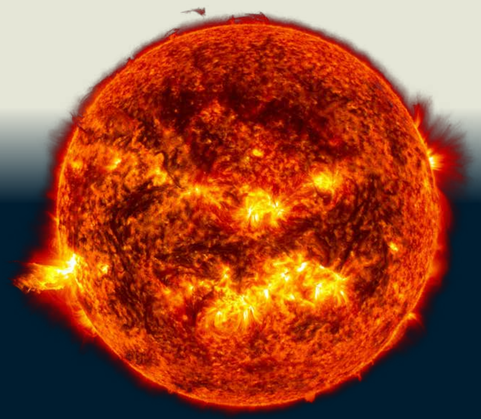
The Sun... our star

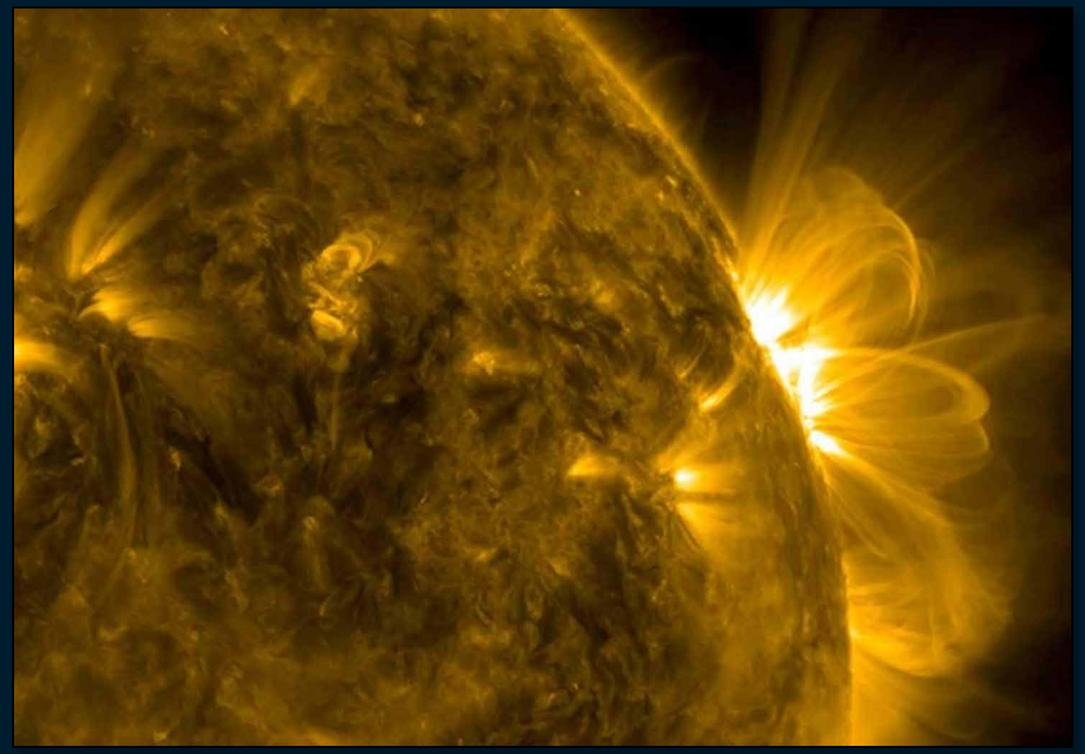
The Sun is the star of the solar system, giving off the energy that makes life possible.

The Sun is a yellow/white star that is about 4.5 billion years old, about halfway through the average 10-billion-year lifespan of yellow stars. In the sun's core, which is about 27 million °F (15 million °C), hydrogen atoms fuse together to form helium atoms in a process called nuclear fusion. Some of this energy, in the form of photons, moves through the Sun in a process that can take thousands of years before reaching the surface, which is about 10,340 °F (5,500 °C). It then takes a photon about 8 ½ minutes to reach Earth as sunlight.

The Sun's diameter is about 865,000 miles (1.4 million km). It is so large that 1.3 million Earths or 1000 Jupiters would fit inside of it. If the Sun were as tall as a typical front door, Earth would be about the size of a nickel.

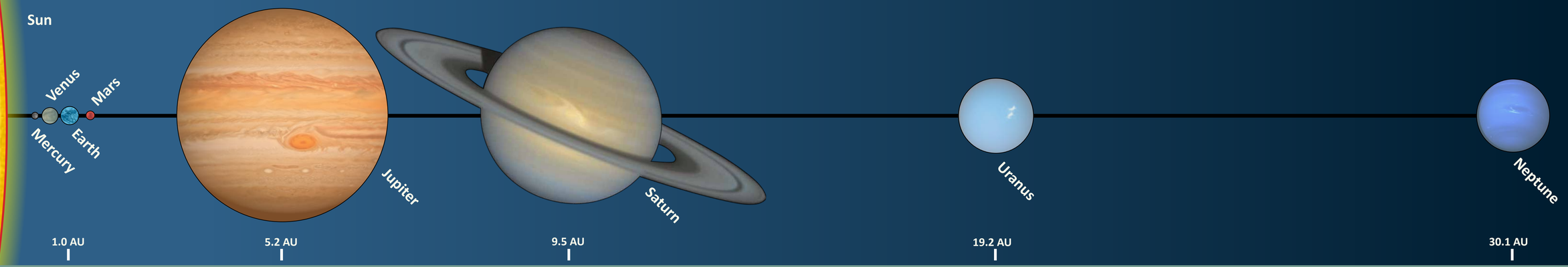
The Sun is about 93 million miles (150 million km) from the Earth, scientists call this measurement an Astronomical Unit (AU).





The Sun goes through cycles of activity that last about 11 years where it ejects plasma into the solar system. These emissions reach the Earth as solar wind which cause the aurora as well as damage to satellites.

This shows the sizes of the planets in proportion to each other. The distances are not to scale. An Astronomical Unit (AU) is about 93 million miles (150 million km.)



Photos: NASA / JPL

Written: 2024. For more information visit njaa.org
Exhibit funded by the Federal Highway Administration's Recreational Trails Program through the New Jersey Department of Environmental Protection.

Mercury ☿

The first planet from the sun

Name: Mercury was the messenger to the gods in Roman mythology, famous for moving quickly just like Mercury appears to in the sky.

Distance from Sun: 36 million miles (58 million km)

Size / Diameter: 3,032 miles (4,880 km), about 1/3 the size of Earth. *If Earth were the size of a grape, Mercury would be the size of a blueberry.*

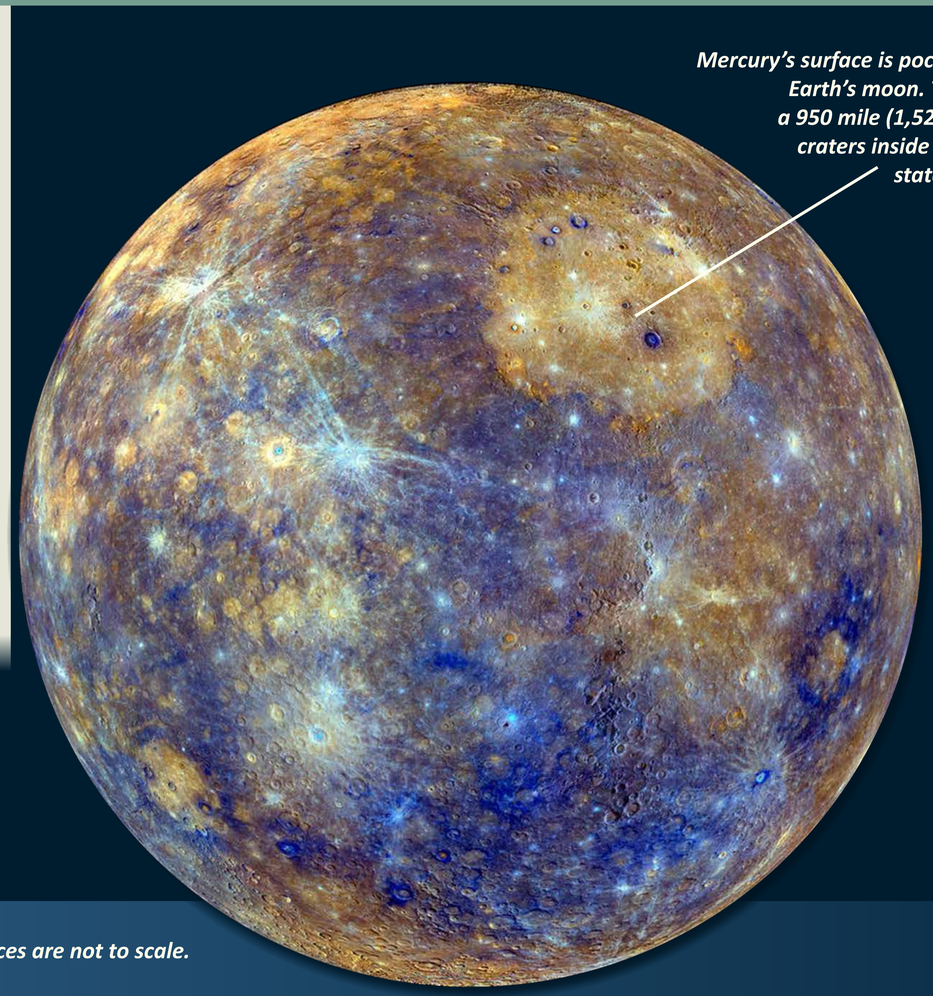
Temperature range: 800°F to –280°F (427°C to –173°C)

Type: Terrestrial (solid land surface)

Moons: none **Rings:** none

Period of Rotation (1 day): 59 Days

Period of Revolution (around Sun) (1 year): 88 Days



Mercury's surface is pockmarked by craters and looks a lot like Earth's moon. The largest impact site is Caloris Basin, a 950 mile (1,525 km) wide crater with several smaller craters inside of it. It could comfortably fit the entire state of Texas (773 miles [1,244 km] wide). This image uses enchanced colors.

Mercury is the planet closest to the sun. It has very little atmosphere so has the widest extremes in surface temperature. Even though parts of the surface are exposed to 800°F (427°C) temperatures for 59 Earth days at a time, due to its slow rotation speed there is still water trapped as ice in the shadows of Mercury's north pole.

This shows the sizes of the planets in proportion to each other. The distances are not to scale. An Astronomical Unit (AU) is about 93 million miles (150 million km.)

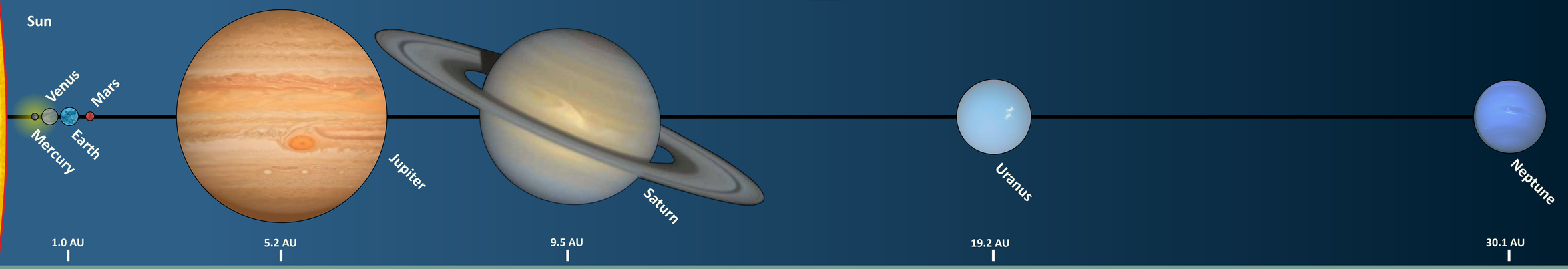


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Photo: NASA / GSFC / Hopkins Applied Physics Laboratory / Carnegie Insitution of Washington

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Venus ♀

The second planet from the sun

Name: Venus is named for the Roman goddess of love and beauty due to its bright appearance in the sky.

Distance from Sun: 67 million miles (108 million km)

Size / Diameter: 7,521 miles (12,104 km), about 95% the size of Earth. It was called Earth's sister planet.

Average Temp: 864°F (462°C)

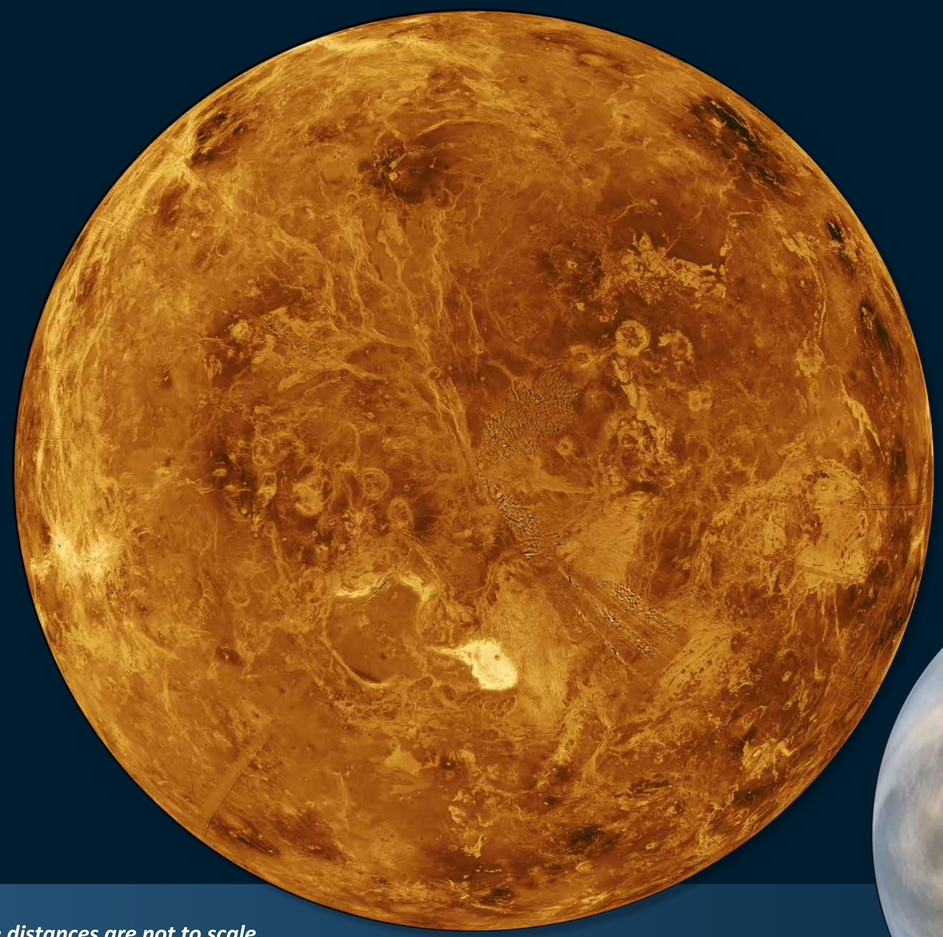
Type: Terrestrial

Moons: none **Rings:** none

Period of Rotation (1 day): 243 days

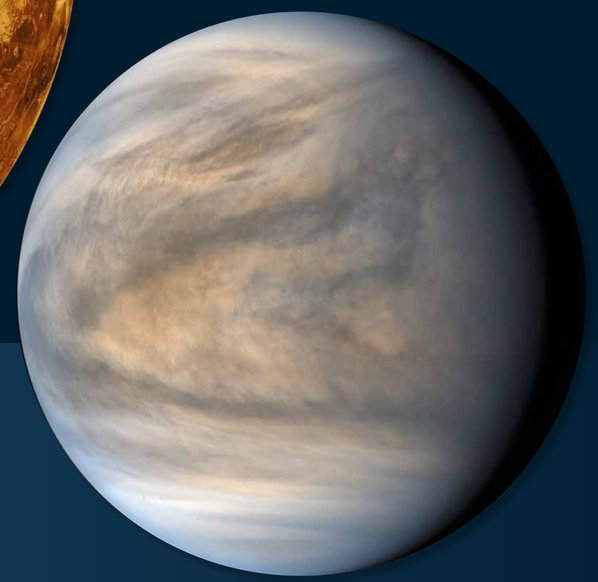
Period of Revolution (around Sun) (1 year): 225 days

Although it is further from the sun than Mercury, Venus's thick atmosphere of carbon dioxide and sulfuric acid traps enough heat to make it the hottest planet. The atmospheric pressure is also almost 100 times that of Earth. Unlike most other planets, it rotates so that the sun rises in the west and sets in the east and a full day is longer than a year.



Venus is the 2nd brightest object in the night sky, only the full moon is brighter. It was also called the evening and the morning star since it is so bright it can be seen during sunrise or sunset.

On the left is a radar view of the surface of Venus under the cloud cover. Below is the view of Venus from space, covered by its thick atmosphere.



This shows the sizes of the planets in proportion to each other. The distances are not to scale. An Astronomical Unit (AU) is about 93 million miles (150 million km.)

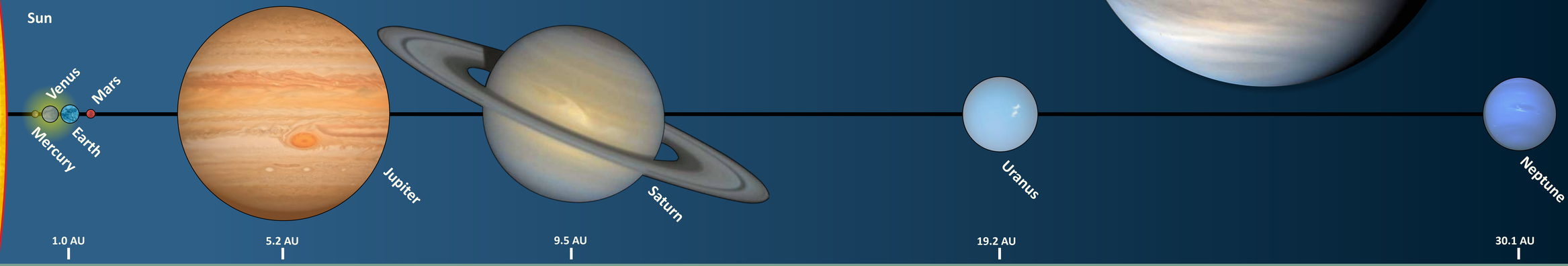


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Photo: NASA /JPL / JAXA / ISAS / DARTS / Damia Bouic

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Earth

The third planet from the Sun

The name: Earth comes from the Old English and Germanic language word meaning “the ground.”

Distance from Sun: 93 million miles (150 million km) this is known as an Astronomical Unit (AU).

Size / Diameter: 7,926 miles (12,756 km)

Average Temp: 59°F (15°C)

Type: Terrestrial

Moons: 1 **Rings:** none

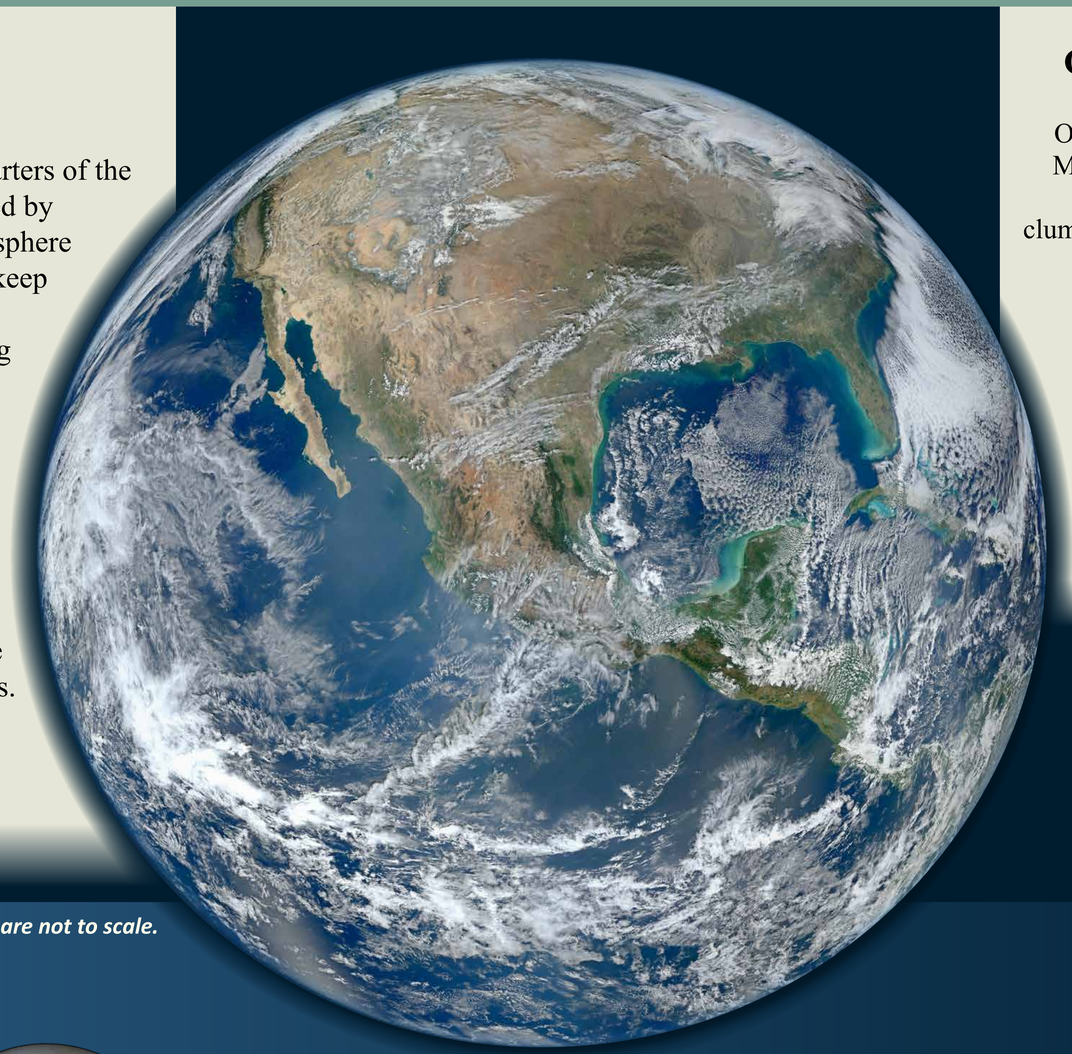
Period of Rotation (1 day): 23 hours, 56 minutes

Period of Revolution (around Sun) (1 year): 365.26 days

Our Earth is the largest terrestrial planet in the solar system and the largest of the inner planets. Its temperature range also makes it the only planet where water can exist as a liquid, solid (ice) and gas (water vapor), vital for supporting life.

Nearly three-quarters of the surface is covered by water. Our atmosphere holds in heat to keep our planet warm even when facing away from the sun and protects the surface from small asteroids.

The Earth is tilted about 23.5 degrees, which causes the changing seasons.



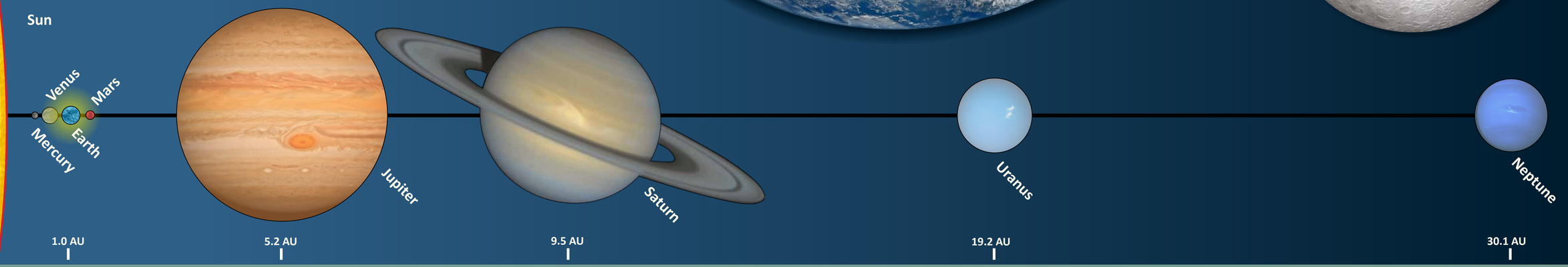
Our Moon

Our Earth is theorized to have collided with a Mars-sized object about 4.5 billion years ago. The molten material that was ripped away clumped together in orbit and formed the Moon.

Diameter: 2,160 miles (1,740 kilometers).
Distance from Earth: about 238,855 miles (384,400 km).

Period of Rotation and the Period of Revolution around the Earth are the same - about 27 days. This is why the Moon always keeps one side facing the Earth. The Moon’s gravity also causes our tides.

This shows the sizes of the planets in proportion to each other. The distances are not to scale. An Astronomical Unit (AU) is about 93 million miles (150 million km.)



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Photos: NASA / JPL / GSFC

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Mars ♂

The fourth planet from the Sun

Name: Mars is named for the Roman god of war due to its blood red appearance.

Distance from Sun: 142 million miles (228 million km)

Size / Diameter: 4,212 miles (6,792 km).
If Earth were the size of a grape, Mars would be about as big as a raspberry.

Average Temp: 70°F to –225°F (20°C to –153°C)

Type: Terrestrial

Moons: 2 **Rings:** none

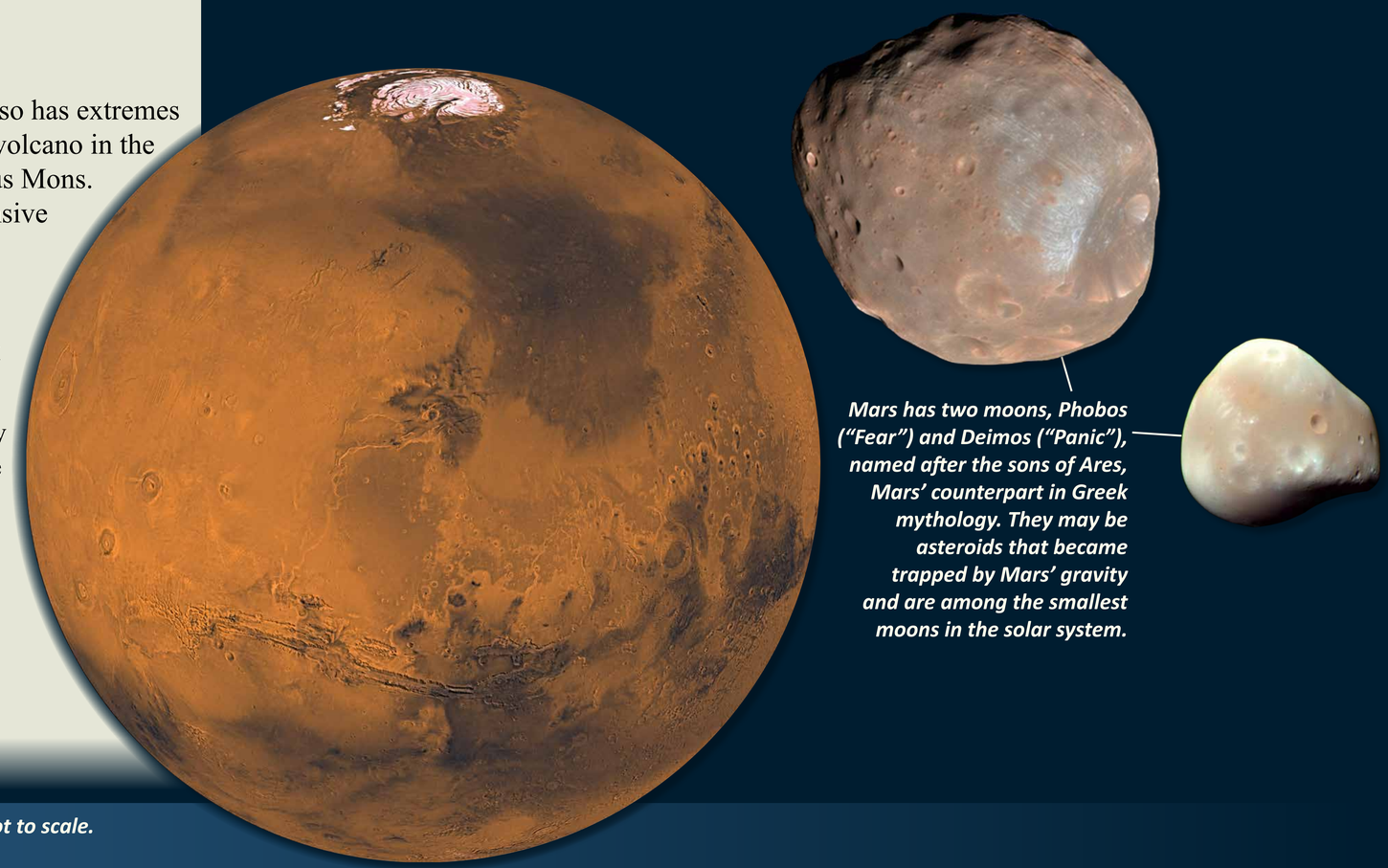
Period of Rotation (1 day): 24 hours, 37 minutes

Period of Revolution (around Sun) (1 year): 687 days

Mars is often called the Red Planet because of its iron oxide (rust) surface. It has high winds that cause planet-wide dust storms that can last many months. The poles are covered in solid carbon dioxide (dry ice) and water.

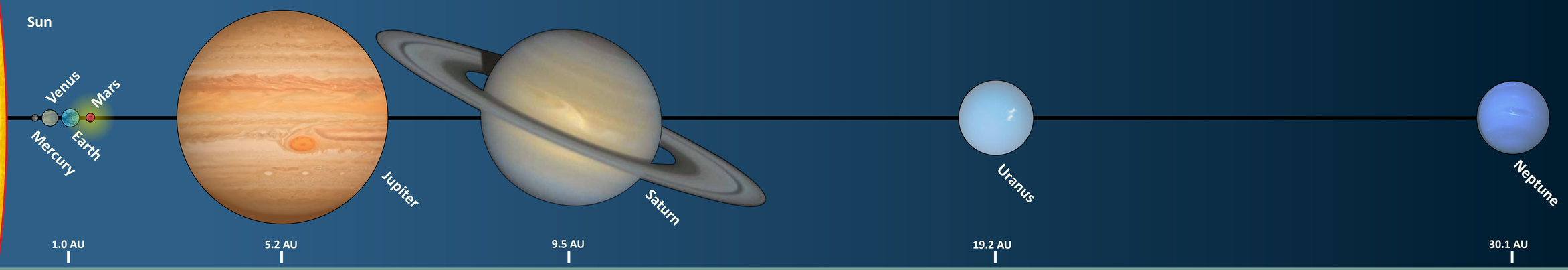
Martian geography also has extremes including the largest volcano in the solar system, Olympus Mons. There is also an extensive canyon system called Valles Marineris that is long enough to reach from New York to California.

Erosion patterns show that at one point there was liquid water on Mars meaning the climate was very different than today.



Mars has two moons, Phobos ("Fear") and Deimos ("Panic"), named after the sons of Ares, Mars' counterpart in Greek mythology. They may be asteroids that became trapped by Mars' gravity and are among the smallest moons in the solar system.

This shows the sizes of the planets in proportion to each other. The distances are not to scale. An Astronomical Unit (AU) is about 93 million miles (150 million km.)



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Photos: NASA / JPL-Caltech/ University of Arizona

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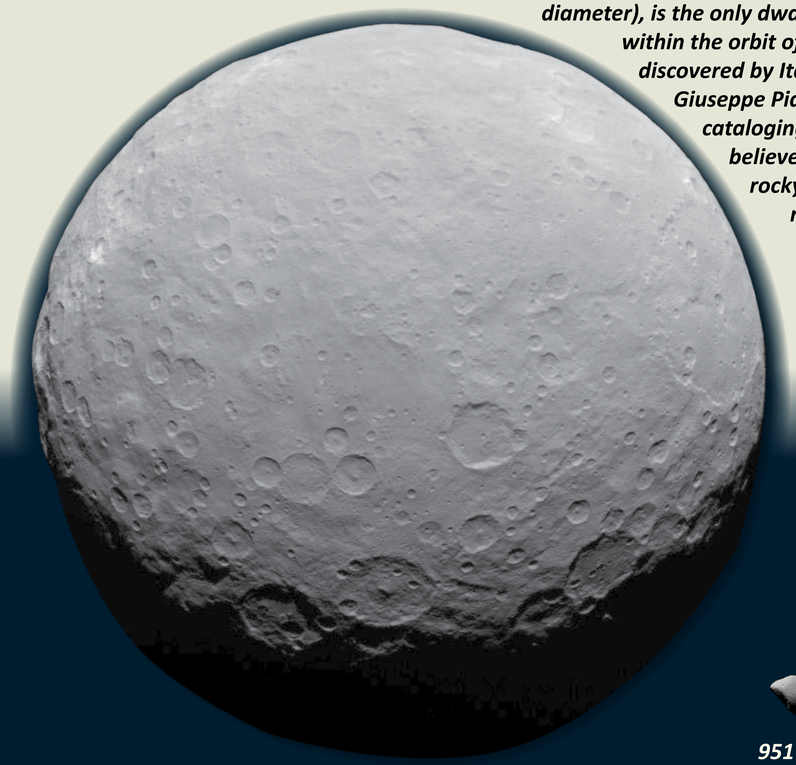
The Asteroid Belt

The asteroid belt hugs the orbital plane of the solar system, a great field of rock and ice between Mars and Jupiter.

It is composed of rock, dust, minerals and small quantities of ices ranging in size from tiny dust particles to oddly shaped chunks of conglomerates many miles across.

Asteroids are considered minor planets—an object that is neither a true planet nor a comet—that orbit within the Solar System. They are rocky remnants left over from the early formation of our Solar System. There are roughly one million known asteroids, most of which are located within the asteroid belt that spreads across 140 million miles between Mars and Jupiter.



Ceres, the largest known asteroid (590 mile (940 km) diameter), is the only dwarf planet located within the orbit of Neptune. It was discovered by Italian astronomer Giuseppe Piazzi in 1801 while cataloging stars. Scientists believe that Ceres has a rocky core with an icy mantle. It formed 4.5 billion years ago along with the planets.

Contrary to popular belief, the asteroid belt is mostly empty. The average distance between objects is 600,000 miles (965,606 km) or 76 times the Earth's diameter.

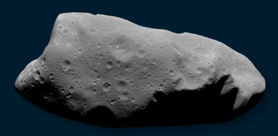
Asteroid impacts can have devastating effects on the Earth's living inhabitants. The large Chicxulub impact 66 million years ago is thought to have caused the mass extinction of the dinosaurs and many other forms of life on our planet.

4 Vesta

355.8 x 346.2 x 277.4 miles
572.6 x 557.2 x 446.4 km

1 Ceres

599.3 x 599.1 x 554.1 miles
964.4 x 964.2 x 891.8 km

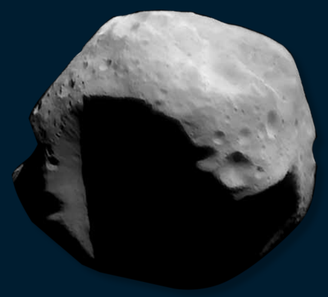


243 Ida

36.5 x 15.8 x 11.6 miles
58.8 x 25.4 x 18.6 km

951 Gaspra

11.3 x 6.5 x 5.5 miles
18.2 x 10.5 x 8.9 km

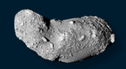


253 Mathilde

41 x 29.8 x 27.3 miles
66 x 48 x 44 km

433 Eros

20.5 x 8 x 8 miles
33 x 13 x 13 km



25143 Itokawa

0.3 x 0.1 x 0.1 miles
0.5 x 0.2 x 0.2 km

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Photos: NASA / JPL / JPL-Caltech / JHUAPL / JAXA / Ted Stryk / Emily Lakdawalla

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Jupiter ♃

The fifth planet from the Sun

Name: Jupiter is named for the Roman king of the gods.

Distance from Sun: 484 million miles (778 million km)

Size / Diameter: 86,880 miles (139,820 km).
318 times the mass of Earth. 2.5 times more massive than all the other planets in the solar system combined. Eleven Earth diameters would span Jupiter at its equator.
If Earth were the size of a grape, Jupiter would be as big as a basketball.

Average Temp: –234°F (–145°C)

Type: Gas planet of mainly hydrogen and helium.

Moons: There are 95 known moons orbiting Jupiter. Most are captured asteroids. The four largest, Io, Europa, Ganymede and Callisto, were first seen by Galileo Galilee with his telescope in 1610.

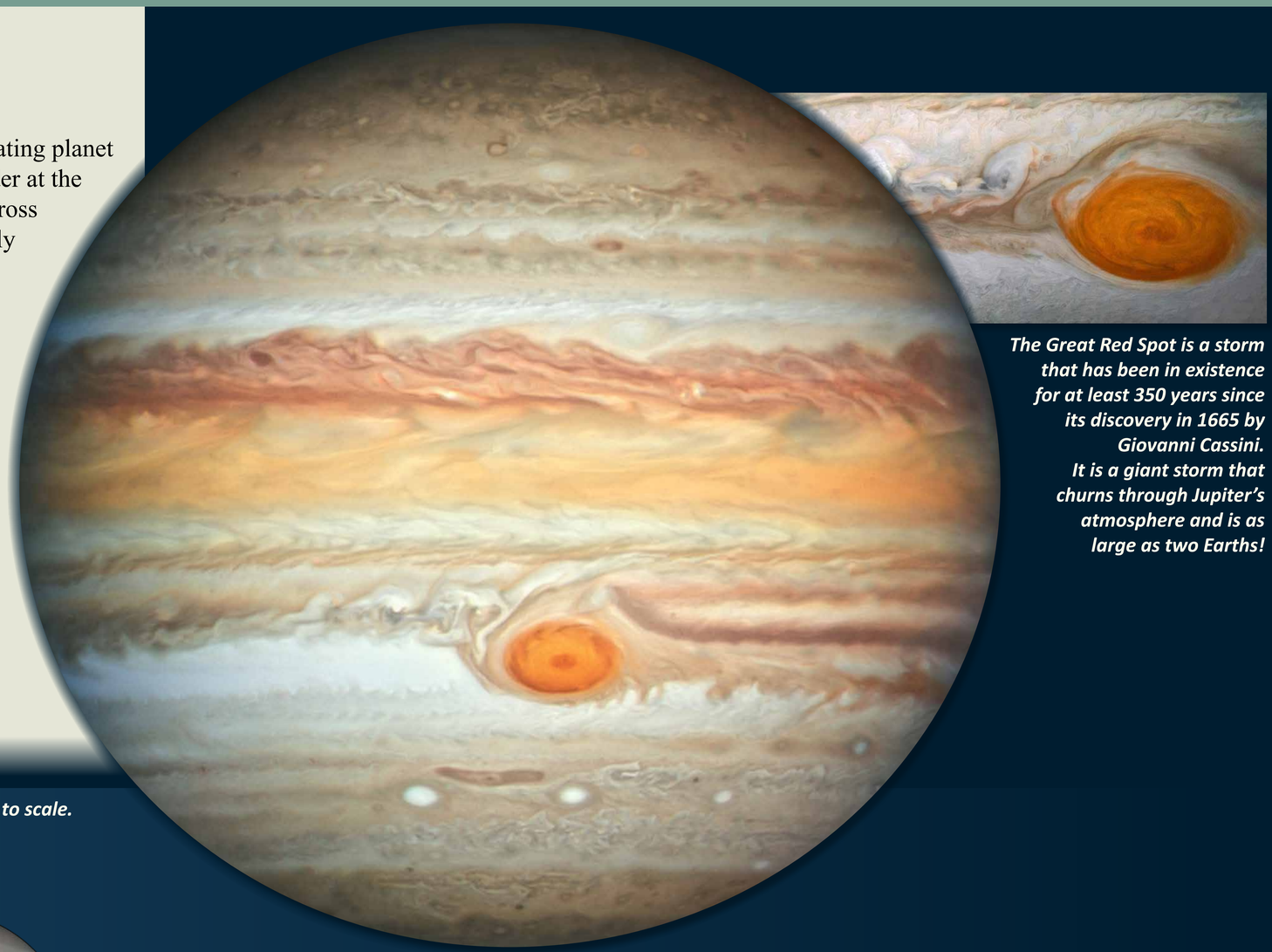
Rings: 4 sets of rings of dust and small rock pieces.

Period of Rotation (1 day): 9 hours, 55 minutes

Period of Revolution (around Sun) (1 year): 4,328 Earth days (almost 12 years)

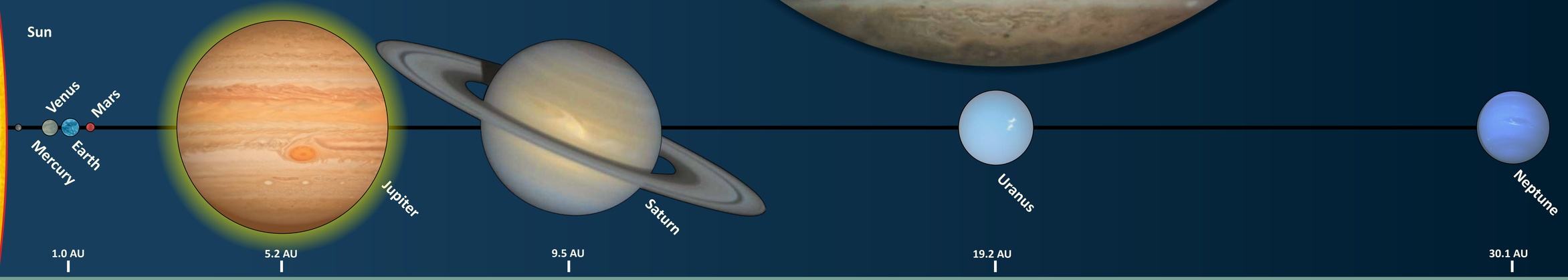
Jupiter is the fastest rotating planet making it oblate — wider at the equator compared to across the poles. This extremely fast rotation causes strong wind currents to produce bands of clouds encircling the planet. Changes in the bands can alter Jupiter's appearance.

Jupiter was the first planet to form. Its inward migration during the primordial Solar System impacted much of the formation history of the other planets.



The Great Red Spot is a storm that has been in existence for at least 350 years since its discovery in 1665 by Giovanni Cassini. It is a giant storm that churns through Jupiter's atmosphere and is as large as two Earths!

This shows the sizes of the planets in proportion to each other. The distances are not to scale. An Astronomical Unit (AU) is about 93 million miles (150 million km.)



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Photos: NASA / ESA / A. Simon, Goddard Space Flight Center / C. Go / Hubble Heritage Team / STScI / AURA

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Saturn ♄

The sixth planet from the Sun

Name: Saturn is named for the Roman god of agriculture and wealth who was also the father of Jupiter.

Distance from Sun: 886 million miles (1.4 billion km)

Size / Diameter: 150,000 miles (241401 km). It is the second largest planet with a diameter almost 9.5 times larger than Earth's.
If Earth were the size of a grape, Saturn would be about as big as a volleyball.

Average Temp: –288°F (–178°C)

Type: Gas planet of mainy hydrogen and helium.

Moons: Saturn has 146 known moons, 63 of which have formal names.

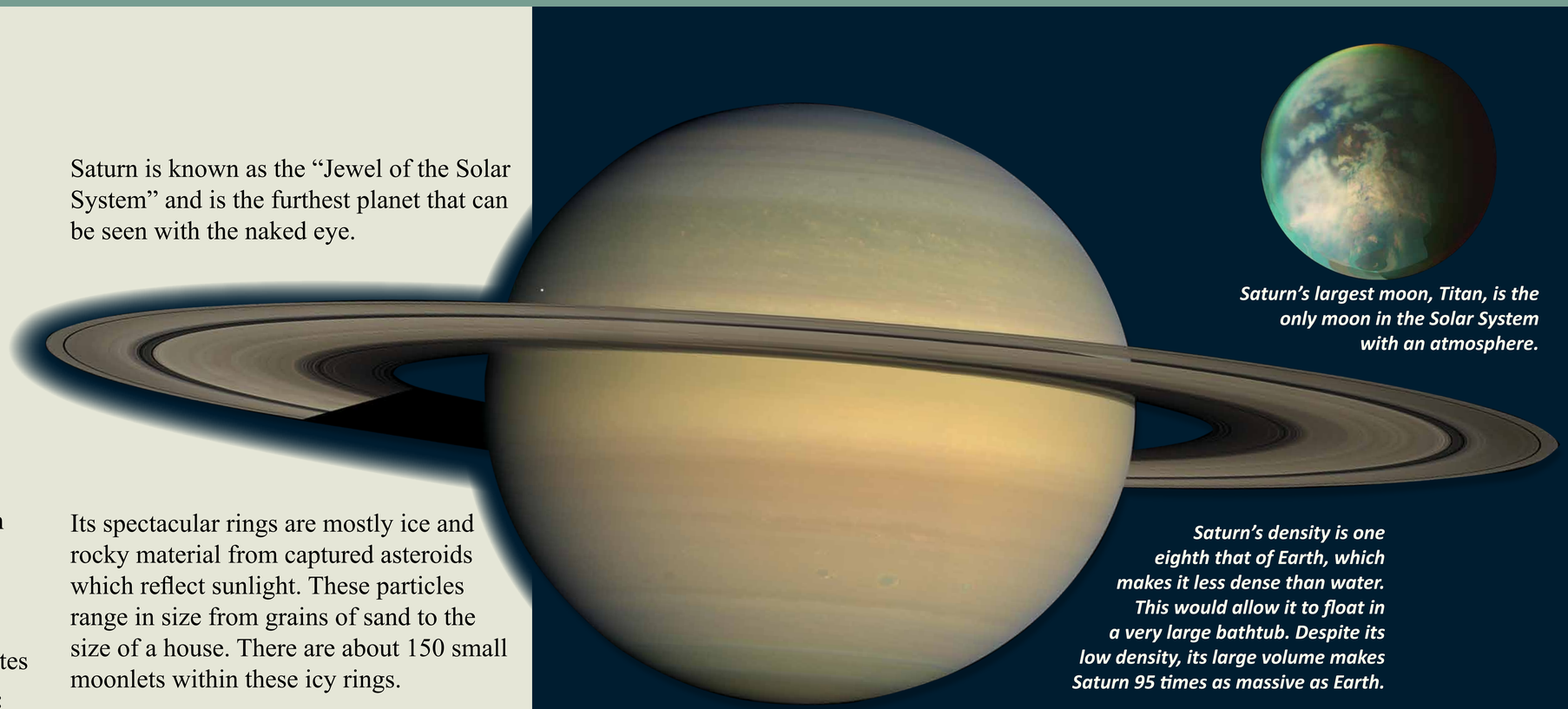
Rings: Saturn's rings are mostly ice and rocky material from captured objects.

Period of Rotation (1 day): 10 hours, 32 minutes

Period of Revolution (around Sun) (1 year): 10,585 Earth days (29 years)

Saturn is known as the "Jewel of the Solar System" and is the furthest planet that can be seen with the naked eye.

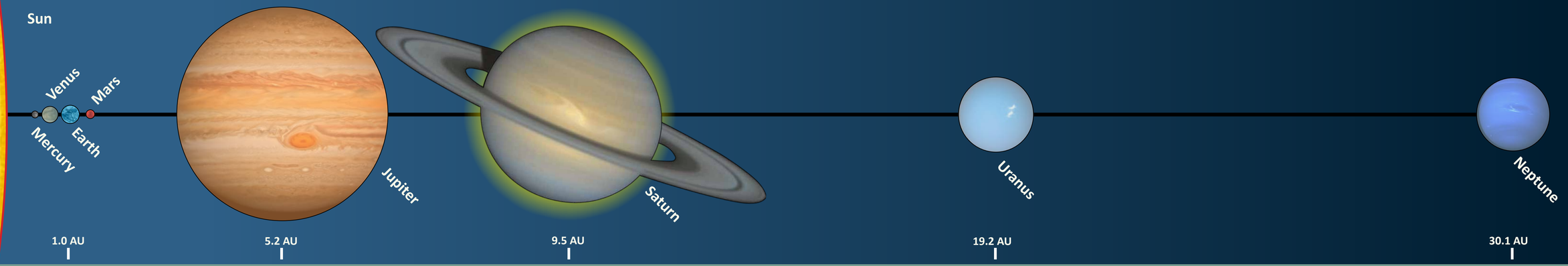
Its spectacular rings are mostly ice and rocky material from captured asteroids which reflect sunlight. These particles range in size from grains of sand to the size of a house. There are about 150 small moonlets within these icy rings.



Saturn's largest moon, Titan, is the only moon in the Solar System with an atmosphere.

Saturn's density is one eighth that of Earth, which makes it less dense than water. This would allow it to float in a very large bathtub. Despite its low density, its large volume makes Saturn 95 times as massive as Earth.

This shows the sizes of the planets in proportion to each other. The distances are not to scale. An Astronomical Unit (AU) is about 93 million miles (150 million km.)



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Photos: NASA / JPL / Space Science Institute / University of Arizona

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Uranus ♅

The seventh planet from the Sun

Name: Uranus is the only planet whose name is derived from a figure in Greek mythology, the Greek god of the sky, Ouranos.

Distance from Sun: 1.874 billion miles (3.015 billion km)

Size / Diameter: 31,590 miles (50839 km). Uranus is 4 times wider than Earth.
If Earth were the size of a grape, Uranus would be about as big as a softball.

Average Temp: –357°F (–216°C)

Type: An ice planet of water ice, methane and ammonia with a rock and ice core.

Moons: There are currently 28 moons orbiting Uranus with Miranda and Titania being the largest.

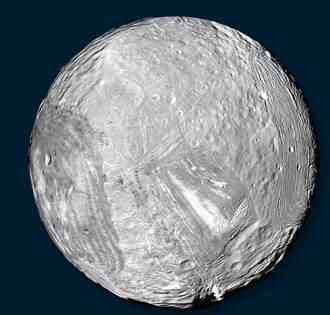
Rings: 13 known rings.

Period of Rotation (1 day): 17 hours, 14 minutes

Period of Revolution (around Sun) (1 year): 30,660 days (82 years)

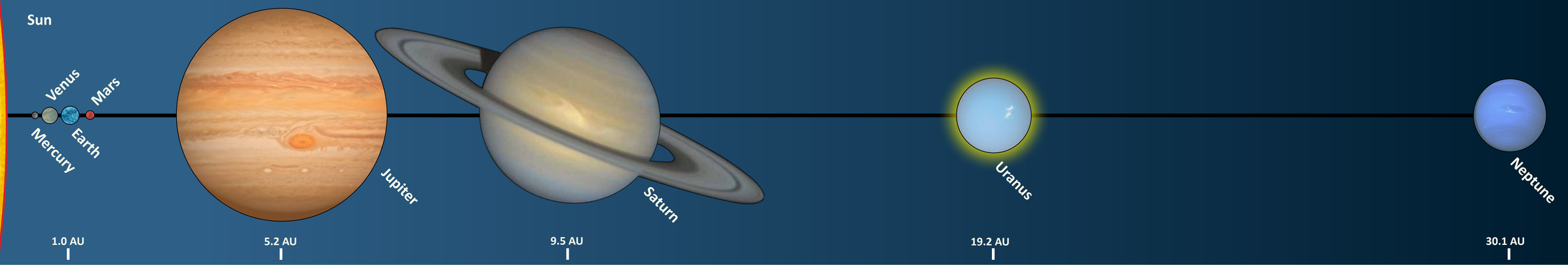
Uranus rotates on its side causing the most extreme seasons in the solar system, with summer and winter lasting for 21 years each. However, Uranus is so far from the sun that the seasonal temperature variance is only minimal.

The orbit of Uranus's moons are also tilted. The moon Miranda has the tallest cliffs in the solar system, twice the height of Mount Everest.



Uranus' moons Titania (above) and Miranda (below)

This shows the sizes of the planets in proportion to each other. The distances are not to scale.
An Astronomical Unit (AU) is about 93 million miles (150 million km.)



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Photos: NASA / JPL / JPL-Caltech / GSFC

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Neptune ♆

The eighth planet from the Sun

Name: Neptune is named for the Roman god of the sea.

Distance from Sun: 2,793 billion miles (4,495 billion km)

Size / Diameter: 30,598 miles (49,242 km). Four times wider than Earth.
If Earth were the size of a grape, Neptune would be about as big as a baseball.

Average Temp: -353°F (-214°C)

Type: An ice planet of water ice, methane and ammonia.

Moons: Currently 16 known moons. Triton is the largest.

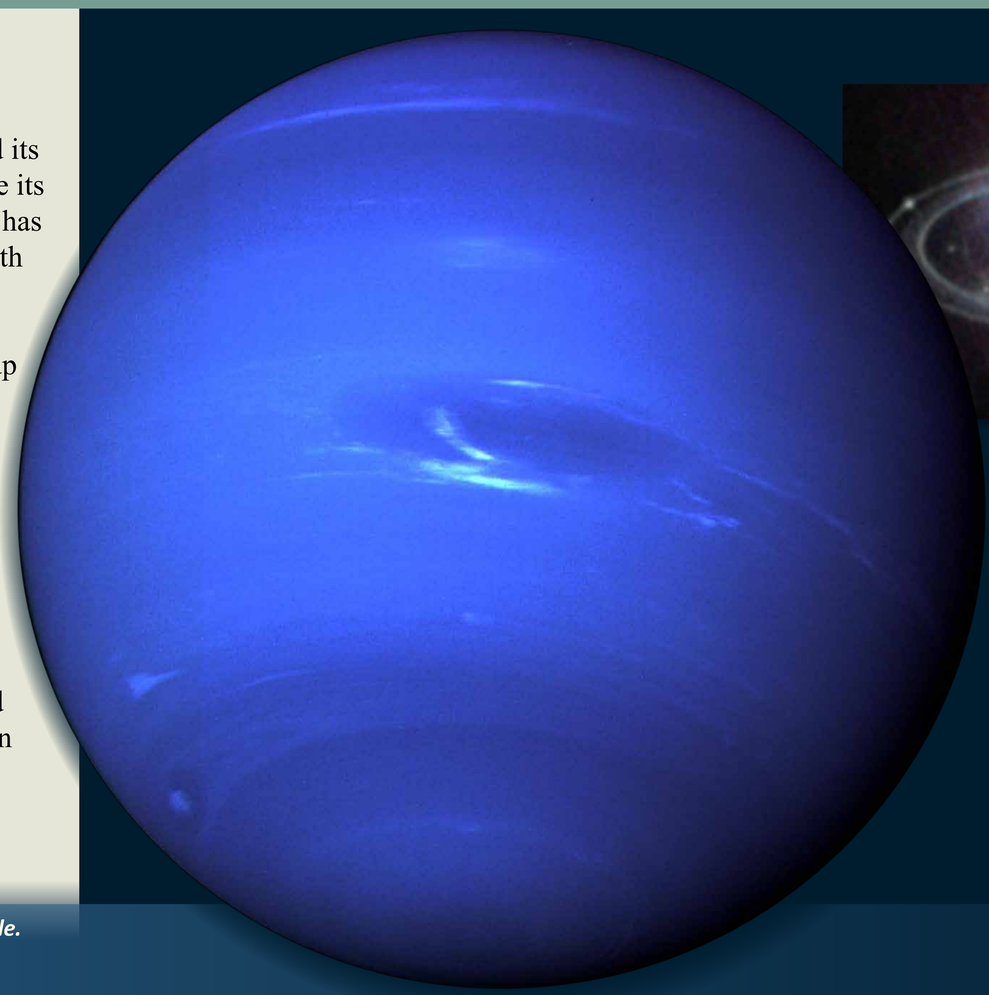
Rings: Neptune has several rings which consists of ice particles coated with silicates or carbon-based material.

Period of Rotation (1 day): 16 hours

Period of Revolution (around Sun) (1 year): 60,225 days (165 years)

In 2011, Neptune completed its 165-year orbit, the first since its discovery in 1846. Neptune has a very active atmosphere with numerous large storms and high-speed winds tracking across the planet at speeds up to 1,300 miles per hour (1,931 km/hr). One of Neptune's storms was the largest ever seen and was recorded by the only spacecraft to ever visit the planet, Voyager 2 in 1989.

Neptune's moons are named after sea gods and nymphs in Greek mythology.



Neptune has at least five main rings and four more ring arcs that are made up of small dust and ice particles.

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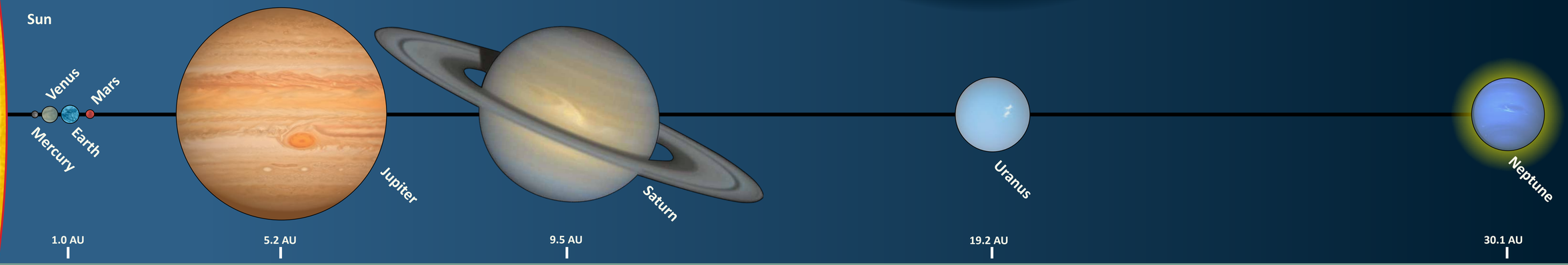

Photos: NASA / JPL / ESA / CSA / STScI

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Beyond Neptune

Beyond Neptune's orbit lies the Kuiper Belt, the Oort Cloud and the rest of our Galaxy...

The Kuiper Belt is similar to the asteroid belt, but much larger - up to 20 times as wide and 200 times as massive. Astronomer and planetary scientist Gerard Kuiper first predicted a large belt of objects past Neptune in 1951. The belt was named after him following the discovery of the first Kuiper Belt Object (KBO 1992QB1) in 1992 by astronomers David Jewitt and Jane Luu. Note: The dwarf planet **Pluto** is also considered a Kuiper Belt Object.

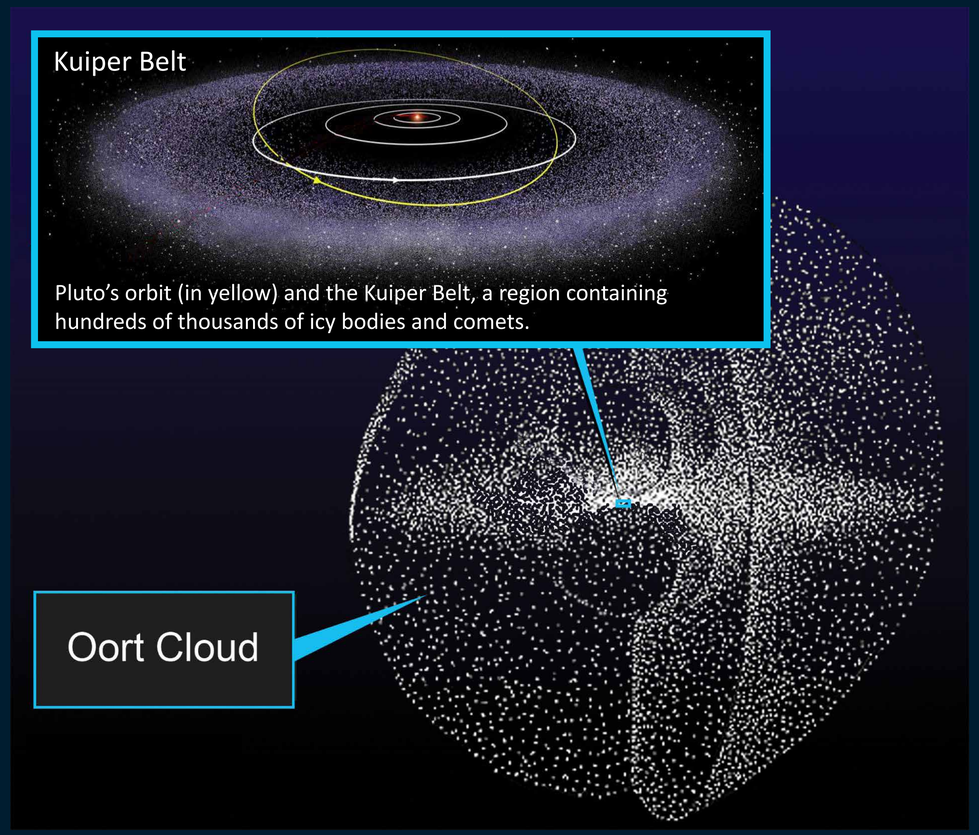
The Oort Cloud appears to be a sphere of icy debris that surrounds the solar system and may contain trillions of objects. It dwarfs the Kuiper Belt by comparison, beginning about 2,000 AU (Astronomical Units) from the Sun and continuing out to 100,000 AU or 3 light years.

An Astronomical Unit (AU) is the distance from the Earth to the Sun or about 93 million miles.

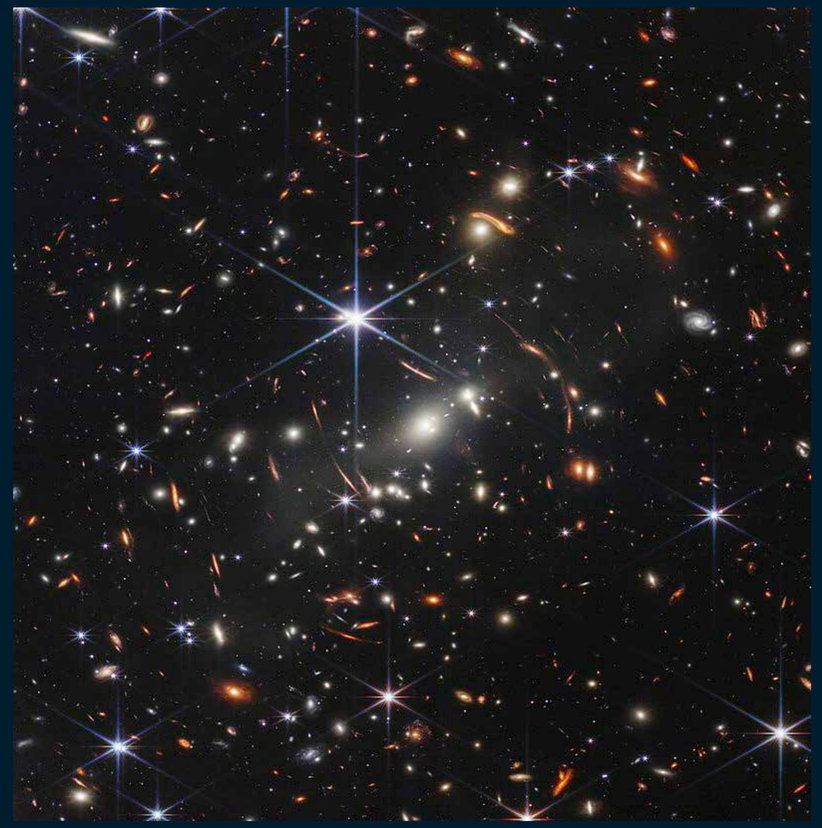
The nearest star to our Solar System - Proxima Centauri is 4.3 light years away.

Beyond the Oort Cloud lies the rest of our galaxy and then the entire universe, which is about 13.8 billion years old and is estimated to be 92 billion light years in diameter.

Our galaxy contains hundreds of billions of stars… and there are hundreds of billions of galaxies in the universe!



Dwarf Planet Pluto - a Kuiper Belt Object
Distance from the Sun: 3.7 billion miles (5.9 billion km)



James Webb Space Telescope – Deep Field image reveals thousands of galaxies. July 11, 2022.

New Jersey Department of Environmental Protection
State Parks, Forests & Historic Sites

Photos: NASA / JPL / GSFC / Johns Hopkins University Applied Physics Laboratory / Southwest Research Institute

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