

Our Solar System

Facts for students



Our Solar System is our local neighbourhood in space and is dominated by the Sun.

The Sun is huge – about one million Earths could fit inside it, and it makes up about 99.8 percent of our Solar System’s mass.

Eight major planets circle the Sun. These are divided into two groups:

- The inner Solar System – the small rocky planets (Mercury, Venus, Earth and Mars).
- The outer Solar System – the massive gas giants beyond the asteroid belt (Jupiter, Saturn, Uranus and Neptune).

Apart from Mercury and Venus, all the planets have moons. In addition, there are dwarf planets, like Pluto, and countless numbers of smaller bodies, including asteroids and comets. Astronomical observations from Earth and robotic exploration spacecraft have revealed that each planet has its own unique characteristics, but there is still much more to learn.



The planets

Here are some facts about each of the planets.

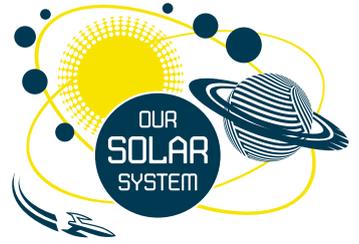
Mercury

- Mercury is the smallest planet in our Solar System (about 4,900 km in diameter) and the closest to the sun.
- It is a rocky planet with a sun scorched, wrinkly surface.
- Mercury takes just 88 Earth days to orbit the Sun, but it rotates very slowly – a “day” on Mercury is 58 Earth days long.
- At night time Mercury’s surface temperatures can drop to -173°C , but in the daytime they can reach 427°C .
- Mercury has no atmosphere and its arid (dry) surface is scarred by countless asteroid, meteor and comet impacts.



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Venus

- Venus is similar in size to Earth, with a diameter of 12,100 km.
- It is the hottest world in the Solar System with surface temperatures reaching 462°C. That's hot enough to melt lead! Venus became this hot, as its thick carbon dioxide atmosphere traps heat like a greenhouse.
- A “year” on Venus is 225 Earth days long, but the planet spins so slowly (and in the opposite direction to the spin of most of the other planets) that it takes 243 Earth days to complete one rotation. This means that one Venus day (rotation) is longer than its year (orbit time).
- Observations using radar have revealed that there are thousands of volcanoes on the surface of Venus, some up to 240 km in diameter. Evidence strongly suggests that volcanic activity is still occurring.
- Seen from Earth, Venus is the brightest object in the night sky apart from the Moon.



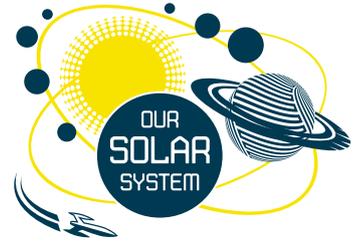
Earth

- Earth is the largest of the “terrestrial”, or rocky, planets (12,742 km in diameter), and has the greatest density of any planet in the Solar System.
- Earth is the only world in the universe where life is currently known to exist.
- The atmosphere is composed mainly of nitrogen (78 percent) and oxygen (21 percent).
- With surface temperatures ranging from -88 to 58°C, Earth is the only place in the Solar System where water exists in all three forms – solid, liquid and gas.
- Our planet only has one moon, with a radius about one quarter of the Earth's, making it the largest moon compared to its parent planet.



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Mars

- At 6,799 km Mars is about half the diameter of the Earth.
- Mars has a surface temperature range of -125 to -20°C.
- A day on Mars is about 40 minutes longer than an Earth day, and it takes 687 days to orbit the Sun.
- Mars may once have been Earth-like, but has now lost its surface water and possesses only a very thin carbon dioxide atmosphere. Most of Mars' atmosphere was either oxidised into its iron rich surface (forming the rusty red colour we see today) or lost to space over time due to Mars' weak gravity.
- Orbiting spacecraft and rovers have provided considerable evidence that there was once water flowing on the surface of Mars; water may even exist today, frozen as permafrost beneath the surface.
- Mars has seasons, like the Earth, and polar caps composed of carbon dioxide ice and water ice. Mars boasts the largest volcano in the Solar System, Olympus Mons, which is 25 km tall (almost three times the height of Mt Everest).
- Mars has two tiny moons, Phobos and Deimos, which were discovered in 1877 and appear to be captured asteroids.



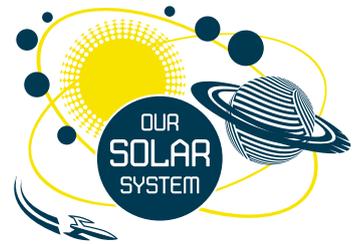
Jupiter

- The largest planet in the Solar System (with an equatorial diameter of 141,000 km), Jupiter is a “gas giant” – a huge ball of hydrogen and helium gas with possibly a small rocky or icy core.
- One thousand Earths could fit inside Jupiter.
- A day on Jupiter is just 10 hours long, but it takes 12 Earth years to circle the Sun.
- The temperature at the top of Jupiter's clouds is -108°C. Massive lightning storms have been observed on Jupiter, as well as auroras at its north and south poles.
- Jupiter has a ring system consisting of four rings.
- Sixty-seven moons have been discovered around Jupiter so far. Its four largest moons, which were first seen by Galileo in 1610, are fascinating worlds in their own right. These moons are called Ganymede (which is larger than Mercury), Callisto (a ball of rock and ice) Io (a boiling world of active volcanoes and lava lakes) and Europa (with a cracked, icy shell believed to cover an ocean of liquid water which may possibly harbour life).



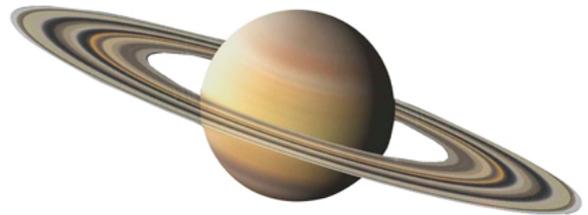
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Saturn

- Saturn is the sixth planet from the Sun, has an equatorial diameter of 120,536 km and is comprised primarily of hydrogen, but its upper cloud layers include ammonia and water ices.
- Saturn takes 10 hours 39 minutes to complete one rotation and 29.45 Earth years to orbit the Sun.
- Like Jupiter, Saturn has complex cloud bands (with a temperature of -139°C) and massive storms, lightning and auroras.
- Saturn is most well-known for its glorious and complex ring system, which is made up of billions of pieces of water ice ranging in size from a centimetre to chunks the size of icebergs. The rings are very wide (about 100,000 km across), but not very deep, being less than a kilometre thick.
- Saturn has 62 known moons, some of which play an important part in shaping the structure of the ring system.
- Saturn's largest moon, Titan, is the second largest in the Solar System and has a dense atmosphere made up of nitrogen and methane. Methane exists on Titan in solid, liquid and gaseous states (just like water on Earth) and there are rivers and lakes of liquid methane on its surface. Titan is considered a possible location for life to evolve, though it would be very different from life on Earth.



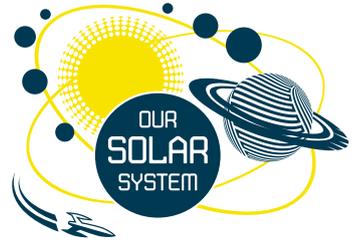
Uranus

- Uranus was the first planet to be discovered using a telescope. It was found by Sir William Herschel in 1781. It is an unusual world, tipped on its side by an ancient impact.
- With an equatorial diameter of 50,000 km, Uranus rotates every 17 and a quarter hours (in a counter-clockwise direction, like Venus) and takes 84 Earth years to complete its orbit of the Sun.
- Uranus has a smoggy atmosphere of hydrogen, helium and methane over an icy interior. It has the coldest planetary atmosphere in the Solar System, with a minimum temperature of -224.2°C .
- Uranus has 13 known rings, made of much darker particles than the rings of Jupiter and Saturn, perhaps the result of the destruction of an ancient moon by an impact.
- Uranus has 27 known moons. Titania, less than half the size of our Moon, is the largest, but Miranda is the most interesting, with its tortured surface of deep fault canyons, terraced layers, and a chaotic variation in surface ages and features.



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Neptune

- Neptune, the outermost of the major planets, was discovered by telescope (in 1846, by Urbain Le Verrier and Johann Galle) as the result of mathematical calculations.
- It is a little smaller than Uranus (equatorial diameter 49,528 km) and similar in composition, but its atmosphere is wracked by fierce winds (measured at travelling 600m per second) and giant storms.
- Neptune takes 164.8 years to complete an orbit about the Sun, but its day lasts just over 16 hours.
- Neptune has a thin system of five rings, composed of ice particles and dust grains, and 14 known moons. Triton, the largest moon, has geysers spewing out nitrogen and dust from below the surface.



Pluto

- Like Neptune, Pluto was also discovered mathematically (by Clyde Tombaugh), but not until 1930.
- Once considered a planet, Pluto is now categorised as a “dwarf planet” due to its small size (an estimated diameter of 2,370 km).
- Pluto has five known moons.
- Pluto was finally explored in 2015. Amazing images of Pluto and its large moon Charon have revealed two very different icy worlds, with complex and unexpected geology, demonstrating that we still have much to learn about our Solar System.



What else is out there?

Apart from the planets, what else lies within our Solar System? The answer is lots of interesting things, including the Sun, asteroids, comets and meteoroids.

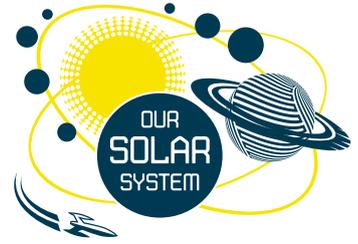
The Sun

The Sun is the centre of our Solar System. It is a star and, like all stars, it does not have a solid surface. Instead it is a ball of gas held together by its own immense gravity, and generates heat and light. Our Sun is a medium-sized star, and its yellow colour indicates its temperature is in the medium range for stars: really hot stars appear blue-white in colour, while the coolest stars are red.



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What about other stars?

We have all seen stars light up the sky at night, but exactly what are they? Stars do not have solid surfaces, they are balls of gas held together by their own gravity. Our Sun is a star. All stars, like our Sun, give out heat and light.

However, did you know that the ONLY star in our Solar System is the Sun? We can see other stars in the night sky, but they are NOT part of our Solar System, as even the closest are many light years distant from us. We have discovered that many stars have their own Solar Systems around them, but they are not part of ours.

Asteroids

Asteroids are material left over from the formation of the Solar System. They are very much smaller than planets and most of them orbit the Sun in an area between Mars and Jupiter known as the Asteroid Belt. Asteroids are solid, rocky objects that don't have any air or atmosphere. If all the asteroids in our Solar System were joined together, they would still be smaller than the Earth's Moon.



Comets

Comets are extremely cold balls of frozen gas, rock and dust. They warm up as they move near the Sun, releasing gases and dust that form tails thousands of kilometres long. Halley's Comet is a famous example. It can be seen from Earth with the naked eye when its orbit brings it into view approximately every 75 years. The next opportunity to see it will be around the year 2061!



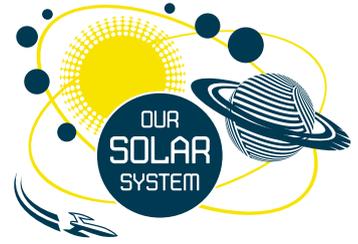
Meteoroids

Meteoroids are small chunks of rock and debris moving around the Solar System. When a meteoroid enters the Earth's atmosphere and begins to burn up it becomes a meteor. Meteors are often seen as a streak of light in the night sky, and are sometimes called "shooting stars". Meteors that do not completely burn up in the atmosphere and land on the Earth are called meteorites.



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What else?

There are many other objects in space that humans have placed there, such as the International Space Station and numerous satellites and planetary probes. There is also lots of “space junk”, including old rocket pieces, bits that have broken off spacecraft and old satellites.

Space exploration and Australia’s involvement

The first spacecraft to orbit the Earth was Sputnik 1 which was launched by the Soviet Union in October 1957. Sputnik 1 carried no passengers, but by November of that year the Russians had launched a dog named Laika into space onboard Sputnik 2. It wasn’t until April 1961 that the first human being was launched into space. The astronaut was Russian Yuri Gagarin who made his famous flight in a Vostok spacecraft which returned him safely to Earth beneath a huge parachute.



In 1969, American astronauts, Neil Armstrong, “Buzz” Aldrin and Michael Collins travelled to the Moon onboard the Apollo 11 spacecraft. It was on this flight that Neil Armstrong and “Buzz” Aldrin became the first human beings to walk on the surface of the Moon.



NASA tracking stations in Australia have played an important part in the exploration of the Solar System. Tracking stations located at Honeysuckle Creek and Tidbinbilla (near Canberra), as well as the Parkes radio telescope played an important role in tracking and receiving data from Apollo 11. At the time of the Moon landing, these facilities were in the best position to receive the broadcasts from the Moon. This made them critical to the success of the mission and enabled Australia to send the very first images of the Moon landing to the entire world!



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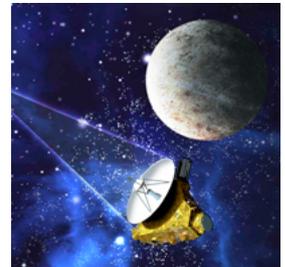
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Did you know that Australian astronauts have been involved in several important missions into space? Dr. Paul Scully-Power is a scientist who has the distinction of being the first Australian-born person to journey into space. He was an oceanographer who was a member of the crew on the 13th space shuttle mission which studied the Earth in 1984. Dr Andrew Thomas is a mechanical engineer who made four space shuttle flights between 1996 and 2005. He spent three months on the Russian Mir space station and also made spacewalks to help construct the International Space Station.



Although people have been to the Moon, the rest of our Solar System has been explored by space probes that are remarkable robotic explorers and Australian tracking stations have been part of all these amazing missions. Since the 1990s, remotely controlled rovers have been exploring the surface of Mars, giving us first-hand information of conditions on our neighbouring planet. In July 2015, Australia's Tidbinbilla complex received the first ever photos of the dwarf planet Pluto, beamed back from the "New Horizons" space probe after a staggering 10 year journey. You may have heard about this event in the media and even seen some of the images.



What an amazing Solar System we live in!

