

PUZZLES, QUIZZES, OUTDOOR LEARNING

# The Spark

Magazine



ISSUE  
No4

**CREATE**  
**A TORNADO**

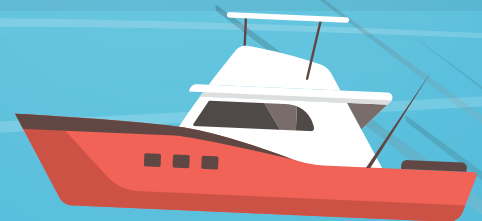
**INVESTIGATE**  
**FLOATING AND**  
**SINKING**

**MEET A**  
**PHYSICIST**

**TAKE A TOUR**  
**OF PLANET**  
**EARTH**

With support from the Inspiring Science  
Fund provided by BEIS, UKRI and Wellcome

GLASGOW  
**SCIENCE**  
**CENTRE!**



# Inside

This issue

## WELCOME

Welcome to the fourth edition of The Spark! Every issue will have exciting experiments for you to try at home, fascinating facts to ponder over, and puzzles and quizzes to challenge your family.

This week we are making water tornados, investigating buoyancy and taking a tour of the Earth. Buckle up as we set off to explore some of the forces and features of our watery world!

You can watch the videos that go along with the experiments this week on the Glasgow Science Centre Facebook page or YouTube channel.

Best wishes,  
Glasgow Science Centre



## CRACK THE CODE

This week on GSC At Home we talked about our favourite planet of all, the Earth! Have a go at cracking the cipher puzzle below to reveal some interesting features of our unique planet.

**Can you crack the code?**

**Each letter in the alphabet has been swapped with another.**

Watch our  
Cryptography video  
for some helpful hints  
about using ciphers.



A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W



OLZHP	Earth has a lot of these, this is why we call it a terrestrial planet.
ZILRAP	A fluffy sign of the water in our atmosphere.
TXQBO	Look for me on the ground, in your garden hose, and even falling from the sky! I'm what gives our planet its famous blue colour.
LUVDBK	I make up about a fifth of the air we breathe.
IFCB	From wee creepy crawlies to colossal creatures of the deep, nobody has found me anywhere other than on Earth....so far!
JLLK	I am more than four and a half billion years old, and definitely not made of cheese.

### BONUS QUESTION

One of our answers is an odd one out. Here's a hint: it is the only one that you won't be able to see, no matter how hard you look for it! If you think you know it, write it down in the box opposite.

## SHARE YOUR PICS WITH US



If you try any of our activities this week, please show us how they turned out! Send your favourite pictures to **CLDteam@gsc.org.uk** or share with us **@TheBothyGSC** on **Twitter**. We'll print a selection of your pictures in the magazine.

Share **@TheBothyGSC**  
email to **CLDteam@gsc.org.uk**



# FAMILY QUIZ

All questions linked to activities in this issue



**DID YOU KNOW?**

The Moon is moving away from the Earth at a speed of about **4 cm per year,**



**that's about the same rate as your fingernails grow!**

## QUESTIONS

Answers on back page

1. Which country experiences the most tornadoes?
2. What organ do fish use to maintain their buoyancy in the water? a) Depth bladder, b) Heart bladder, c) Lung bladder, d) Swim bladder.
3. What kind of scientist studies the weather?
4. Which planets in our solar system are known as 'terrestrial planets'?
5. What does an anemometer measure?  
a) Humidity, b) Rainfall, c) Temperature, d) Wind speed.
6. What is the name for the dark patches on the Moon, that were the preferred landing spots of the Apollo missions?
7. Planet Earth is the fifth planet from the Sun. True or False?
8. What is the name of the weather instrument used to measure atmospheric pressure? a) Atmospherometer, b) Barometer, c) Minimeter, d) Pressometer.
9. Which is denser – salt water or fresh water?
10. Neutral buoyancy is achieved when the weight of an object submerged is equal to the weight of the volume of the fluid displaced. True or False?

**HINT**

You may find some answers throughout this magazine or in our #GSCAtHome videos.

## I'M A... PHYSICIST

### Meet Luke Davis.

Luke works at University College London.

"I use physics to think about how things act on a very tiny scale, called the nanoscale. Originally, I wanted to be an artist. I still love art, but with science I could understand how the world works and this blew my mind. I read a lot of books about science and scientists, I am really inspired by Albert Einstein, Richard Feynman, and Marie Curie. Reading about them showed me how a love of nature and understanding can bring so much joy and fun. As a kid I tried everything and never said no to learning something new. I never cared about making mistakes and this taught me that making mistakes is an important thing."

**Favourite subjects at school: Art, Maths and English.**

**I taught myself Physics.**



## ACTIVITY



# Baths, Boats and Buoyancy

## What will you do?

In this activity you will learn about buoyancy and carry out your own Cartesian diver demonstration. Make your diver rise and fall without touching it!

Ensure you have permission from an adult and their supervision before starting.

## What will you need?

- Plastic bottle
- Glass of water
- Pen cap/lid
- Plasticine or reusable tack
- Cold tap water
- Kitchen towel



## How to do this experiment

**Step 1.** Fill the plastic bottle with water, stopping about 2 cm from the top, to leave some room for air at the top of the bottle.

**Step 2.** Take your pen cap - if there is a hole in the top of your cap, cover it over with a little piece of tack or plasticine. The pen cap is now your diver.

**Step 3.** Let's see what happens when you place your diver into a glass of water. It is likely to be floating on the surface of the water and that's not what real divers do!

**Step 4.** Take the pen cap out and dry it off. You can use some extra plasticine in order to increase the weight of your diver. Add it along the thin part of the pen cap. Make sure you don't cover over the hole where the pen usually goes.

**Step 5.** Place your diver in the glass of water again. It needs to be bobbing just above the surface of the water. If it's not quite there yet, keep adding little bits of plasticine until just the tip of the cap bobs above the water's surface.

**Step 6.** Place your diver into the bottle of water and tightly screw on the cap. It should still be bobbing at the surface.

**Step 7.** Squeeze the sides of the bottle. Your diver should sink down to the bottom. And when you release the bottle, the diver will float back to the surface. Try again to squeeze and release the bottle to observe the diver sinking and floating.

# BATHS, BOATS AND BUOYANCY

## What's going on here?

When we squeeze the bottle, we are increasing the pressure on everything inside the bottle: the water, the air at the top of the bottle, and the air bubble inside the diver. This increased pressure squeezes water into the pen cap which compresses the air bubble in the diver and so the pen cap is less buoyant and the diver sinks to the bottom.

When we release the bottle, the pressure decreases, and the air bubble expands. The diver's buoyancy increases and so it floats back to the surface.

## More to try

What would happen if you used a larger bottle? Can your diver sink all the way to the bottom?

Does changing the temperature of the water in the bottle affect how your diver sinks and floats?

Does your diver still act in the same if you replace the tap water in the bottle with a different liquid – e.g. salt water?

Does it matter how full your bottle is with water?

## Fun facts

Fish have a buoyancy aid, called a swim bladder, which allows them to adjust their depth in water. They can add or remove air from their swim bladder to float or sink, which helps them to maintain their buoyancy.

Submarines have ballast tanks, which work in a similar way to the swim bladder in fish, to regulate their buoyancy and depth at sea.

The 'Cartesian diver' in this experiment is named after French philosopher and scientist, René Descartes.

**Share all your activities!**  
Send your pics to  
[CLDteam@gsc.org.uk](mailto:CLDteam@gsc.org.uk)  
or message  
[@TheBothyGSC](https://twitter.com/TheBothyGSC) on  
Twitter.



**Share your buoyancy experiments with US**  
[#GSCAtHome](https://twitter.com/GSCAtHome)



**Watch the Baths, Boats and Buoyancy video on [#GSCAtHome](https://www.facebook.com/GSCAtHome) Facebook or YouTube page**



## ACTIVITY

# Tornado in a Bottle



## What will you do?

In this activity you will learn about the forces which cause tornadoes and make your own model tornado in a bottle

Ensure you have permission from an adult and their supervision before starting. This activity can get messy so it's best to test your creation over the sink.

## What will you need?

- Two identical plastic bottles
- Plastic lid (like you might find on a yogurt tub)
- Scissors
- Marker pen
- Hole punch
- Waterproof tape



## How to do this experiment

**Step 1.** Fill one plastic bottle with tap water until it is three quarters full.

**Step 2.** Using scissors, trim the edges off the plastic lid so that it is flat. Place it on a flat surface, like a table or kitchen worksurface.

**Step 3.** Take the empty bottle and place it upside down on top of the plastic lid so that it is standing with its neck on the lid.

**Step 4.** Using the pen, draw around the bottle neck so that it marks a circle on the plastic lid, before carefully cutting this shape out.

**Step 5.** Take this plastic circle and using the hole punch, punch a few holes in its centre. These holes should all be connected, to make an opening that is larger than a single hole punch, but does not go right to the edge of your circle.

**Step 6.** Place the punched plastic circle on top of the filled bottle, then place the empty bottle upside down on top of it. The plastic circle should be sandwiched between the opening of the two bottles, and together they should be in the shape of an hour glass.

**Step 7.** Wrap the tape around where the bottle necks meet to fasten them together. Press around the tape to make sure there are no gaps and make sure everything is watertight.

**Step 8.** When you test your tornado in a bottle for the first time, make sure you do it in a sink just in case you have any leaks. You're now ready to turn the bottles upside down (like you would an hour glass) and watch for tornadoes! Hold the top bottle and gently move it in a circular motion to start the tornado forming.

# TORNADO IN A BOTTLE

## More to try

Once you've mastered your tornado in a bottle, why not try making a few changes? Here are just a few of our suggestions:

Add a splash of colour and fun with food colouring.

Bring some bubbles and frothy foam with a little washing-up liquid.

Experiment with polystyrene beads or other objects in the water.

## Fun facts

The fast spinning motion we see inside our bottles is known as a vortex. A tornado is a vortex of air that can form during a violent thunderstorm when warm, humid air collides with cold, dry air.

Swirling columns of air that occur in dry, dusty conditions can lead to the formation of dust devils, a type of whirlwind. They can also occur in bush fires, leading to fire devils... sometimes known as fire tornados!



**Share your  
Tornado  
experiments  
with us**  
#GSCAt Home



**Find more  
exciting activities**  
on our Facebook and  
YouTube pages  
#GSCAtHome



**Watch the Tornado in a Bottle video on**  
#GSCAtHome Facebook or YouTube page

## ABOUT US

Glasgow Science Centre is a 5-star visitor attraction located beside the River Clyde. We are home to hundreds of interactive exhibits where you can discover how the world works. Explore the inner workings of the human body, find out how we can power the future, challenge your family and friends to solve puzzles, explore technologies of the future and marvel at the wonders of the solar system under our fulldome Planetarium. Our team of passionate presenters are always on hand to bring you exciting experiences in our hands-on workshops and live demos in our spectacular Science Show Theatre.

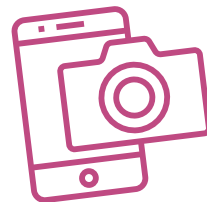
During these challenging times while we are unable to open our doors to you, we are bringing you the excitement of Glasgow Science Centre through GSC At Home. We're online every morning at 10am on our Facebook page and YouTube channel.

## QUIZ ANSWERS



1. The United States has the most tornadoes – reporting more than 1000 per year. The UK has just over 30 tornadoes per year.
2. d) Fish have a swim bladder which helps them maintain buoyancy.
3. A meteorologist studies the weather.
4. Mercury, Venus, Earth and Mars are all terrestrial planets, as they are all made from rock and metals. They are also the planets closest to our sun. The four outer planets – Jupiter, Saturn, Uranus and Neptune – are mostly made of gas.
5. d) Wind speed is measured by an anemometer.
6. Those dark patches on the Moon's surface are called 'maria', from the Latin for 'seas', because they were mistaken for seas by early astronomers. They are not filled with water though – they are ancient lava beds, billions of years old.
7. False, planet Earth is the third planet from the Sun. (It is the fifth largest planet in the solar system.)
8. b) A barometer measures atmospheric pressure. Measuring pressure can help us predict the weather. High pressure suggests clear skies and light winds, whereas low pressure indicates rain and wind is on its way.
9. Salt water is denser than fresh water.
10. True, this follows Archimedes' principle of buoyancy.

## YOUR PICS



## CRACK THE CODE ANSWERS

Rocks, Clouds, Water, Oxygen, Life, Moon

**Bonus Answer** – Oxygen

## WE WANT YOUR FEEDBACK

### We would love to hear what you think!



We hope you liked this issue, but if you didn't, what should we change? What other things would you like to see or what topics are you most interested in?

Don't forget to send us photos of your creations, discoveries and experiments. **You can send feedback and pictures to [CLDteam@GSC.org.uk](mailto:CLDteam@GSC.org.uk) or message us on twitter @TheBothyGSC.** We'll print a selection of your pictures in the magazine.

### KEEP IN TOUCH



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**SCIENCE  
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