

SKY WATCHING

The Planets

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Glossary words

When a word is printed in **bold**, click on it to find its meaning.

WHAT DOES IT MEAN ?

Words within a **box** are explained in the 'What does it mean?' panel at the bottom of the page.

Sky watching

When we sky watch, we look at everything above Earth. This includes what is in Earth's **atmosphere** and the objects we can see beyond it, in **space**.

Why do we sky watch?

Sky watching helps us to understand more about Earth's place in space. Earth is our home. It is also a planet that is part of a space neighbourhood called the **solar system**. When we sky watch we learn about Earth, and our neighbours inside and outside the solar system.

What objects are in the sky?

There are thousands of objects in the sky above Earth. These are Earth's neighbours – the Sun, the Moon, planets, stars and flying space rocks (**comets**, **asteroids** and **meteoroids**). Some can be seen at night and others can be seen during the day. Although some are visible with the human eye, all objects must be viewed through a telescope to be seen more clearly.

When and how can we see objects in the sky?				
Object in the sky	Visible with the human eye	Visible only through a telescope	Visible during the day	Visible at night
 Earth's atmosphere	X	X	X	X
 Sun	✓ (Do not view directly)	X (View only with a special telescope)	✓	X
 Moon	✓	X	Sometimes	✓
 Planets	Sometimes	Sometimes	Sometimes	✓
 Stars	Sometimes	Sometimes	X	✓
 Comets	Sometimes	Sometimes	X	✓
 Asteroids	Sometimes	Sometimes	X	✓
 Meteoroids	Sometimes	Sometimes	X	✓

WHAT DOES IT MEAN



space the area in which the solar system, stars and galaxies exist, also known as the universe

The planets

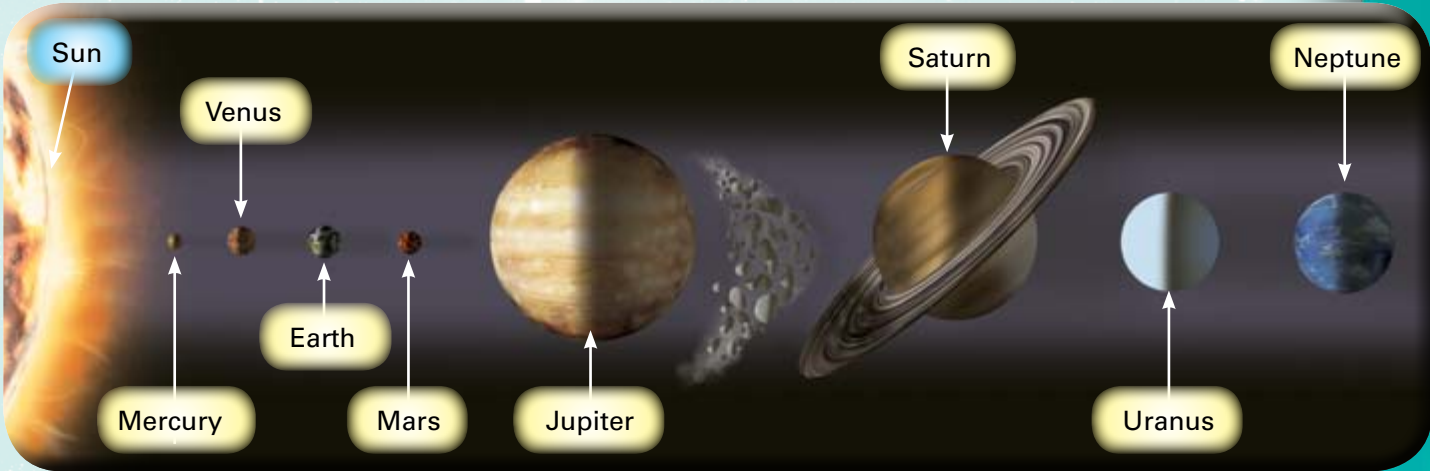
The planets are space objects we can see in the night sky. Most are visible with the human eye. However, some can only be seen through a telescope. The planets in our solar system are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.

Planet watching

Humans have always watched the planets. Since the invention of telescopes 500 years ago, we have been able to see them more clearly. Now, because of space exploration, we have found out even more about the planets. We know what they are made of, what their atmospheres are like and how they affect Earth.



⚠ Sky watching can be done during the day or night, with or without a telescope. Just look up!



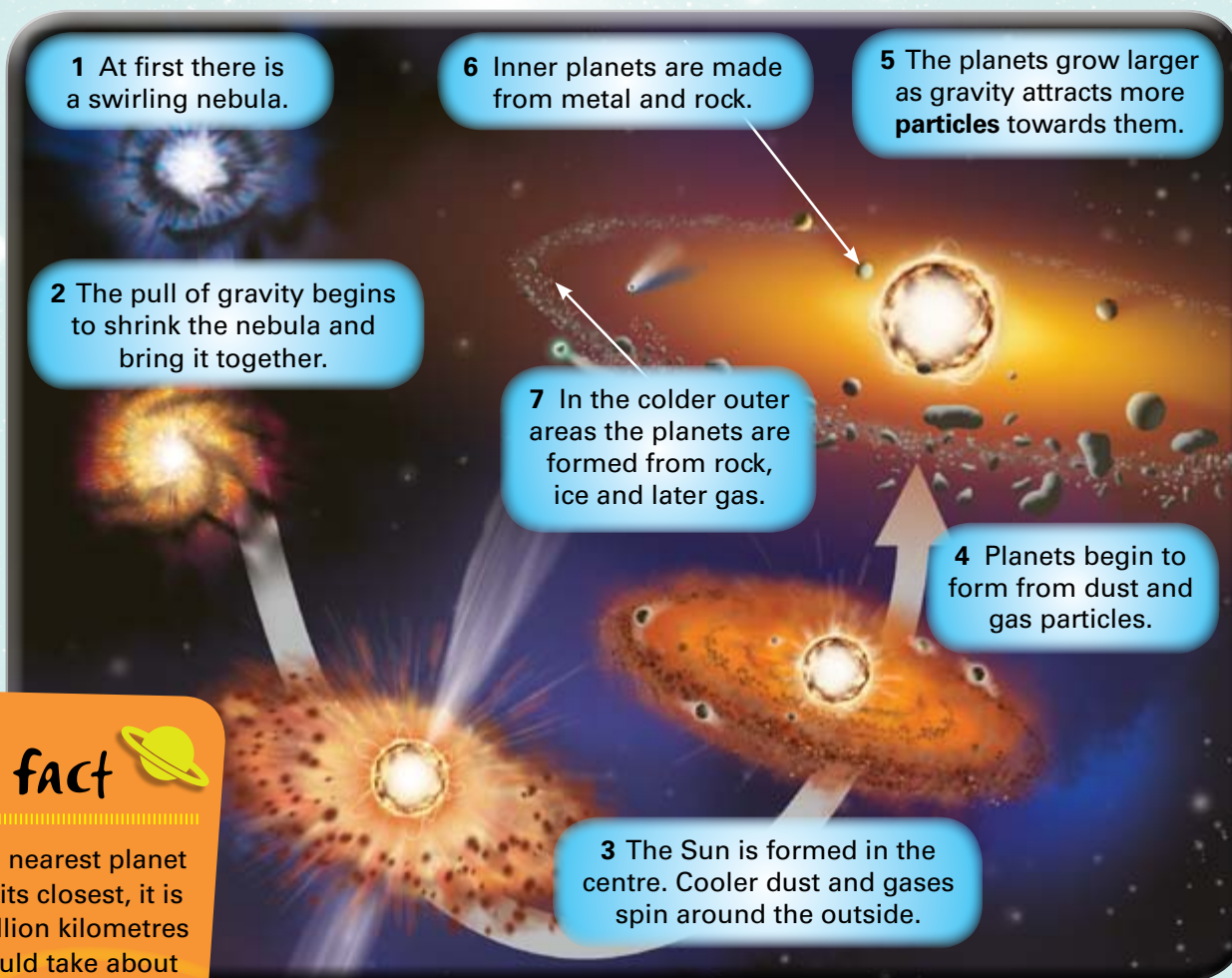
⚠ The planets are some of our closest neighbours in space. This diagram shows the approximate relative sizes of the Sun and the planets. The distances between them are not to scale.

WHAT ARE THE PLANETS?

The planets formed after the Sun was born, billions of years ago. They are huge balls made of rock or gas that **orbit** the Sun.

The planets were formed from leftover gas and dust

The **solar system** formed from a huge, spinning cloud of gas and dust called a **nebula**. The Sun was born from this nebula about 4.7 billion years ago. About 4.6 billion years ago, **gravity** slowly brought the leftover gas and dust circling the Sun together, to form the planets.



Planet fact

Venus is the nearest planet to Earth. At its closest, it is about 38 million kilometres away. It would take about 40 years to drive there from Earth in a car.

It took 80 000 years for the first planet, Mercury, to form from the particles of gas and dust orbiting around the Sun.

WHAT DOES IT MEAN



orbit to travel around another, larger space object

gravity the force that attracts all objects towards each other

The planets are balls of rock and gas that orbit the Sun

Besides Earth, there are seven planets that orbit the Sun. Earth and three other inner planets, Mercury, Venus and Mars, are made up mostly from rock. Jupiter, Saturn, Uranus and Neptune orbit further from the Sun. They are made up mostly of gases.

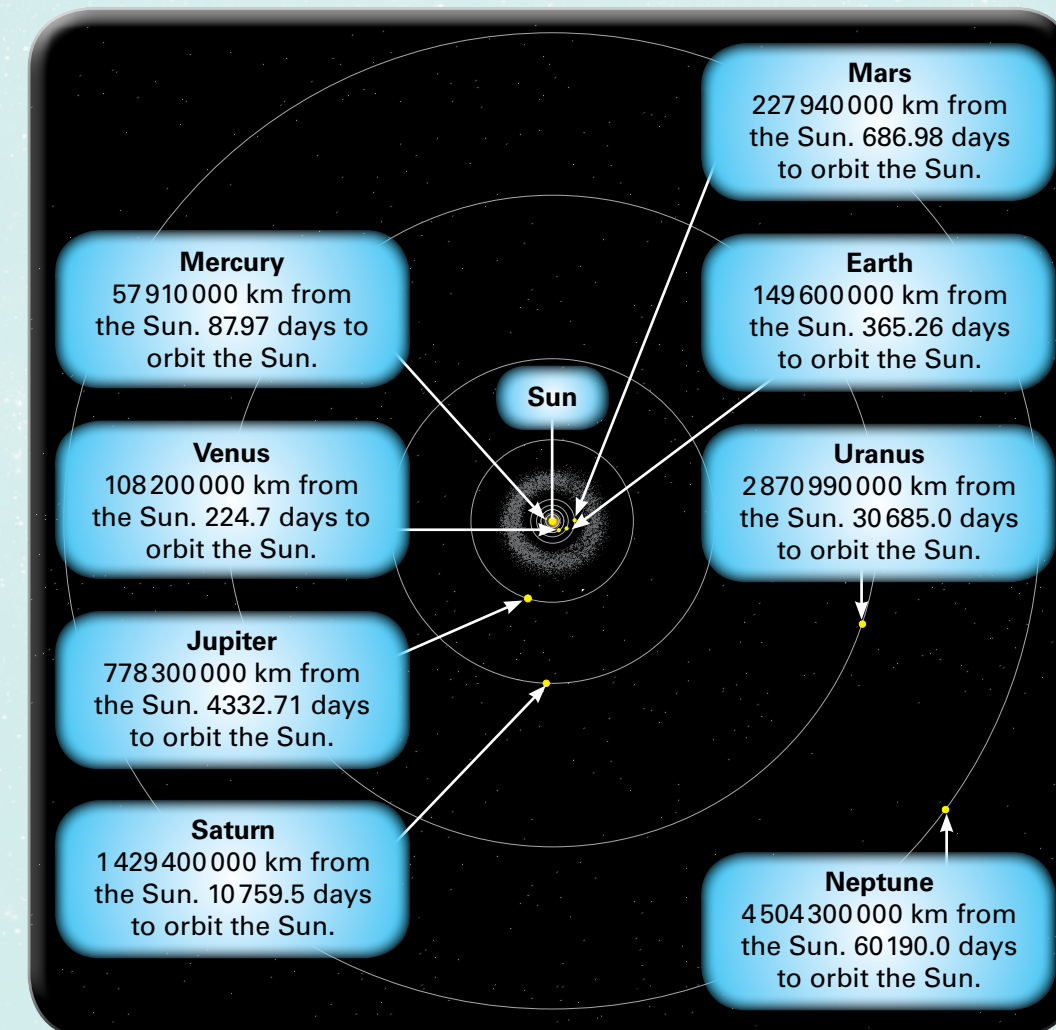
The Sun's gravity keeps the planets in orbit

The planets orbit the Sun because its gravity pulls on them as they move through **space**. The Sun's **gravitational pull** keeps the planets on the same orbital paths and stops them from flying off into space.

FAMOUS SKY WATCHERS



Johannes Kepler, a German astronomer, discovered that the planets' orbits are elliptical, or oval-shaped. He found that the further away a planet is from the Sun, the slower its speed. He also discovered that the size of a planet affects the length of its orbit.



Planets that are far away from the Sun take much longer to complete their orbit than planets that are close.

WHAT DO THE PLANETS LOOK LIKE FROM EARTH?

Five planets can be seen from Earth with the human eye. They look like small points of light in the night sky. The other two planets can only be seen through a telescope. None of the planets stay in the same place in the sky.

The planets look like bright lights in the sky

Mercury, Venus, Mars, Jupiter and Saturn can all be seen from Earth with the human eye. These planets seem to shine like stars but they do not 'twinkle' like stars. This is because stars make their own light, while the planets just reflect the light of the Sun. Stars twinkle because their light comes from a long way away and it is changed when it enters the Earth's **atmosphere**. The light from planets is closer and steadier.

How bright the planets appear in the sky depends on how far away they are from Earth and how large they are.

The planets move through the sky

While the stars stay in the same place in the sky each night, the planets change position. Different planets can be seen in the sky at different times of the year. They also move very slowly across the sky when they are visible.

Planet fact

The word 'planet' comes from the Ancient Greek word *planetes*, which means wanderer. The Ancient Greeks were sky watchers and many of the names for the planets and the stars come from them.



Planets such as Venus move across the night sky over the course of several months.

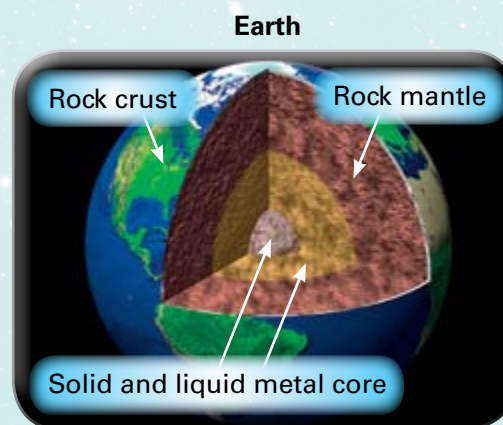
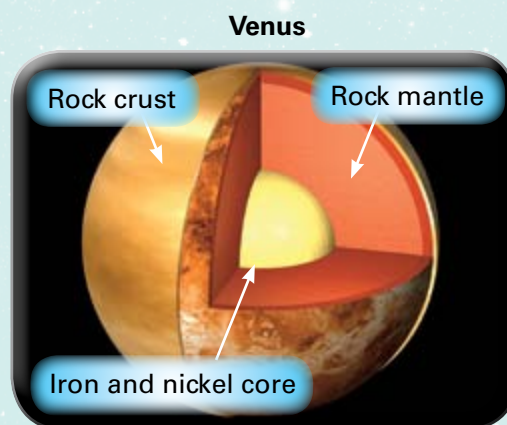
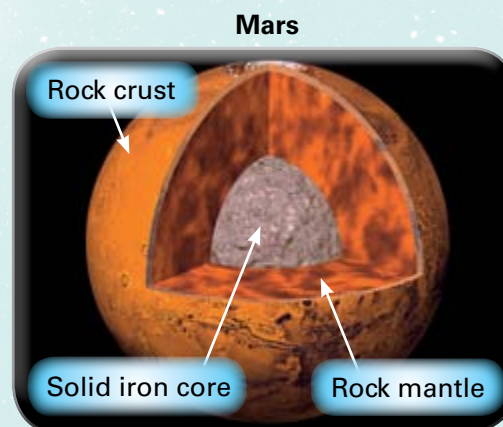
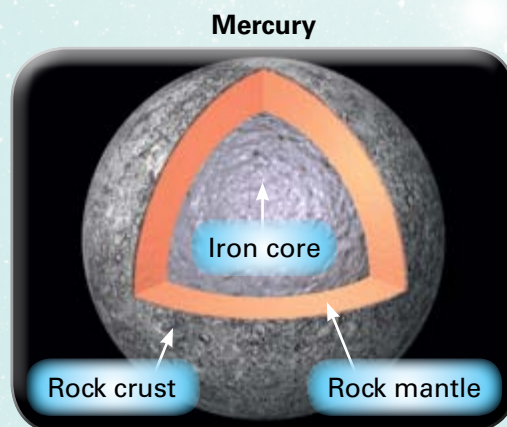
WHAT ARE THE PLANETS MADE OF?

From Earth, we cannot tell what is inside the planets. Scientists gather information about the planets using telescopes and space exploration. They know that the planets close to the Sun are mostly made of rock. Those further away are mostly made of gas.

The closest planets are rocky

Rocky planets formed in the area closest to the Sun. This is because only metal and rock were able to stand the heat in this part of the **solar system**. All of the planets that formed there are made up of a metal **core**, with a **mantle** and a **crust** of rock. The rocky planets are Mercury, Mars, Venus and Earth.

The rocky planets are alike, but Mercury has the largest metal core and the smallest mantle.



WHAT DOES IT MEAN



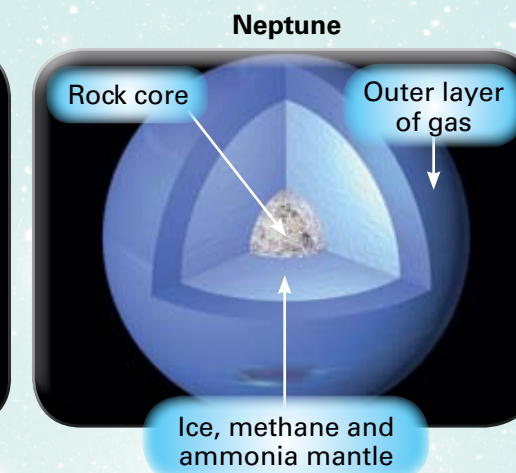
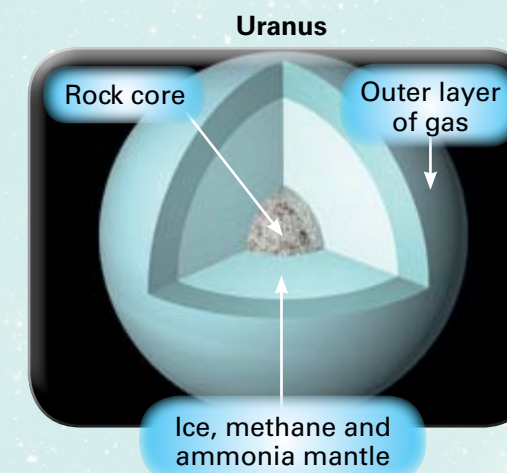
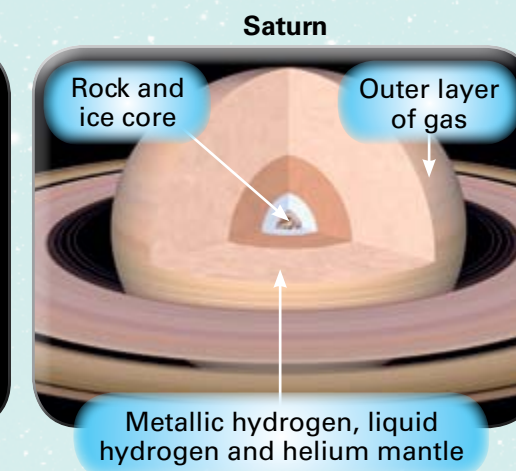
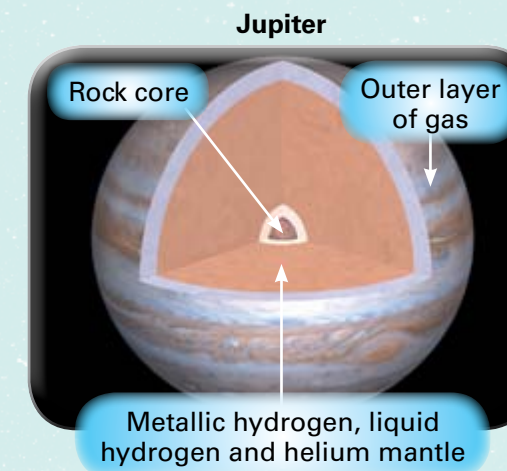
core the centre of a star, planet or moon

mantle the middle layer of a planet or moon, between the crust and the core

crust the outside layer of a planet or moon

The furthest planets are gas giants

The planets that are known as gas giants are Jupiter, Saturn, Uranus and Neptune. They all have cores made of rock. The mantles of Jupiter and Saturn are made from the gases **hydrogen** and **helium**. The mantles of Uranus and Neptune are made from **methane**, **ammonia** and ice. They all have an outer layer of gas that blends into the **atmosphere**.



FAMOUS SKY WATCHERS



National Aeronautics and Space Administration (NASA) is the United States Government space agency. In 1979, NASA's space probe *Voyager 1* went to Jupiter and Saturn. In 1989, *Voyager 2* flew past Uranus and Saturn.

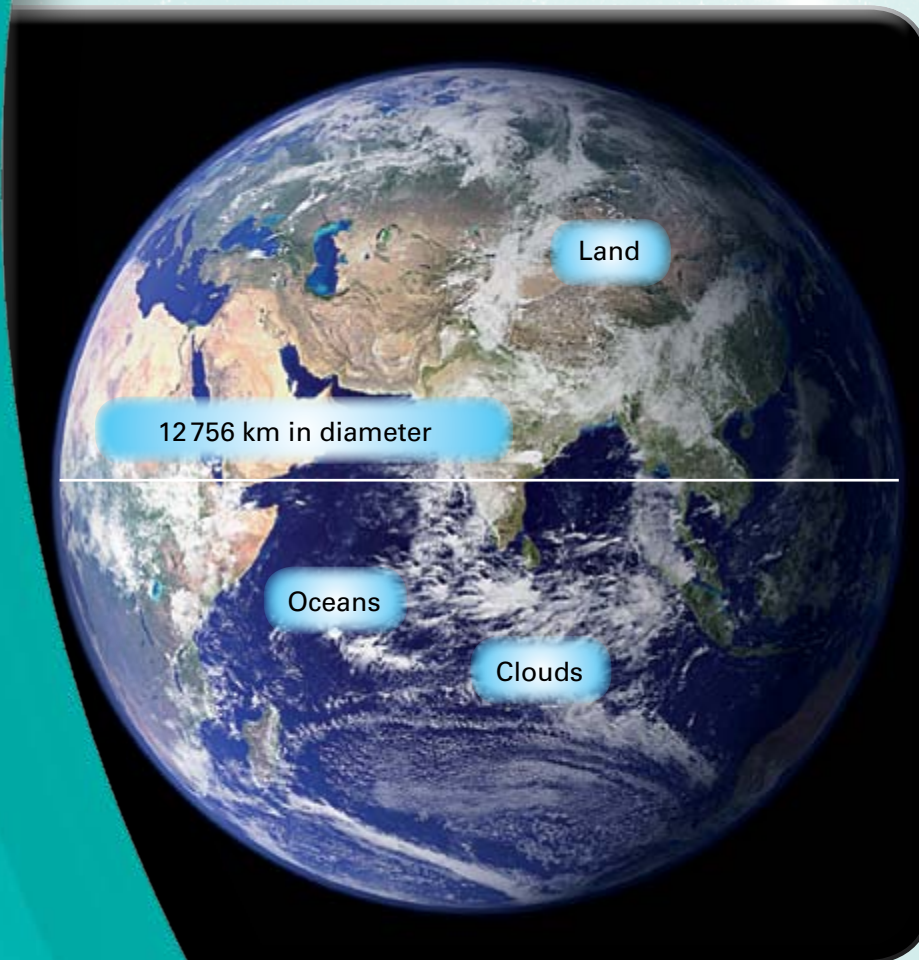
The gas giants have solid cores that are surrounded by different kinds of gases.

WHAT ARE CONDITIONS LIKE ON AND AROUND THE ROCKY PLANETS?

Conditions vary a great deal on the rocky planets. Earth has plenty of water and the right kind of **atmosphere** to support life. However, the other three rocky planets are dry, harsh and lifeless.

Earth is the blue planet

When **space** exploration began, we humans were finally able to see our own planet. Photos taken by space satellites show Earth as a blue planet, wrapped in a swirl of white clouds. It is **orbited** by one moon.



⚠ Earth is the only planet in our **solar system** that is home to plant and animal life.

Earth's surface is covered in water

Earth's blue colour when seen from space comes from its oceans. They cover about 75 per cent of the planet's surface. Having water on Earth has helped life to develop. It also assists in keeping temperatures even.

Earth's atmosphere gives life

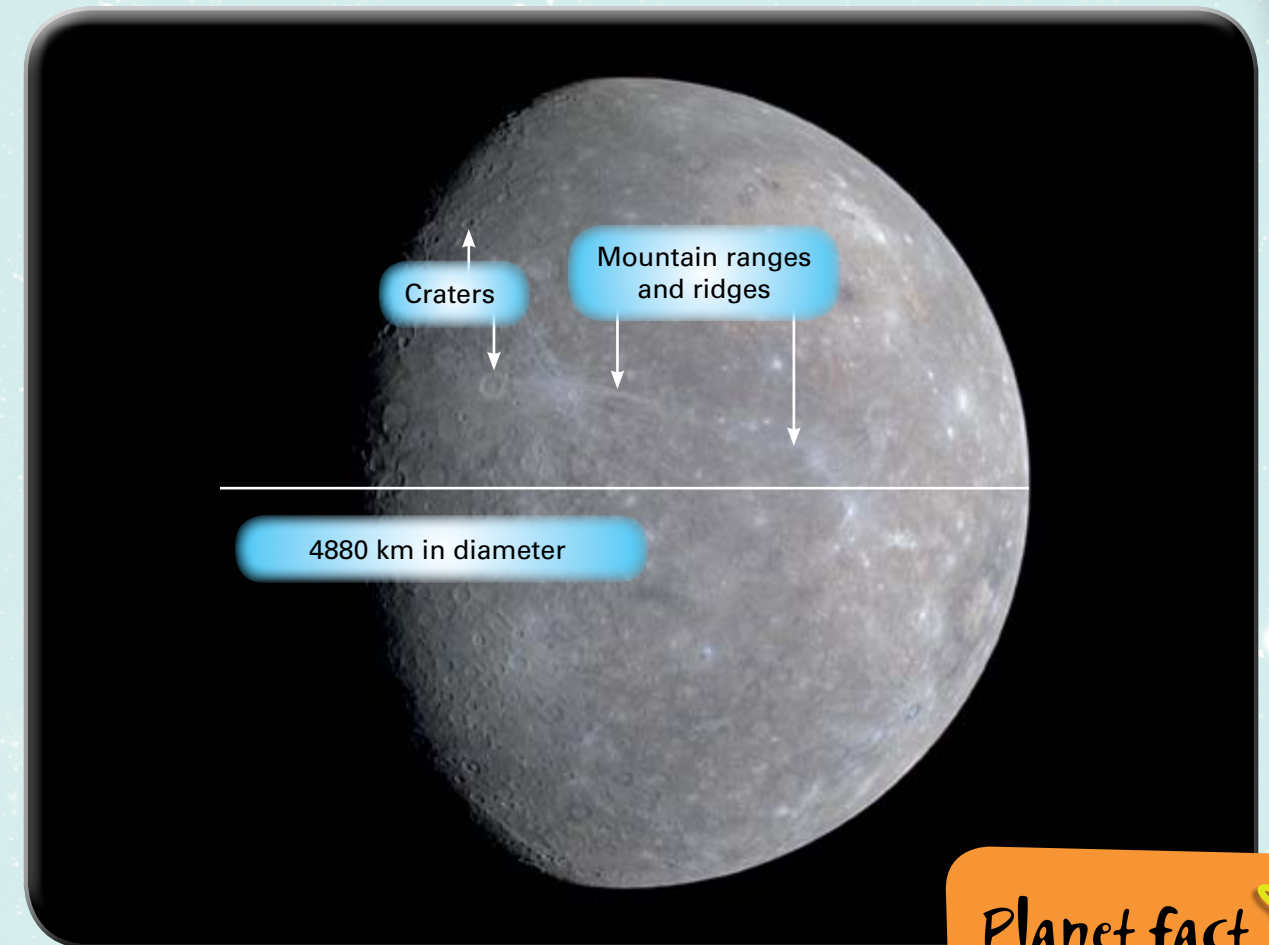
Earth's atmosphere is a blanket of **gases** that lies around the surface of the planet. It protects us from the harmful rays of the Sun. It also provides us with air to breathe and keeps Earth at an even temperature.

Mercury is dusty and dry

Mercury is the planet closest to the Sun. It is a dusty, lifeless place with extreme temperatures and a thin atmosphere. In the 1970s, space probes flew past Mercury and sent images back to Earth.

Mercury's surface is dry

Mercury's surface is rough, dry, dusty and waterless. It has many large **plains**, some mountain ranges and **craters** that were caused by impacts from space objects.



⚠ More than half the surface of Mercury is covered in impact craters.

Mercury has a thin atmosphere

Mercury has a very thin atmosphere. This is mostly because it does not have enough **gravity** to keep gases close to its surface. Temperatures on Mercury are extreme because of its thin atmosphere.

Planet fact

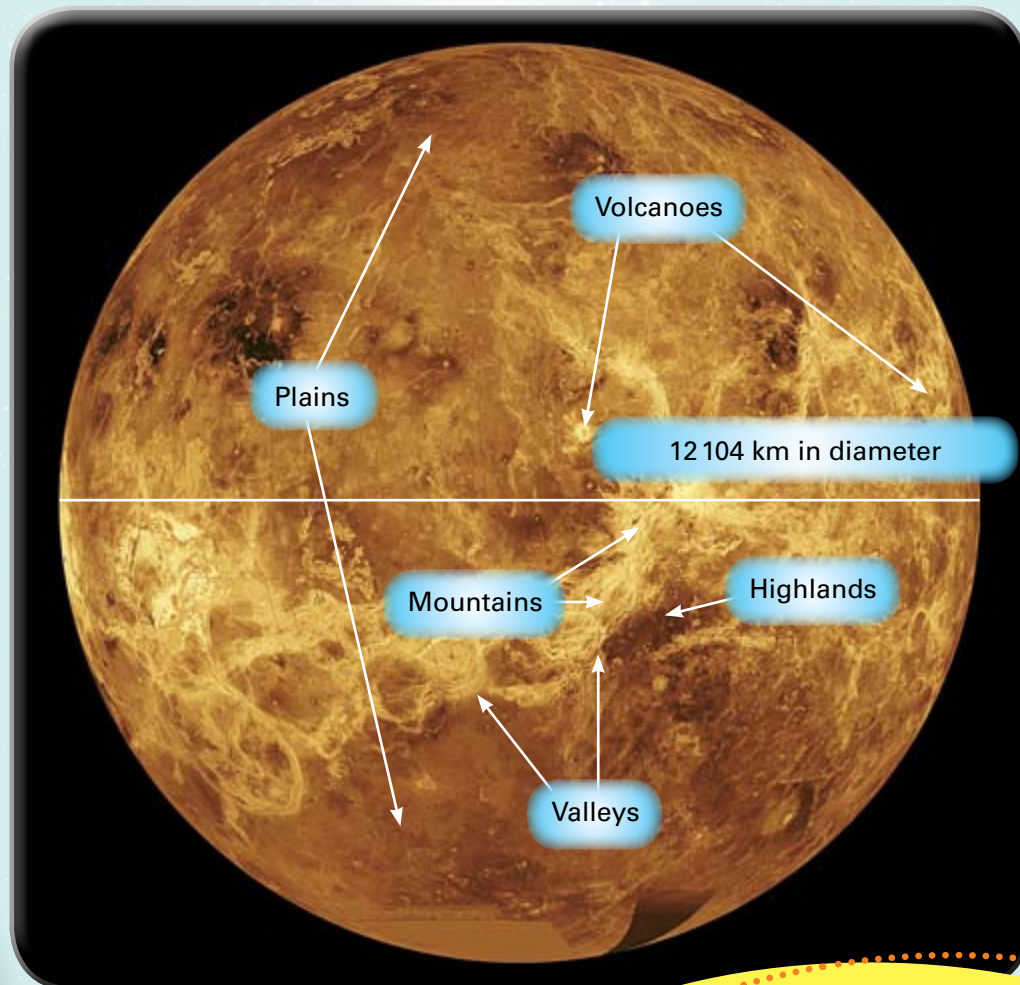
Temperatures on the surface of Mercury range from -180°C to as high as 450°C . The average temperature of the planet is about seven times higher than on Earth.

Venus is dry and volcanic

Venus is a ball of rock, almost the same size as Earth. It has a thick, hot **atmosphere** and is covered in volcanoes. Since 1969, scientists have used **radar** to look more closely at Venus.

Venus's surface is volcanic

The surface of Venus is dry, rocky and volcanic. More than three-quarters of Venus's surface is made up of **plains** that were formed by **lava** from volcanoes. These plains are dotted with **craters** from **space** object impacts. There are also large **highlands** and mountain regions.



- Highland areas make up about 20 per cent of Venus's surface. They are about 4–5 kilometres higher than the plains.

FAMOUS SKY WATCHERS



Space probes are used to find out as much as possible about Venus's atmosphere and clouds. In 1970, the Russian probe Venera 7 was the first probe to reach Venus and send information back to Earth. The European Space Agency's Venus Express probe has been **orbiting** Venus since 2006.

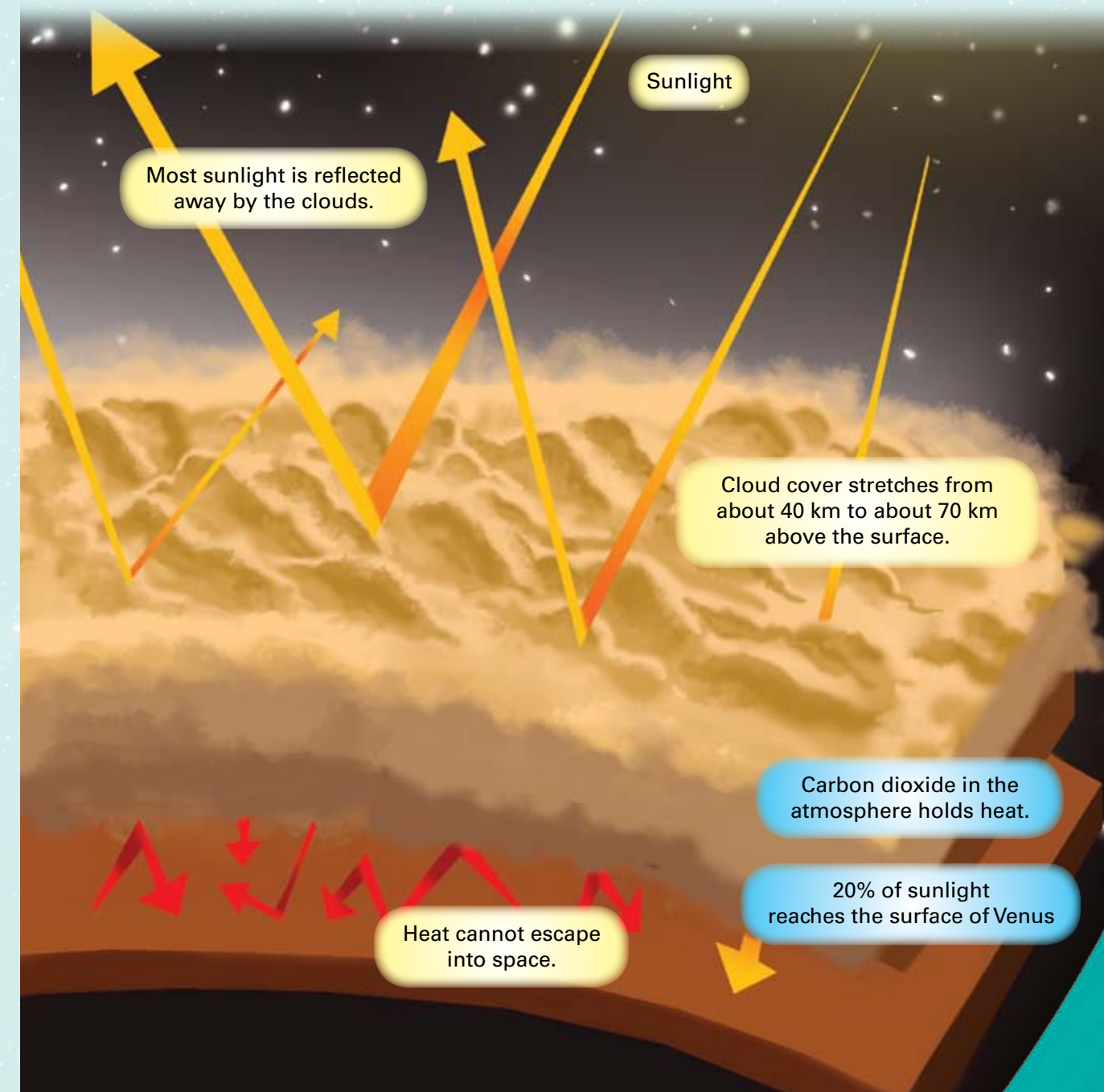
Venus's atmosphere is thick and poisonous

Venus has a thick, poisonous atmosphere that stretches 80 kilometres into space. A layer of this atmosphere is made of thick cloud. It contains dust and acid that comes from the volcanoes below. This cloud makes Venus dark and gloomy. It also keeps the heat from the Sun trapped on the surface. This makes the planet very hot.

- Venus's cloudy atmosphere traps the heat from the Sun close to the planet's surface, but blocks much of the Sun's light.

Planet fact

Venus has the hottest atmosphere of any planet in the **solar system**. Its thick atmosphere keeps temperatures at 464°C. This is about 18 times hotter than a warm day on Earth.



Mars is dusty and cold

Mars is about half the size of Earth. It is dusty, cold and dry, with a thin **atmosphere**. It is **orbited** by two moons. We have learned about Mars from the **space** probes that have flown past or landed there.

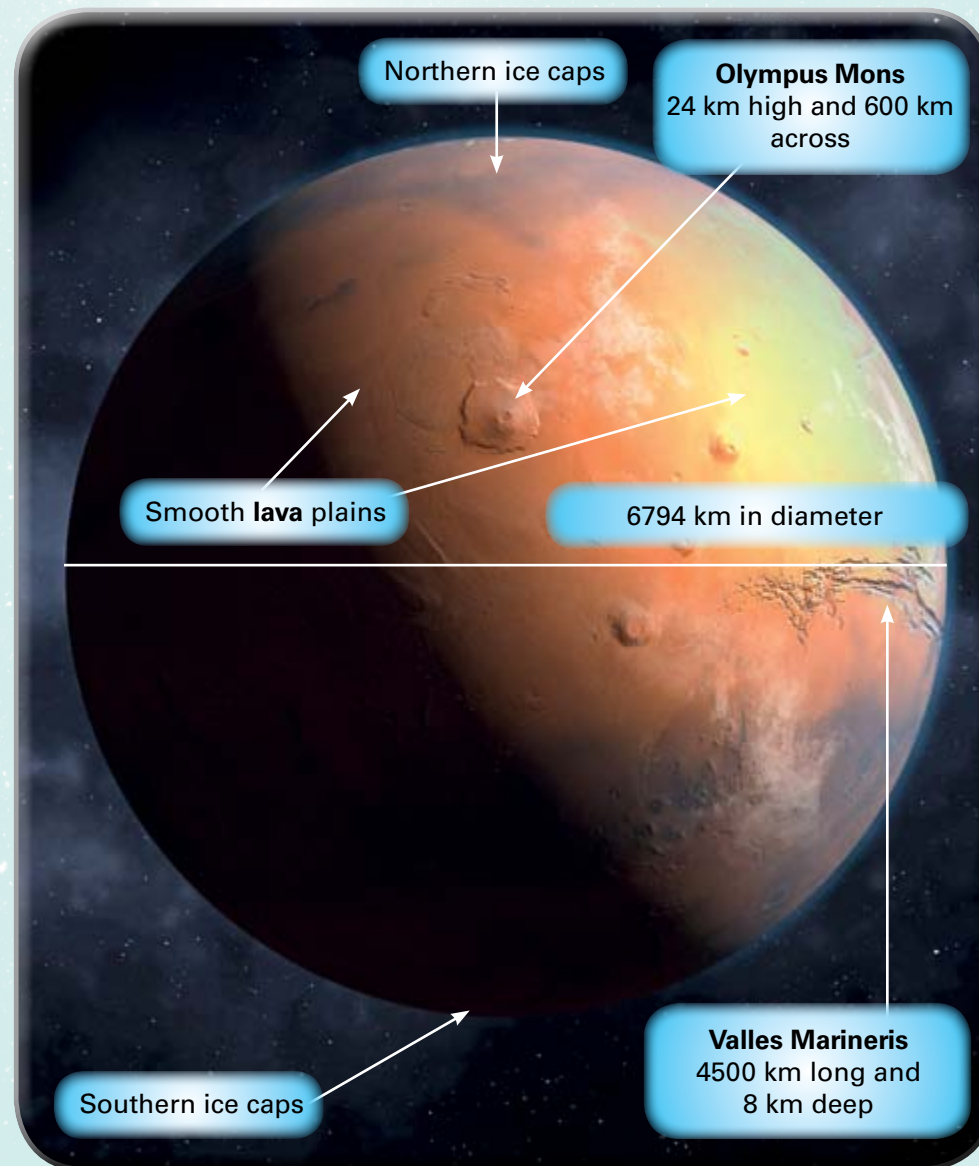
Mars's surface is dry and red

Mars is dry, dusty and red coloured. Large **plains** can be found in the northern part of the planet. **Craters** dot the **highlands** in the south. There are many extinct volcanoes and canyons around the **equator** of Mars. There is ice at the north and south poles.

Mars has the  biggest volcano and the biggest canyon in the **solar system**. Olympus Mons is the largest volcano and Valles Marineris is the largest known canyon.

Planet fact

Mars was named after the Roman god of war because of its red appearance. Its colour comes from the iron oxide (rust) that is found across its surface.



WHAT DOES IT MEAN



equator an imaginary line around the middle or widest part of a round space object, such as a star or planet

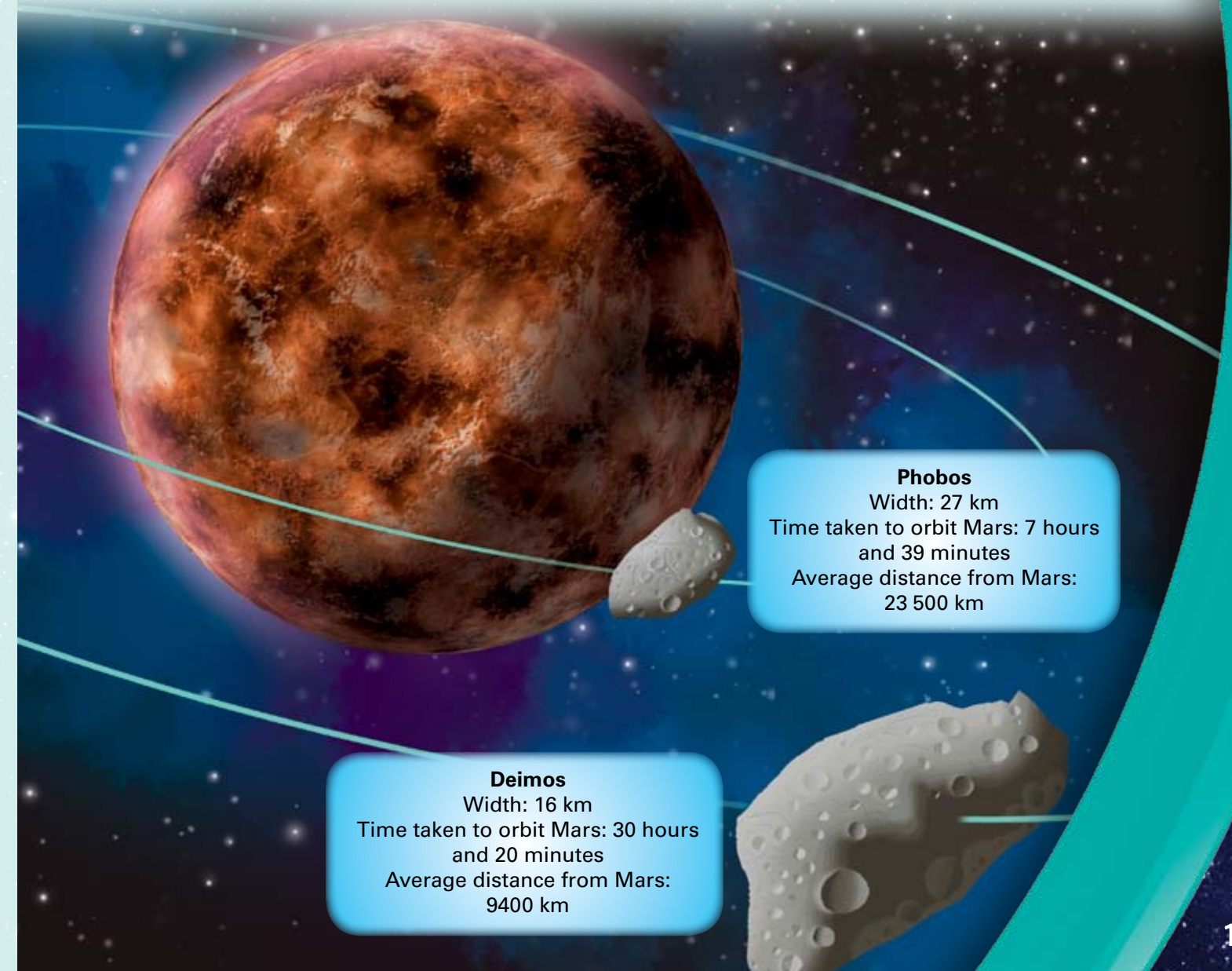
Mars's atmosphere is thin and dry

Mars has a thin, dry atmosphere, which looks pink because it picks up red dust from the planet's surface. It is a cold place, with an average temperature of -63°C . Up to one-third of its atmosphere can be frozen at any time. It does not rain on Mars, but it is very windy.

Mars has two moons

Mars is orbited by two moons, called Phobos and Deimos. Astronomers believe the moons were once **asteroids** that were caught by Mars's **gravity** billions of years ago.

 Phobos is slowly being pulled closer to Mars by the planet's gravity. One day it could crash into Mars.

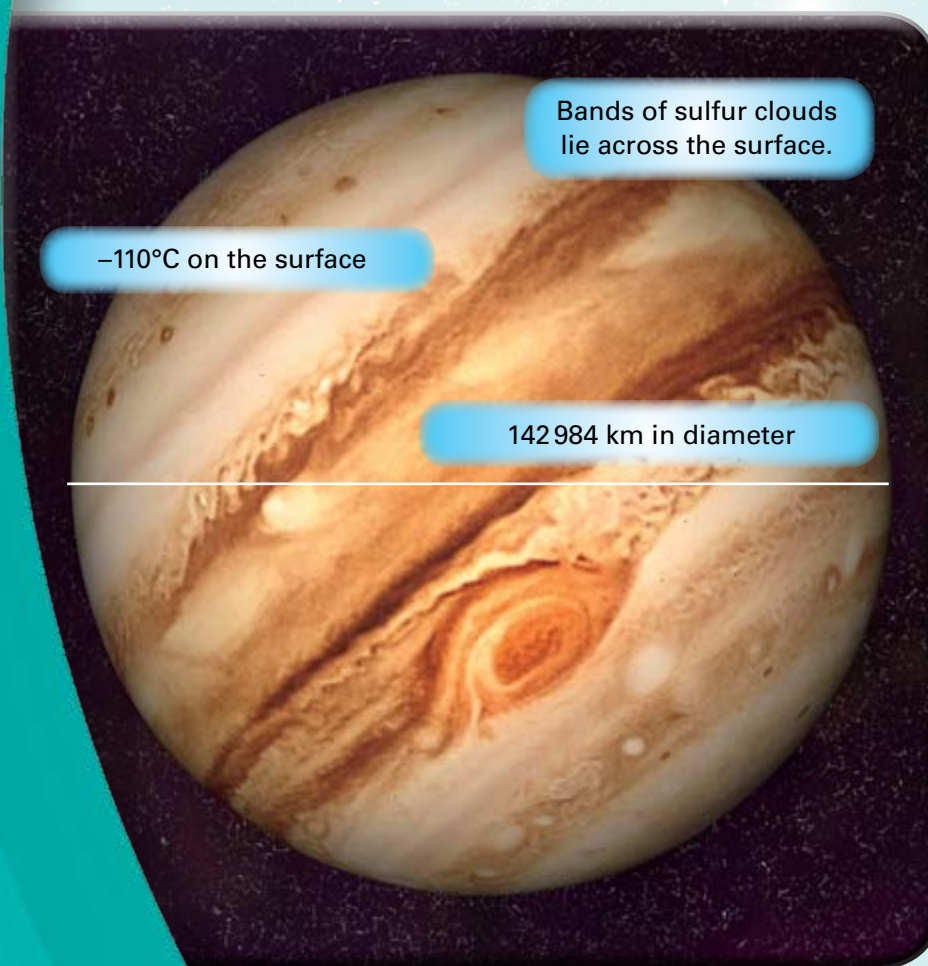


WHAT ARE CONDITIONS LIKE ON AND AROUND THE GAS GIANTS?

Conditions on the **gas giants** are very different from those of Earth. They do not have a solid **crust** and their outer layers of gas blend into their **atmospheres**.

Jupiter is surrounded by rings and moons

Jupiter is the largest planet in our **solar system**. It is mostly gas and has no solid surface. Jupiter is surrounded by dusty rings and is **orbited** by 62 moons. A **space** probe orbited Jupiter from 1995 to 2003 and sent information to Earth.



Jupiter does not have a crust

Instead of a crust, Jupiter has an outer layer that is 1000 kilometres thick. This layer is made up of the gases **hydrogen** and **helium**. The temperature of this layer is about -110°C .

Planet fact

Although the surface of Jupiter is cold, its **core** is thought to be about $30\,000^{\circ}\text{C}$. Jupiter is slowly shrinking in size, and as it shrinks it gives off energy in the form of heat.

⚠ The light and dark bands that can be seen on Jupiter are clouds that lie just above its surface.

Jupiter's atmosphere creates huge storms

Jupiter's atmosphere is a blanket of cloud that is 1000 kilometres thick. It is made up of ice, water and **ammonia**. Wind in Jupiter's atmosphere creates storms. Some of these are so huge that they can be seen through a telescope from Earth.

Jupiter is surrounded by rings

Jupiter's rings are made of tiny dust **particles** that have gone into orbit around the planet. The dust comes from space objects that have crashed into Jupiter's moons.

Jupiter is surrounded by many moons

Jupiter is orbited by 62 moons. Ganymede is Jupiter's largest moon. It is the largest moon in the solar system. It is bigger than the planet Mercury.

✓ Jupiter and its four planet-size moons were photographed by space probe *Voyager 1* and made into this collage. They are not shown to scale but are in their relative positions.

FAMOUS SKY WATCHERS



Simon Marius, a German astronomer, was the first to see Jupiter's four largest Moons in 1610. He named them Ganymede, Callisto, Io and Europa after characters from Ancient Greek myths.



Saturn is cloudy and surrounded by rings and moons

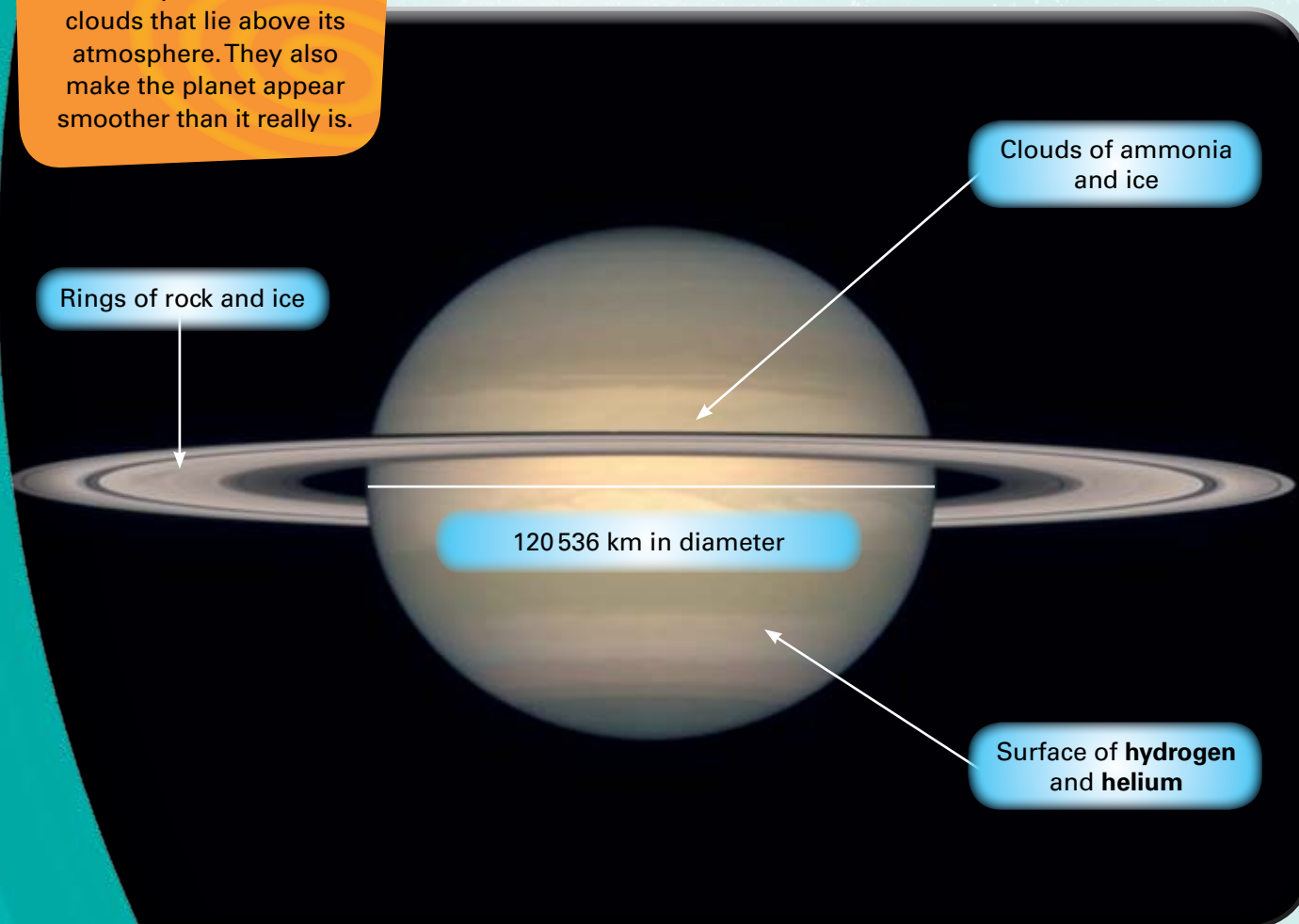
Saturn is the second largest planet in our **solar system**. It is a ball of **gas**, with a cloudy **atmosphere**. Saturn is surrounded by thick rings of ice and rock. It has about 60 moons. A **space** probe has been **orbiting** Saturn since 2004, sending images to Earth.

Planet fact

Saturn is sometimes called the butterscotch planet because of its yellowish colour. This colour is caused by haze and white clouds that lie above its atmosphere. They also make the planet appear smoother than it really is.

Saturn looks yellow

Because Saturn is made up of gases, it does not have an outer **crust**. From the outside, Saturn looks buttery yellow. This colour does not come from its surface. It comes from the Sun's light, which is reflected by the **ammonia** and ice clouds in the atmosphere.



⚠ With the human eye, Saturn looks like a bright star. A telescope is needed to see its rings.

Saturn's atmosphere is made of three layers

Saturn's atmosphere has three layers of clouds. These clouds are made of ammonia and ice. The atmosphere is very windy and there are often storms.

Saturn is surrounded by rings

Saturn's rings are very bright and can be seen through a home telescope. They are made of icy lumps of dust and rock. Some of these lumps are tiny, while others are metres across.

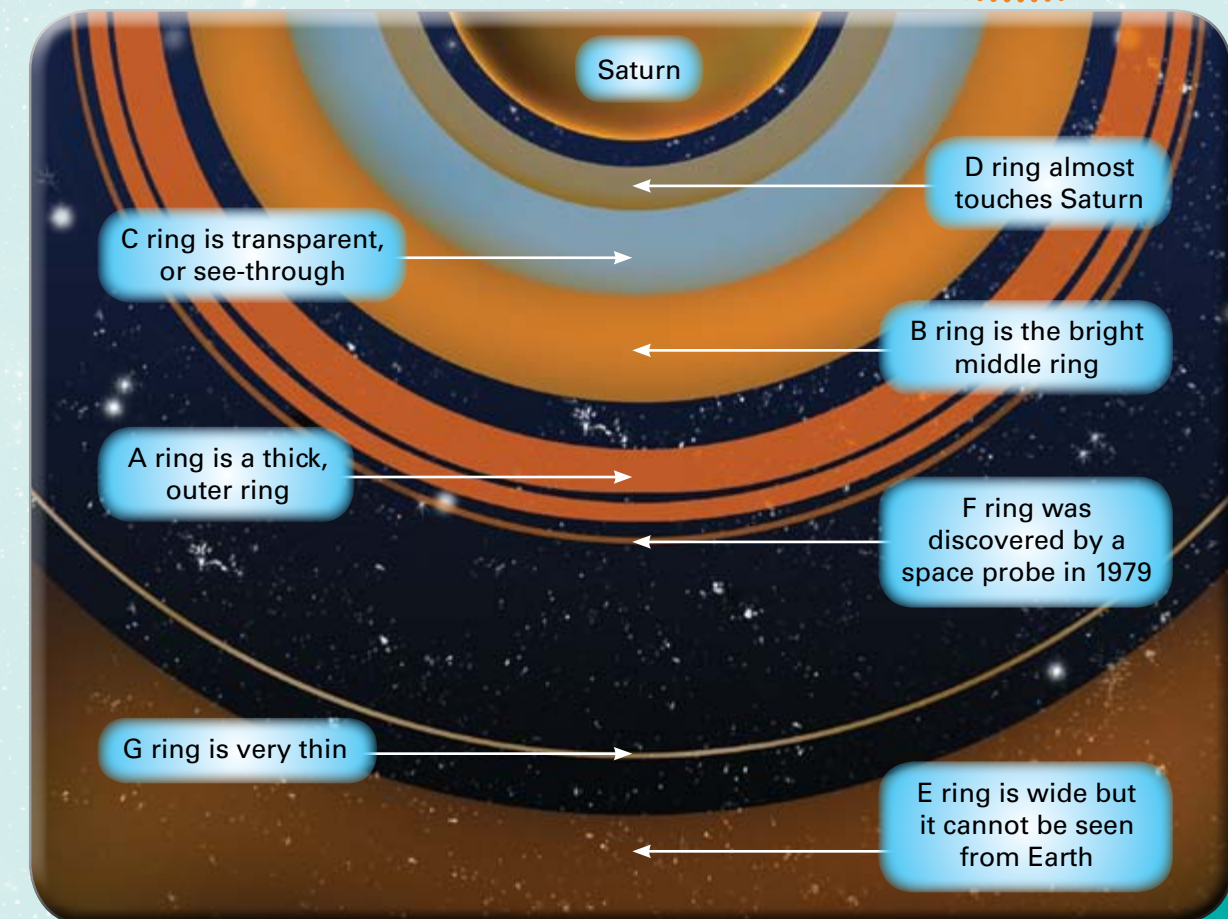
Saturn is surrounded by many moons

Saturn's 60 moons range in size from a few metres to more than a kilometre wide. Titan is the largest, and it is the second-biggest moon in our solar system. Jupiter's moon Ganymede is the only one larger. Titan is bigger than the planet Mercury.

FAMOUS SKY WATCHERS



In 1655, the Dutch astronomer Christiaan Huygens was the first astronomer to realise that Saturn had rings. He also discovered one of its moons, Titan.



⚠ Saturn has at least seven rings. Four of these can be seen from Earth with a telescope.

Uranus is surrounded by rings and moons

Uranus cannot be seen from Earth without a telescope. Little was known about this planet until a **space** probe flew past it in 1986. Like other **gas** giants, the surface and **atmosphere** of Uranus is made up of **helium**, **hydrogen** and **methane** gases. Methane gas gives Uranus its blue colour.

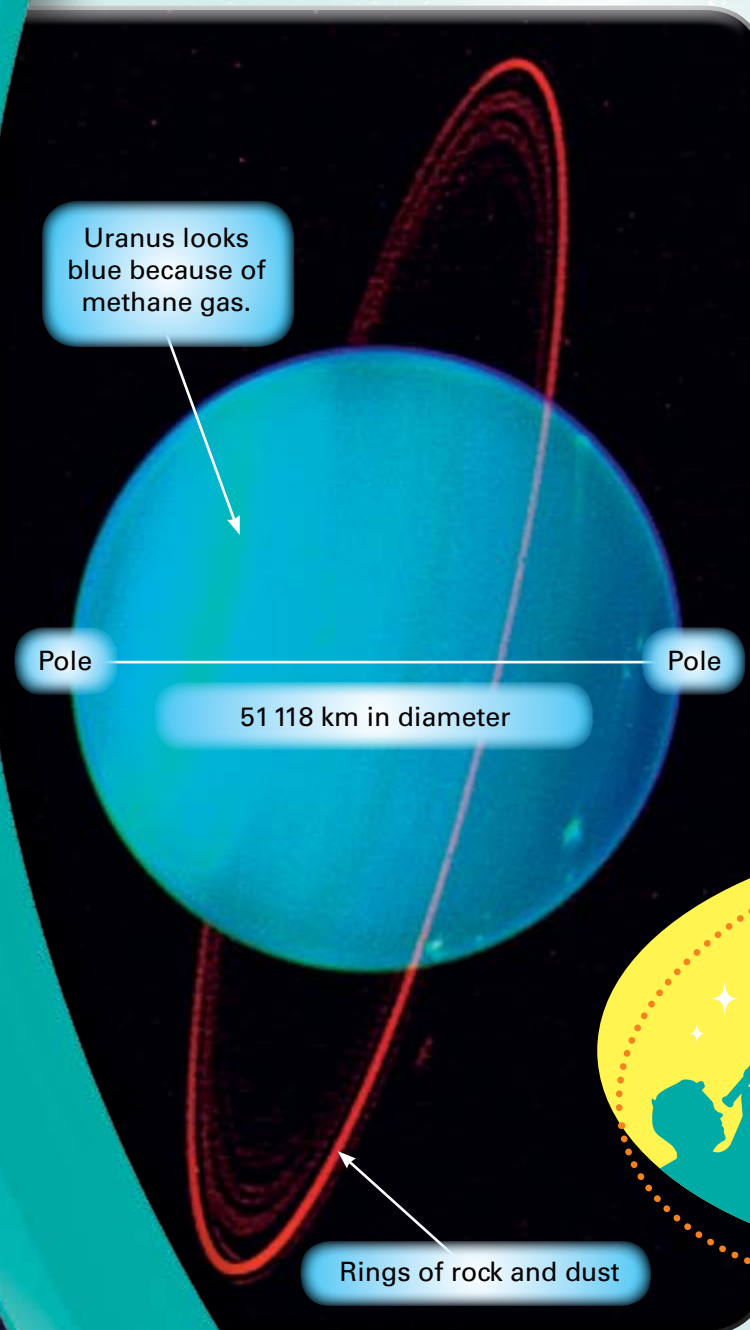
Uranus is surrounded by rings

Uranus has 13 rings that are made of rock and dust **orbiting** its **equator**. Because Uranus is tilted on its side, we see the rings running from the top to the bottom, rather than around the middle.

Uranus is surrounded by many moons

Uranus has 27 moons. The moons closest to Uranus orbit in the opposite direction to those further away.

⚡ Not all of Uranus's rings are clearly visible through a telescope from Earth, although they can be seen in this infrared image.



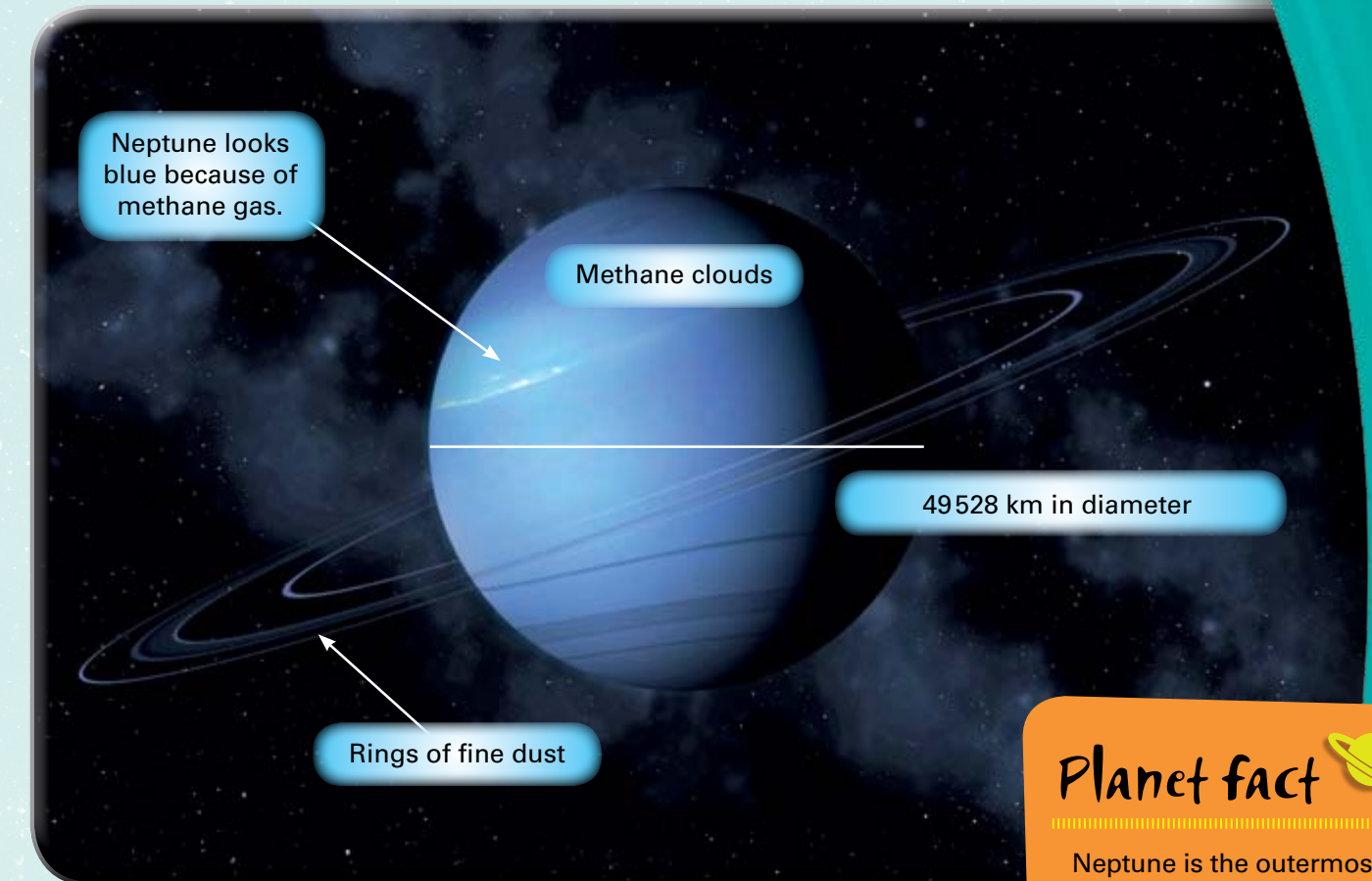
FAMOUS SKY WATCHERS



The German-British **astronomer** William Herschel discovered Uranus in 1781. At first he thought what he saw was a **comet** or a star. However, after observing it for some time he realised it was a planet.

Neptune is cloudy and surrounded by rings and moons

Neptune looks like a tiny dot when seen through a telescope from Earth. A space probe flew past the planet in 1989 and sent back images of its clouds, rings and moons. Scientists think that Neptune is a lot like Uranus but has more wind and storms.



⚡ Neptune looks bluer than Uranus because it has more methane gas in its atmosphere.

Neptune is surrounded by rings

Neptune is surrounded by five thin rings. Scientists believe they are made from fine dust that has come from Neptune's moons.

Neptune is surrounded by many moons

Neptune has 13 moons. Four of these sit within Neptune's rings. One of the moons is almost as large as Earth's moon, but most are quite small.

Planet fact

Neptune is the outermost planet in the **solar system**. It is 30 times further from the Sun than Earth. Neptune was not discovered until 1846. It can only be seen clearly through powerful telescopes.

DO THE PLANETS MOVE?

From Earth, we see the planets change their positions in the night sky. This is because they are **orbiting** the Sun. Each one of the planets also **rotates** on its axis.

The planets orbit the Sun

In our **solar system**, each planet orbits the Sun at a different distance and at a different speed. For example, Earth travels around the Sun at 107 280 kilometres an hour. Neptune, which is much further away, travels at only 19 548 kilometres an hour.

Planet fact

It takes 224 Earth days for Venus to orbit the Sun (which equals one Venus year). It takes 243 Earth days for it to rotate on its axis. This means that a Venus day is longer than a Venus year!

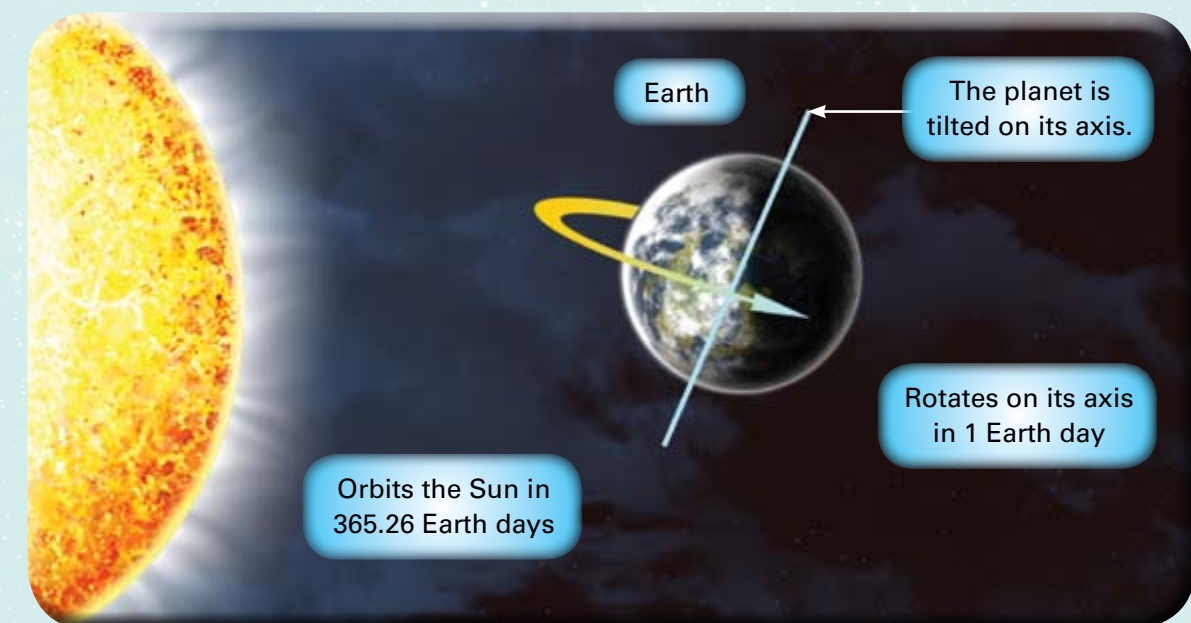
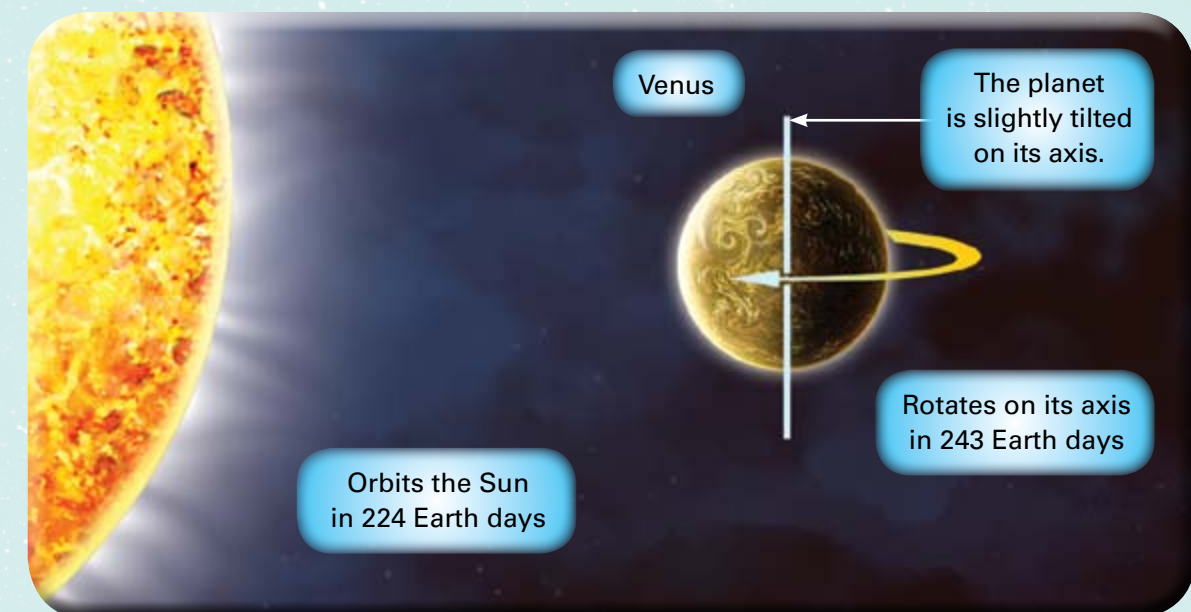
How the planets orbit the Sun

Planet	Average distance from the Sun (kilometres)	Speed of orbit (kilometres per hour)	Time it takes to rotate 360°
Mercury	57 910 000	172 440	58.6 days
Venus	108 200 000	126 000	243 days
Earth	149 600 000	107 280	23 hours 56 minutes
Mars	227 940 000	86 760	24 hours 37 minutes
Jupiter	778 300 000	47 160	9 hours 56 minutes
Saturn	1 429 400 000	34 920	10 hours 40 minutes
Uranus	2 870 990 000	24 480	17 hours 14 minutes
Neptune	4 504 300 000	19 548	16 hours 7 minutes

▲ Planets that are closer to the Sun move more quickly through **space** than those further away.

The planets rotate

Each of the planets in our solar system rotates on its axis. One whole spin equals one whole day on that planet. A day on Jupiter is the shortest, at only 9 hours 56 minutes in Earth time. A day on Venus is the longest, at 243 Earth days.



▲ Venus rotates very slowly compared to Earth. It spins in the opposite direction to most planets.

HOW DO THE PLANETS AFFECT EARTH?

The other planets in our **solar system** affect Earth by protecting us from **space object impacts**. They are also our neighbours in space, and we learn a lot from watching and studying them.

V Without the other planets, Earth may not have survived **orbiting** the Sun.

Planet Jupiter protects Earth from space object impacts.

Earth is a planet in the solar system, and we can learn a lot from studying the other planets.

Planet Jupiter protects Earth

Of all the planets, Jupiter plays the biggest part in protecting Earth.

Jupiter is the largest planet and it therefore has strong **gravity**. Jupiter's gravity pulls **comets** and **asteroids** towards it and away from Earth.

Thousands of space objects hit Jupiter every year.

Earth is a planet in the solar system

Humans have always watched the planets. Like stars, planets have always been an important part of the night sky. For thousands of years, astronomers thought that Earth was at the centre of everything. It took a long time to discover that Earth was also a planet.

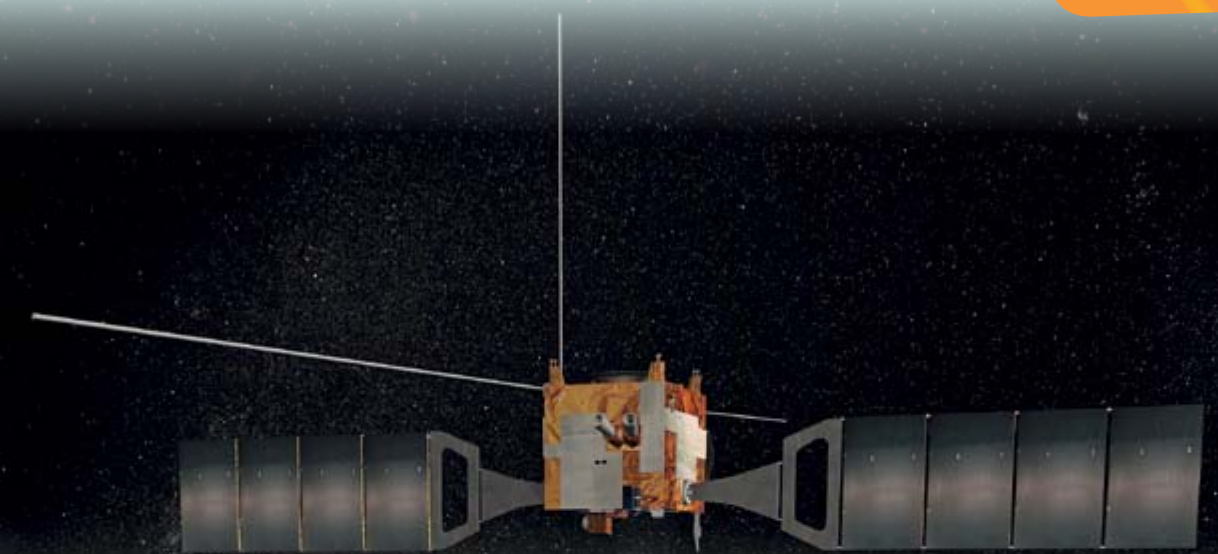
Learning from the planets

Scientists have learned a lot from studying the planets. Venus and Mars are planets that are a lot like Earth. If Earth's **atmosphere** becomes too polluted, our planet could become like Venus, which is too harsh and hot for life.

V Space probes have gathered information about all of the planets in our solar system. In 2003, the European Space Agency's *Mars Express* journeyed to Mars.

Planet fact

Some scientists believe that Jupiter may also be harmful to Earth. They believe that Jupiter's gravity pulls many space objects from the **Main Belt** and throws them into the paths of other planets.



WHAT IS THE FUTURE FOR THE PLANETS?

There are no real threats to the planets that scientists know about. Although the planets can be hit by **space objects**, they are not likely to be destroyed by them. It is most likely that the planets will **orbit** the Sun until it begins to die. At that point, the **solar system** will also come to an end.

Planet fact



Scientists believe that a large space object crashed into Earth about 65 million years ago. They believe that this is what led to the death of the dinosaurs and a lot of other life that existed on Earth at the time.

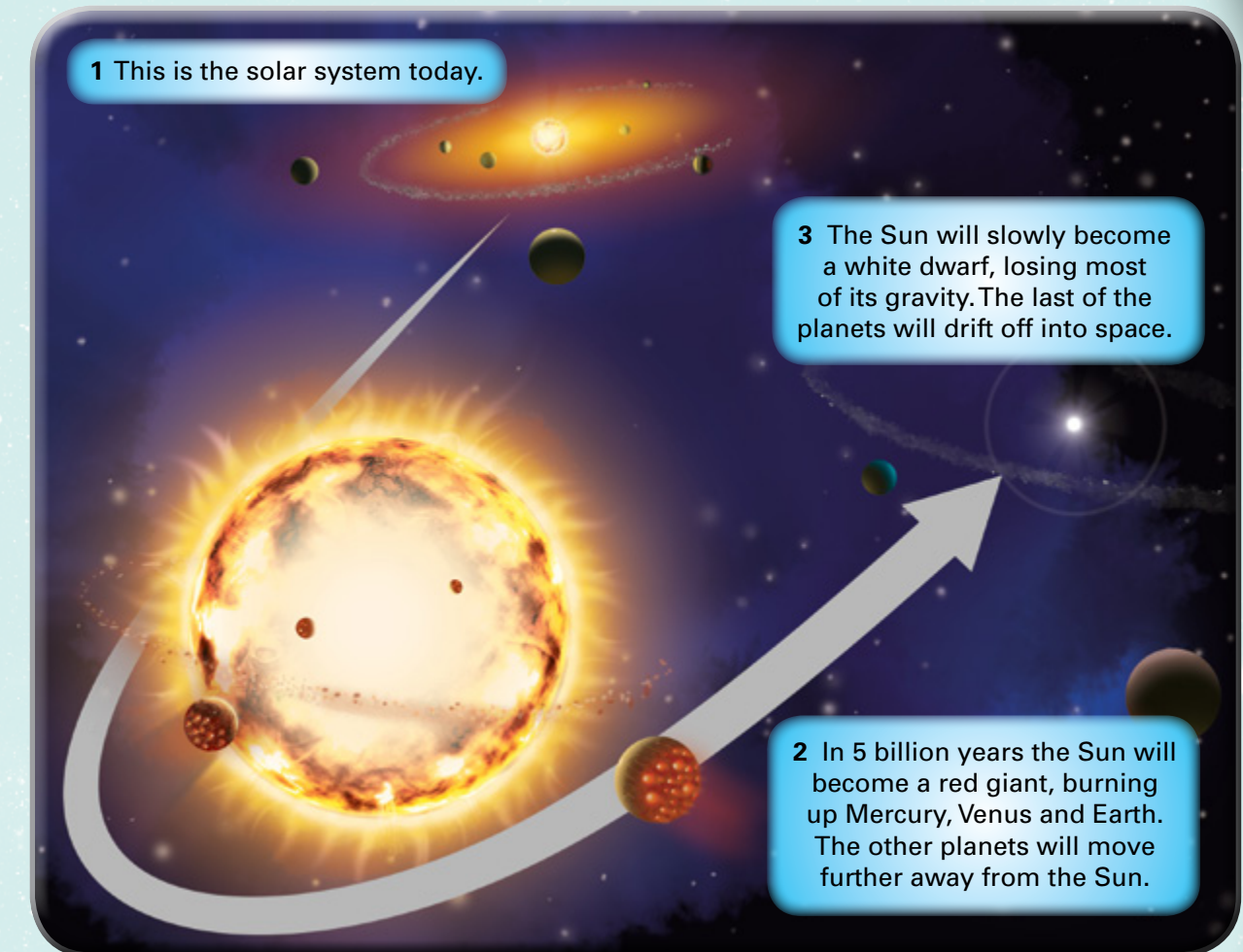
The planets are harmed by space objects

It is unlikely that space objects will destroy any of the planets in our solar system. However, this does not mean that space objects are not harmful. If a space object hit Earth, it could badly affect life on our planet. Large impacts throw dust into the **atmosphere**, blocking the Sun. Without sunlight, plants cannot grow. Without plants there is no food for animals and humans.

- ✓ Scientists believe that large space object impacts have caused a lot of damage on Earth in the past.

The end of the solar system

In about 5 billion years, the Sun will grow into a **red giant** star. It will become about eight times larger than it is today. When this happens, the inner planets will be destroyed by its heat. The outer planets will move further out into space. The red giant will slowly burn out to become a **white dwarf** star. At this point it will no longer have the **gravity** to hold the planets in orbit around it.



FAMOUS SKY WATCHERS



Astronomers such as 20th-century astronomer Paul Eddington realised that the stars produce their own energy. Knowing this, scientists worked out that stars such as our Sun have a life span of about 10 billion years.

- ⚠ Scientists believe that the planets will not die until the Sun dies in billions of years' time.

WHAT IS THE BEST WAY TO PLANET WATCH?

Planets in our **solar system** can be difficult to find from Earth. They do not appear at the same time or in the same place in the sky every night. Venus and Mars are the two planets that are easiest to watch. See if you can find them.

Watching Venus

Venus can be seen either in the early morning in the eastern sky, or in the early evening in the western sky. It is the brightest object in the night sky after the Moon. It is often called the morning star or the evening star.

Watching Mars

Mars is often only seen for a few months each year. It is larger than most stars and it looks red in the night sky. It comes close to Earth every 26 months.

Useful equipment for backyard astronomy

Equipment	What it is used for
 Binoculars or a telescope	A pair of binoculars or a telescope will help you see the planets in more detail.
 Sky chart	A sky chart will help you to identify the planets you can see in the sky. Remember these change from month to month, so make sure you have an up-to-date chart.
 Compass	A compass will help you face the right direction when reading a sky chart.
 Torch with red cellophane over the light bulb	Use a torch to help you read the sky chart. Putting red cellophane over the light bulb end of the torch will prevent its light from affecting your night vision.



Useful websites

The Nine Planets: <http://www.nineplanets.org>

Welcome to the Planets: <http://pds.jpl.nasa.gov/planets>

Solar System: <http://science.nationalgeographic.com/science/space/solar-system>

Solar System: http://www.kidsastronomy.com/solar_system.htm

GLOSSARY

ammonia	an air-like substance that is colourless, poisonous and has a strong smell
asteroids	small, rocky or metal space objects that orbit the Sun
atmosphere	the layer of gases that surrounds a planet, moon or star
axis	an imaginary line through the middle of an object, from top to bottom
comets	small, rocky and icy space objects that have long, shining tails that appear when orbiting near the Sun
core	the centre of a star, planet or moon
craters	deep, round holes made by space object impacts
crust	the outside layer of a planet or moon
equator	an imaginary line around the middle or widest part of a round space object, such as a star or planet
gas	a substance that is not solid or liquid, and is usually invisible
gravitational pull	the forces of gravity that attract two objects towards each other
gravity	the force that attracts all objects towards each other
helium	an air-like substance that is colourless and odourless; it is the second most common gas in the universe
highlands	land that is hilly and higher than seas or plains but not as high as mountains
hydrogen	an air-like substance that is colourless, odourless and can easily catch on fire; it is the most common gas in the universe
lava	hot, liquid rock that flows out of volcanoes
Main Belt	an area between Mars and Jupiter where thousands of asteroids and meteoroids orbit the Sun
mantle	the middle layer of a planet or moon, between the crust and the core
meteoroids	small space objects that are made of rock and metal, and range from metres wide to the size of a pea
methane	an air-like substance that is colourless, odourless and can easily catch on fire
nebula	a cloud of gas and dust in space
orbit	to travel around another, larger space object
particles	very small parts of substances or matter
plains	low-lying, flat areas of land
radar	an instrument that uses radio waves to find the location, distance, direction or speed of moving and fixed objects, and which is often used to produce images
red giant	a very large, cooling star
rotates	turns or spins around a fixed point or an axis, like a spinning top
solar system	the Sun and everything that orbits around it, including planets and other space objects
space	the area in which the solar system, stars and galaxies exist, also known as the universe
white dwarf	a small, dense star that is slowly fading

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