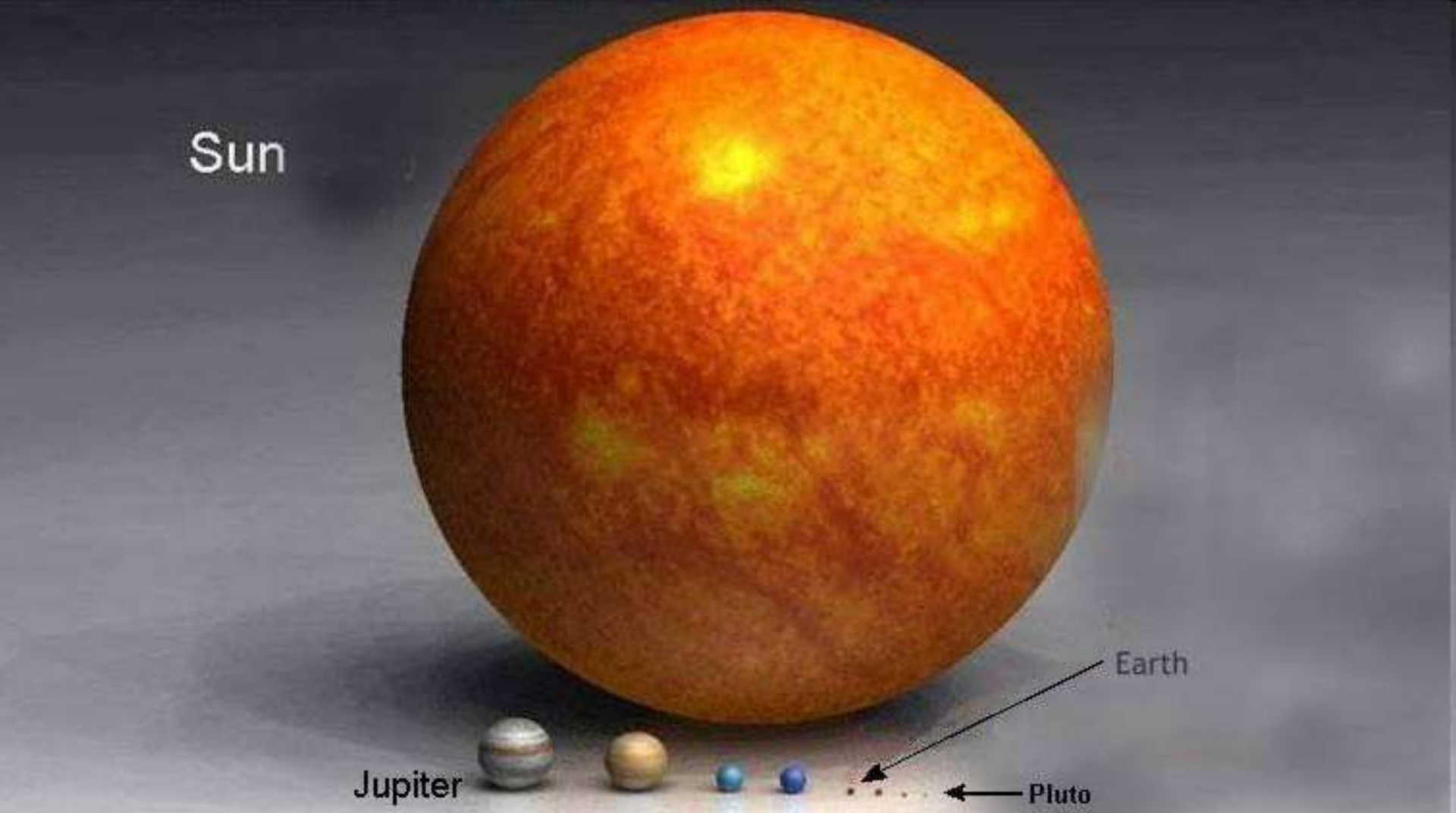
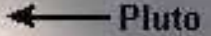


Jupiter



Pluto

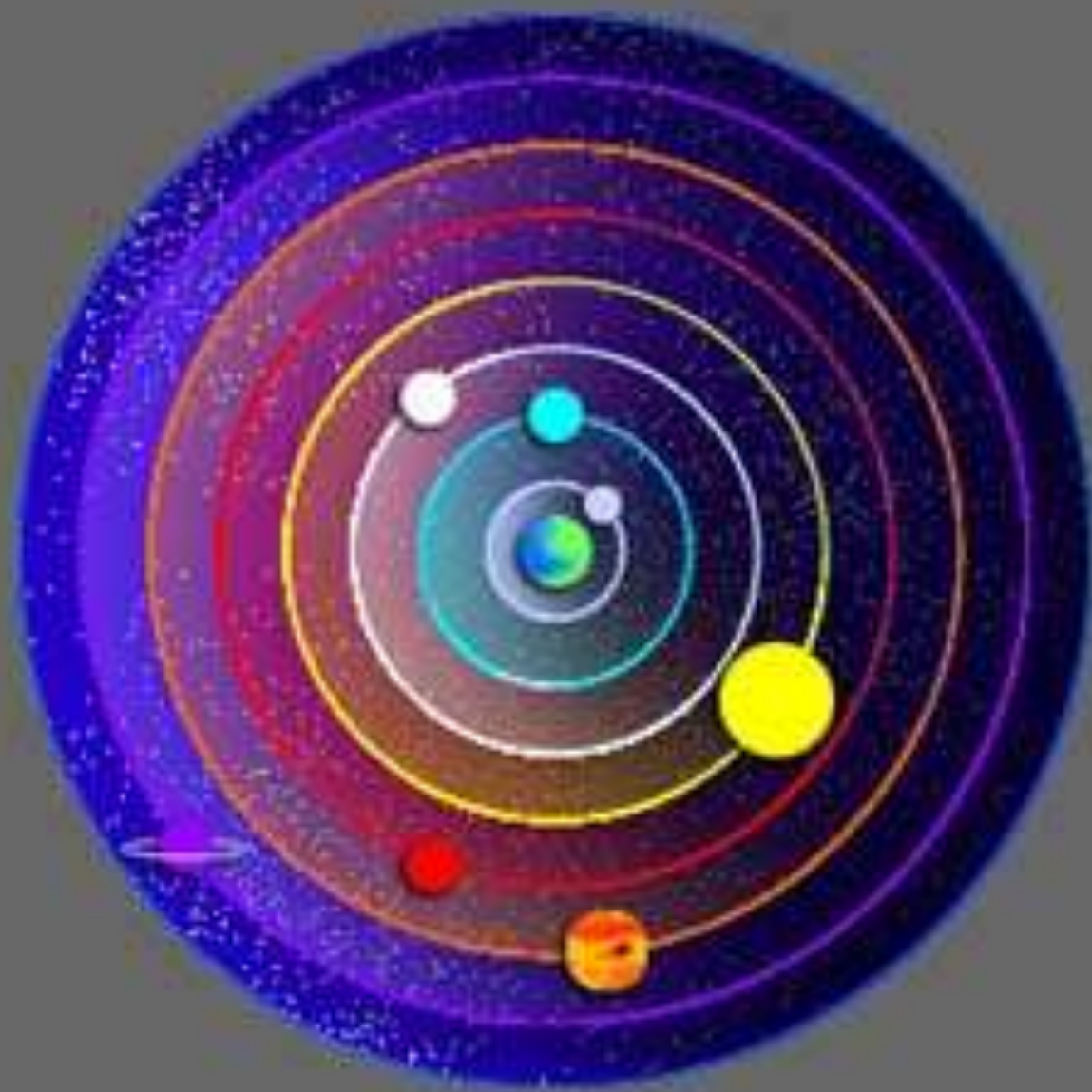
Earth



Early Beliefs about the Solar System

- Greek astronomers believed that the earth was the center of the universe
- Ptolemy believed this 150 AD
- Polish astronomer





**Copernicus
believed that the
sun was the
center and the
planets orbited in
a perfect circle
around it 1500 AD**



**Nicolaus Copernicus
(1473-1543)**



Johannes Kepler

- **Established some laws of planetary motion based on mathematical findings 1600 AD**

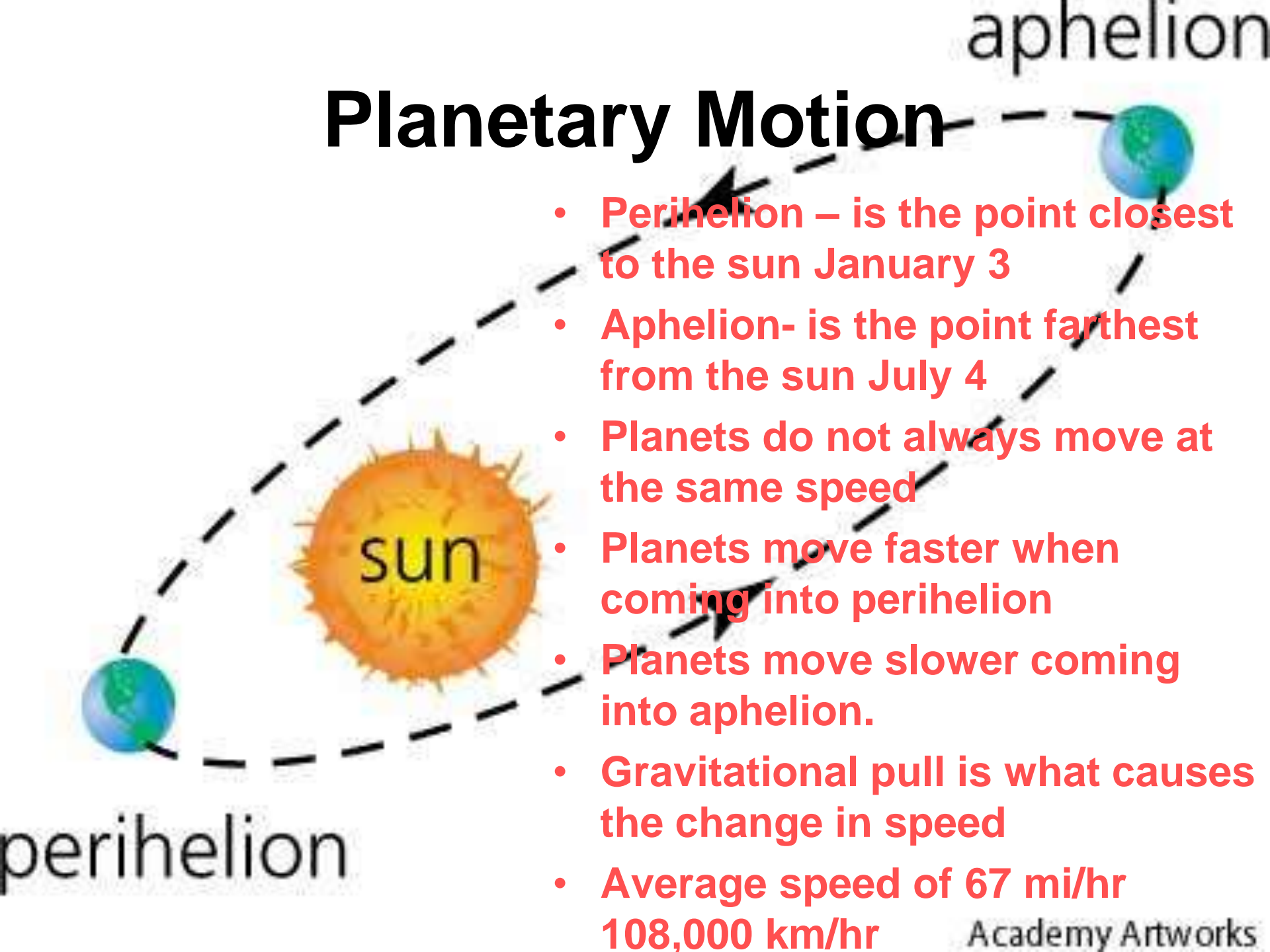


Kepler's Laws

- **Planets orbits are elliptical thus planets are not the same distance from the sun at all times**
- **Planets do not always move at the same speed**
- **The time it takes a planet to make 1 revolution depends on the planets distance form the sun**

**you must know Kepler's three laws.*

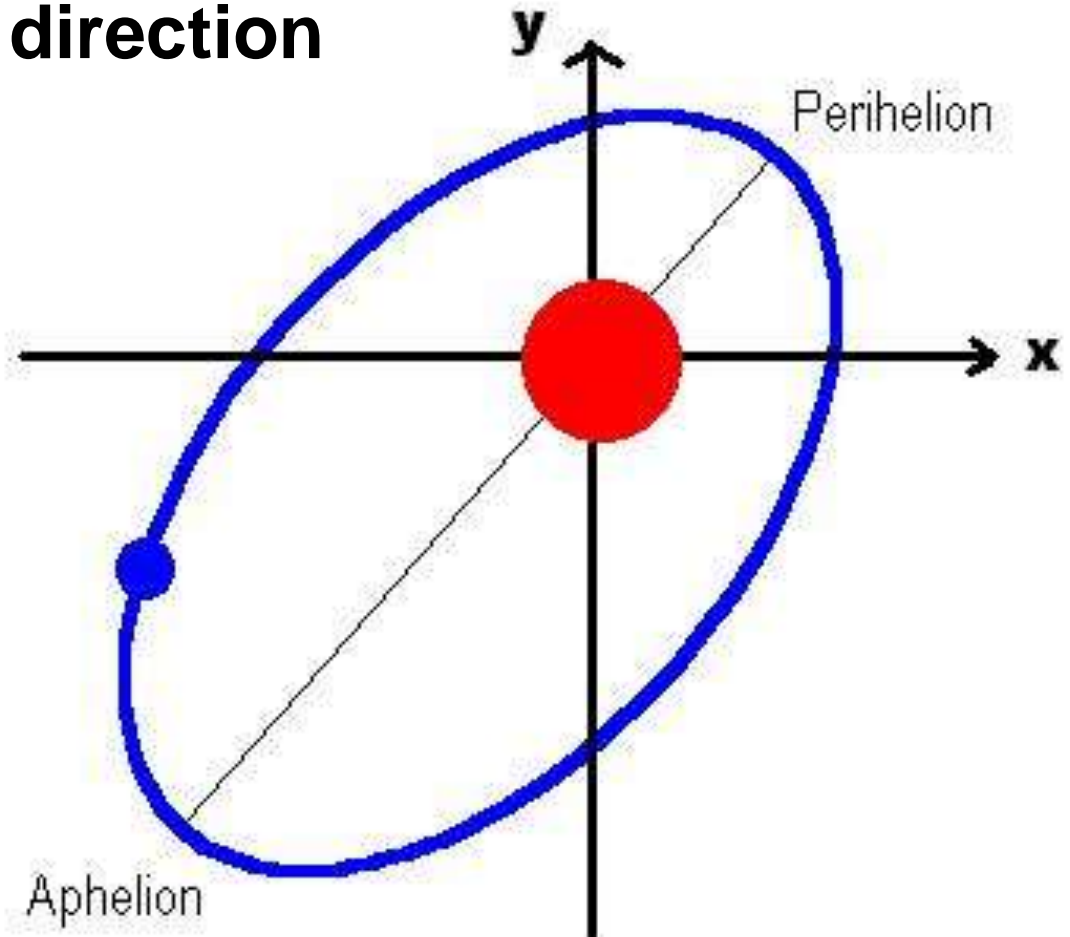
Planetary Motion

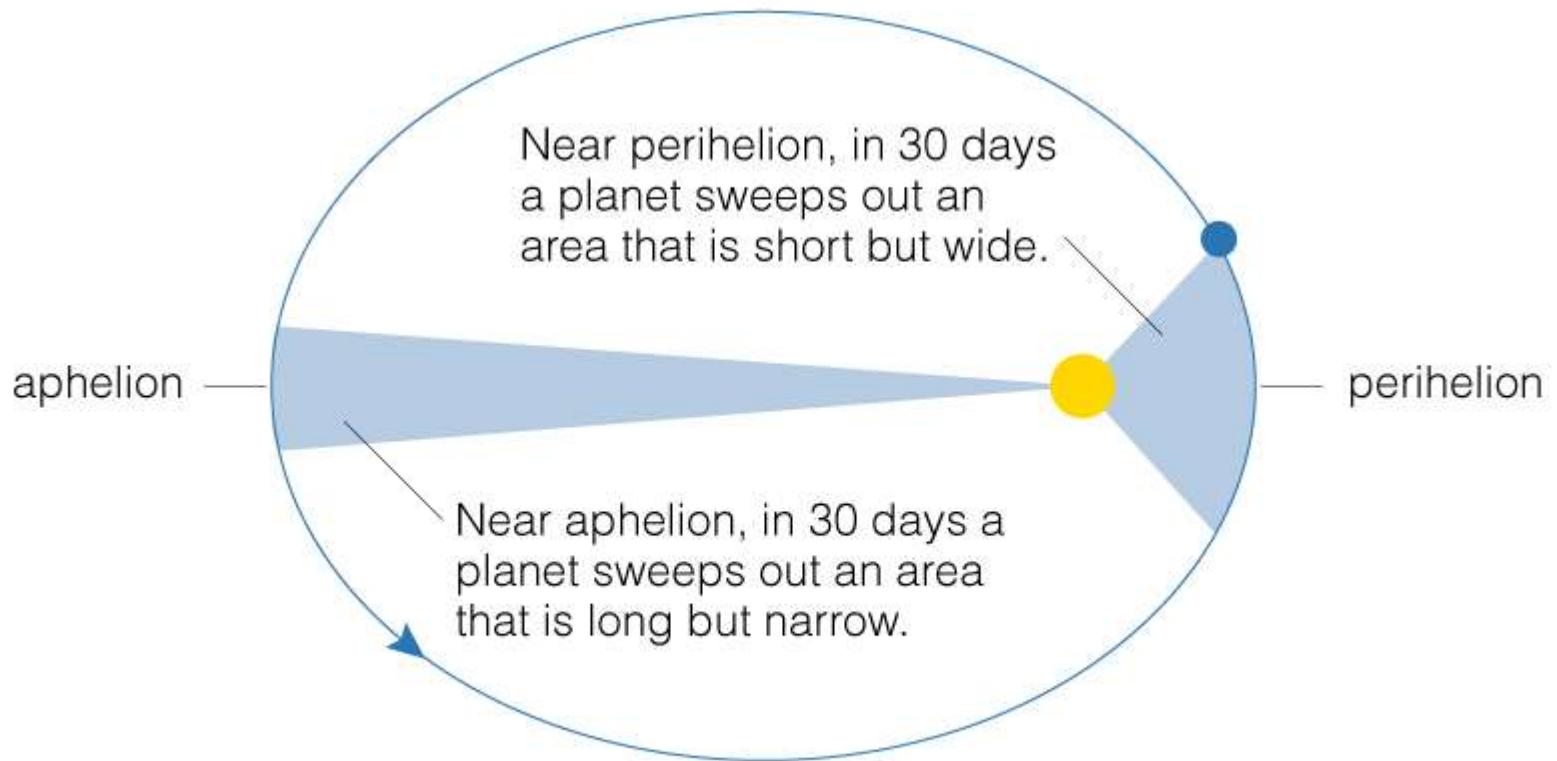


- Perihelion – is the point closest to the sun January 3
- Aphelion- is the point farthest from the sun July 4
- Planets do not always move at the same speed
- Planets move faster when coming into perihelion
- Planets move slower coming into aphelion.
- Gravitational pull is what causes the change in speed
- Average speed of 67 mi/hr
108,000 km/hr

Planetary Motion

- Inertia and gravity are what keep planets in orbit
- Inertia is the tendency of an object to keep its speed and direction



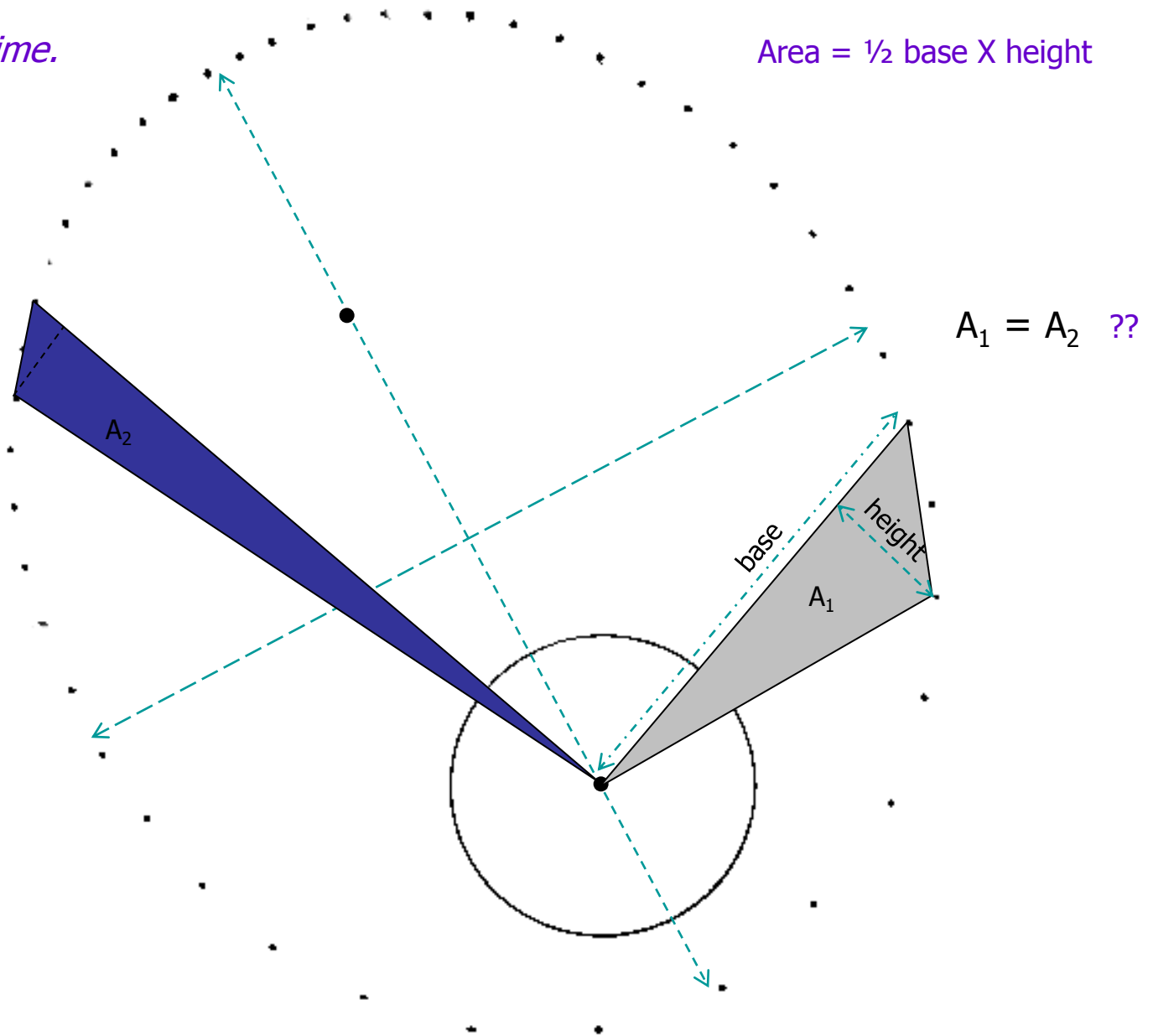


The areas swept out in 30-day periods are all equal.

Verifying Kepler's 2nd

Equal area in equal time.

Area = $\frac{1}{2}$ base X height



Iron Oxide (FeO) Concentrations of the Inner Planets



Mercury
2-3 wt%



Venus
7-8 wt%



Earth
8 wt%



Mars
18 wt%

The inner planets

Earth



Venus



Mars



Mercury



Pluto



Mercury

- planet closest to the sun
- Diameter of 4880 km about 1/3 that of earth
- A Mercury year is 88 earth days
- A mercury day is about 59 earth days
- Temperature on mercury ranges from 450 °C during the day to -170 °C at night
- Mercury has iron core which gives it a magnetic field and holds a thin veil of gases
- Mercury is only visible just before sun rise or just after sunset
- Seventh brightest object in the sky

• Diameter	4878 km
• Average Distance from Sun	57.8 million km
• Size compared to Earth	0.4x
• Gravity compared to Earth	0.38
• Surface Temperature	Max Day Side 467°C Min Night Side -183°C
• Length of day hours	58 Earth days 16
• Length of year	87.9 days
• Eccentricity of Orbit	0.206
• Density	5.43 g/cm ³
• Atmosphere	Oxygen - 56% Sodium - 35% Helium - 8% Potassium & Hydrogen - 1%

Mercury Surface



Mariner 10

- the first space craft to take pictures of Mercury



Venus

- The planet between Mercury and Earth
- Venus' diameter is 12100 km so it is about the size of earth
- Venus is earth's closest neighbor
- Venus rotates from east to west opposite of earth's rotation
- A Venus day is 243 earth days
- A Venus year is 225 Earth days

Venus' surface

- Temperature averages about 470 °C
- The pressure of the atmosphere is 90 x that of earth
- Venus has craters, active volcanoes, mountains, valleys and plains
- The large amounts of CO₂ in Venus atmosphere trap and hold heat

Earth

- **The only planet that supports life**
- **Average temperature 14 °C**
- **70 % of earth surface is covered by water**
- **Diameter is 12,756 km**
- **Constant change on the surface of earth**



Mars

- visible from earth without a telescope
- Mars has a diameter of 6794 km (about $\frac{1}{2}$ of earth's)
- Mars' day is 24 hours, 37 minutes
- Mars' year is 687 earth days
- Mars has 2 moons that are not round
 - Phobos – diameter 27 km
 - Deimos – diameter 15 km

Mars

A satellite image of Mars showing the polar ice caps and the reddish surface. The image is a composite of several smaller images, showing the planet's surface in various shades of red, orange, and brown. The polar ice caps are visible as white and light blue areas at the top and bottom of the frame. The surface is covered in craters, canyons, and other geological features.

- appears to have seasons represented by expansion and retreating of the ice caps
The north cap is frozen water
The south cap is frozen CO₂
- Mars contains the same elements as earth, the coating of iron oxide makes mars appear red
- Mars has huge craters and inactive volcanoes and huge canyons.
- Mountains on mars are higher and canyons deeper than on Earth.
- Temperature ranges from 35 °C to -170 °C

Quiz

1. What was Ptolemy's idea of the solar systems order?
2. Give Kepler's three laws.
3. What was Copernicus's belief about the planets orbit and order of the solar system?
4. What is perihelion and what time of year is the earth's perihelion?
5. Name the inner planets.
6. What two things are responsible for keeping a planet in orbit?
7. Give the order of the planets from the sun outward.
8. Which planets appear as bright objects in the morning and evening sky?
9. What part of the orbit is a planet moving its fastest?

Asteroids and Meteoroids

The background of the slide features two large, irregularly shaped objects, likely asteroids or meteoroids, set against a black background. The objects are light gray with darker, shadowed areas, giving them a three-dimensional appearance. One object is on the left, and another is on the right, both appearing to be in motion or orbiting.

- Asteroids are minor planets that orbit the sun

Asteroids are in a band between Mars and Jupiter

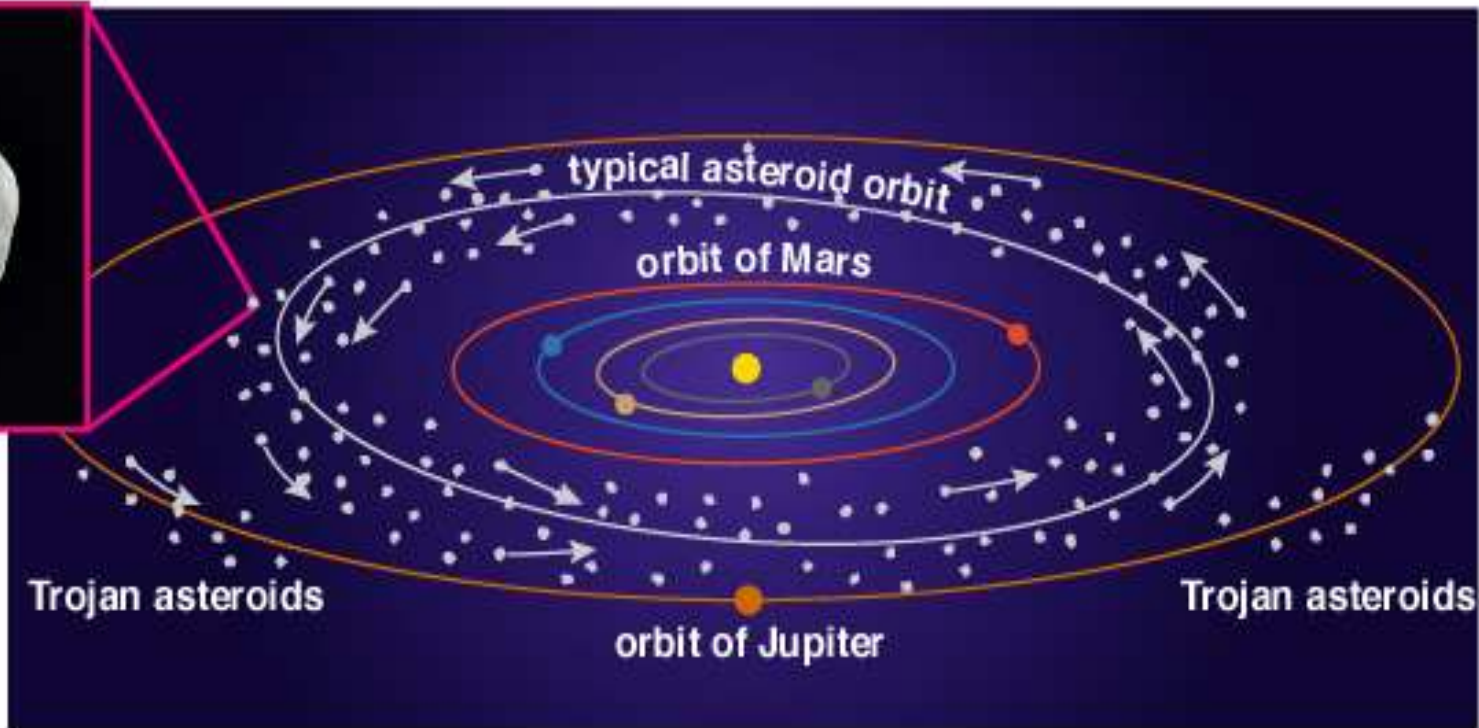
Asteroids range in diameter from 16 km to 160 km

Asteroids theories

Asteroids are pieces of another planet

Asteroids maybe pieces of two planets that collided

Bits that did not ever fuse to form planets



Meteoroids, meteors and meteorites

- **Meteoroids are pieces of rock or metal in outer space**
- **Meteor – when a meteoroid starts glowing because it has entered the earth atmosphere**
- **Meteorite – is the result of a meteor hitting the earth surface**
- **Millions of meteoroids approach the earth's surface each day**



The outer planets



Jupiter

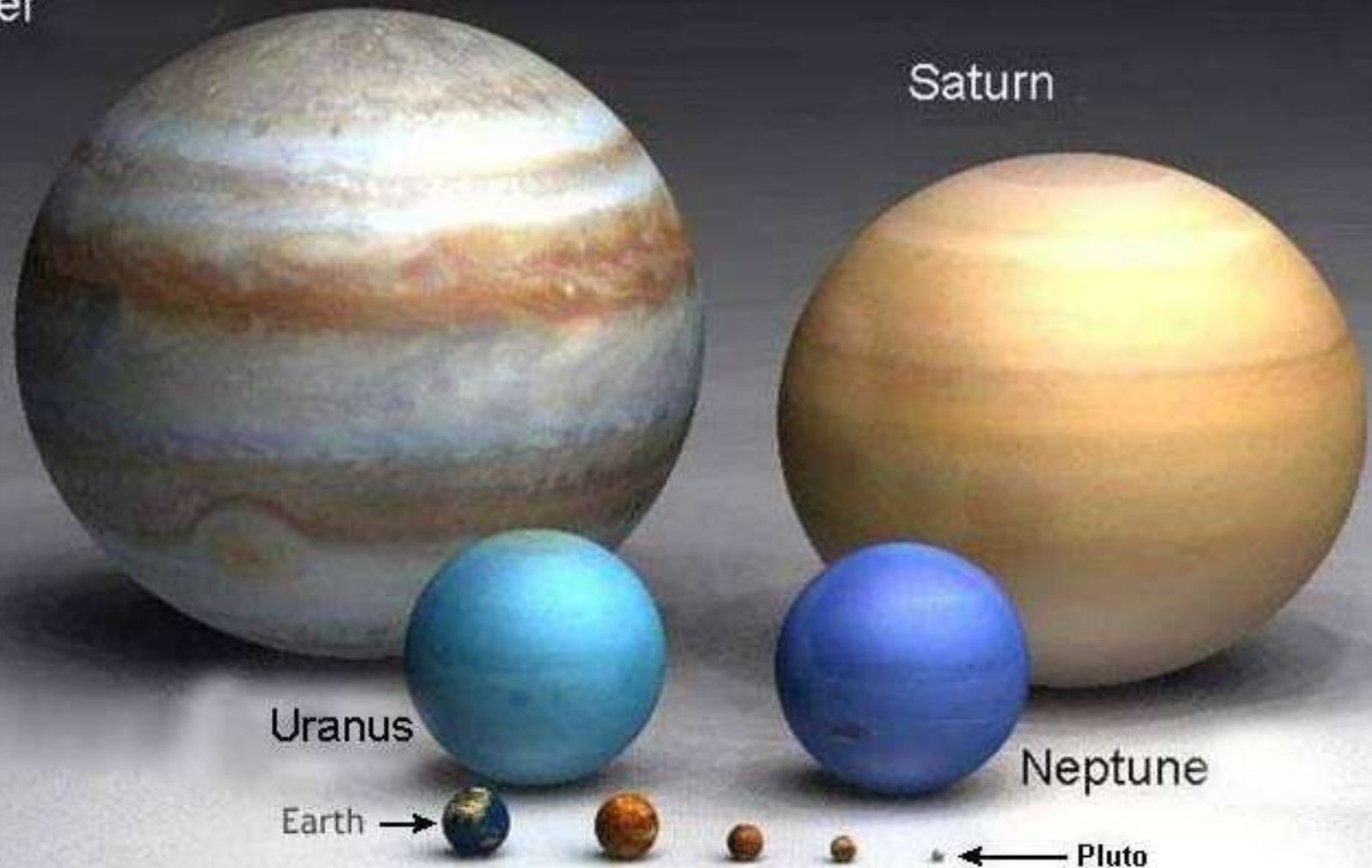
Saturn

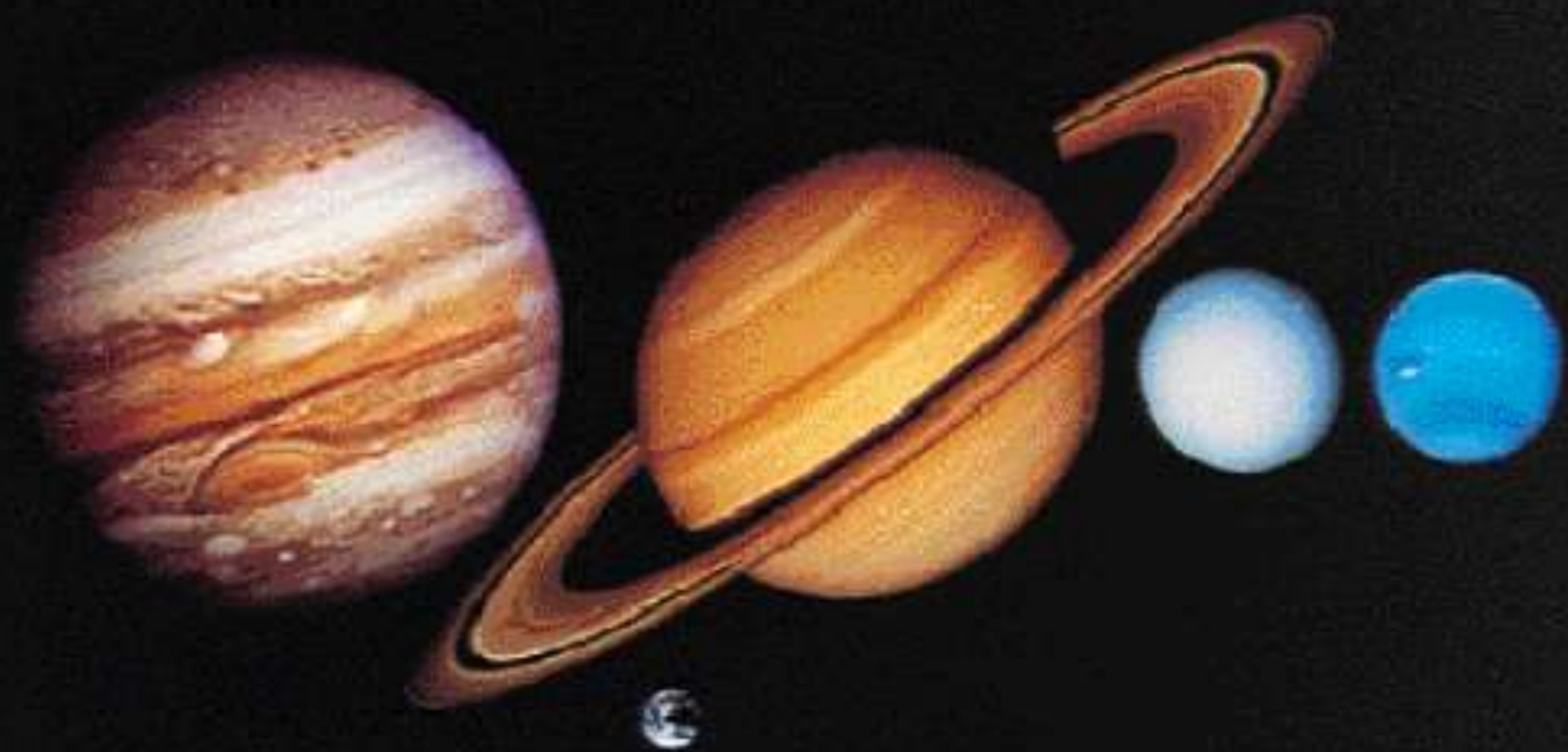
Uranus

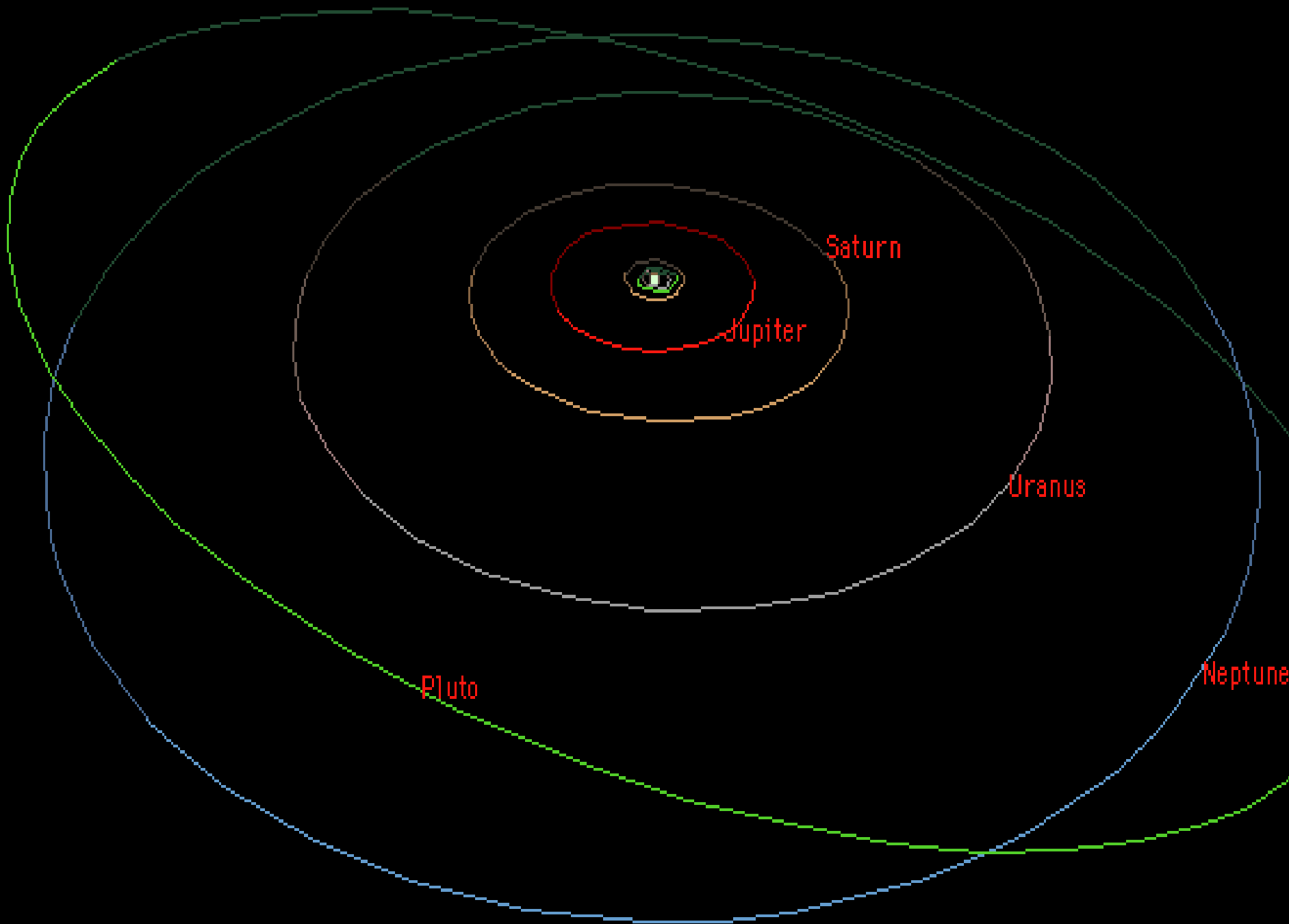
Neptune

Earth

Pluto







Jupiter

- **Diameter – 143,200 km, 11 x that of earth**
- **Mass causes gravity to be 2.5 times that of earth**
- **Jupiter rotates once every 9 hours and 55 minutes**
- **The speed of Jupiter's rotation causes it be elliptical**
- **Its revolution around the sun takes 11.9 Earth years**

Jupiter

- Jupiter's atmosphere is composed of several layers
 - The outer layer is frozen ammonia
 - The inner layer mostly hydrogen and helium
- Surface of Jupiter
 - Possibly liquid hydrogen with a mote dense layer of hydrogen underneath
 - The core is thought to be iron and silicone
- Jupiter emits twice as much energy as it receives from the sun
- Jupiter's great red spot is a swirling mass of gasses

Jupiter has 16 moons

- **Ganymede's diameter 5275 km**
- **Callisto's diameter 4820 km (rings)**
- **Europa's diameter 3130 km (Cracked egg look)**
- **IO Diameter 3630 km – has active volcanoes**



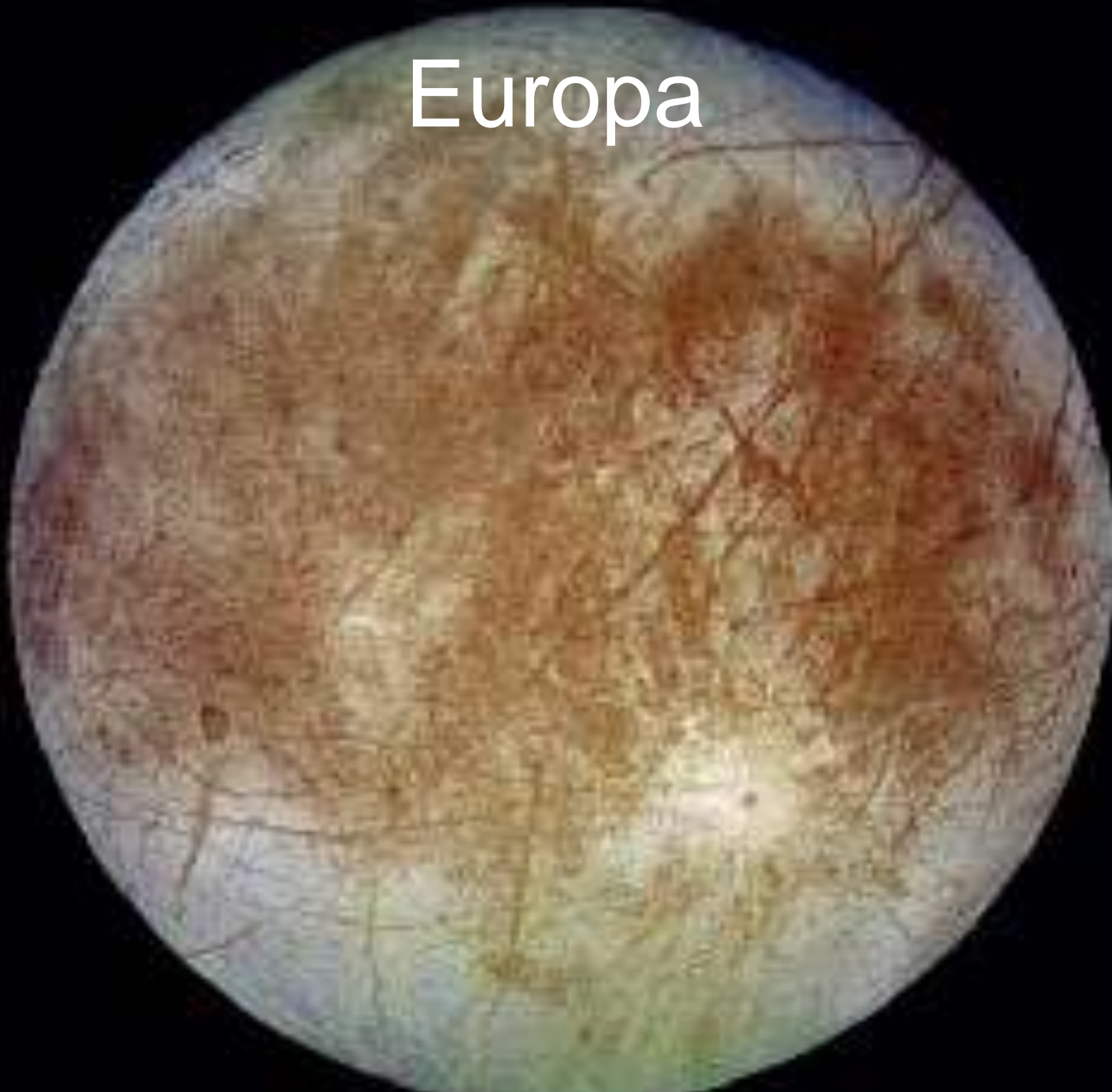
Ganymede

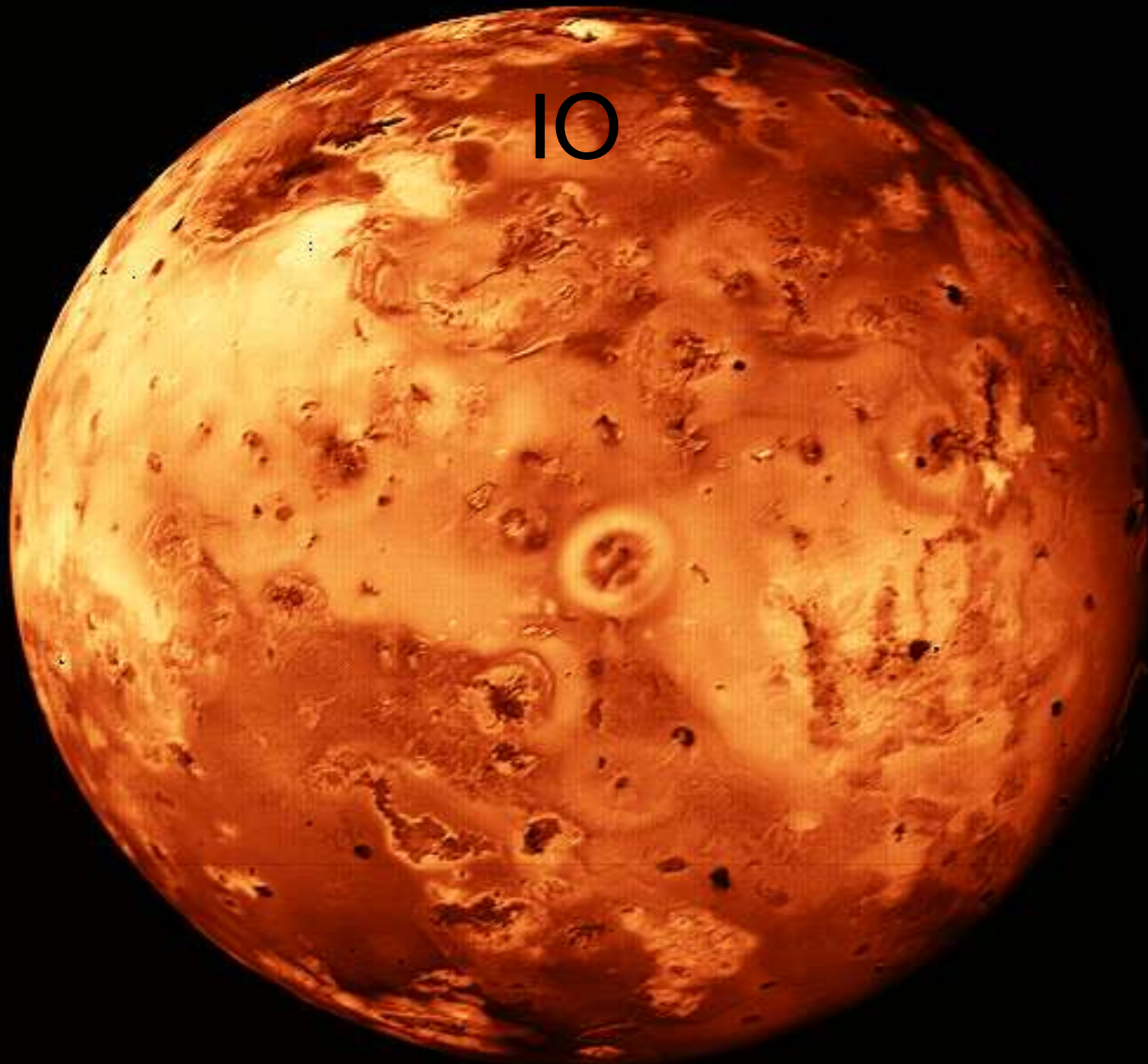


Callisto



Europa

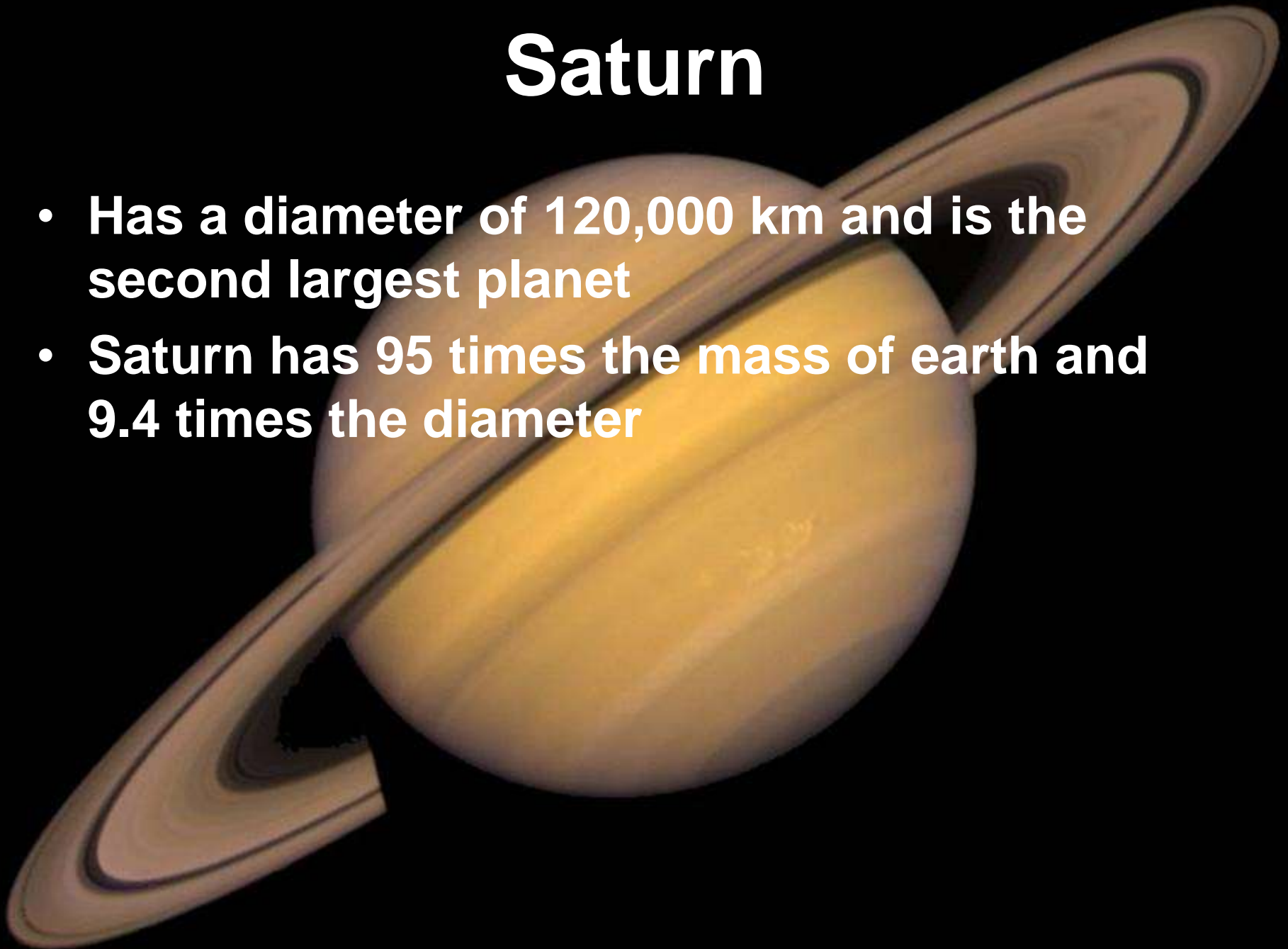




10

Saturn

- **Has a diameter of 120,000 km and is the second largest planet**
- **Saturn has 95 times the mass of earth and 9.4 times the diameter**



Saturn

A 3D rendering of the planet Saturn, showing its characteristic rings. The planet is a pale yellowish-gold color, and the rings are a mix of brown and tan. The rings are tilted at an angle, and the planet is shown from a perspective that makes the rings appear to curve around it. The background is a solid black, with a few small white specks representing distant stars.

- **series of rings that revolve around the planet**
 - The rings are composed of frozen chunks of materials
 - Outer ring diameter is 275,000
- **Saturn has 18 moons**
- **Saturn rotates in 10 hours and 40 minutes**
- **Saturn revolves in 29.46 earth years**
- **Titan is Saturn's largest moon, 5,800 km and an atmosphere of methane**

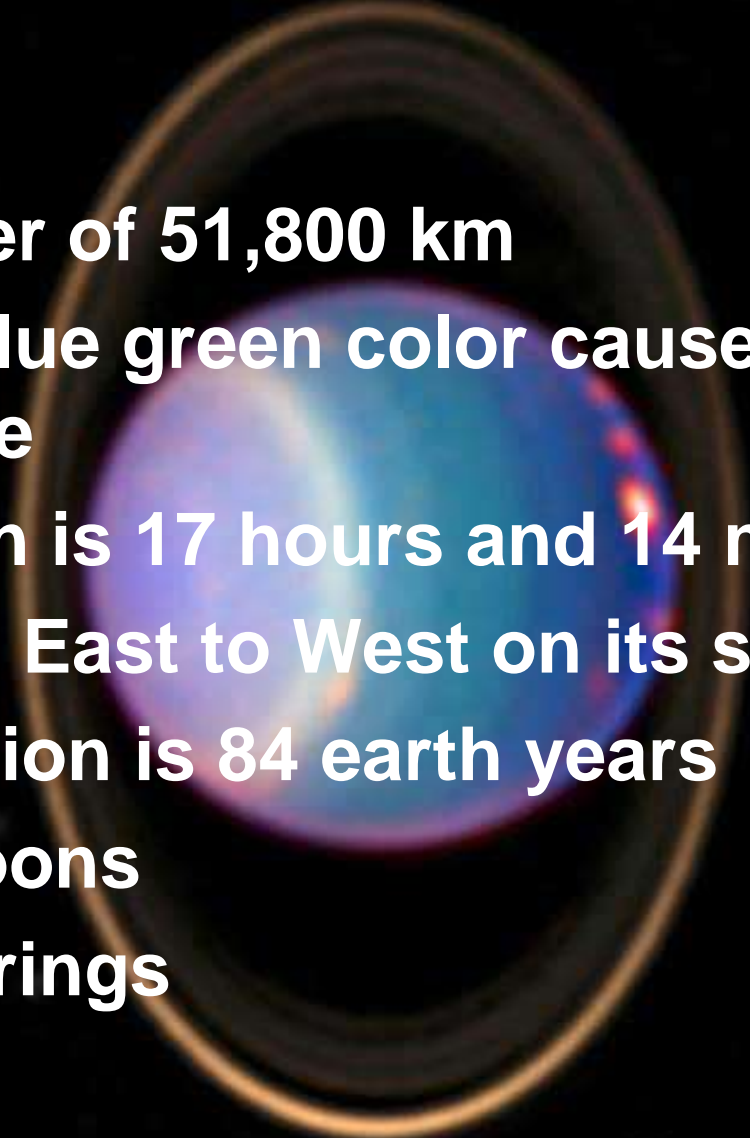


Titan

Titan

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Calvin J. Hamilton

Uranus

- Diameter of 51,800 km
 - Has a blue green color caused by methane
 - Rotation is 17 hours and 14 minutes
 - Rotates East to West on its side
 - Revolution is 84 earth years
 - Five moons
 - Has 11 rings
- 

Neptune



- **Pale blue in color**
- **Diameter of 49,500**
- **Rotation is 16hours and 10 minutes**
- **Revolution is 165 earth years**
- **Two known moons**
- **Atmosphere is helium and hydrogen**

Pluto



- **The last known planet**
- **Occasionally Neptune is farther from the sun than Pluto**
- **Pluto diameter is 3000 km**
- **Rotation 153 hours**
- **Revolution is 248 earth years**
- **Pluto has a moon Charon that is almost as large as itself**
- **Sometimes are considered a double planet**

Comets

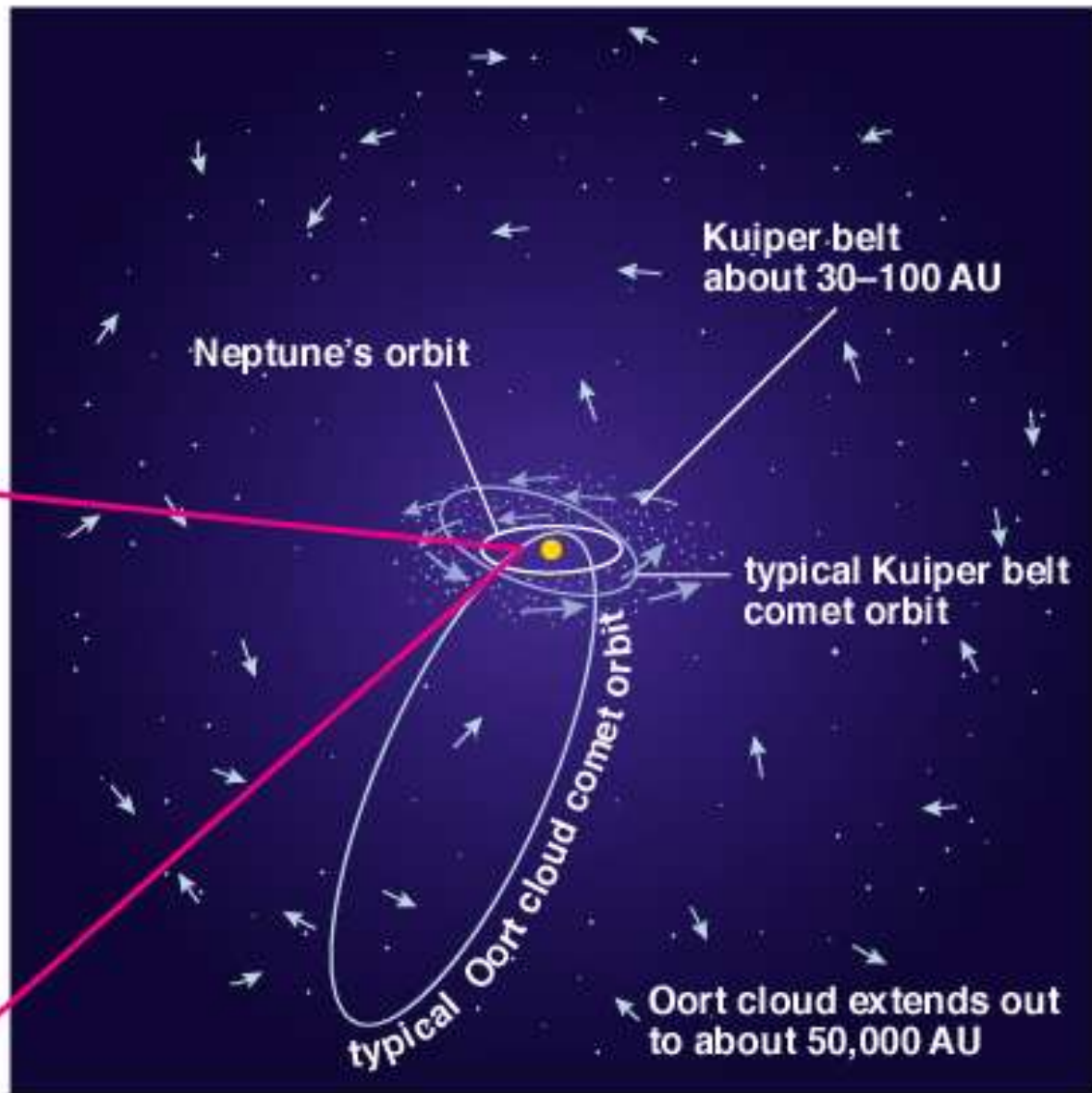
- **Comets are space objects made of minerals dust gas and ice**
- **Comet means long hair**
- **Comets have a head and tail**



Comets

- **The head contains most of the matter**
 - Coma
- **The tail always points away from the sun and reflects sunlight**
- **Solar wind keeps the comet tail pointing away from the sun**
- **Comets have a regular orbit pattern**
- **Haley's comet comes every 76 years**
- **Comet's orbits are very elliptical compared to a planet**

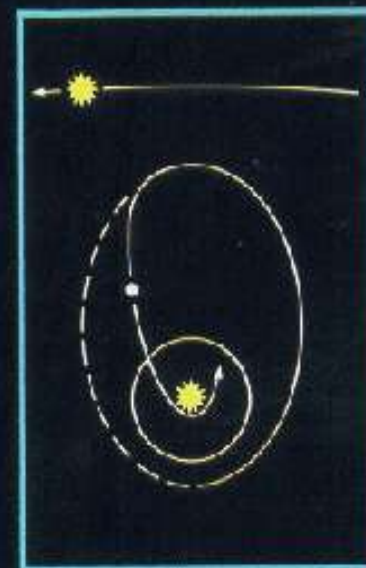
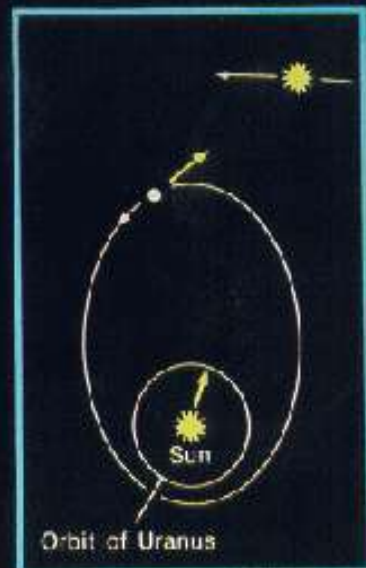






50,000 a.u.

A horizontal scale bar with vertical end caps, labeled "50,000 a.u.", indicating the distance from the Sun to the edge of the Oort Cloud.



**The Oort
Comet Cloud**

To Galactic
Pole

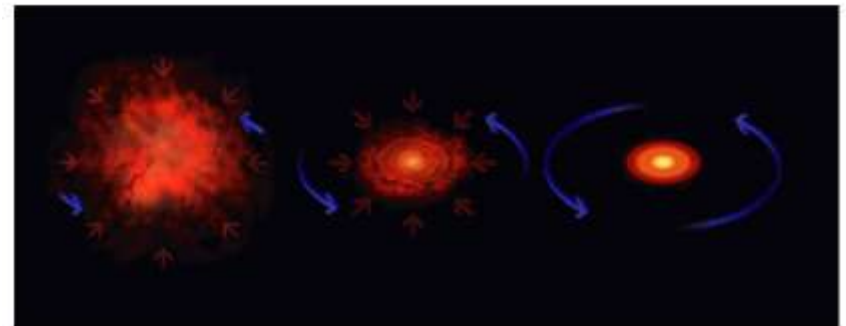
An arrow pointing towards the upper right, labeled "To Galactic Pole", indicating the direction towards the center of the galaxy.

Origin of the solar system

- **Two main theories**
 - One is the “Companion Star Theory”
 - The other is the “Dust Cloud Theory”



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Review

1. What is the difference between a meteoroid, meteor and a meteorite?
2. What planets make up the inner planets?
3. Which inner planet rotate from east to west?
4. Which planet has the shortest orbital period?
5. Which planet is nearest to the earth?
6. Which planet has a high temperature and pressure?
7. Which planet has a volcano three times as tall as Mt. Everest?
8. This planet has cloud layers composed of sulfuric acid.
9. This planet other than earth has a north and south polar ice cap.
10. This planet supports life.