

GROUND CONTROL

Find out how gravity works with the UK Space Agency and conduct an experiment to see it in action.

What is gravity?

Gravity has played a big part in shaping the universe. It is the force that makes pieces of matter clump together to form planets, moons and stars, and what makes the planets, such as Earth, orbit stars, like the Sun.

As Sir Isaac Newton discovered in the 1680s, gravity is also what causes apples to fall from trees. He contended that any particle of matter in the universe is attracted to another particle with a force that depends on two things – their mass and the distance separating them. Essentially, the more mass the object has, the stronger the gravitational pull. This is what keeps objects (including us) on the ground and stops them from floating into space.

Newton's theory dominated the scientific view of the universe for three centuries, but in the 1900s, Albert Einstein had a different theory. In his general theory of relativity he said that gravity is what happens when space itself is curved or warped around a mass, such as a star or a planet. Thus, a star or planet creates a dip in space, causing any other object that comes too near to fall into the dip, just as a large body on a

trampoline would cause a marble placed on the edge to roll towards it. Einstein's proposal was groundbreaking, and quite a number of experiments have backed up his theory, but there are still a number of questions that remain unanswered. For example, how do the forces that hold atoms together differ from gravity when there is hardly any actual matter in an atom?

Now you've learned about gravity, get ready to find out how to train like a real astronaut and put the theory into practice.

The first Briton in space was Dr Helen Sharman; in 1991 she visited the Mir Space Station before it was replaced by the International Space Station

Einstein's theory was that large objects cause a 'dip' in space that drags other objects in

Did you know...

The Earth's gravitational force keeps us on the ground and gives us weight when we stand on a scale

If there was no gravitational force acting on a spaceship, it would continue in a straight line

In space, gravity pulls the spaceship towards the Earth, forming a curved path known as an orbit. Gravity also causes planets to orbit each other

Train Like an Astronaut

On 15 December 2015 astronaut and former Scout, Tim Peake, became the first Briton on board the International Space Station (ISS), where he will spend six months working on lots of scientific projects.

While he is on board the space station Tim trains for two hours a day to maintain his fitness, which helps prevent too much loss of muscle mass and bone density in the weightless environment. Without gravity, astronauts' muscles can deteriorate and bones weaken as calcium goes into the bloodstream.

Tim will also need to be agile and dexterous and he has trained hard to face

the mental challenges astronauts face in space. The international space education programme, Train like an Astronaut, provides some fantastic resources that show how fit and healthy you would need to be to be an astronaut. As previous European Space Agency astronaut Samantha Cristoforetti once said, 'Your body is your spaceship for life!'

Today's Scouts can get ready to be the next generation of space explorers with the help of the fun training activities on trainlikeanastronaut.org.

ESA astronaut Tim Peake gives the thumbs up in zero gravity after his arrival on the International Space Station



ShAre.
Send us photos of your experiments. Turn to page 3 for details

Activity

Gravity drop

Test the science of gravity with a simple experiment using glass marbles.

Suitable for all sections

You will need:

- Glass marbles in various sizes
- Other objects the same size but made of different materials

Instructions

1 Gather marbles of various sizes but make sure they are all made from the same material, ie glass.



2 Give each young person a small marble and ask them to predict how long it will take the marble to fall. Then ask them to drop them from the same height at the same time.

3 The marbles should all reach the floor at the same time.

4 Using marbles and other objects of the same size but different materials ask the Group to repeat the experiment. How fast do they think they'll fall now?

TIME NEEDED

15 minutes

BADGE



The UK Space Agency partner the Scout Astronautics Activity Badge.

PARTNER



OUTCOMES

The Group can measure the speed of falling objects, relating the time of the fall to their weight and size.

TAKING IT FURTHER

Explore how gravity affects objects as they impact the earth in another experiment using flour, a baking tray and a marble. Download the activity sheet from scouts.org.uk/ukspaceagency.

MORE INFORMATION

Visit scouts.org.uk/ukspaceagency to download the 'Mission X Activity Sheet' where Scouts can train to experience the challenges faced by astronauts like Tim Peake.

WOGGLEBOX

James says
'XpXPXPXP.'

