

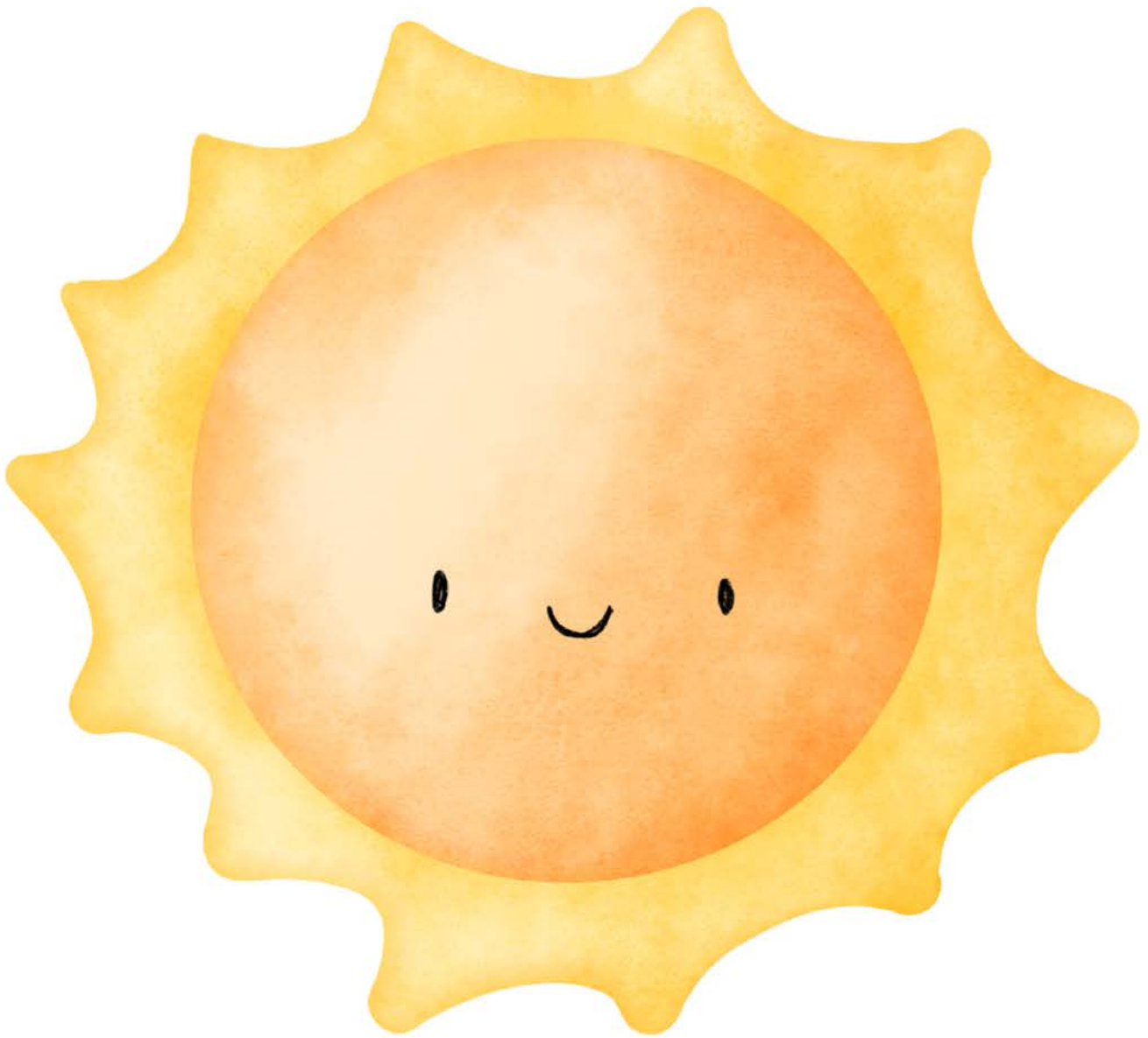


THE SCHOOLS'
OBSERVATORY

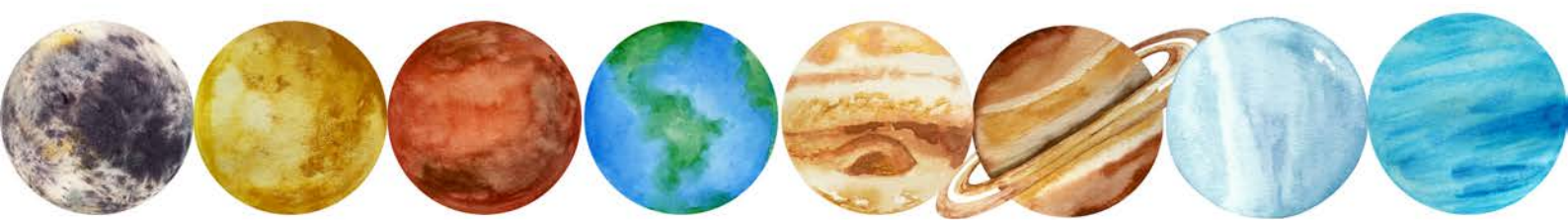
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Activities for EYFS The Solar System



Background information

The Schools' Observatory use the wonders of space to inspire the next generation of scientists, programmers and engineers. They provide resources for schools, support for teachers and free use of the world's largest robotic telescope through their website, schoolsobservatory.org.

The Schools' Observatory is proud to be part of Liverpool John Moores University and are based in LJMU's Astrophysics Research Institute in Liverpool, UK.

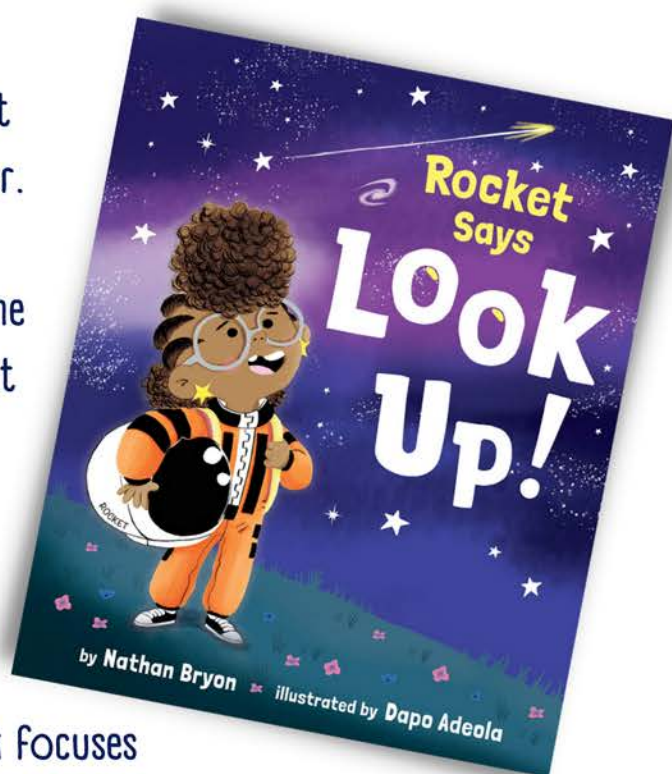
In partnership with Durham Book Festival's Little Read, The Schools' Observatory have created packs of themed resources for Early Years Foundation Stage children. These can be used at home or in nursery settings to engage children with the story, "Look up" by Nathan Bryan.

The main character in "Look up" is Rocket.

Rocket is very interested in space and the night sky and is looking forward to a meteor shower. Children may not have seen a meteor before, but they have probably seen the Moon and some stars. They may even have seen a planet without realising it!

When stargazing, it's easiest to start by looking for the brightest objects in the night sky. These include stars, the Moon, and the planets of our Solar System. This activity pack focuses on our Solar System.

This booklet has information for you on pages 3 to 10, ideas for activities to do with the children on pages 11 to 19 and finally additional resources and weblinks we think you might be interested in on pages 20 to 22.



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Please note: the images used in this document are not to scale.

The Solar System

What is the Solar System?

Our Solar System contains the Sun, 8 planets, and lots of smaller objects. It formed from a huge cloud of gas and dust about 4,500 million years ago.



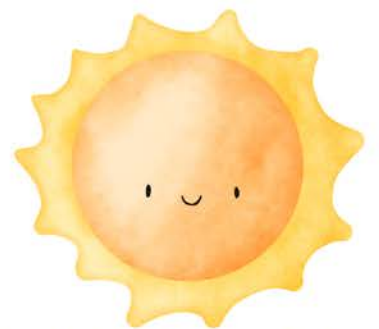
Everything in our Solar System orbits the Sun. The Sun is the only star in our Solar System. Our Solar System is part of a huge galaxy of stars, called the Milky Way.

We have learned a lot about the Solar System by looking at how planets move in the night sky. Our observations have improved since the invention of telescopes about 400 years ago. More recently, robots and space probes have explored the Solar System for us. They have sent back photos and data from other planets and moons.

Our ideas about the Solar System have changed over time as our knowledge has grown. Hundreds of years ago, scientists thought the Earth was the centre of the Solar System. We now know that is not correct. Everything in our Solar System, including the Earth, orbits the Sun.

The Sun

The Sun is a star and gives off light. Waves of this light travel through space in all directions. We experience heat and light from the Sun because these waves reach us on Earth. The light from the Sun is bright enough to damage our eyes if we look directly at it, even if we wear sunglasses. Children should be warned about the dangers of looking at the Sun.



The Solar System

Does the Sun move across the sky each day?

No. The Sun stays where it is, in the middle of our Solar System. In fact, it is the Earth that is moving. The Earth spins around its axis like someone spinning a basketball on their finger. This makes it appear that the Sun is moving.

Why do we get day and night?

We get day and night because the Earth rotates around its axis once every 24 hours. When the part of Earth we are on is facing the Sun, it is daytime. When the part of Earth we are on is turned away from the Sun, it is night-time.

Is the Sun so bright because it is bigger than other stars?

No. The light from the Sun is so bright on Earth because the Sun is so much closer to us compared to other stars. The Sun is an average star, so it is not bigger or brighter than most other stars.

Why does sunshine seem different in summer and winter?

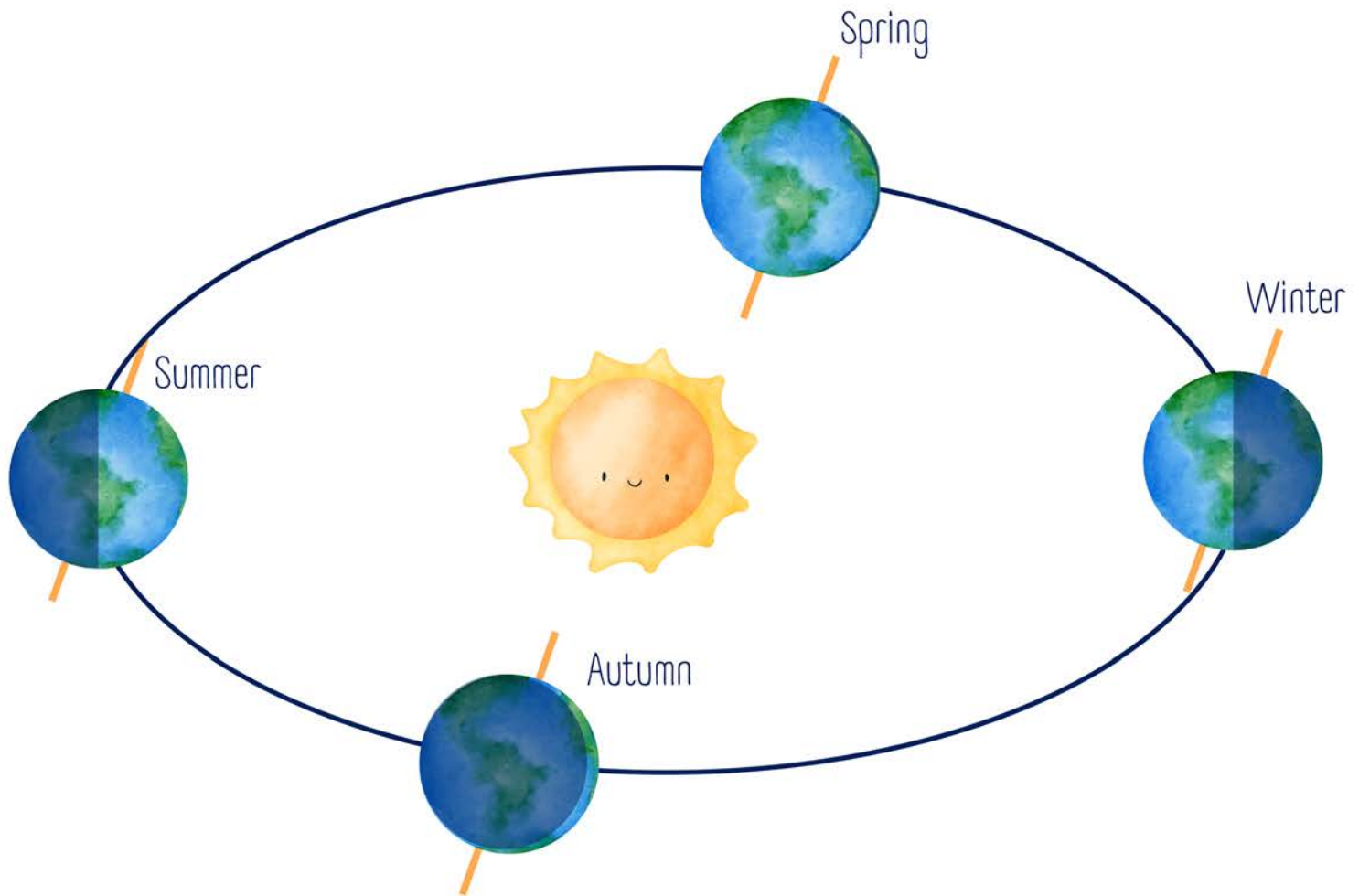
Children may notice the sunshine feels warmer in the summer. They may also see that daylight lasts longer in the summer than in the winter. We experience these changes as seasons.

Earth has seasons because its axis is tilted compared to the axis of the Solar System – it is not stood up straight as it spins! So as the Earth orbits the Sun each year, different parts of the planet get more or less direct sunlight.

For example, in December, the Northern Hemisphere is tilted away from the Sun. It receives less direct sunlight than the Southern Hemisphere. People in the Northern Hemisphere experience colder temperatures and shorter days.

The Solar System

However, in June the Northern Hemisphere is tilted towards the Sun. It receives more direct sunlight than the Southern Hemisphere. People in the Northern Hemisphere experience warmer temperatures and longer days.



Seasons in the Northern Hemisphere during 1 orbit of the Sun.

The orange lines show the tilted axis of the Earth.

The oval blue line shows the orbit of the Earth.

Credit: The Schools' Observatory

The Solar System

What about eclipses?

We experience a solar eclipse when the Moon blocks light from the Sun from reaching us here on Earth. The sky gets dark, like at night-time, but just for a few minutes! During an eclipse, the Earth, Moon, and Sun must be in a straight line.



The Moon is smaller than the Sun so how does it cause an eclipse?

Well, the Moon is 400 times smaller than the Sun, but it is 400 times closer to the Earth. This quirk of nature means the Moon and the Sun look the same size in the sky.

So why isn't there a total solar eclipse every month?

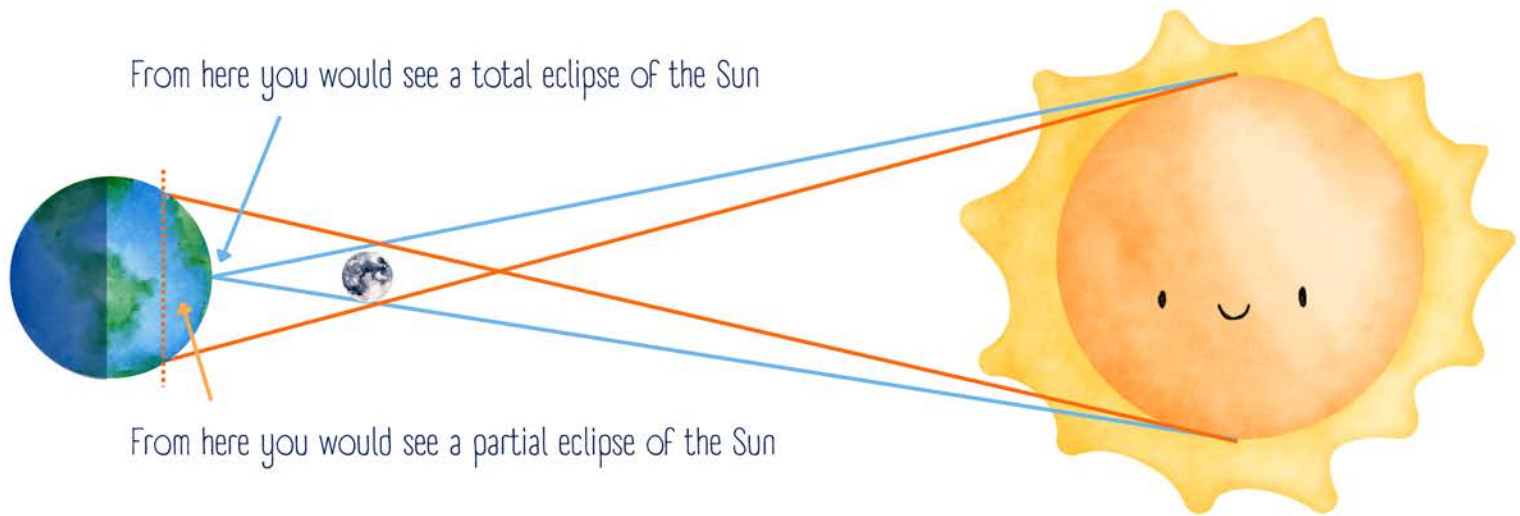
The Moon's orbit is on a tilt compared to the Earth's orbit of the Sun. It usually passes above or below the line between the Sun and the Earth. We get a solar eclipse at the rare times when all three objects line up.

A total solar eclipse occurs on Earth roughly every 18 months. But the Moon's shadow only covers a part of the Earth's surface. So, you have to be in the right place to experience a solar eclipse. Remember it is never safe to look directly at the Sun, even during an eclipse.

Parts of the Earth not completely in the Moon's shadow see a partial eclipse. The Sun looks like it has a dark shadow on part of its surface. The sky gets darker, but it doesn't feel like night-time.

The Solar System

What about eclipses?

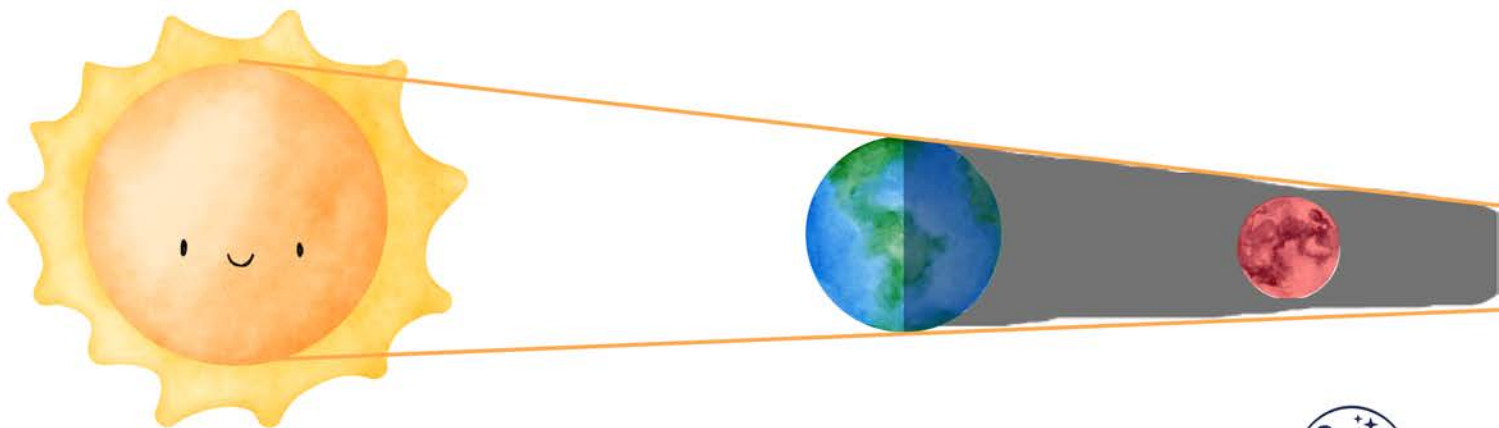


When the Earth, Moon and Sun are in a straight line, the part of the Earth in the Moon's shadow experiences a solar eclipse.

Credit: The Schools' Observatory

We also experience lunar eclipses. This is when the Earth blocks most of the Sun's light reaching the Moon during a full Moon. A lunar eclipse can last several hours. It is safe to look at a lunar eclipse.

During a lunar eclipse the Moon looks a red-brown colour (it is sometimes called a blood Moon). This is because any light that reaches the Moon has had to go through the Earth's atmosphere. The atmosphere is dusty and scatters light making it redder. This is also why we have red sunrises and sunsets, because when the Sun is low on the horizon it has to pass through more atmosphere.



The Solar System

The Planets

Our Solar System contains 8 planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.

The 4 planets closest to the Sun are the inner or terrestrial planets. They are small, warm, rocky worlds, with few (or no) moons and no rings. They are: Mercury, Venus, Earth, and Mars. Venus, Earth, and Mars all have atmospheres and weather.



Mercury



Venus



Earth



Mars

The 4 outer planets are larger and cooler. They are made of gases and ices. Together they contain 99% of the mass that orbits the Sun. These planets are often called giant planets. There are the gas giants: Jupiter and Saturn. And the ice giants: Uranus and Neptune. The giant planets have a lot of moons, over 200 between them! They also all have rings, although we only see Saturn's rings from Earth.



Jupiter



Saturn



Uranus



Neptune

The Solar System

Generally, the closer to the Sun, the warmer the planet. However, Venus, the second planet from the Sun, is hotter than Mercury. It is hotter because it has a very thick atmosphere. This acts like a big blanket, trapping the heat and stopping it from escaping into space. Earth is at a special distance from the Sun, known as the habitable zone or Goldilocks zone! This is because it is not too hot, not too cold, it is just right for liquid water to exist.

There are 5 planets you can see in the night sky without using binoculars: Mercury, Venus, Mars, Jupiter, and Saturn. They will look like very bright stars. It is very hard to spot Mercury. This is because it is usually in a part of the sky very near to the Sun. Mars often looks an orange or red colour, and its rusty red colour has given it the nickname 'the red planet'. Venus is often called 'the morning star' or 'the evening star' because we see it around dawn or dusk.

Our Astronomy Calendars tell you the best time to observe planets and other objects in the night sky.

Everything else

The Solar System also contains lots of smaller objects. These also orbit the Sun.

Dwarf Planets

Dwarf planets are larger and rounder than asteroids, but not as massive as planets. The Solar System contains 5 dwarf planets: Ceres, Pluto, Eris, Makemake, and Haumea. Ceres is in the asteroid belt, the other 4 are beyond Neptune.

Asteroids

Asteroids are pieces of rock, too small to be planets. Most asteroids are in the asteroid belt. This is a huge collection of rocks between Mars and Jupiter.

The Solar System

Comets

Comets are large balls of ice, rock and dust. You can think of them as large dirty snowballs that hurtle around the Solar System. When a comet passes near to the Sun, the Sun's heat starts to melt and boil the outer layers of the comet. This produces a long tail of gas.

Meteors

Meteors, sometimes called shooting stars, are not stars at all. They are small pieces of dust or rock from space which set on fire as they fall through Earth's atmosphere. Their superfast speed through the air causes them to burn up as they fall.

Meteors are usually debris from comets or asteroids. Sometimes they are larger chunks of rock that make it all the way to the ground. If they land on Earth, we call them meteorites. Most of the meteorites that have been found come from asteroids, but some come from the Moon and even Mars!

Feedback

We welcome feedback from practitioners. If you want to let us know how much your children have enjoyed our activity or how we could improve it, please send us some feedback using the details below:

Share your planetary creations with The Schools' Observatory!
Email SchoolsObs@ljmu.ac.uk or tag [@SchoolsObs](https://www.instagram.com/SchoolsObs) on social media.

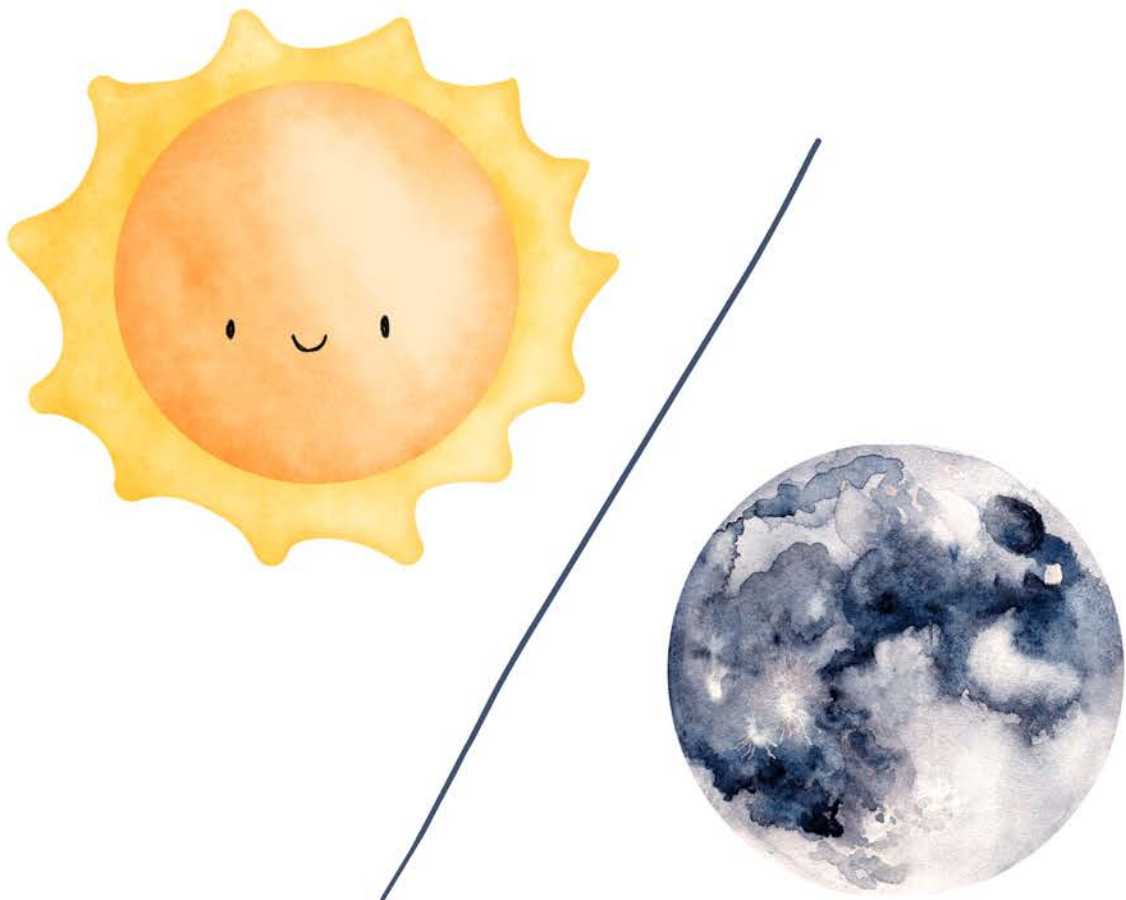
The Solar System: Activities

Activity 1 – Collecting day and night words

Introduce the topic of day and night. Pin on the wall a piece of light blue (or white) paper and a piece of black paper. Explain that the children are going to collect words to do with day and night.

1. Ask the children which piece of paper should represent day and which should represent night.
2. Ask the children to suggest words to do with daytime and add them to the paper.
3. Ask the children to suggest words to do with night-time and add them to the paper.

You could also use this activity as an introduction to ‘opposites’ as part of children’s literacy.



The Solar System: Activities

Activity 2 - Sorting day and night objects

Put two hoops on the floor and label one 'day' and one 'night' (you don't have to use hoops, you can mark out separate areas in other ways). Gather a selection of objects that represent daytime or night-time. These could include pyjamas, toothbrush, toy nocturnal animals, shopping bag, slippers, outdoor shoes, breakfast cereal, story book. You could also include images or objects representing stars, the Sun, and rainbows. If you include items like the Moon or clouds, remember that we can see these in both the day and night-time.

- Show the children a selection of objects.
- Ask the children to choose an object.
- Talk about the object. What is it? What is it used for? When do we use it? Is it a daytime or night-time object? Where should it go? Which group does it belong to? What is it similar to? What is it the opposite of?
- Ask the child to put the object in either the day hoop or night hoop.

If an object could go in either category, children could overlap the two hoops to create a section in the middle for both day and night, like a Venn diagram.



The Solar System: Activities

Activity 3 – Day or night game

Darken the room by turning off the light and closing any curtains. Get an adult to stand in the middle of the room holding a light source. The adult is the Sun. Ask the children to stand in a circle around the Sun. Explain that in this game, they are going to be the Earth. Tell them that the Earth turns around every 24 hours. And that is why we have day and night.

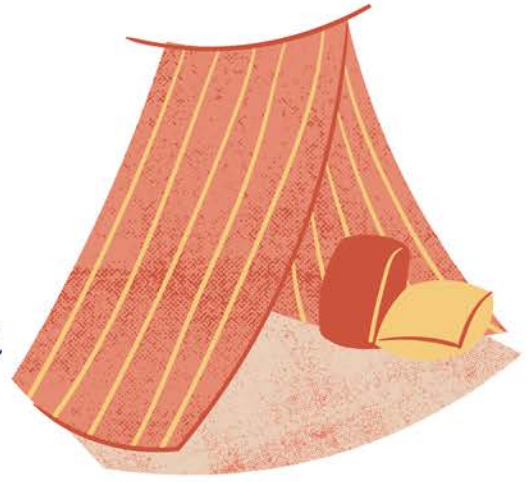


- Ask the children to face the Sun. Is it light or dark? Is that daytime or night-time?
- Ask the children to turn around so they have their backs to the Sun. Is it light or dark? Is that daytime or night-time?
- Ask the children to face the way they think shows daytime. They should be facing the Sun.
- Ask the children to face the way they think shows night-time. They should have their backs to the Sun.
- Ask the children to turn around slowly on the spot. Tell them to stop when they think they have got to 'daytime'.
- Ask the children to turn around slowly on the spot. Tell them to stop when they think they have got to 'night-time'.

The Solar System: Activities

Activity 4 – Exploring shadows

Create a dark section within your learning environment. You can ask the children for ideas to help you do this. Within the dark space, provide torches and objects that will make interesting shadows. You can include natural objects like leaves and feathers; household objects like colanders and combs; classroom equipment like different shaped blocks. Try to include a mixture of transparent and opaque objects.



Let the children explore making shadows by using the objects to block the light from the torch. Why is it making a shadow? What is blocking the light? Do all the objects block the light? Does the object have to be in a special place to make a shadow? What happens if they move the objects closer to the light? What happens if they move the objects further from the light? They could also experiment with making shadows with different parts of their bodies.

Encourage children to make shadow puppets. You can help children to trace images from books and stories onto paper. Then cut the shape out and take it into the dark den to see the shadow they make. Children can make up stories or retell stories using their puppets.

On sunny days, go outside and encourage children to notice their shadows and the shadows of objects around them. In the winter months, when the Sun is low in the sky, their shadows will look very long. In the summer months, when the Sun is high in the sky, their shadows will look shorter. This is also true during the course of the day – the shadows will be longer at the start and end of the day when the Sun is lower on the horizon, and shorter around midday when the Sun is overhead.

The Solar System: Activities

Activity 5 – Solar System scale walk

It's hard to imagine how far apart things are in space. You can walk along a scale model to help understand the distances.

Equipment needed:

- Images of or name labels for the Sun and 8 planets
- Metre stick or trundle wheel

Set up the walk:

- place something to represent the Sun at the starting point.
- place images or name labels of the planets at the distances in the table below around your building or outside space. If you have limited space, you may want to stop at Jupiter or Saturn.

During the activity:

Lead the children along the walk and encourage them to spot the images or signs you have placed.

You can use this activity as the start of exploring the topic to encourage awe and wonder. Children may have lots of questions about planets as you go. This can lead into the 'planet exploration table' activity. Children may already have knowledge about which planet will come next in the sequence.

Alternatively, you can do this activity after children have started exploring planets. They could then try to recall songs, actions, or facts as you encounter each planet on the walk. If children ask where the nearest star would be, it would be 300 km away!



Mercury



Venus



Earth



Mars



Jupiter



Saturn



Uranus



Neptune

The Solar System: Activities

Planet	Scale distance from Sun
Mercury	40 cm
Venus	70 cm
Earth	1 m
Mars	1.5 m
Jupiter	5 m
Saturn	10 m
Uranus	20 m
Neptune	30 m

The Solar System: Activities

Activity 6 - Planet exploration tables

Set up tables or stations for children to research and explore the planets of our Solar System. Include objects, books about our Solar System, and images. Use the table below to provide clues for children to guess our quick facts about each planet. Ask children what the clues tell them about the planet. Why might they need the objects? Try to include ways for children to mark make and record what they find out.

Planet	Quick facts	Clues
Mercury	Rocky and covered in craters. Closest to the Sun.	Pieces of rock. Sunglasses.
Venus	The hottest planet in our Solar System. Has lots of volcanoes!	Fans to keep you cool. Images or toy volcanoes.
Earth	Only planet with life. Only planet with oceans of water on the surface.	Tray of water. Pieces of plant. Toy animals.
Mars	Rocky and sandy. Has the largest volcano in the Solar System.	Pieces of rock. Sand tray. Images or toy volcanoes.

The Solar System: Activities

Planet exploration tables continued...

Planet	Quick facts	Clues
Jupiter	Has a huge storm called the Big Red Spot. Has a strong magnetic field.	Recording of a storm sound to listen to. Magnets and magnetic objects.
Saturn	Has 7 sets of rings around it. Less dense than water so it would float!	Hula hoops or ring toss. Tray of water with different balls – sponge balls that float, metal or rubber balls that don't float.
Uranus & Neptune	Cold and dark. Made of gas and ice.	Warm winter clothes. Ice cubes or slush.

The Solar System: Activities

Communication, Language, Emotions

Create an action for each planet of our Solar System, based on what children have learned about it. For example: arms wide for Jupiter, showing how big it is; pretending to use a hula hoop for Saturn, representing its rings.

There are British Sign Language signs for all of the planets in the Solar System, and many more space words, you can find them at: www.ssc.education.ed.ac.uk/BSL/astrohome.html

Alternatively, there are Makaton versions which use the sign for Earth with the planets first letters: www.youtube.com/watch?v=MXpM5k8uUM0

Art & Design ideas

Display images and models of the planets and Sun around your learning environment. Provide materials for children to create their own representations of the objects in our Solar System. Children could use chalk or paint to recreate the cloudy textures we see on the surface of many planets.

Make planet inspired 'suncatchers'. Use black paper with a round circle cut out of it. Cover the gap in the black paper with up pieces of tissue paper stuck together with glue. Encourage children to pick a planet and choose the colours of the planet.



The Solar System: Additional Resources & Web Links

Word Bank

day	far	orbit	Sun
asteroid	Jupiter	planet	turn
comet	light	rotate	Uranus
dark	Mars	Saturn	Venus
distance	near	shadow	
dwarf planet	Neptune	Solar System	
Earth	night	spin	

Schools Observatory Online Games

If you have a Smart board, or tablet, you can use these online games to help children recognise and order the planets:

Drag the planets into the correct order:

www.schoolsobservatory.org/things-to-do/order-planets

Find the planet pairs:

www.schoolsobservatory.org/things-to-do/pair-planets

The Solar System: Additional Resources & Web Links

The Schools' Observatory Website

You can use The Schools' Observatory website to search for more information about the Solar System. We think these are good places to start learning:

www.schoolsobservatory.org/search/



Ancient Astronomy	Orbits
Asteroids	Robots and Space Probes
Atmosphere	Seasons
Comets	Solar Eclipse
Day and night	Stargazing Calendars
Dwarf Planets	Stars
Solar System Formation	Telescopes
Galaxies	The Moon
Light	The Planets
Lunar Eclipse	The Solar System
Meteors	The Sun
Milky Way	

The Solar System: Additional Resources & Web Links

Other Useful Links

You can find lots of songs for children about the planets of our Solar System. These are a couple of our favourites:

Planets song: www.youtube.com/watch?v=PCxjuDePdCI

Dwarf planets song: www.youtube.com/watch?v=ws3kWuMiOY8

NASA has lots of resources about the Solar System

NASA Space Place for kids: spaceplace.nasa.gov/menu/solar-system

Search NASA's image library for pictures of planets: images.nasa.gov

Here are some recommendations for books about the Solar System:

8 little planets: www.csferrie.com/book/8-little-planets

Or see it being read by the author: www.youtube.com/watch?v=zTlz7n7Ze1A

Hello, World! Solar System:

www.goodreads.com/en/book/show/25739103-hello-world-solar-system