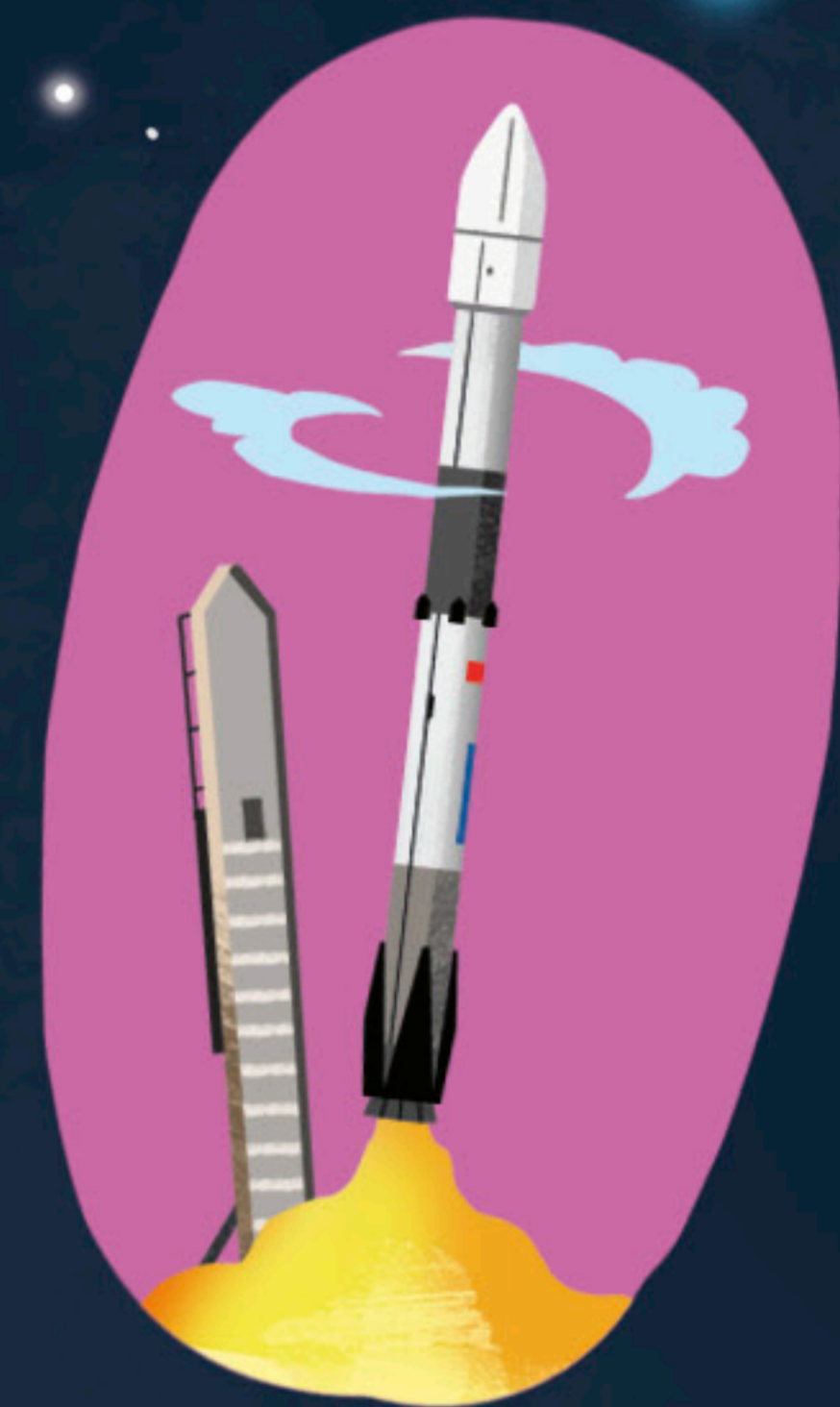


*Tell me about...*

# SPACE



**A FIRST  
SCIENCE book  
for curious  
minds!**

*Written by Emily Dodd  
Illustrated by Chorkung*



Tell me about...

# SPACE

A TEMPLAR BOOK

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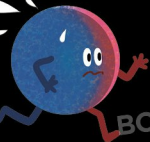
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# Welcome to Space

Imagine taking off in a rocket and flying into space. If you looked back, this is what you would see...

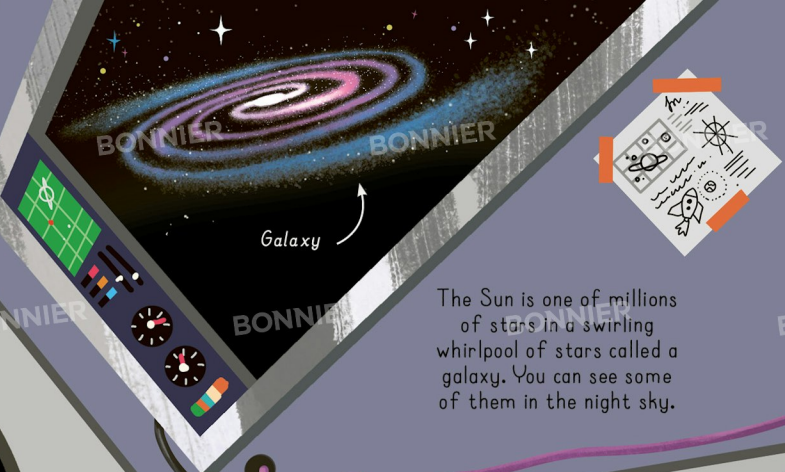


Our home! It's a beautiful, rocky, water-covered ball called planet Earth.

Round and blue

Planets travel in circles around stars. They can be made of rock, like Earth, or from gas and ice.

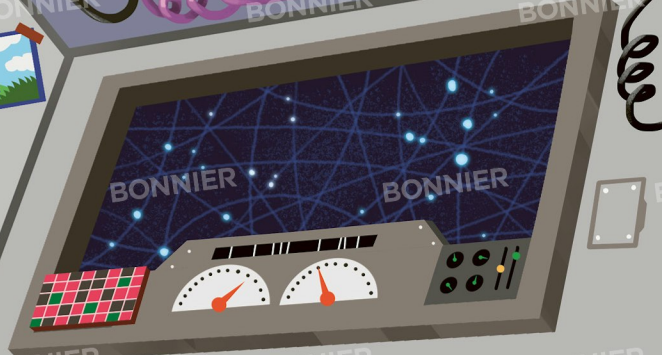
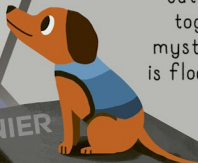
Earth circles around a star we know well. That's because we see it every day - it's called the Sun!



Galaxy



The Sun is one of millions of stars in a swirling whirlpool of stars called a galaxy. You can see some of them in the night sky.



There are millions of galaxies out there, too! They're joined together by dark, stretchy, mysterious webs and all of this is floating in a place called space.

Space is amazing! And it's spreading out and making itself bigger all the time.

# Looking Up

One of the brilliant things about space is that we can see it from Earth! Here are some of the things you can see:

## Stars

These beautiful twinkling dots are enormous balls of burning gas. They shine out light as they burn.



## Constellations

For thousands of years, people have looked up at the stars and made dot to dot pictures. We call these star pictures constellations.



## Did you know..?

Stars look small but most are much bigger than Earth. They're just very, very far away.



## Planets

Bright dots that don't twinkle are planets. They don't make their own light. They reflect the Sun's light, like mirrors.



## Satellites

Bright dots moving in a straight line across the sky are usually satellites. Scientists send them into space to do important jobs like making maps and taking pictures of the weather.

I can see a lion!

Look, it's moving!

That looks like a flying horse!

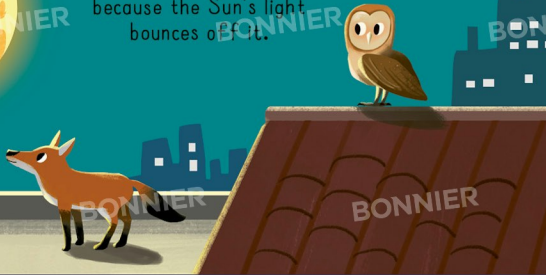


# The Moon

The Moon is the brightest object in the night sky. It's a round, rocky ball about a quarter of the size of Earth.



The Moon looks bright because the Sun's light bounces off it.



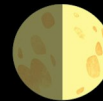
The Moon travels around Earth in a loop called an orbit. Each orbit takes about a month.



When the Moon was young, it was battered by space rocks. That is why it is covered in pits called craters.



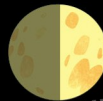
As the Moon orbits Earth, the Sun's light shines on it's surface.



It might look as if the Moon changes shape but actually it doesn't. We see parts of the Moon that are lit up by the Sun, and the shape we see depends on where the Moon is on its journey around Earth.



The rest of the Moon is in shadow. We call the changing shapes the phases of the Moon.



It's behind you!



Did you know...? The same side of the Moon always faces towards Earth. The other side is called the dark side of the Moon because we can't see it!

# Shooting Stars and Space Rocks

Have you ever seen a shooting star? It's not really a star at all! It's a tiny bit of space rock the size of a grain of sand.

When a rock from space travels towards Earth, it falls through the air around our planet and rubs against it. This is called friction.



Rub your hands together quickly for five seconds. Can you feel them heating up? This heat is because of friction too. When a space rock speeds through Earth's air, there's so much friction that it catches fire!



A space rock falling through the air is called a meteor. If it lands on Earth, we call it a meteorite.



Meteorites can be made from stone or metal or a mixture of both.

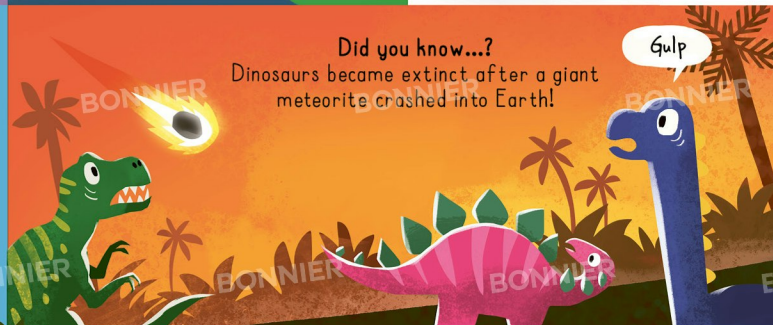


Meteorites are easy to spot in snowy and sandy places where they stand out.

When a bigger space rock travels through the air, we can see it glowing as it catches fire, even in the daytime.



Did you know...?  
Dinosaurs became extinct after a giant meteorite crashed into Earth!



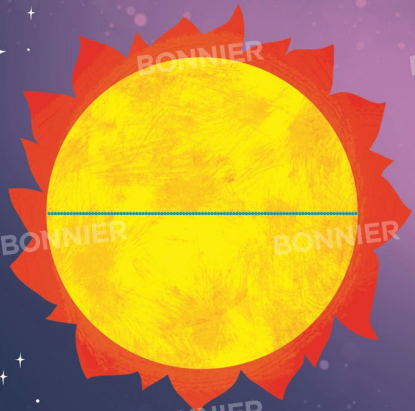


# The Sun

The Sun is our closest star. It's a huge ball of glowing gas that gives our planet heat and light. It powers our weather too.



The Sun's light and heat helps plants to grow. Every living thing survives because of the Sun.



The Sun is so big, you could fit 100 Earths across it in a row! That sounds massive but there are much bigger stars out there.



Earth takes a year to travel around the Sun in a big circle. So by the time you are five years old, you've been around the Sun five times!



Nighttime



See you tomorrow!

Earth spins on the spot. When it's turned away from the Sun, it is nighttime. When it turns towards the Sun, daytime arrives.

It takes 24 hours, or one day, for Earth to make one complete spin.

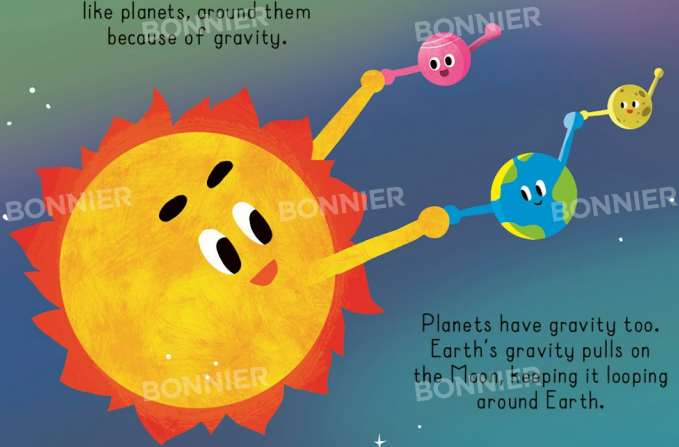


During our night, when the Sun's light is shining on the other side of Earth, we can peer out into dark space!

# Gravity

The Sun has an invisible pull coming from it, called gravity. Gravity keeps Earth in place on its path around the Sun.

Big things in space, like stars, pull smaller things, like planets, around them because of gravity.

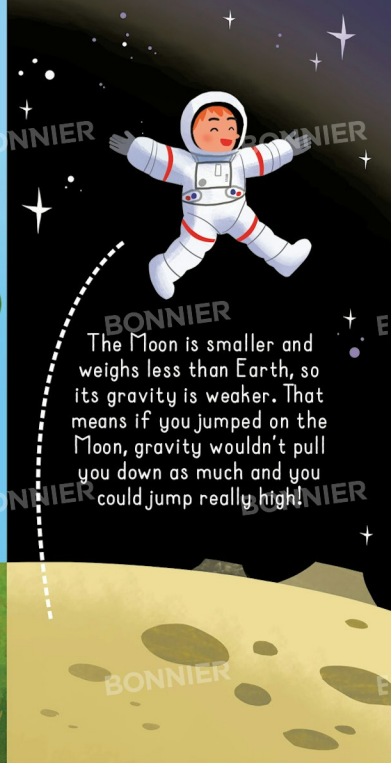


Planets have gravity too. Earth's gravity pulls on the Moon, keeping it looping around Earth.

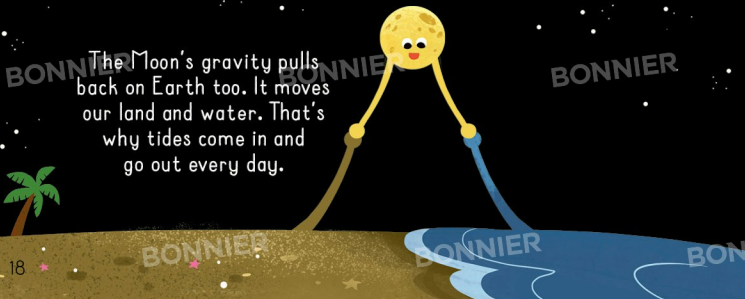
Gravity is pulling on you too! If you jump up, you come back down because of gravity.



The Moon is smaller and weighs less than Earth, so its gravity is weaker. That means if you jumped on the Moon, gravity wouldn't pull you down as much and you could jump really high!



The Moon's gravity pulls back on Earth too. It moves our land and water. That's why tides come in and go out every day.



Imagine you put this book down and it floated away. That's what would happen without gravity!



But if there was too much gravity, you would be squashed flat!

# The Solar System

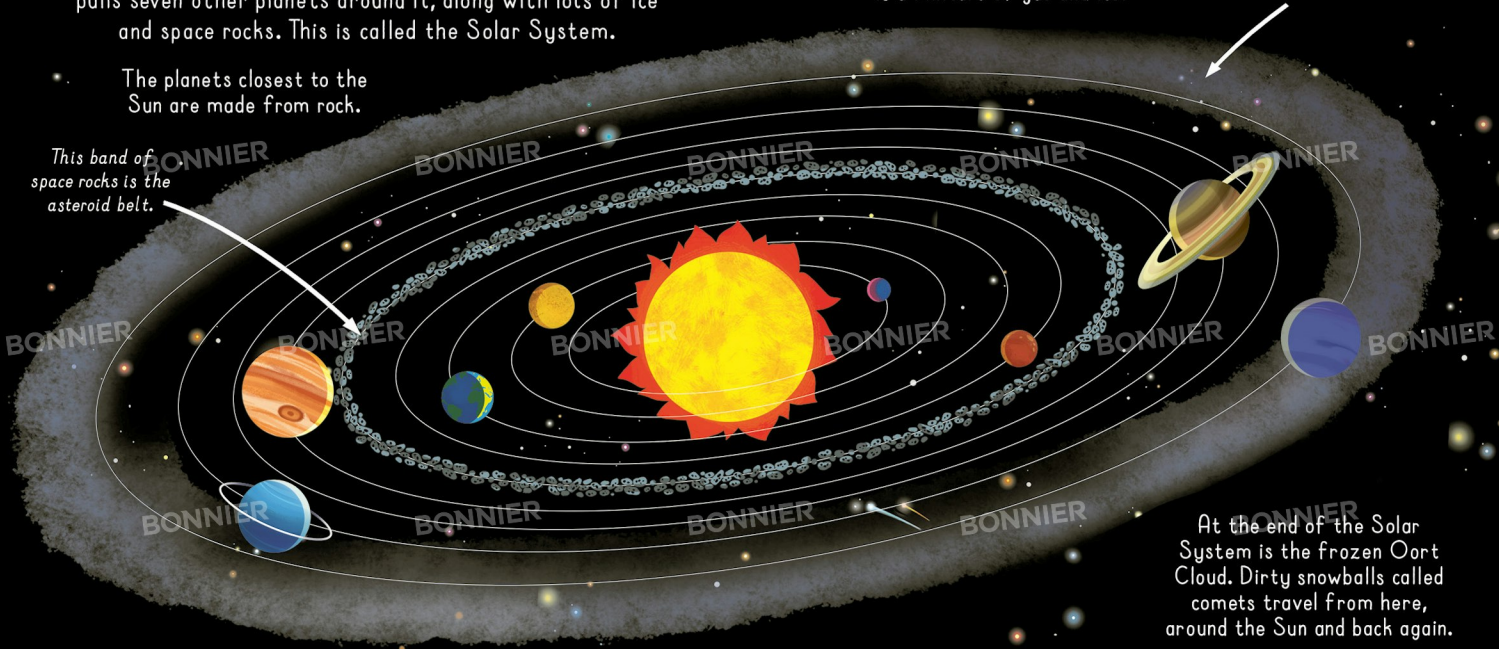
Earth isn't the only planet that circles the Sun. The Sun pulls seven other planets around it, along with lots of ice and space rocks. This is called the Solar System.

The planets closest to the Sun are made from rock.

*This band of space rocks is the asteroid belt.*

The planets further away have a solid core made of rock or metals. Swirling around the core is a mixture of gas and ice.

*This band of space rocks is the Kuiper Belt.*



At the end of the Solar System is the frozen Oort Cloud. Dirty snowballs called comets travel from here, around the Sun and back again.

**Did you know...?**  
The water we drink may have come to Earth millions of years ago on a comet!




Everything in our Solar System is made from the leftovers of an exploded star. So even you are made from stardust!



# Making Planets


All the planets in our Solar System began as tiny grains of dust. That's right, planet Earth was once smaller than a full stop!



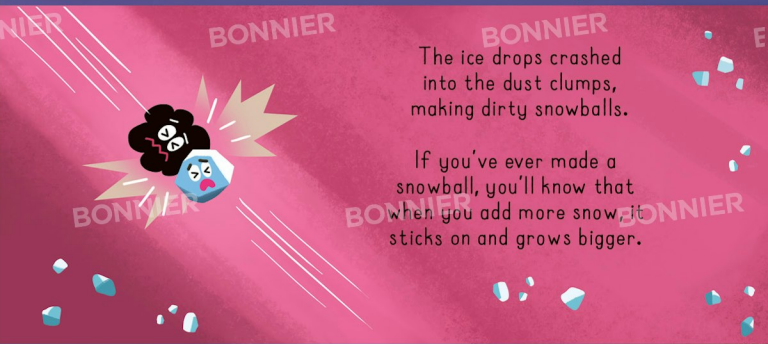
When the Sun was just beginning, it was surrounded by a flat, round cloud of dust.

The Sun pulled the dust into a circle around it and bits of dust began crashing together to make clumps.

The clumps closest to the Sun later became the rocky planets.




Far from the Sun, near the edges of the dust cloud, there were little drops of water. It was very cold, so the water froze into ice.



The ice drops crashed into the dust clumps, making dirty snowballs.

If you've ever made a snowball, you'll know that when you add more snow, it sticks on and grows bigger.



The dirty space snowballs kept crashing, joining together and getting bigger. The biggest snowballs pulled gas around them until they became the gas giant planets.



Hello!

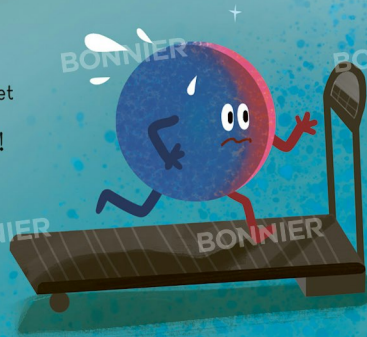
Hi, nice to meet you!

# The Rocky Planets

The four planets closest to the Sun were made as dust clumps collided to make pebbles. They crashed and joined together to make rocks called planetesimals, which grew into the rocky planets.

Mercury is closest to the Sun. It's the smallest, fastest planet in the Solar System. It circles the Sun four times every year!

The side facing the Sun is very hot while the other side is freezing cold.



Our home Earth is the third planet from the Sun.



Mars is planet number four. It is called the 'Red Planet' because a metal called iron in its soil rusts and turns a brownish red colour.



Venus is next. It spins in the opposite way to the other planets.

It's covered in volcanoes that let out a gas called carbon dioxide. This gas traps sunlight and makes Venus very hot.



Empty river beds on Mars show that water flowed there in the past.

Where is the water?



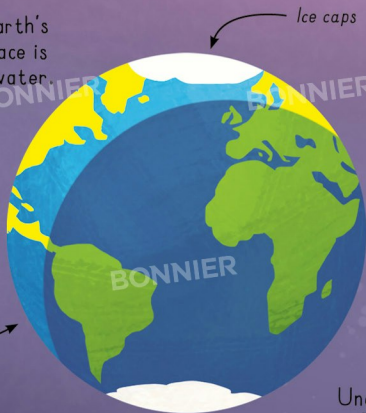
Did you know...? Dust storms on Mars sometimes cover the whole planet!



# Planet Earth

We live on Earth, the third planet from the Sun. It's mostly made of rock, so a better name for it would be planet rock.

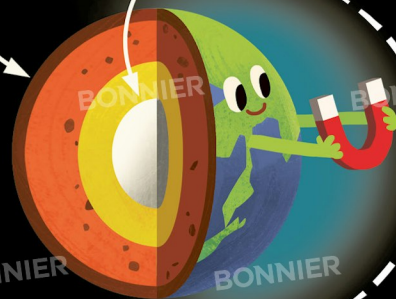
Most of Earth's rocky surface is covered in water.



Under the surface, Earth is made of layers.

Under the crust is a layer of hot squashed rock called the mantle.

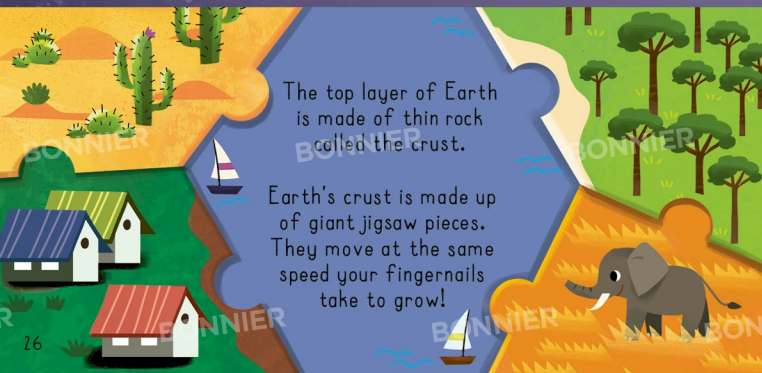
In the middle of Earth is a metal ball called the core. The centre is solid metal and the outside is liquid metal.



The metal core makes Earth a giant magnet! The magnet makes a barrier called a forcefield that protects Earth from dangerous rays that come from space. They bounce right off it!

The top layer of Earth is made of thin rock called the crust.

Earth's crust is made up of giant jigsaw pieces. They move at the same speed your fingernails take to grow!



Did you know...?

The jigsaw pieces that make up Earth's crust sometimes push against each other. This can set off volcanoes, earthquakes and tsunamis.



# Life on Earth

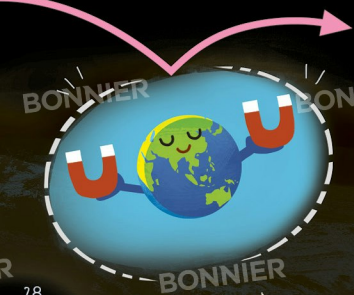
Earth is in the perfect place in the Solar System for us. It has everything plants, animals and humans need to survive.

We have flowing water to drink and light to help plants grow. The air is good for us to breathe and it traps the right amount of heat to keep us warm.



Earth's gravity keeps life on the planet without squashing it, and our Moon pulls the tides, keeping our water moving.

The metal core makes a forcefield around Earth that protects us from rays.

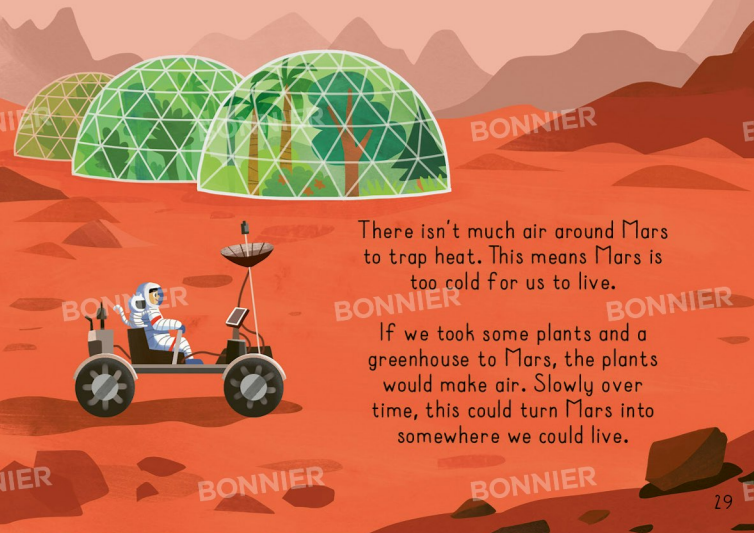


Scientists look for all these things when they are searching for life in space.



Venus started out as a rocky ball like Earth, but the carbon dioxide in its air trapped so much sunlight that Venus warmed up.

Now it's so hot that if you drove there, your car would melt!



There isn't much air around Mars to trap heat. This means Mars is too cold for us to live.

If we took some plants and a greenhouse to Mars, the plants would make air. Slowly over time, this could turn Mars into somewhere we could live.

# Gas Giants and Mysterious Moons

After Mars, we reach the gas giant planets Jupiter and Saturn. Under their layer of swirling gases is a solid core of rock, ice and metal.

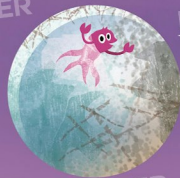
Jupiter is the biggest planet in our Solar System.



Did you know...?  
The Red Spot on Jupiter is wider than Earth. It's actually a storm that's been raging for 300 years!

One of Jupiter's moons, Europa, has cracked ice on its surface. There could be an ocean beneath the ice with creatures living in it!

Jupiter and Saturn each have more than 80 moons and scientists are discovering more all the time.



hello

Saturn's rings are made of ice, rock and dust. They could be made from a broken moon.

Time for a splash!



Saturn is our lightest planet. If you dropped it into a giant bath of water, it would float!



Another moon, Io, has volcanoes that erupt all the time.

Titan is Saturn's biggest moon. It has rivers, lakes and oceans and it even rains there – but it's not like rain on Earth!





# Ice Giants

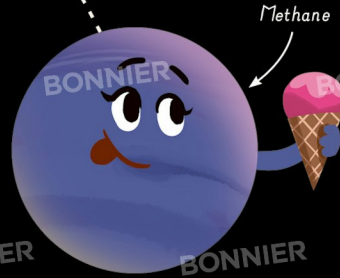
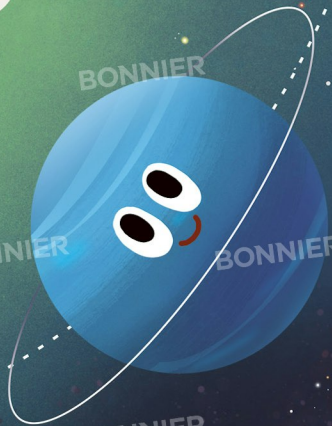
The planets Uranus and Neptune are called ice giants because they have a solid core of rock surrounded by swirling liquids and frozen gases. They are also furthest from the Sun's warmth.



Uranus is the coldest planet in the Solar System. It takes a massive 84 years to orbit the Sun!

You're taking your time!

Uranus doesn't spin like the other planets. It rolls on its side like a ball. Scientists think a giant space rock knocked Uranus sideways when it was young!



Neptune is surrounded by a gas called methane. Methane traps sunlight, heating the planet up. That's why Neptune is warmer than Uranus even though it's further from the Sun.

Neptune's winds are the fastest in the Solar System. They blow faster than the speed of sound!

Whoosh!



Neptune is the smallest ice giant. It is only four times wider than Earth! It's the only planet you can't see from Earth with just your eyes.

Where is it?

I can see it!



Did you know...? Scientists think there could be rain made from diamonds on the ice giants!



# Beyond the Planets

Our Solar System doesn't end at Neptune. It keeps going for millions of miles further than that!

Past the planets is a doughnut shaped circle of space rocks and icy snowballs called the Kuiper Belt. This is where we find the dwarf planet Pluto.

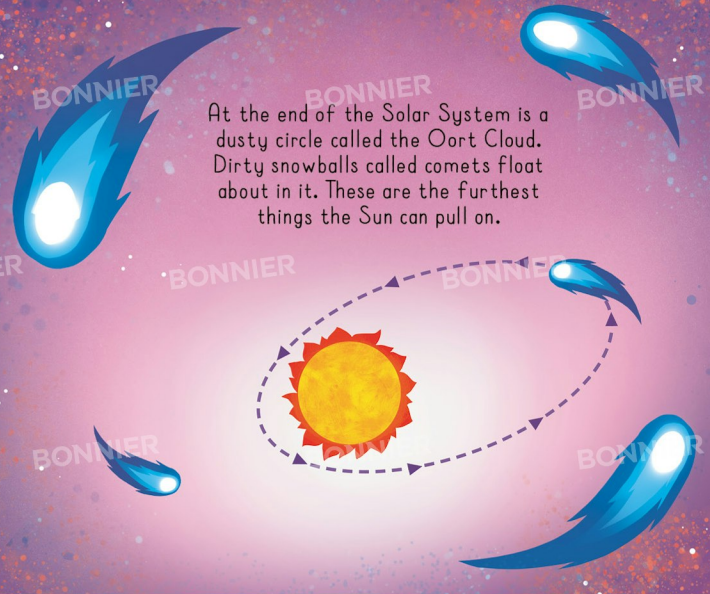
Hello, I'm Pluto!

Pluto used to be an official planet. But scientists found bigger space rocks in our Solar System. They finally decided Pluto was not a planet and renamed it a dwarf planet.

I'm a dwarf planet too. I'm called Eris!



At the end of the Solar System is a dusty circle called the Oort Cloud. Dirty snowballs called comets float about in it. These are the furthest things the Sun can pull on.



When comets from the Oort Cloud fly near to the Sun, their ice melts and they grow two tails. One tail is made from glowing gas and the other from glowing dust!

Gas tail

Around the centre is dust

Dust tail

Centre made from rock and ice

# The Milky Way

Our Solar System is part of an enormous, swirling galaxy of stars called the Milky Way.

If you flew a long way away, the Milky Way would look like this:

In the very centre of our galaxy is a mysterious thing called a black hole.

We are here!

A black hole sucks everything into it, including light! But we're so far away that there's no danger of us being sucked inside.

On a clear night, you can see the stars in our galaxy stretching across the sky in a milky looking path. What you're seeing is the middle of the Milky Way galaxy from the outside.



There are billions of galaxies in space and they come in different shapes.

That looks like a gigantic lentil!



Oval

Lenticular

Barred spiral

Irregular

Spiral

Is that the Milky Way?



Did you know...?  
There are more stars in the universe than grains of sand on every beach on Earth put together!

# Seeing into Space

So much of what we know about space is because telescopes have helped us to see further into it.

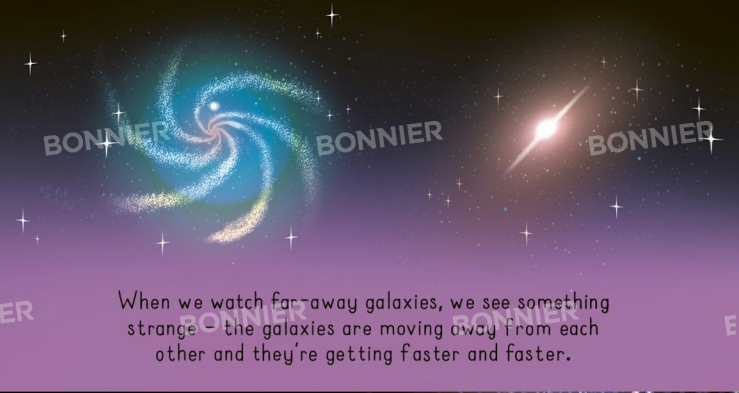
**Did you know...?**  
Telescopes use curved glass to collect light from space.



An observatory is a building made for a telescope. The bigger the telescope, the more light it can collect and the further it can see into space.

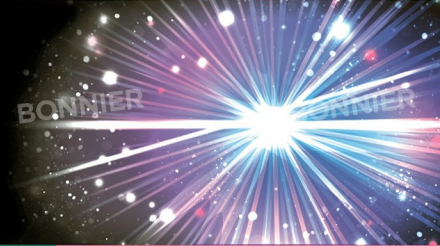


Observatories have been built on top of volcanoes. There are even telescopes floating in space! Big telescopes can see new stars being born and old stars exploding.



When we watch far-away galaxies, we see something strange: the galaxies are moving away from each other and they're getting faster and faster.

That's because everything in space is part of a giant explosion called the Big Bang.



Before the Big Bang, there was nothing. No stars. No oceans. No trees. No rocks. No sheep. No people. Nothing!



All the bits that make up everything were squashed into a ball the size of a peach. Then it exploded and time began.

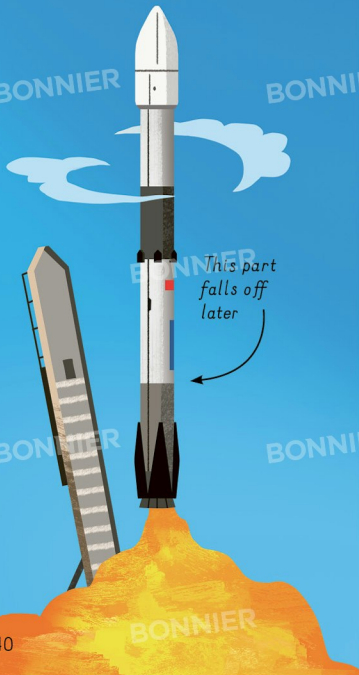
That's what scientists think!



# Going into Space

One way to see even further into space is to travel into it.  
We send machines and even people into space.  
Here's what you need to go...

A rocket to take you there and back



This part falls off later



Air in tanks so you can breathe in space

Dried space food to eat



Did you know\_?  
Dried food is easier to store in space because it doesn't go mouldy.

Water to drink and wash with



A space toilet

A space sleeping bag

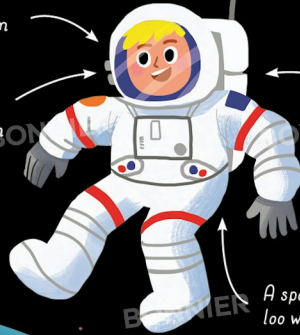
When you leave the rocket, you'll need a spacesuit which has:

A sun visor to protect you from space rays

A microphone to speak to people on the spacecraft

An air tank

A space nappy to go to the loo when you're outside



In space, you float because there is no gravity. Your muscles get weaker when you're floating about, so you need to do lots of exercises to stay strong.

If you land on a planet or moon, there is gravity there to hold you down.



# Exploring at Home

One day, you might be an astronaut. But until then, there are lots of things you can do to find out about space.

A good way to see into space is to plan a stargazing night with a grown up. Here's what you need:

Warm clothes

Star charts

Binoculars or telescope

Snacks

Hot drink

Go somewhere dark and safe and give your eyes a few minutes to get used to the darkness. Soon you should start to see stars and planets.



You can use binoculars or a telescope to look at the Moon from your home.

If you drop pebbles into flour, you can see how craters are formed.

Make a moon flicker book by drawing a circle in the top corner of each page in a notebook. Draw the shape of the Moon on a new page every night for a month. Flick through the pages to see the phases of the Moon.



We're learning more about space all the time. Imagine when you grow up, you might discover a new planet, a far-away galaxy or even alien life!

# Glossary



## Asteroid

A small, rocky object that travels around the Sun in an orbit.

## Big bang

An idea about how time, space and everything began. Everything was squashed together in a peach-sized ball, then it exploded and grew bigger.

## Black hole

A place in space that sucks in all the things around it with its enormous gravity, like a space vacuum cleaner. It is the leftovers of a heavy star that exploded into itself.

## Comet

A ball made from dust, ice and gas that travels through space.

## Dwarf planet

The name for objects in the Solar System that look and act like planets, but are not big enough to be a planet.

## Friction

The force made between two things rubbing together. It causes things to heat up and it slows travelling things down as they move.

## Galaxy

A swirling group of billions of stars.

## Gas

A material made up of tiny pieces that spread out and are so small you can't see them. A gas doesn't have a solid surface, which is why you can't stand on the gas giant planets.

## Gravity

An invisible force that pulls everything towards each other. In space, gravity pulls planets towards stars and moons towards planets, also pulls us towards Earth so we don't float away.

## Liquid

A material made up of bits that slide past each other, but they still stick together. A liquid flows and can be poured, for example, rain water!

## Magnetic forcefield

The area around a magnet where it pulls or pushes on other things that are magnetic. Earth's magnetic forcefield protects Earth from harmful space rays by pushing them away.

## Meteor

A space rock that flies through Earth's air.

## Meteorite

A space rock that has flown through the air and then landed on a planet or a moon.

## Moon

A rocky ball that travels around a planet on a circle path called an orbit.

## Orbit

A circle or egg-shaped path that things in space travel on to loop around bigger objects.

## Planet

A large, round rocky ball or a ball surrounded by swirling gas that travels around a star on a path called an orbit.

## Solar System

The group of planets, rocks and comets that all orbit around our Sun.

## Star

A huge burning ball of gas. Stars twinkle when we see them in the night sky.



