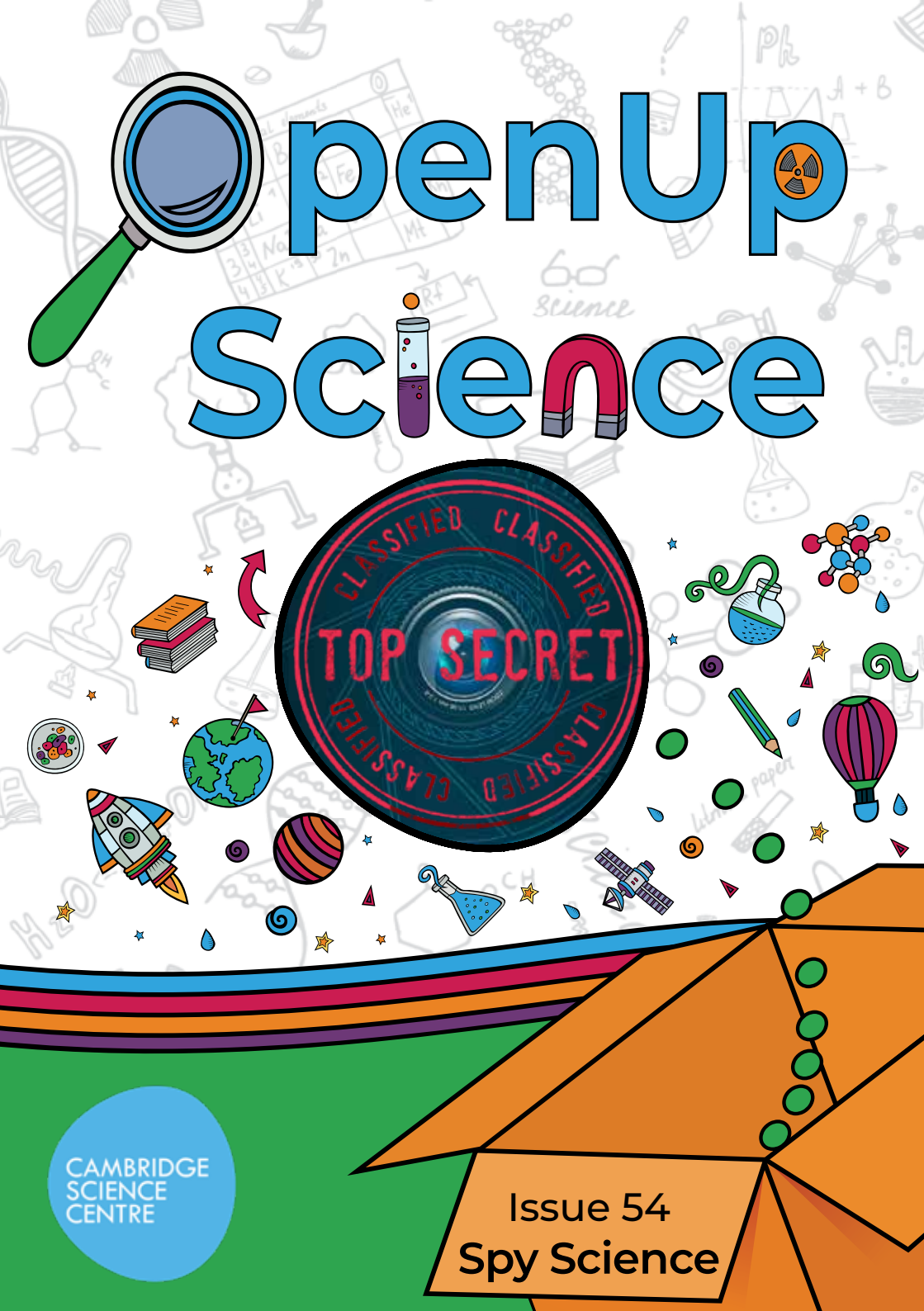




penUp Science



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Issue 54
Spy Science

Welcome to OpenUpScience

from Cambridge Science Centre.

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This issue is all about Spy Science.

Spies are highly trained undercover agents. They listen in, create new identities, betray trust, use gadgets and talk in codes to seek out top secret information without being detected.



*Don't
give
anything away, you
never know who's
watching.....*



A lot of modern spying is cyber spying, where secrets are stolen by hacking into computers and other technology. However, agents are still used. How many? No one can know for sure.

Being a spy requires skills in code cracking, quick thinking and memory. Do you think you have what it takes? Practice your spy science skills inside this issue.



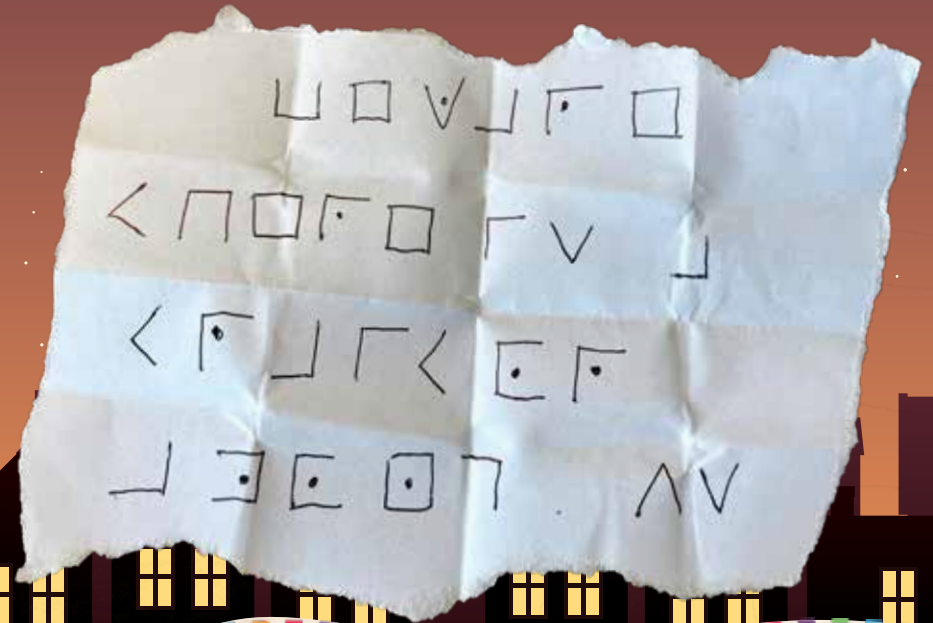
Can you Decipher

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You can make a secret code out of simple dots and shapes that represent each letter of the alphabet. Here, each letter is represented by the shape of its surroundings.

An agent has risked their life getting this message to you in the dead of night. But what does it say?

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

Message: _____

Invisible Ink

Using these three different methods and a bit of science, can you pass along some secret messages?



Heat method

Resist method

What to do

1. Mix some lemon juice with a few drops of water.
2. Dip the cotton bud in the solution and write a message on the paper.
3. After the solution is dry, the paper should look blank.
4. With help from an adult, heat the paper up with the iron. You should see your message.

Lemons contain an acid which turns brown when it breaks down. When you apply heat with the iron, you are speeding up this process.

What you'll need

- Lemon juice
- Paper
- Cotton bud
- Iron
- Adult supervision

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What you'll need

- A white candle
- Paper
- Water
- Paint
- Paintbrush

What to do

1. Use the candle as a pencil to write your message.
2. To reveal the message, mix together some paint and some water and brush it over the paper.

Wax is what scientists call hydrophobic. This means it repels water. Hydro comes from the word water and phobic means 'scared of'. Because the wax is hydrophobic, or 'scared of water' the watery paint doesn't stick to it, revealing your message.

Invisible Ink

Which method works the best?

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Chemical method

What to do

1. Mix together the bicarbonate of soda and water in a glass and give it a stir.
2. Dip the cotton bud in the solution and use it to write your message on the paper.
3. Let the solution dry, then gently dust off any loose bicarbonate of soda.
4. In another glass mix together the turmeric and the hand sanitiser. If it isn't liquid enough you can add a dash of water.
5. Brush this solution over the paper to reveal the message.

Turmeric is a pH indicator. This means it reacts with materials and changes colour depending on whether the material is an acid or a base. The ink is made with bicarbonate of soda which is a base, so the turmeric solution reacts when brushed over it.

What you'll need

- 3tbsp bicarbonate of soda
- 3tbsp water
- Paper
- Cotton bud
- 1 tbsp turmeric
- 3 tbsp alcohol hand sanitiser
- Paintbrush
- 2 glasses

Which method worked the best?

Why?

Listen Through Walls

The art of espionage involves intercepting information without being detected. One way of doing this is to listen to secret conversations through walls. You have been tasked with finding the best method for this. Are you up to the challenge?

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What to do

1. In one room, put the TV or other device at a medium/high volume.
2. Go in the next room and close the door.
3. Put one glass against the wall and press your ears against the base of the glass. Can you hear the noise next door?
4. Test each of the other glasses and materials. Which is the best?

What you'll need

- Two rooms next to each other
- A TV or something that you can control the volume of sound
- A few different shaped glasses
- A balloon
- A jumper
- Anything else you want to test!

What is happening?

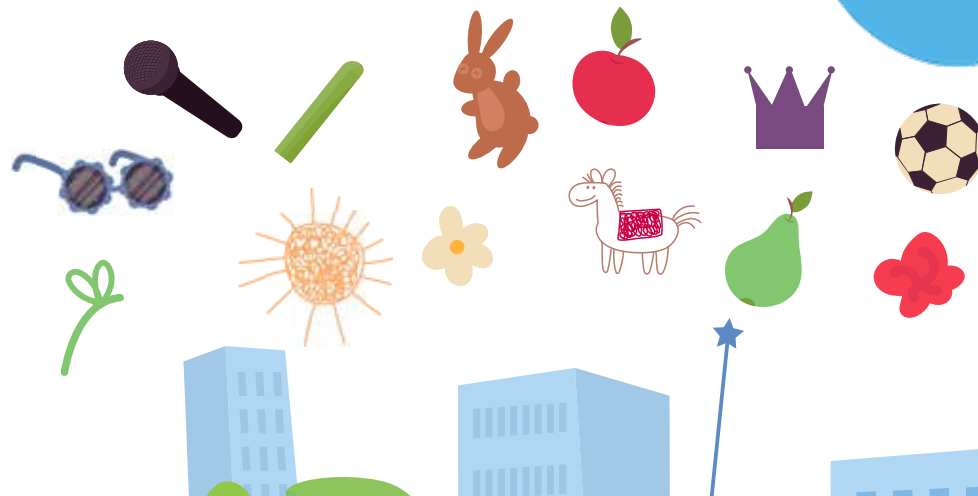
Sound is a vibration. When something is making a noise, the vibrations are passed into its surroundings, including solid things like walls. Different shapes and materials pass sound vibrations from the wall to your ear in different ways.

The thicker the wall, the harder it is to hear through, so try different walls as well!

I Spy

How good are your observation skills? Can you find the 15 hidden images?

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De-classified Gadgets

Throughout history, spies have used devices, or gadgets, to help them do their job without being detected. A gadget could contain listening and video recording devices, or even conceal weapons to help get out of a sticky situation! Below are two gadgets used by spies, but there are probably hundreds more that we don't know about.

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TOP SECRET

Codename: The Bug



Function: A recording device used to listen to unsuspecting targets.

Disguise: Looks like a dragonfly.

Limitation: Wind.

Codename: The Doo Doo Device



Function: Detects movement to track people and sends out radio signals.

Disguise: The one thing no one would touch - poop!

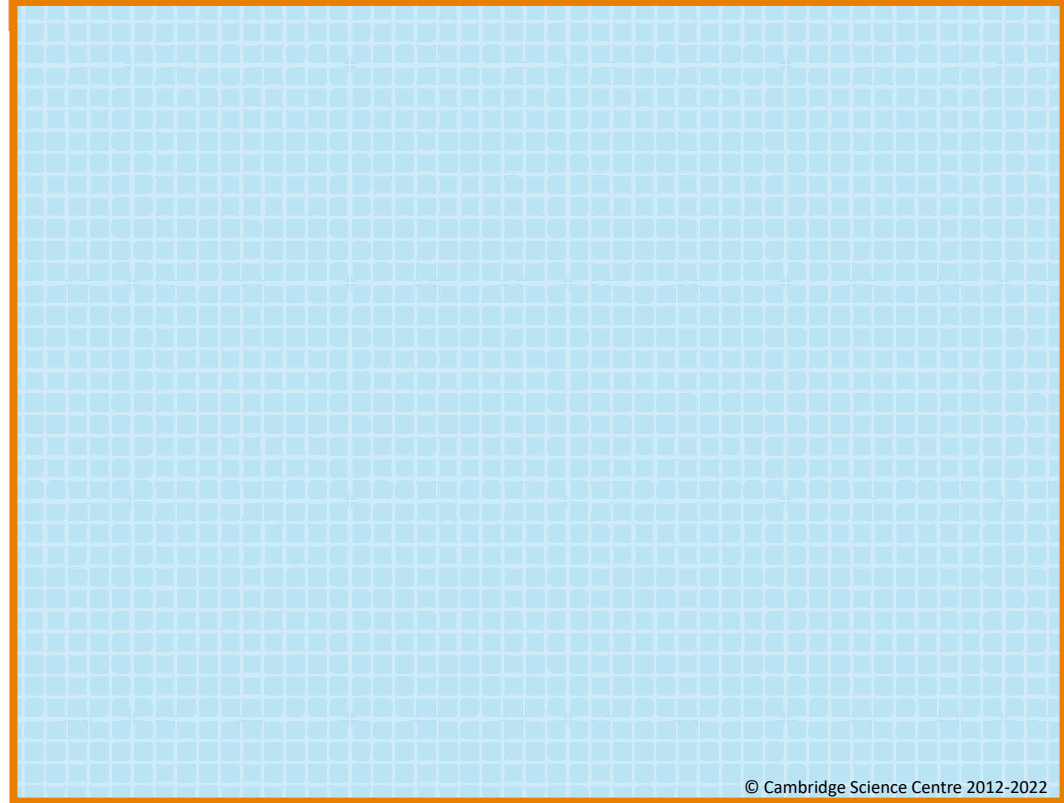
Limitation: Battery.

My Gadget

Design your own spy gadget for future spies.

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Codename:



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How does your gadget work?

What will your gadget help a spy to do?

Committed to Memory

In the secretive world of spying, having a good memory is essential. A spy can't take notes in case they are caught with them, so being able to remember their cover details, mission and gathered intelligence is vital. Test your memory with this activity.

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What to do

1. Get a friend to place the 15 items on the tray and cover it with the blanket.
2. When you're ready, get your friend to remove the blanket and start the timer. Look at the tray for 30 seconds and try to remember all of the things on it.
3. After 30 seconds, recover the tray.
4. Write down all the things that you can remember. How many can you get?

Try getting your friend to remove one item from the tray without you looking. Can you figure out which one they removed? Is this easier or harder?

What you'll need

- 15 random items (a paperclip, a pencil, an orange...)
- A timer
- A tray
- A blanket
- Pen
- Paper
- A friend

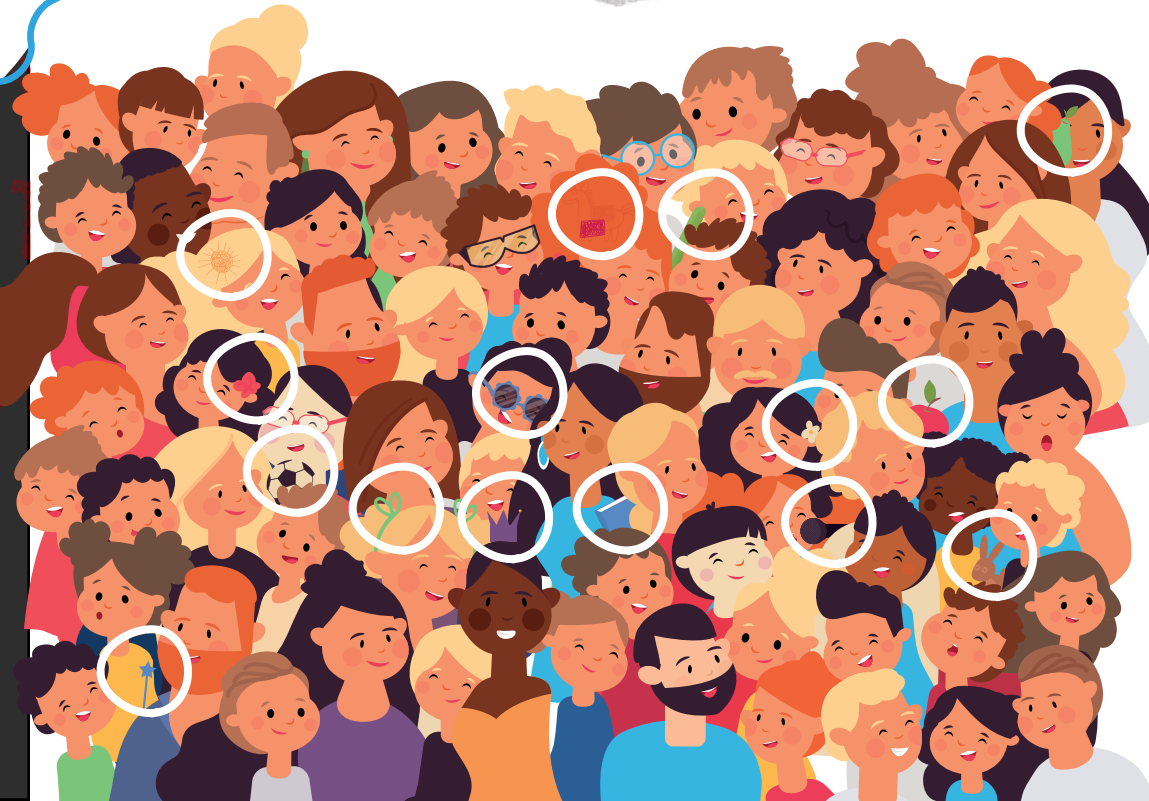
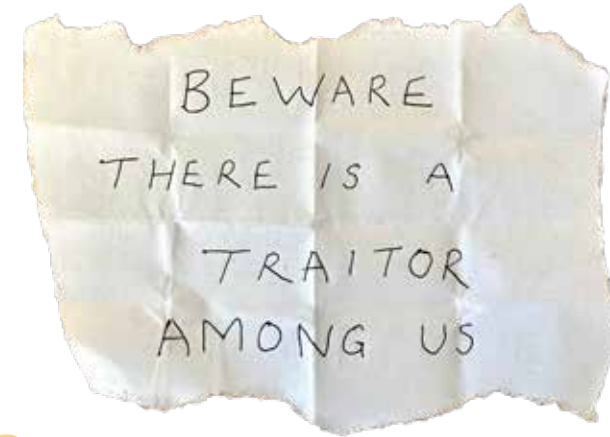
How quickly can you spot which item is missing?



Puzzle solutions

If you have any questions or want to send us a photo of your experiments, drop us an email at openupscience@cambridgesciencecentre.org

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