

MY FIRST **SPACE** ENCYCLOPEDIA



INTRODUCTION

Are you ready to travel through space?

Get on board our spaceship as we zoom past planets, comets and stars.

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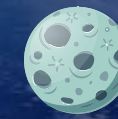
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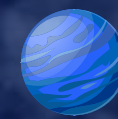
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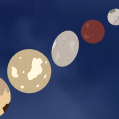
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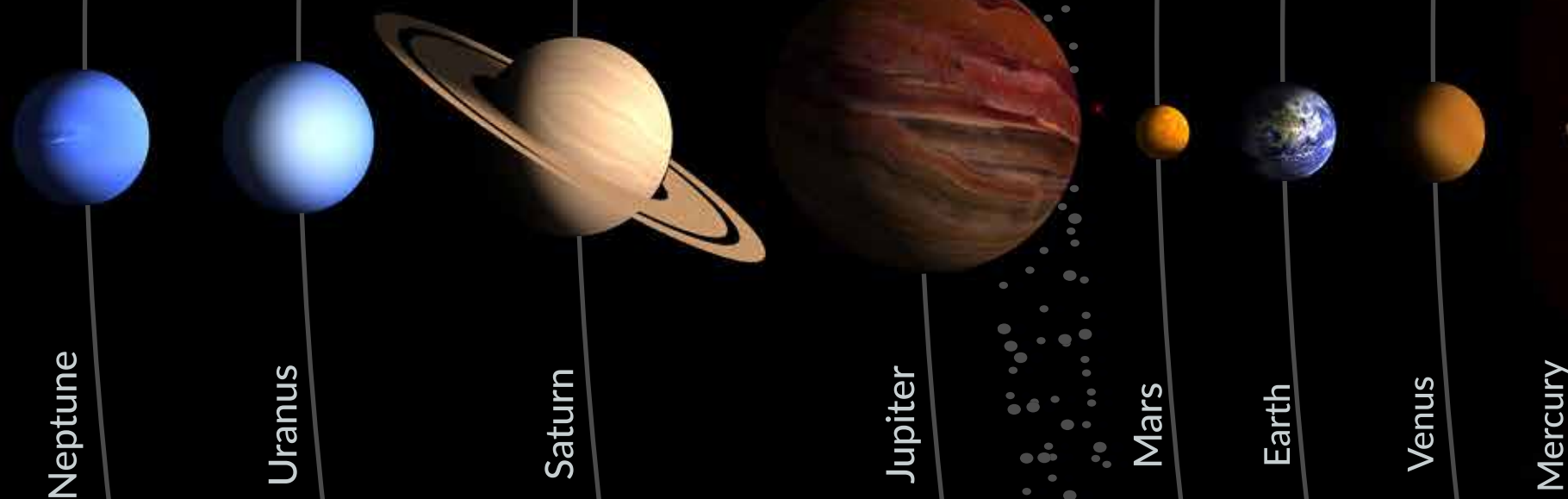


This book contains photos and images taken by The National Aeronautics and Space Administration (NASA). Since this book is targeted towards children, a lot of the space concepts have been simplified. Refer to adult encyclopedias for more detailed information.

SOLAR SYSTEM

The Sun is the center of our solar system. Our solar system has 8 planets, including our planet Earth. Each planet orbits around the Sun. Can you point out these planets in this image?

There are several other space objects in our solar system. These are dwarf planets, moons, asteroids, comets and meteoroids.



OBJECTS IN THE SOLAR SYSTEM

SPACE WORDS

ORBIT: To travel around something in a fixed path.



The largest objects that move around the Sun are called **PLANETS**. The 8 planets in our solar system are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.



DWARF PLANETS are smaller than planets. They share their orbits with other space objects.



Planets have space objects that orbit around them. These are called **NATURAL SATELLITES** or **MOONS**.



There are a large number of rocks between Mars and Jupiter called asteroids. These go around the sun in a disc called the **ASTEROID BELT**.



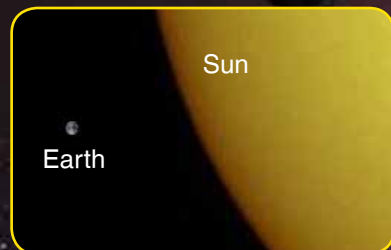
COMETS are snowballs of frozen gases, rock and dust. They begin to melt when they come near the Sun and form a bright tail.



METEORIDS are small chunks of rocks in space. Most meteoroids are no bigger than a pebble.

SUN

The Sun is the star in our solar system. It is very bright and gives us light and warmth. Because it is so bright, you should not look at it directly.



The Sun is so big that that over a **MILLION EARTHS** can fit inside it.

FACTS ABOUT THE SUN

SPACE WORDS

GRAVITY:

All objects attract other objects due to a force called gravity. The bigger the object, the stronger the gravitational force. Planets and stars have very strong gravity.

TRY AT HOME

Try throwing a ball up in the air. Why does it always come down? It is the Earth's gravity pulling all objects to itself.

DID YOU KNOW?

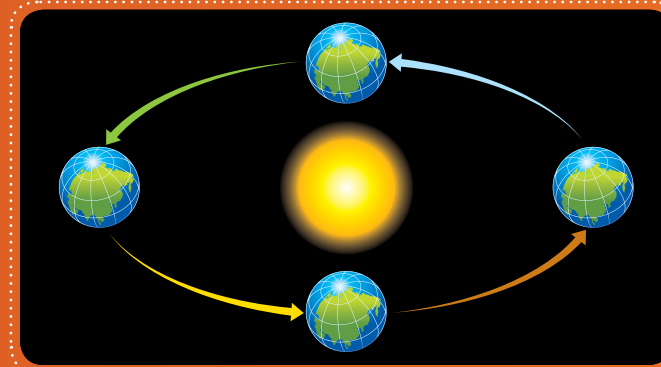
- *The Sun is over a million years old.*
- *Light from the Sun reaches the Earth in 8 minutes.*



The Sun is a **STAR**. Stars are huge balls of hot gas which give off large amounts of heat and light. **Why do you think other stars don't look as big and bright as the Sun?**



The Sun has very strong **GRAVITY**. This gravity keeps all the planets in their fixed orbits around the Sun.



One complete orbit around the Sun is equal to **ONE YEAR** for that planet. Earth takes 365 days to finish one orbit around the Sun.



PLANTS use sunlight to create their food. Humans and animals depend on plants to survive. Thus, the Sun helps create the food we eat.

MERCURY

Mercury is the first planet from the Sun in our solar system. It is the smallest planet. It is also the fastest among all planets to complete one orbit around the Sun.



Earth is **THREE TIMES** the size of Mercury.

FACTS ABOUT MERCURY

MOONS:
Mercury has no moons.

YEARS:
A year on Mercury is just 88 days.

SPACE WORDS

PLANET:
A large rounded space body that orbits a star.



A spacecraft called **MESSENGER** was sent by NASA to orbit Mercury. In March 2011, it reached the orbit and took photographs of the small planet.



Mercury has **EXTREME TEMPERATURES**. The side facing the Sun is very hot. But the side facing away from the Sun is very cold. This happens because there is no atmosphere on Mercury to trap the heat.

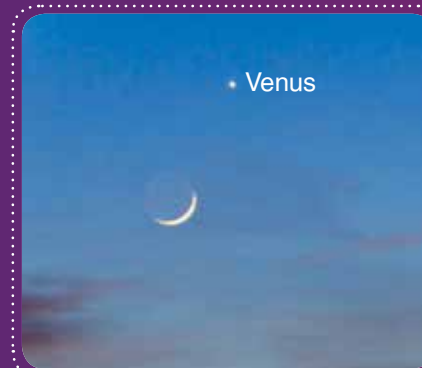
VENUS

Venus is the second planet from the Sun in our solar system. It comes closest to Earth than any other planet. The surface of Venus is dominated by volcanic features, as it has more than 1600 volcanoes.



Venus and Earth are almost the **SAME SIZE**. Earth is a little bigger.

FACTS ABOUT VENUS



If you look from Earth, Venus is the **BRIGHTEST** planet in the sky. **Can you try and spot Venus in the sky?**



Venus has a lot of thick clouds. They trap a lot of heat, making Venus very hot. It is the **HOTTEST PLANET** in the solar system.

MOONS:
Venus has no moons.

YEARS:
One year on Venus is 225 days.

EARTH

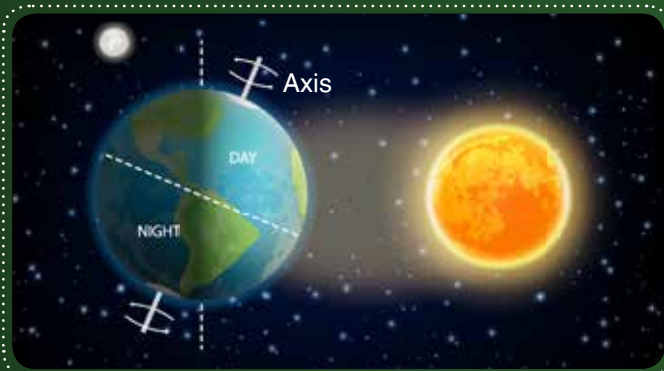
Earth is the third planet from the Sun in our solar system. It is our home planet. Animals, plants and human beings are only found on Earth.



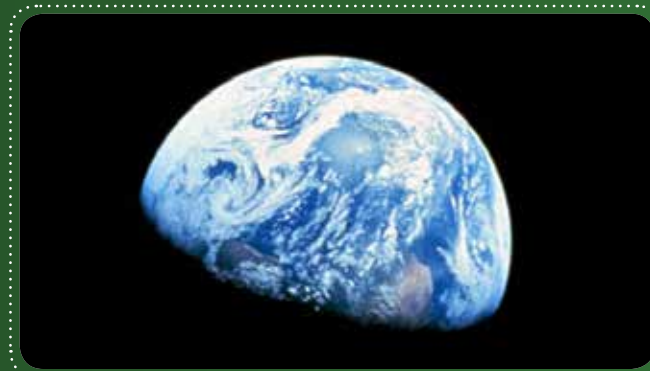
NOTE FOR PARENTS

Explain rotation and revolution by taking a ball. Use a flashlight as the Sun. Replicate the rotation and revolution of the Earth to explain day and night, and a full year.

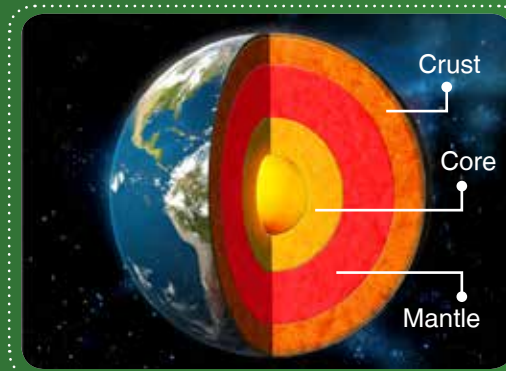
FACTS ABOUT EARTH



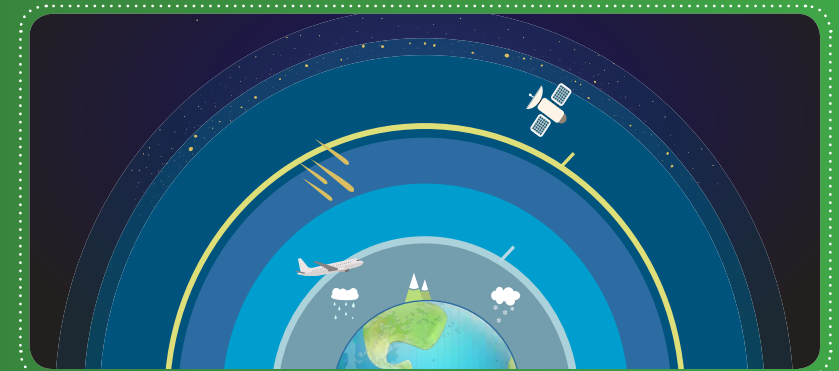
Earth spins like a top. The line it spins on is called the **AXIS**. As the Earth spins, the side of the Earth facing the Sun has day. The side not facing the Sun has night. **Do you know how much time it takes Earth to complete one spin?**



Can you guess the colour of Earth from space? The surface of Earth is covered with a lot of **WATER**. When you look at Earth from space, it appears blue.



Earth is made of **THREE LAYERS**. The outermost layer is solid rock. But the inner layers are actually hot liquid. This hot liquid can sometimes reach the surface. **Do you know what it's called?** (hint: volcanoes)



Take a deep breath. Do you feel air coming in? Air covers the Earth like a blanket. This blanket of air surrounding the Earth is its **ATMOSPHERE**.

MOON

The Moon is the natural satellite of the Earth and orbits around it. Natural satellites are large space objects that orbit other planets.



You can fit **THREE** Moons inside the Earth.

FACTS ABOUT THE MOON



The **PHASES OF THE MOON** are the different ways the Moon looks from Earth over a period of a month. This happens because the Moon is lit up by the Sun's light, and as the Moon orbits the Earth, we see different parts of the lit areas of the Moon.

Can you look at the Moon tonight and identify which phase it is showing?



Astronaut Buzz Aldrin standing on the Moon.

DID YOU KNOW?

- The Moon travels around the Earth in 27 days.
- The Moon does not have its own light. It shines brightly because the light of the Sun reflects on it.

SPACE WORDS

ECLIPSE: When one space body blocks the light of the Sun from another, it is called an eclipse.



On July 21, 1969, astronaut **NEIL ARMSTRONG** became the first person to step foot on the Moon. Above is a photo of the astronauts Neil Armstrong, Buzz Aldrin and Michael Collins who were part of Apollo 11, the first successful space mission to land humans on the Moon.



There are times when the Moon comes in between the sun and the earth. The Moon blocks the sun's light. This is called a **SOLAR ECLIPSE**.



The surface of the Moon is filled with large holes called **CRATERS**. These are the grey spots you see on the Moon. **Look at the Moon tonight. Can you see the craters?**

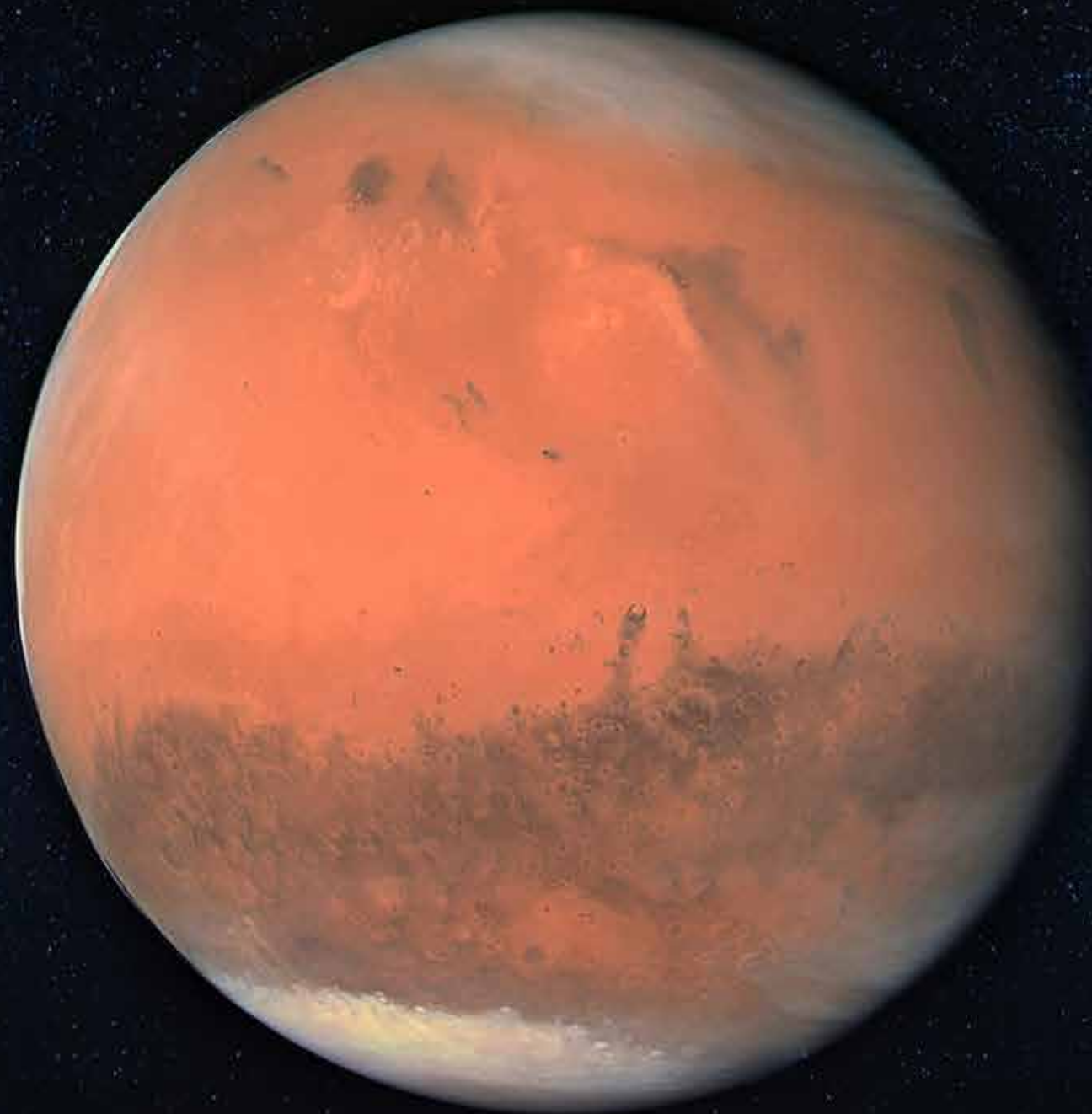
MARS

Mars is the fourth planet from the sun in our solar system. It has very cold temperatures, many times colder than Earth's winters. Mars also appears red in the night sky. This is the reason why Mars is also called the red planet.



Mars is approximately **HALF** the size of Earth.

FACTS ABOUT MARS



MOONS:

Mars has 2 moons. Their names are Phobos and Deimos.

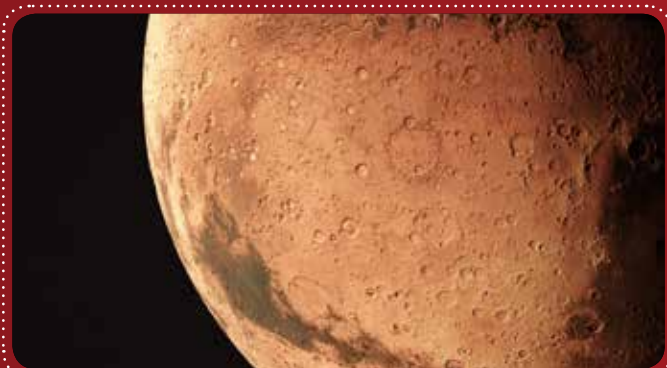
YEARS:

One year on Mars is 687 days.

SPACE WORDS

ASTRONAUT:

A person who trains to go into outer space.



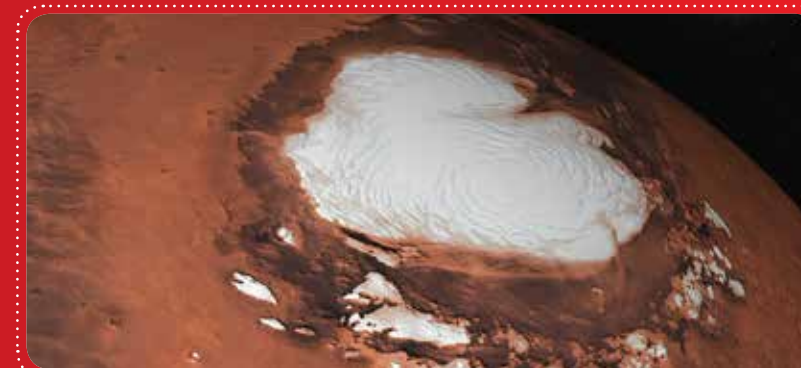
Mars is covered with a layer of **IRON**. This iron reacts with the air outside and turns reddish brown. This process is called rusting. This is the reason why Mars appears red in colour.



Humans have used spaceships to land robots on Mars. These robots, called **ROVERS**, explore the surface of Mars and send information back to Earth. Over the years, 4 rovers have landed on Mars, called Sojourner, Opportunity, Spirit and Curiosity.



Mars has the largest volcano in the solar system. It is called **OLYMPUS MONS**.
Have you ever seen a volcano?



We have discovered **WATER** on Mars. Scientists are now trying to see if life is possible on this planet. **Do you think one day we will be able to live on Mars? What will be the challenges?**

JUPITER

Jupiter is the fifth planet after the Sun in our solar system. It is the biggest planet. Jupiter is a gas giant, which means it has no solid surface. The images of Jupiter (like the one on the right) show different layers of gas. The gases moving at different speeds create bands on the surface.



Jupiter is so big that more than a **1000 EARTHS** can fit inside it.

FACTS ABOUT JUPITER



MOONS:

Jupiter has 79 moons.

YEARS:

One year on Jupiter is equal to 12 years on Earth.

SPACE WORDS

GAS:

Air like substances that cannot be picked up or poured into a container.



Jupiter has a lot of big storms. One of them is called the **GREAT RED SPOT**. This famous storm is bigger than Earth and has been going on for the last 350 years. **Can you imagine living in a never ending storm?**



Jupiter has more moons than any other planet in the solar system. One of the moons called **GANYMEDE** is the biggest moon in the solar system



One of the moons of Jupiter, **EUROPA**, is covered in ice. Scientists believe there may be water under the ice.



Many **SPACECRAFTS** have observed Jupiter. But none have been able to go inside the clouds. The latest spacecraft to visit Jupiter is Juno, which entered the planet's orbit in 2016. **What do you think is under Jupiter's many clouds?**

SATURN

Saturn is the sixth planet from the Sun in our solar system. It is the second biggest planet. Saturn is known for having shining rings around it. It is also a gas giant like Jupiter.

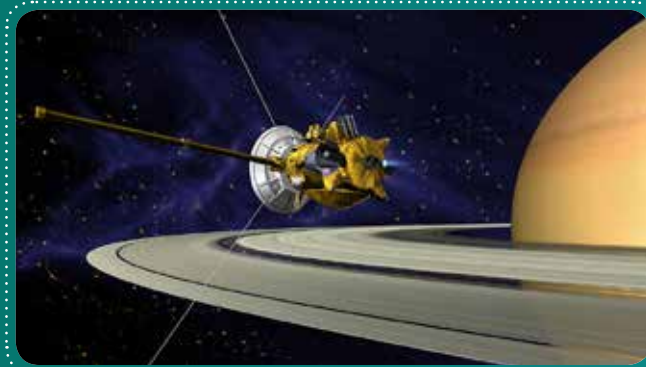


Over **700 EARTHS** can fit inside Saturn.

FACTS ABOUT SATURN



The rings around the planet are made up of millions of **ICE CRYSTALS**. Their sizes can vary from being as big as shops to as small as dust particles.



A spacecraft named **CASSINI** was the first to orbit Saturn in 1997. It was in space for 20 years, out of which 13 years were spent orbiting Saturn. **If you had your own spacecraft, where in space would you take it?**



Saturn's biggest moon is called **TITAN**. Titan is bigger than Mercury.



Saturn is very **LIGHT IN WEIGHT**. It is so light that if you could put Saturn in a large bathtub full of water, it will float! **Try dropping a plastic ball and an iron object into a bucket of water. Which one floats? Why?**

MOONS:

Saturn has 62 moons.

YEARS:

One year on Saturn is equal to 29 years on Earth.

SPACE WORDS

GAS GIANT:

Planets that have no solid surface. They are mostly made of gas. Jupiter & Saturn are Gas Giants.

URANUS

Uranus is the seventh planet from the Sun in our solar system. It was the first planet discovered using a telescope. Have you ever looked through a telescope?



Uranus is **14 TIMES** the size of Earth.

FACTS ABOUT URANUS

MOONS:
Uranus has 27 moons.

YEARS:
A year on Uranus is equal to 84 years on Earth.

SPACE WORDS

TELESCOPE:
An instrument used to view planets and other stars. By using lenses, it makes distant objects appear bigger.



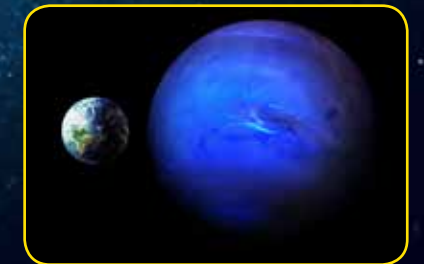
Uranus has **NO SEASONS**. This means the temperature on Uranus stays the same throughout the year. This happens because it is too far from the Sun. **Do you know how many seasons there are on Earth?**



There is only one spacecraft, called **VOYAGER 2**, which has travelled to Uranus. It flew by Uranus in 1986.

NEPTUNE

Neptune is the eighth and last planet from the Sun in our solar system. It is the coldest among all the planets. It is deep blue in colour. Neptune spins very fast. One day on Neptune is only 16 hours.



Neptune is **17 TIMES** the size of Earth

FACTS ABOUT NEPTUNE

MOONS:
Neptune has 14 moons.

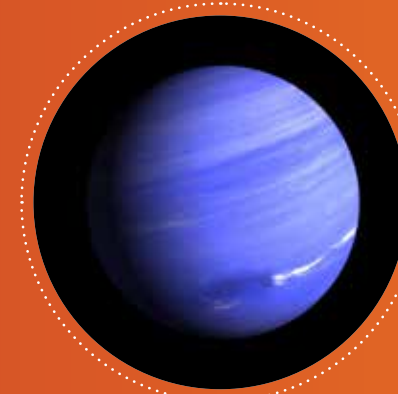
YEARS:
One year on Neptune is 165 years on Earth.

DID YOU KNOW?

• *Uranus and Neptune are called Ice Giants. They are heavier and colder than Gas Giant planets.*



Neptune's biggest moon is called **TRITON**. It is almost as big as Earth's moon.



The weather on Neptune is **COLD** and **WINDY**. This planet has the strongest winds in the entire solar system.

DWARF PLANETS

The word dwarf means small. The dwarf planets are much smaller than the eight planets. They also travel around the Sun and are part of our solar system.

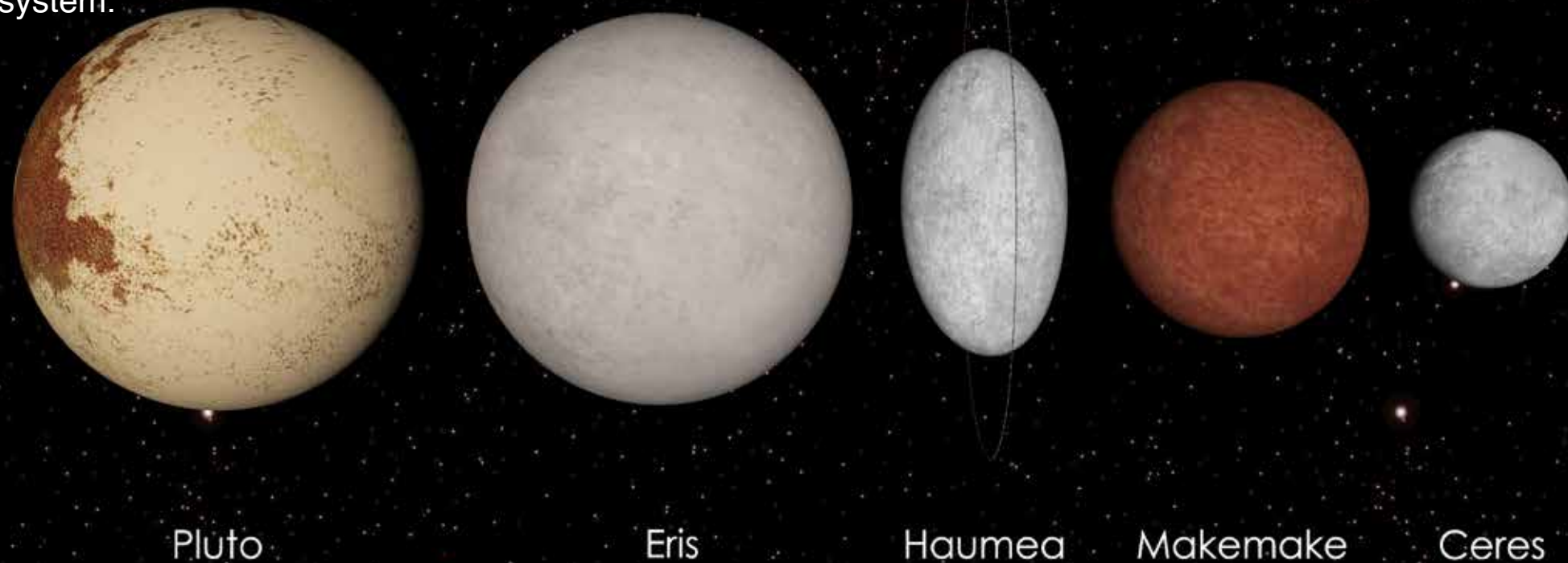
DID YOU KNOW?

- There are 5 dwarf planets in the solar system.
- Dwarf planets don't have independent orbits like planets. Their orbits intersect with other space objects.

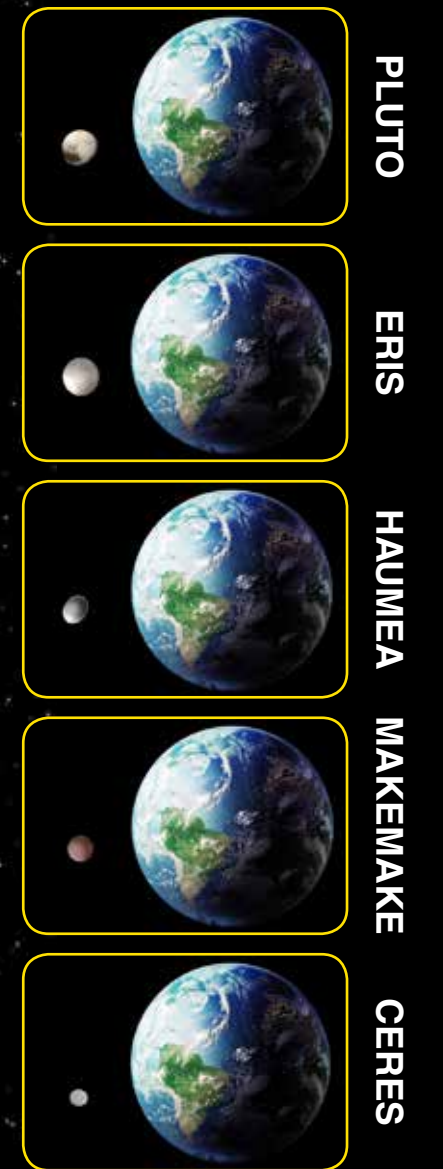
SPACE WORDS

KUIPER BELT:

A large ring full of millions of icy space objects. It is bigger than the orbit of Neptune. Pluto, Haumea and Makemake are on this belt.



SIZE COMPARISON TO EARTH



FACTS ABOUT DWARF PLANETS



PLUTO orbits even further away from Neptune. It is the largest dwarf planet in our solar system. It was called a planet many years ago. But over the years scientists began to think that Pluto was too small to be called a planet. In 2006, the International Astronomical Union announced that Pluto was now a dwarf planet.



ERIS is the second biggest dwarf planet after Pluto. It was discovered in January 2005. Eris has one moon called Dysnomia. **If you were asked to name a newly discovered moon, what would you name it?**



HAUMEA [pronounced: how-MEH-ya] is a dwarf planet which looks like a potato. It has two moons. Haumea is also the only dwarf planet to have a small ring around it.



MAKEMAKE [pronounced: MAH-kee MAH-kee] is the only dwarf planet which does not have its own moon. One year on Makemake is equal to 308 years on Earth.



CERES [pronounced: SEER-ees] is a dwarf planet which lies between Mars and Jupiter. It is the first dwarf planet from the Sun in our solar system. It is made of rock and ice.

METEOROIDS

Meteoroids are really small rocks floating in space. Sometimes they fall down on Earth. As they enter the Earth's atmosphere, the friction causes them to burn, creating long bright streaks of light. These are called meteors or 'shooting stars'.

DID YOU KNOW?

- The size of meteoroids can range from small grains of sand to as big as cars.
- 25 million meteoroids enter Earth's atmosphere each day.

SPACE WORDS

METEORITE:

A meteor turns into a meteorite when it lands on Earth.

FACTS ABOUT METEOROIDS



Hoba is the world's largest meteorite (pictured above). It weighs 66 tons and is 9 feet long by 9 feet wide. It is located in Namibia. **Can you find Namibia on the map of the world?**



When many meteors enter the Earth's atmosphere at the same time, the sky lights up. This is called a **METEOR SHOWER**.

COMETS

Comets are small bunches of rocks and icy gas. They travel around the Sun in large orbits. They are seen as bright balls in the sky with a long tail of light.

FACTS ABOUT COMETS



The most well known comet is called **HALLEY'S COMET**. It comes near Earth once every 75 years.



COMET ORBITS are much bigger than most planetary orbits. A comet can take hundreds, or even thousands of years to complete just one orbit around the Sun!

DID YOU KNOW?

- A comet's long tail of light is called a **Dust Tail**. It is a trail of dust and rocky material that is left behind as the comet moves along its orbit. It is the most visible part of a comet.
- The **Oort cloud** is an outer region of the solar system. The Comets which start from here have orbits that last millions of years.

STARS

Stars are giant balls of hot gas. They give out heat and light. Most of the pinpricks of light that shine in the night sky are stars.

DID YOU KNOW?

- The nearest star to the Earth is the Sun.
- The nearest star after the Sun is called Proxima-Centauri. Light from there takes more than four years to reach Earth. (It only takes 8 minutes for light to travel between Sun and Earth)

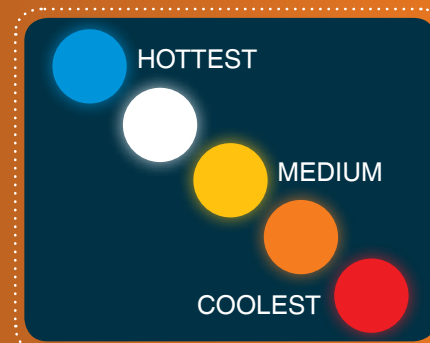
SPACE WORDS

CELESTIAL BODY:
A natural object that exists outside the Earth's atmosphere. Examples include stars, planets, asteroids, comets, and meteoroids.



If we go to an area with no city lights and look up on a clear moonless night, we will be able to see more than **2000 STARS!** How many stars can you see at night from your house?

FACTS ABOUT STARS



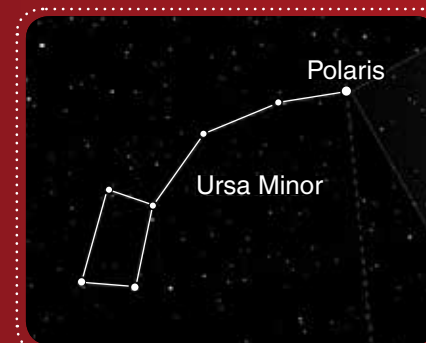
We can tell how **HOT** a star is by looking at its colour. Blue stars are the hottest. Red stars are the coolest. Yellow is medium. Our Sun is yellow. Can you try spotting blue and red stars at night?

CONSTELLATIONS



Many years ago, we did not have a lot of knowledge about the solar system and space. In those days people used to match the stars in the night sky to make outlines of figures. These outlines are now known as constellations.

FACTS ABOUT CONSTELLATIONS



Early explorers used constellations for navigation. Polaris (the North Star) is part of the **URSA MINOR** (pictured above) and it helped navigators know directions even at night.



12 constellations belong to an area of the sky called **'ZODIAC'**. These are Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricorn, Aquarius, and Pisces. Our birthdays tell us which zodiac sign is ours. Find out which is your zodiac!

DID YOU KNOW?

- In 1922, an official list of 88 constellations were confirmed for the entire night sky by the International Astronomical Union.
- Constellations come in many shapes. They could be animals, inanimate objects, mythological figures, etc.

GALAXIES

A galaxy is a gigantic collection of stars, planets, dust and gas held together by gravity. There are billions of galaxies. Our galaxy is called the Milky Way.



DID YOU KNOW?

- An average galaxy contains 100 million stars.
- Elliptical galaxies are so bright that we would have day light all the time if we lived in one.

SPACE WORDS

LIGHT YEAR:
Distance travelled by light in one year. It is equal to 9 trillion kilometers.

FACTS ABOUT GALAXIES

GALAXIES COME IN 3 SHAPES



SPIRAL GALAXIES



IRREGULAR GALAXIES



ELLIPTICAL GALAXIES



Our galaxy, the **MILKY WAY**, is a barred spiral galaxy. There are between 100 to 400 billion stars in it, and over 100 billion planets. The Milky Way is visible from Earth as a hazy band of white light. **Can you try spotting it in the night sky?**

UNIVERSE

The Universe contains everything we can see. All physical matter, stars, planets and galaxies are part of the Universe.

FACTS ABOUT THE UNIVERSE

DID YOU KNOW?

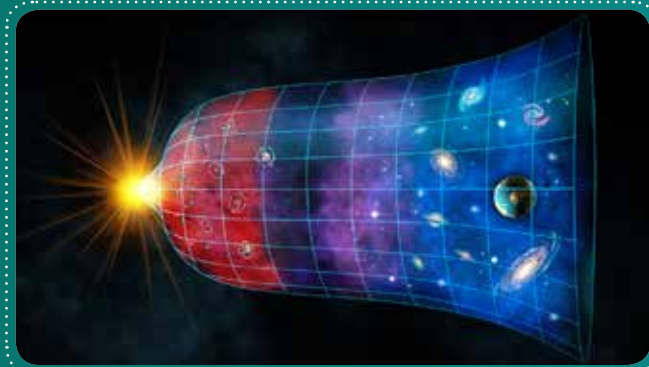
- The Universe does not have a fixed size. It keeps expanding over time.
- The Universe has no centre.

SPACE WORDS

COSMOLOGY:
The branch of science that studies the origin and nature of the universe.



The Universe is so big that we can only measure it in **LIGHT YEARS** (see space word on previous page). We have been able to see 93 billion light years of the Universe.



Scientists believe that the universe was started with an explosion called the **BIG BANG**. This gave birth to everything we see including galaxies, stars and planets.



In the Universe we can see huge clouds of dust and gas. These are called **NEBULAS**. In these Nebulas, when the gas, dust and other materials come together in a dense form, stars are born.



The Universe contains **BLACK HOLES**. These are areas in space where the gravity is so strong, even light cannot reflect back from it. Scientists in 2019 were able to take the first ever picture of a black hole.

EXPLORING SPACE

Humans have sent over 5,000 spacecrafts into space since 1957. These include artificial satellites, rovers and spacecrafts with humans on it. Every year we continue to explore more and more of the Universe. Would you like to be a space explorer when you grow up?



A satellite

FACTS ABOUT EXPLORING SPACE



An astronaut exploring space.

DID YOU KNOW?

- The first person to go into space was Yuri Gagarin in 1961.
- The Moon is the only space body apart from Earth, where humans have set foot.

SPACE WORDS

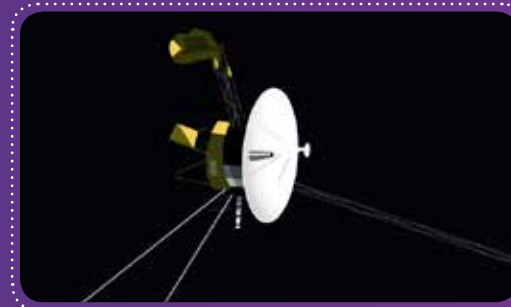
ASTRONOMY:
The subject in which we learn about other planets and outer space.



People who go into space are called **ASTRONAUTS**. Astronauts go through tough training to survive space travel. **Can you guess why astronauts wear space suits?**



To launch into outer space, we need to reach a speed of 7 miles per second. This is required to escape Earth's gravity. This is done by using **ROCKETS**.



SPACE PROBES are satellites sent to study outer space. These probes carry special cameras and complex instruments which can conduct experiments. Voyager 1, a space probe sent in 1977, is 13 billion miles away from Earth. This is the furthest a man made object has travelled in space.



Several countries came together with the common goal of learning more about space. The result was a huge artificial satellite called **THE INTERNATIONAL SPACE STATION (ISS)**. Astronauts stay there for weeks and months to conduct experiments. The ISS orbits the Earth in just 92 minutes, and travels around the Earth 15 times in one day.

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