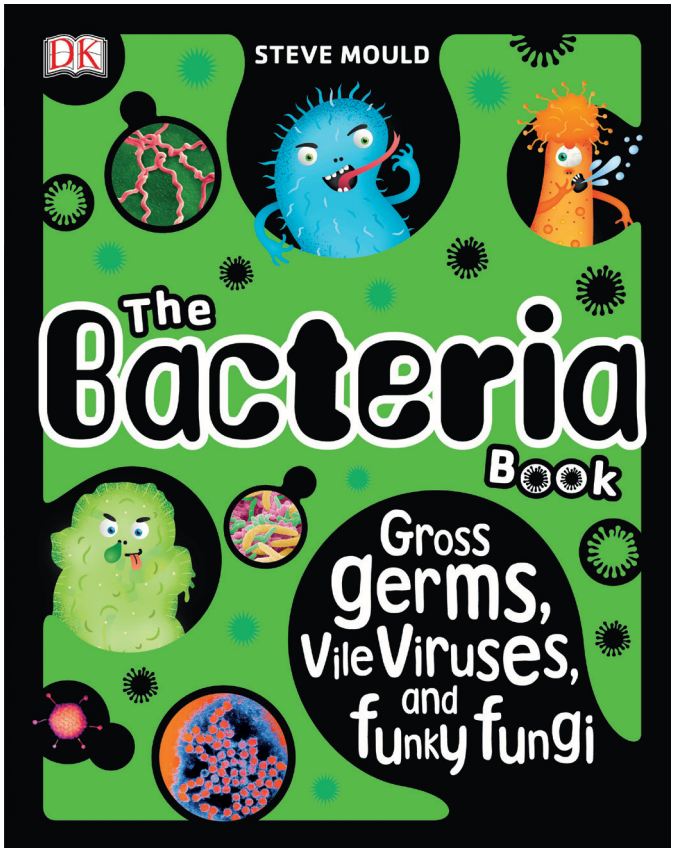
THE BACTERIA BOOK

Student activity sheet

This is one of a series of six activity sheets to use alongside the books which have been shortlisted for the Royal Society Young People's Book Prize 2019.

CENTRE *for* INDUSTRY EDUCATION COLLABORATION



Get ready to take a peek into the microscope as you get hands on with practical activities inspired by our microscopic friends and foes, who we met in *The Bacteria Book* by Steve Mould.

What is a microbe?

A microbe, or microorganism, is a living thing so small that you can't see it with your naked eyes. Microbes are everywhere around you, on you and even inside of you.

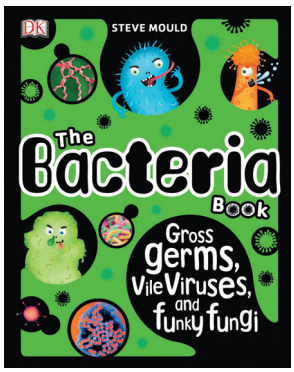
Meet the microbes:

- **Bacteria** are the most common type of microbe and there are more bacteria on Earth than all other animals, insects and people combined. Learn more about bacteria from page 14.
- **Viruses** are the smallest type of microbe, much smaller than bacteria, and are responsible for lots of different diseases, such as the common cold, chickenpox or mumps. Learn more about viruses from page 34.
- **Fungi** get their food from other organisms, dead and alive. Types of fungi include mould, yeast and mushrooms. Learn more about fungi from page 44.

"The world of the small is endlessly fascinating."

The Bacteria Book

© Chokniti Khongchum



THE BACTERIA BOOK

Student activity sheet (continued)

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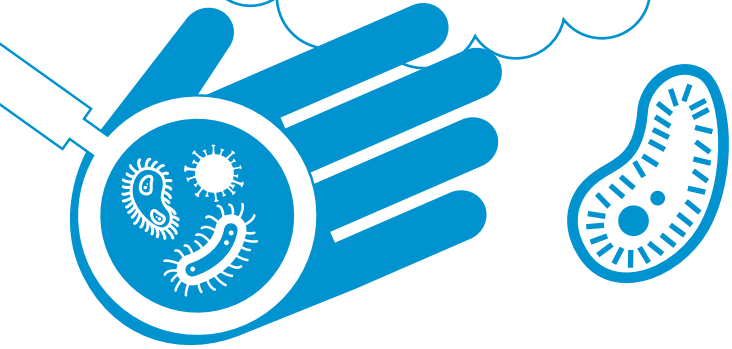
Mini-experiment: how do microbes move around?

Microbes have some clever ways of getting from one person to the next. Let's do a mini-experiment to learn about one of the ways they do this.

- You and your classmates should brush some washable coloured paint or biodegradable glitter on your hands. These should all be a different colour for the mini-experiment to work.
- Go around and shake each other's hands, touch objects and furniture around the room (make sure these can be wiped clean!).
- After 5 minutes of doing this, take a look at your hands, those of your classmates and the objects around the room.

Do you see how the paint has spread? Microbes, including viruses and bacteria, spread around in much the same way.

How else do you think microbes can be passed on? Write your answers on a piece of paper, then go to page 36 and 37 of the book to see how many you got right



Mathematics challenge: The power of doubling

Bacteria are made up of just one cell and they create new bacteria by dividing into two copies of themselves. One cell becomes two, two cells become four, four cells become eight and so on. An E. coli cell, a type of bacteria, takes 20 minutes to divide into two. Based on this, fill in the blanks:

Time from start (minutes)	Number of E.coli cells	Time from start (minutes)	Number of E.coli cells
0	1	140	
20	2	160	
40		180	
60	8	200	
80		220	
100	32	240	
120	64	260	

Extension challenge:

How many minutes wouldit take E.coli to multiple to over 30,000 cells?

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Teacher activity sheet

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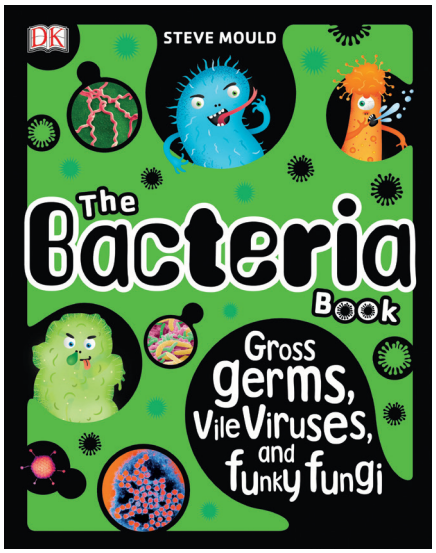
CENTRE *for* INDUSTRY EDUCATION COLLABORATION

Each activity pack contains some ideas for experiments to do with your students and other experiments that they can try for themselves at home. Additionally, each pack gives information relating to careers and a maths focus to help students understand the importance of mathematics education across the curriculum.



Get your students to create a mouldy museum

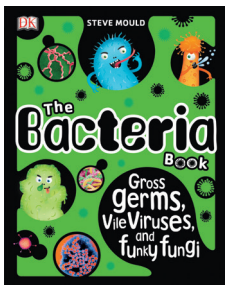
In this experiment students will be investigating how long it takes mould to take over a piece of food and what this process looks like.

1. Ask students to bring a fresh piece of food, for example a tomato or a piece of bread – into school. This can be whatever they might have at home.
2. Seal the samples tightly in a clear plastic bag that has been labelled with the date.
3. Place the sample in a safe place in the classroom or science lab. This could be pinned to a notice board, on a shelf or in a cupboard.
4. Ask students to think about what might happen to the food over the next few hours, next few days and next few weeks. Ask them to write their ideas down and explain to them that this is known as their hypothesis.
5. Over the next few weeks, students can carefully observe their sample every day. Ask them to:

a. Write down the changes they see
b. Draw what the sample looks like each day
c. Take photographs of the sample which can be used to create a time lapse video
d. Measure the area of mould growth using a transparent grid or a ruler

Health and safety information

- Please note that some people are allergic to mould or suffer from asthma.
- Food samples must be sealed and never opened to minimise the spread of spores in the air.
- Children must wash their hands and not eat or drink whilst investigating.
- Sealed bags of food must be double bagged and disposed of in the bin at the end of the investigation.



THE BACTERIA BOOK

Teacher activity sheet (continued)

Ask students to consider the following:

What could you do to speed up the mould growth?

What could you do to slow down the mould growth?

What might happen with different types of food or samples? Why do you think this is?

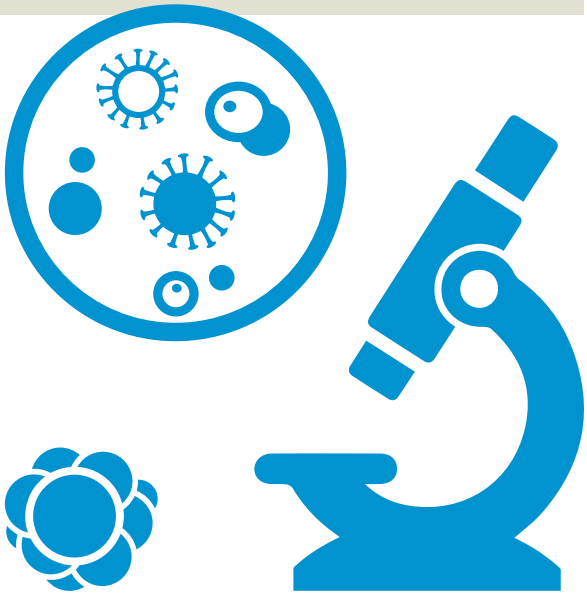
Researching like a scientist:
Help students to plan and design an experiment to help them answer the questions above and think about what other questions they might want to answer. Your students can read more about this effect on pages 46 – 47 of The Bacteria Book.

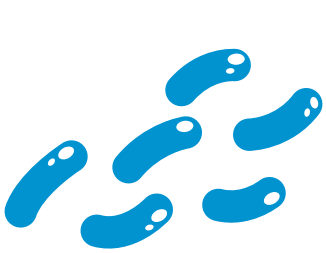
Career links

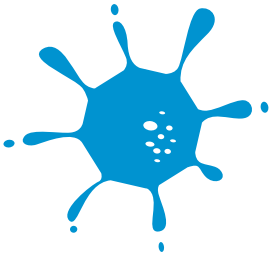
Help students make the link to careers where this type of science is used including:

- **Food technologists:** get creative developing new recipes and processes for food production, and keep food safe and delicious in the factories where it is made.
- **Pharmacologists:** conduct important research to discover how new medicines can be used to fight dangerous microbes or how microbes themselves can be used to fight diseases and make medicines.
- **Astrobiologists:** study how microbes might live and behave in outer space, and what this might mean for life on other planets.

Get students to research more about these, and other careers related to microbiology, by doing a search online.







If you would like to get your students involved in the Young People's Book Prize as a judging panel, please email **sciencebooks@royalsociety.org** for more information.

KID SCIENTISTS

Student activity sheet

This is one of a series of six activity sheets to use alongside the books which have been shortlisted for the Royal Society Young People's Book Prize 2019.

CENTRE *for* INDUSTRY EDUCATION COLLABORATION

Go on a science journey with practical activities inspired by some of the world's most brilliant scientists and their childhood, as you read about them in *Kid Scientists* by David Stabler, illustrated by Anoosha Syed.

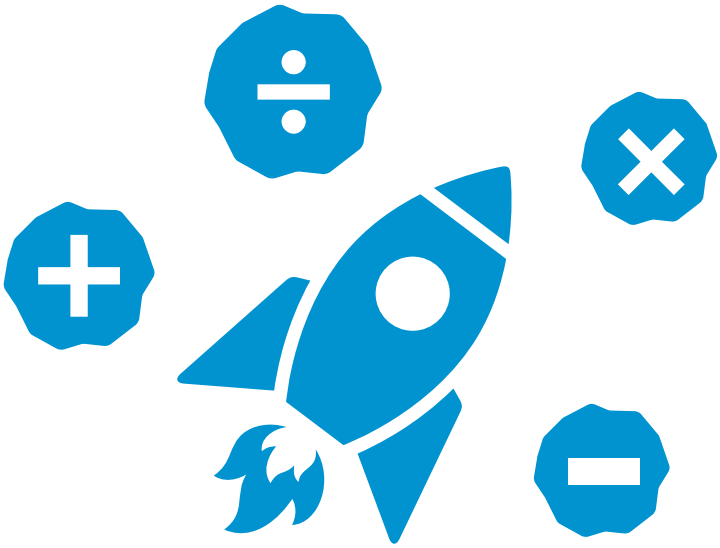
Meet Katherine Johnson

Katherine Johnson is an African American mathematician whose calculations helped to put a man on the moon for the very first time.

Katherine was born in 1918 and celebrated her 101st birthday in August 2019. When Katherine was born, the zip as we know it today had just been invented. Growing up it would have been impossible for her to imagine that someday her maths skills would help people go into space and return safely. As a child, she loved counting and counted everything she could and as she grew older, Katherine continued to learn more about maths and how numbers work. Her hard work and determination led her to a job that hadn't even been invented when she was a young person.

"Every kid is a scientist. A scientist's job is to ask questions and seek answers, and who's better at that than a kid?"

Kid Scientists



KID SCIENTISTS

Student activity sheet (continued)

This is one of a series of six activity sheets to use alongside the books which have been shortlisted for the Royal Society Young People's Book Prize 2019.

Your future as a scientist

Just like Katherine Johnson, scientists of the future will have to solve problems, overcome challenges or work on projects that we don't even know about yet. Through her love of counting and maths, Katherine discovered a career that changed her life and made history.

And now it's your turn to imagine what your future as a scientist will look like. Think about the things that you like or interest you, as well as what you love doing and, using the challenges listed below (or any other challenges you think of) as inspiration, imagine a career that you could be doing in 50 years. Using pictures as well as stories from your life so far, write your very own chapter to go in *Kid Scientists*.

LIVING ON OTHER PLANETS

CLIMATE CHANGE

DECLINING NATURAL RESOURCES

ANIMAL AND PLANT EXTINCTION

Mathematics challenge: Surprising sums

As you read through *Kid Scientists*, make note of how many of the scientists in the book used maths or numbers in their job.

- Were there any that surprised you?
- Can you think of any other science careers where maths might be useful?

Create a poster for your classroom explaining why maths is an important subject.

Picture the great scientific discovery or technological advances that you will have made when you are in your 50s.

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KID SCIENTISTS

Teacher activity sheet

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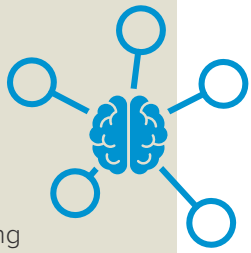
Each activity sheet contains some ideas for experiments to do with your students and other experiments that they can try for themselves at home. Additionally, each sheet gives information relating to careers and a maths focus to help students understand the importance of mathematics education across the curriculum.

Activity 1: What type of person do they think becomes a scientist?



In pairs, or groups, ask them to create a mind map of the sort of person they think can become a scientist. Aim for as many traits or qualities as possible in 5 minutes and then share their ideas. Playing outside or with toys, being creative, making a mess (and mistakes), and asking lots of questions are important in developing a scientific mind.

Now ask your students to consider the following questions:

Do you like exploring the world around you?

Have you ever wondered how something works?

Are you excited by new discoveries and inventions?

Do you enjoy making, baking or building?

Have you ever tried to learn more about something, by asking questions or doing research?

Note for teachers

There is a growing body of evidence that although children enjoy science at school they do not choose to study science further because they think that it is not done by 'people like me'; rather they tend to see scientists as a special sort of person. This book has lots of opportunities to help children understand that all sorts of people can become scientists and that the main attribute is being curious about how the world works and wanting to find out more.

KID SCIENTISTS

Teacher activity sheet (continued)

Activity 2: Ask a scientist!

Using the information about the chair of the Young Persons' Book Prize selection committee, Professor Sheila Rowan, challenge your students to find out more about a scientist or engineer that they know (a parent, a friend, another teacher, a STEM Ambassador for example).

Physicist Professor Sheila Rowan MBE FRS helped to choose the shortlisted books and we asked her about her own childhood. Sheila always did like making things. When she was little, she was happiest when using scraps of paper, beads and wool to make homemade Christmas decorations. She also enjoyed reading and visited her local library every week; walking home with her arms full of books. Sheila thinks that reading lots of fiction and non-fiction books made her ask lots of questions about the world, and is one of the reasons that by the age of ten she decided to become a scientist. All that reading really helps her in her job as a scientist today, as she reads about the work of other scientists. She enjoys science because every day is different, and loves the 'aha' moment when she solves a problem. In Shelia's words: "Do what you love! Scientists do a huge variety of different kinds of job so there is a role for many different kinds of people".

Suggested questions, to be printed for students to ask at home:

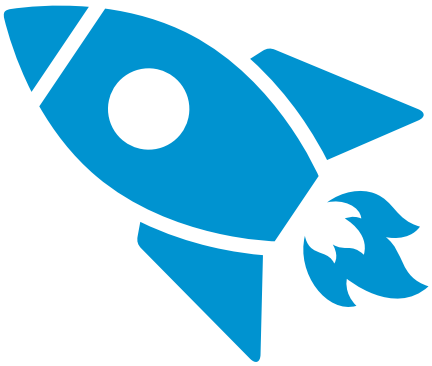
- What were your favourite things to do as a child?
- What was your favourite subject at primary school?
- How old were you when you decided to work with science?
- How did your likes, hobbies and interests influence you to become a scientist?
- How do your likes, hobbies and interests help you in your career as a scientist?
- What is the best thing about being a scientist?
- What recommendations would you give to children who would like to be scientists in the future?

Career links

Help your students to explore other career options that they can access from studying science, such as:

- **Science teacher:** play a crucial role in inspiring young minds about the world around them and how it works
- **Science communicator:** share your passion for science with a large audience through events, television, special programmes and online
- **Science writer:** keep up to date with the latest most exciting advances in science and report these to the world

Get students to think about the skills a scientist has and how these skills are useful in many other careers.



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PLANETARIUM

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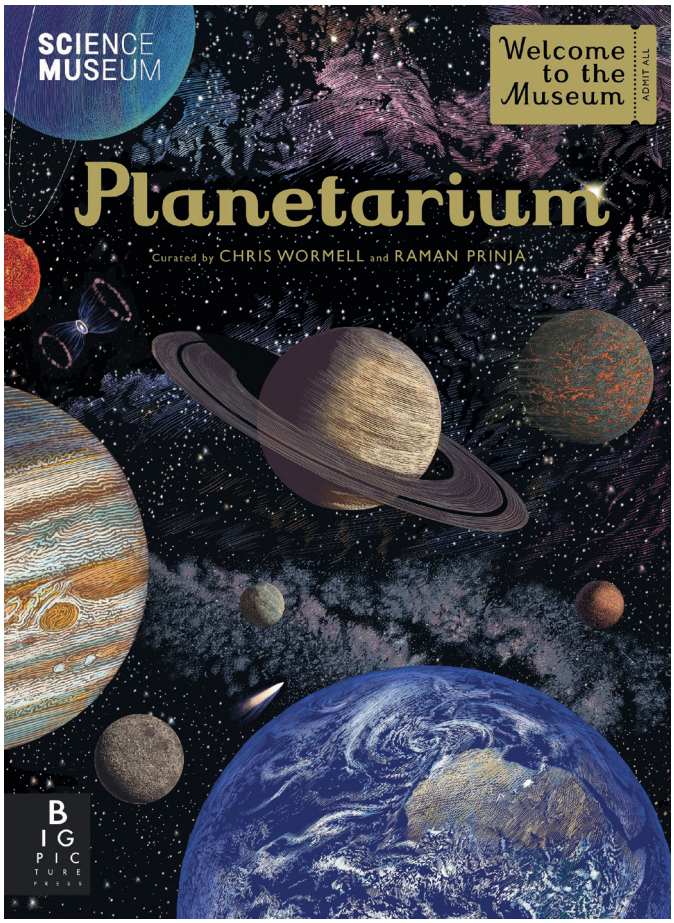


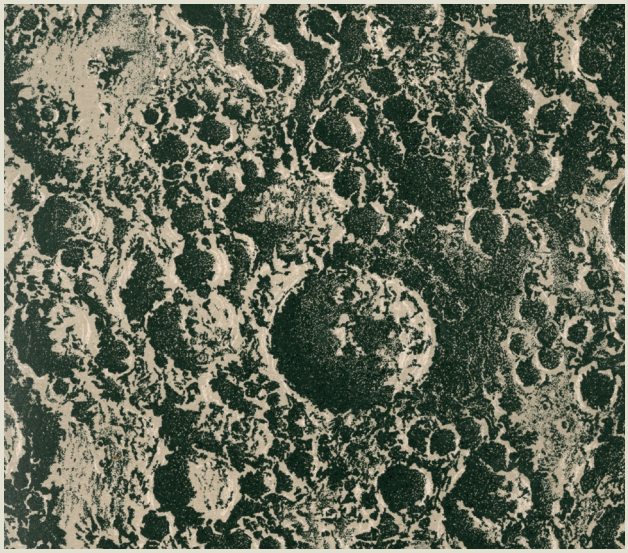
"You will visit places where no human has ever set foot, and view exhibits too large to hold within any museum"

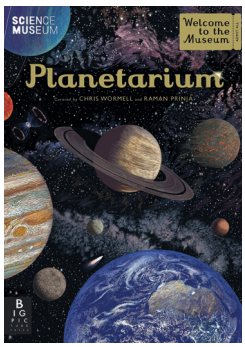
Planetarium

Scientists and artists have a long history of working together: exciting discoveries made by scientists have inspired artists to create unique works of art and the beautiful illustrations, paintings and other artwork created by artists have helped scientists to understand, teach and share their scientific discoveries. *Planetarium* by Chris Wormell and Raman Prinja is just one example of what artists and scientists can create when they work together.

Get your pencils out

As an artist you need to look at things very carefully and notice every tiny detail so that you can make an accurate picture. When you look carefully at something for a long time to draw or paint it, you notice things that you would not usually see, such as the specific shape or shade of colour. This attention to detail not only makes you a better artist, it makes you a better scientist.





PLANETARIUM

Student activity sheet (continued)

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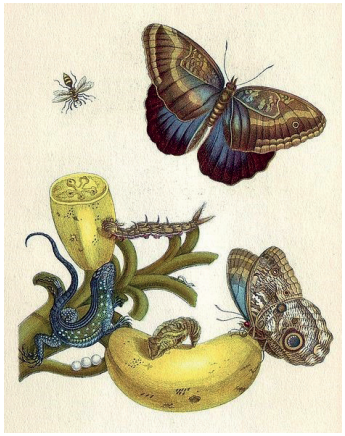

Image: Maria Sybilla Merian (*Metamorphosis insectorum Surinamensium* 1705).

Now, using Maria Sybilla Merian's illustrations as inspiration, you must draw an image that can be used to explain to somebody else something that you have learned about in science. This could be something small, like a flower, twig, a shell or a feather; or it could be a process such as plastic recycling, dissolving or climate change. Make your picture as accurate as possible. When you are done, show your picture to a friend or a parent and see if you have been successful in teaching them science through art.

You may think that you cannot draw! Drawing is a skill that everyone can learn, and time spent learning to draw teaches you to observe things carefully - an essential skill for scientists.

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Mathematics challenge: Surprising sums

On page 18 of *Planetarium*, you discover how far away from the Sun each of the planets is in 'astronomical units' (AU) which is the distance from the Earth to the Sun.

Imagine that one AU is the same as 10 Unifix cubes (or sugar cubes!). Can you complete the table to show how many Unifix cubes you would need for all of the other distances?

Once you've done this, think of the type of round object, or sphere, you might use to represent each planet and lay them the correct order and correct distance from the sun. You will first need to work out what size spheres you might need if the Earth was the size of a cherry tomato. Page 19 of *Planetarium* might help you get started.

Planet	Distance from sun (AU)	Number of Unifix cubes	What size sphere to use
Mercury	0.4	4	
Venus	0.7		
Earth	1	10	cherry tomato
Mars	1.5		
Jupiter	5.2		watermelon
Saturn	9.6		
Uranus	19.2		
Neptune	30.1	301	

PLANETARIUM

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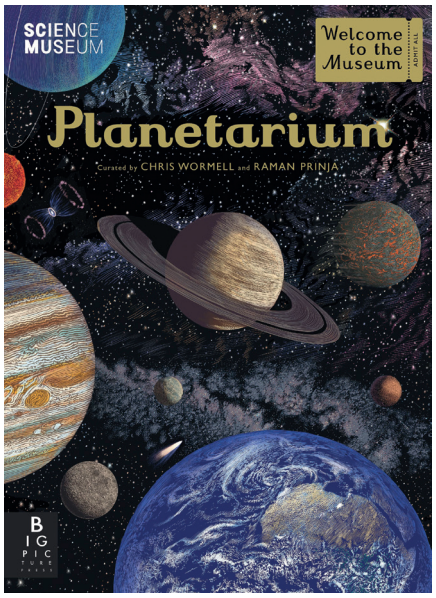


The links between art and science

The Royal Society has a large collection of scientific art work, going back several hundred years. This picture was painted by the artist Maria Sybilla Merian in 1705, long before photographs were invented. Show this image to your students and get them to write down what animals, insects and flowers they see as well as what they think is happening. Then, working in pairs, ask them to answer the following questions:

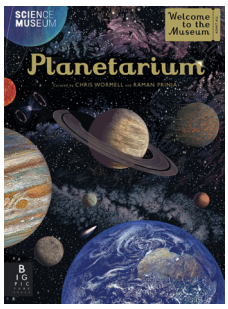
Image: Maria Sybilla Merian (*Metamorphosis insectorum Surinamensium* 1705).

Suggested questions:

How would this picture have helped scientists who were working over 300 years ago, at a time before photographs, to study and talk about butterflies and other insects?

What does the picture show that could not be shown in a single photograph? How might this help people today to understand the life cycle of a butterfly?

Why do you think scientific art was important in a time before the internet and photographs?



PLANETARIUM

Teacher activity sheet (continued)

Printing pictures: intergalactic artwork

In *Planetarium*, the images have been created by Chris Wormell using a process called printmaking. This involves carving the image you want to print into a material, like wood or linoleum, covering it in paint and using this to stamp the image onto paper. Considering health and health and safety issues plan an activity where students carve their own space-inspired images into a sponge, a potato or polystyrene and print their own intergalactic artwork.

© ClarkandCompany

Career links

For those students who would love a job that combines finding out about the world with creating artwork that helps others to understand what they see, they might like the sound of these careers:

- **Scientific animator:** uses moving images to help people understand how things work and what they look like. This includes things that are too small to see with the naked eye, such as blood cells and microbes.
- **Medical illustrator:** makes pictures that help people to understand more about how the body works and what happens when people are ill.
- **Architect:** uses art and science to design buildings that are strong and efficient as well as being pleasant to look at.

Get students to discover more about these, and other careers related to art and science, by doing a search online.

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MAKING WITH STATES OF MATTER

Student activity sheet

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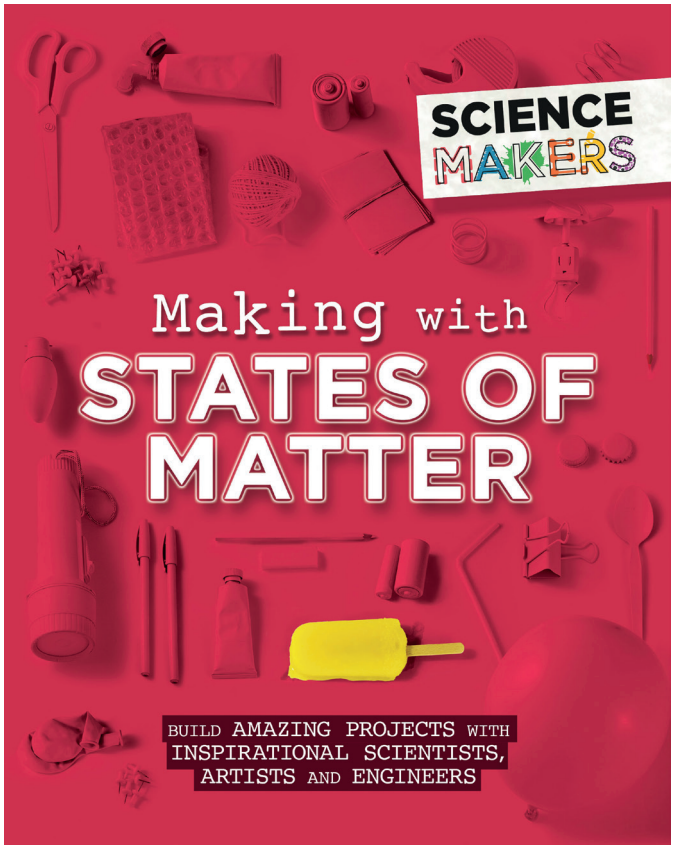


Find out more about how inspirational scientists, artists and engineers build amazing projects using changing states as you read about *Making with States of Matter* by Anna Claybourne.

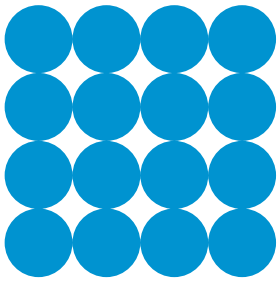
What's the 'matter'?

Matter can change between states and the three main states of matter are: solid, liquid and gas. When matter changes between a solid and a liquid, or a liquid and a gas for example, it is called a change of state.

Hungarian maker, Maria Telkes, used this idea to invent a lifesaving device. Her solar still uses **evaporation** and **condensation** to change undrinkable salt water to thirst quenching, and more importantly safe drinking water. You can read more about Maria Telkes on page 20.

"Changes of state are used in all kinds of everyday activities and inventions"

Making with States of Matter



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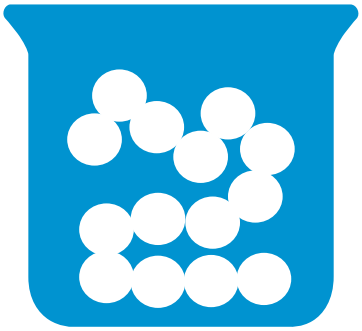

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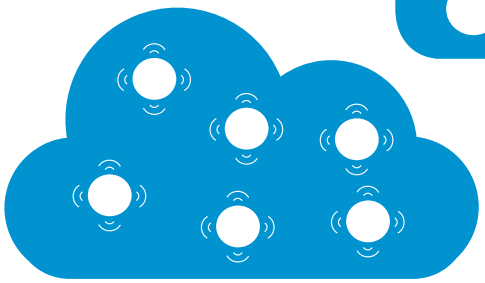

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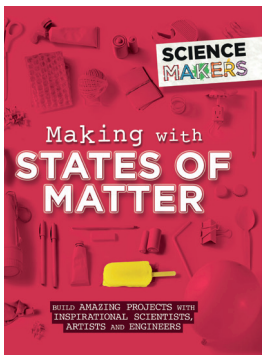

MAKING WITH STATES OF MATTER

Student activity sheet (continued)

This is one of a series of six activity sheets to use alongside the books which have been shortlisted for the Royal Society Young People's Book Prize 2019.

Save your life at sea

Now it's your turn to step into the shoes of a sailor lost at sea and to create your own solar still. Use the instructions below, or those on page 20 – 22 of *Making with States of Matter*

What you need:

- A clean, dry, clear mixing bowl
- A smaller bowl or pot
- Cling film
- Jug
- Lump of plasticine
- Table salt
- Water

Instructions

1. Fill your jug with water from the tap and add enough table salt so that the mixture tastes salty, like seawater. **Do not drink the salty water**
2. Pour the salty water into a large, clear bowl so that it is a few centimetres deep.
3. Place a smaller bowl or pot into the centre of the salty water, keeping the inside dry.
4. Stretch cling film tightly over the top of the large bowl and make sure it is secure.
5. Place a lump of modelling clay on top of the cling film so that it pushes the centre down slightly.
6. Leave the bowl in a place where it will get sunshine for most of the day.
7. Go back after an hour and write down what you see.
8. Once you have collected enough water in the small bowl, pour this out gently and taste it. Is it still salty?

Having created a solar still of your own, think about what changes you would make to improve it.

Mathematics challenge

What state is water at these temperatures...
46°C, 127°C, – 21°C, 74°C, – 2°C ?

Write the temperatures in the correct columns; solid, liquid or gas.

Solid (ice)	Liquid (water)	Gas (water vapour)

Freezing/ melting point

Evaporation point

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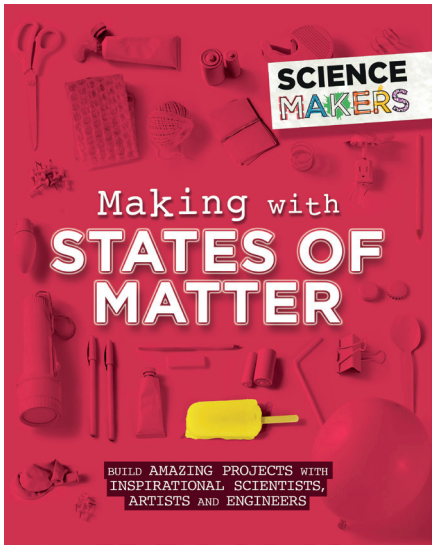
MAKING WITH STATES OF MATTER

Teacher activity sheet

This is one of a series of six activity sheets to use alongside the books which have been shortlisted for the Royal Society Young People's Book Prize 2019.

CENTRE *for* INDUSTRY EDUCATION COLLABORATION

Each activity sheet contains some ideas for experiments to do with your students and other experiments that they can try for themselves at home. Additionally, each sheet gives information relating to careers and a maths focus to help students understand the importance of mathematics education across the curriculum.



Investigation: exploring the difference between melting and dissolving

Do students know the difference between melting and dissolving? And do they know which of these two processes involves a change of state? Encourage students to create their own code language.

Experiment 1

Place a sealed bag of table salt and a sealed bag of candle wax in a jug of hot water. Ask students to think about the questions below and form a **hypothesis**. Discuss their hypotheses in the class. Make sure you have tried the experiment yourself so that you know what to expect.

What do they think will happen to the salt? Why?

What do they think will happen to the candle wax? Why?

Note for teachers

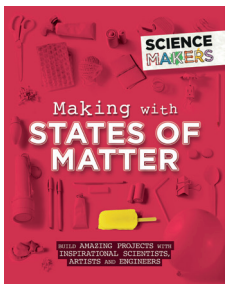
Think about risks when using hot water and ensure students are supervised at all times.

Be careful to avoid misconceptions surrounding melting and dissolving.

In melting, **heat** is needed to change the material from a solid to a liquid.

In dissolving, heat is not necessarily needed (although it will make the process faster).

Dissolving involves **two** materials and involves the production of a **solution**. The dissolved substance (the **solute**) is still present in the solution even though it might look like it has disappeared.



MAKING WITH STATES OF MATTER

Teacher activity sheet (continued)

Experiment 2

Add a tablespoon of table salt and a tablespoon of candle wax directly into the hot water. Ask students the same questions and get them to form another hypothesis.

Once you have demonstrated both experiments, discuss the following questions with your class:

What do they think will happen to the salt? Why?

What do they think will happen to the candle wax? Why?

Does melting involve a change of state?

Does dissolving involve a change of state?

What is the difference between melting and dissolving?

Career links

If your students have enjoyed reading the 'maker profiles' in this book and want to know more about careers associated with changing states of matter, why not suggest the following:

- **Chemists:** study the substances that make up matter, the properties and changes that take place when solids, liquids and gases are combined to create new substances.
- **Chefs:** use science and engineering in the kitchen by working with food in solid and liquid form. The heating or cooling of ingredients helps ingredients to mix and change state.
- **Environmental engineers:** make sure water is safe to drink, and protect people from the effects of the environment, such as pollution.

Get students to discover more about these, and other careers related to chemists, engineering and art, by doing a search online.

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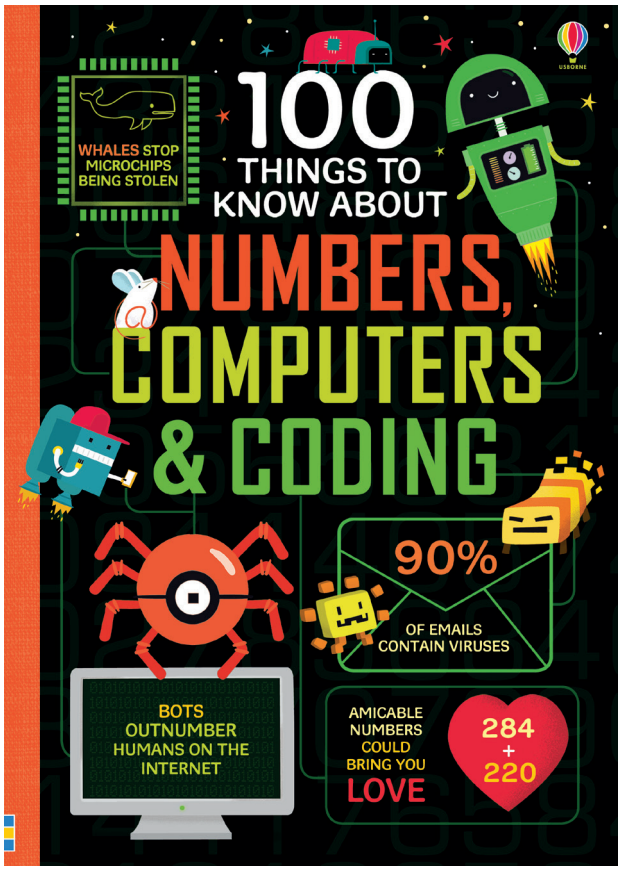
100 THINGS TO KNOW ABOUT NUMBERS, COMPUTERS AND CODING

Student activity sheet

CENTRE *for* INDUSTRY EDUCATION COLLABORATION

This is one of a series of six activity sheets to use alongside the books which have been shortlisted for the Royal Society Young People's Book Prize 2019.



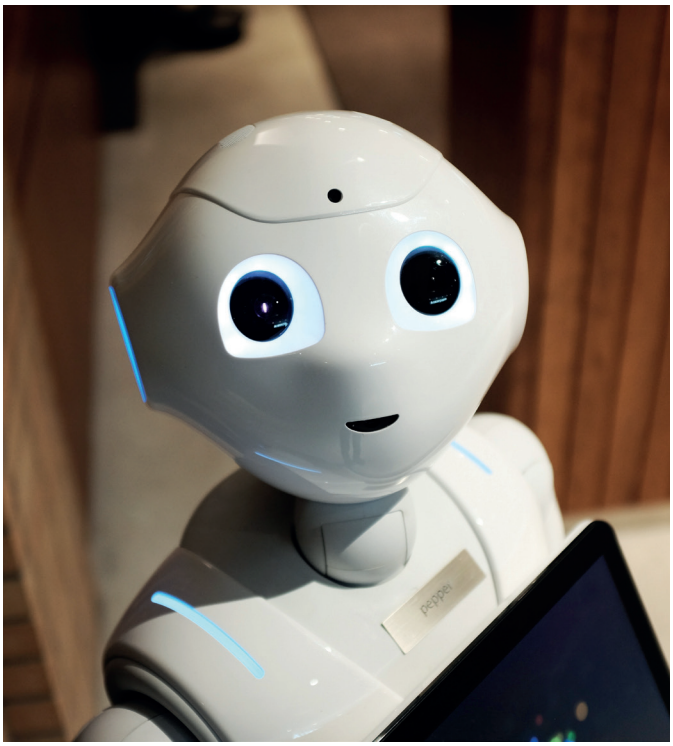
"People have been arguing for centuries about whether numbers really exist"

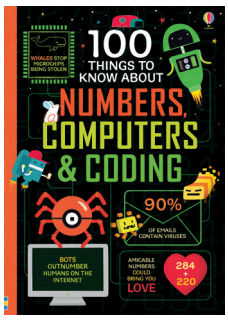
100 things to know about numbers, computing and coding

In this book you will find out lots of different facts about numbers, computers and coding, one hundred to be exact.

Numbers, numbers everywhere

Have you ever wondered "when am I ever going to use this?" when sat in a mathematics lesson? Well, you might be surprised to hear that numbers and data are all around us and shape the very world we live in. From computers which only speak the language of numbers, through robots and artificial intelligence experts, to crime fighting cyber security analysts, we are surrounded by maths every day.





100 THINGS TO KNOW ABOUT NUMBERS, COMPUTERS AND CODING

Student activity sheet (continued)

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Ding dong challenge

Did you know that when church bells ring they are not only playing musical notes, but they are creating mathematical sequences too? On page 81, you will have learned that the number of bells in a church, will influence the number of sequences a bell ringer could play. For example, a church with 2 bells can ring its bells in 2 different ways, and a church with 5 bells can ring their bells in 120 different sequences.

As the bells are different sizes, they will produce a different note and so the different sequences produce different tunes

Similarly, if you fill a number of glasses with different amounts of water, they will each make a different note when you gently tap them with a spoon. Can you find all of the different orders that you could tap them in for the following number of glasses?

Number of glasses	Number of different sequences
4	
5	120
6	
7	5,040
8	
10	

Remember to keep track of the order that you are tapping the glasses and consider if there might be a mathematical way to calculate this.

Hint: you can find out more about the mathematical equation to calculate this on page 81.

Mathematics challenge: how many grains of rice could fill the ocean?

Wouldn't it be amazing if you could work out how many grains of rice would fill an Olympic sized swimming pool? We know that you're thinking that it would take an awful long time to count them all but don't worry, you won't have to do this.

First of all, you need to count how many will fit into a 25ml (0.025l) plastic container. This will form the basis of the next calculations.

You are going to be working with some amazingly big numbers so you might like to use a calculator to help you.

Container	Capacity (Litres)	Number of grains of rice
Small glass	0.025	
Mug	0.25	
Reusable water bottle	2	
Bath tub	308	
Olympic sized swimming pool	2,500,000	

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100 THINGS TO KNOW ABOUT NUMBERS, COMPUTERS AND CODING

Teacher activity sheet

CENTRE *for* INDUSTRY EDUCATION COLLABORATION

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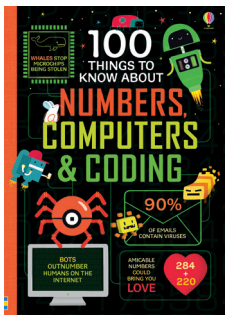
Activity 1: Secret messages and hidden codes

Secret codes have been used to hide messages since as early as the ancient Greeks who used wooden sticks called scytales to encode important battle information. As time has passed, methods for code writing have become more difficult to crack – from the complicated coding of the Enigma machine that was used by the Germans in World War II to the supposedly unbreakable computer ciphers of the modern day. Students can read all about Morse code on page 88 and 89 of *100 things to know about numbers, computers and coding*, This way of sending secret messages has been used for the last 160 years and uses dots and dashes in place of letters and numbers.

Give your students a copy of the Morse code alphabet, and get them to create their own secret message to send to someone else in the class. When they are done, mix up all of the messages and encourage them to try and crack the coded messages. As an extension activity, why not encourage students to create their own code language?

A	•—	N	—•	1	•————
B	—•••	O	———	2	••———
C	—•—•	P	•——•	3	•••——
D	—••	Q	——•—	4	••••—
E	•	R	•—•	5	•••••
F	••—•	S	•••	6	—••••
G	——•	T	—	7	——•••
H	••••	U	••—	8	———••
I	••	V	•••—	9	————•
J	•———	W	•——	0	—————
K	—•—	X	—••—		
L	•—••	Y	—•——		
M	——	Z	——••		



100 THINGS TO KNOW ABOUT NUMBERS, COMPUTERS AND CODING

Teacher activity sheet (continued)

Activity 2: Clever clothing

Wearable technology is all the rage but what is it? Designers and scientists have worked together to create clothing that has built-in computer technology. Pages 104 to 105 of this book highlights some of the futuristic technology that has already hit the runways. Challenge students to invent an item of smart clothing and sketch what this might look like, as well as provide information about what it does. Some suggested questions are given below:

What type of wearable might be useful?

What type of technology might make life more exciting?

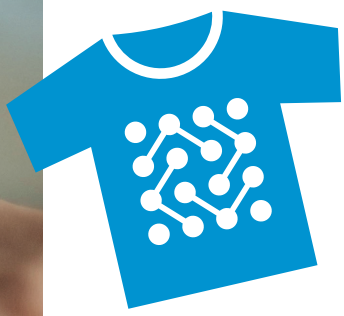
What type of technology might help someone to overcome a tricky problem?

Career links

If your students have been inspired to learn more about careers that involve using mathematics, computing and coding in the real world, here are just three options for them to consider:

- **Software engineers:** write programs for computers and other digital devices and help to make computers run more efficiently
- **Data analysts:** look at the numbers and statistics produced by computers, work out what they mean and explain them to others.
- **Robotic engineers:** uses computer aided design to create robots to do jobs which are too dangerous or dirty for people to do.

Get students to discover more about these, and other careers related to numbers and data, by doing a search online.



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THE ELEMENT IN THE ROOM

Student activity sheet

This is one of a series of six activity sheets to use alongside the books which have been shortlisted for the Royal Society Young People's Book Prize 2019.

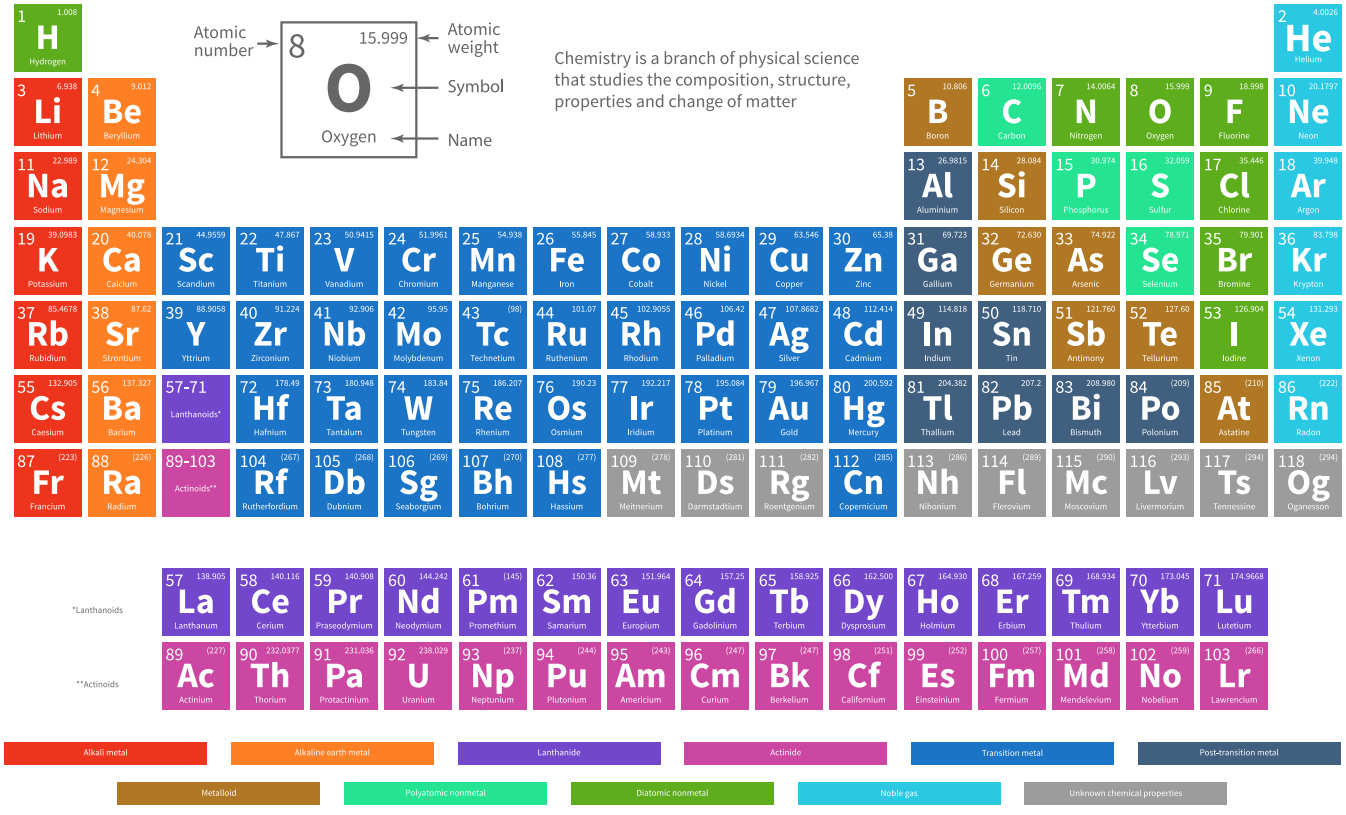
CENTRE *for* INDUSTRY EDUCATION COLLABORATION

Explore how everything in the universe is made from incredibly tiny building blocks, which scientists call the 'elements' as you get hands-on in activities inspired by *The Element in the Room* by Mike Barfield.

What is the periodic table?

There are 118 'elements' known so far. These are arranged and recorded in a table, according to their weight and properties, for example how they look and how they can change. Each element has a symbol, like a code name, which is made up of one or more letters. The information in the periodic table is the result of hundreds of years of detective work by many scientists, known as chemists.

> "More elements will surely be made. And maybe you will be the person who discovers them."
>
> ***The Element in the Room***



THE ELEMENT IN THE ROOM

Student activity sheet (continued)

Exploring Elements

Take a good look at the periodic table on page 6 and 7 of *The Element in the Room*, you can also find the periodic table online. Which elements have you heard of? Do you know what these elements are used for? Discuss these questions in a group, and see how many elements you already know.

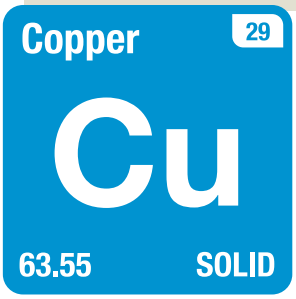
Do you know what's in a name?

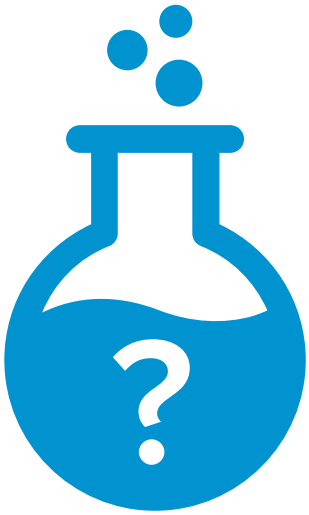
Many elements are named after famous places and people. For example:

Copper gets its name from the Latin word 'Cuprum', meaning 'from the island of Cyprus' which is the location of ancient copper mines.

Can you guess who the element Einsteinium (atomic number 99) is named after?

What would you name an element discovered by you in the future? Why would you call it this?





Mathematics Challenge

As well as a symbol or 'code name', all elements have a number at the top, which increases by one as you travel along each row from left to right. This is called the element's atomic number.

See if you can learn the chemical symbol and atomic number for the elements you are familiar with. above.

Can you think of an engaging and interesting way of remembering this information?

For example, He is the symbol for Helium, with atomic number 2, so you could imagine two shiny balloons filled with helium gas floating away into the sky.

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THE ELEMENT IN THE ROOM

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Activity: Elements everywhere!

Here are 20 elements your students may have heard of:

aluminium	fluorine	krypton	oxygen
calcium	gold	lead	platinum
carbon	helium	mercury	silver
chlorine	hydrogen	nitrogen	tin
copper	iron	neon	titanium

1. Allow them to search for their own 'element in the room' by looking for different objects that contain an element from this list. Encourage them to create their very own eclectic element collection. For example, they might find a piece of jewellery made from gold or, for carbon, they could include a pencil that contains graphite which is a form of carbon.
2. Working in groups, get students to make a collection of everyday objects on a large piece of paper and label which element each one is made from.
3. Remind them that some objects may contain more than one element.
4. When the collections are complete, take a photo of them to display in the classroom.

Note for teachers

Learning about the periodic table and associated vocabulary is beyond what children are expected to know at the primary school age and can be conceptually very tricky. For now, the focus should be on children familiarising themselves with the names of more common elements, exploring where these can be found in everyday objects and understanding how they can be useful to us.

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THE ELEMENT IN THE ROOM

Teacher activity sheet (continued)

Extension challenge:

Using *The Element in the Room* book and other sources of information (from books, the internet, family and friends) encourage students to discover more about the periodic table and where we find common elements and how they can be useful to us.

They should think of a fun and interesting way to present their new knowledge: for example they could continue to build their eclectic element collection, produce top trumps style cards containing information about their chosen element, invent a fun game about the periodic table or write a song, poem or riddle that can teach other children about elements.

Career links

Chemistry careers are about much, much more than safety goggles, beakers, and the periodic table. Chemistry is in everything, even incredible careers. Encourage students to consider:

- **Forensic scientists:** play an important role in solving crime by gathering evidence and keeping it safe. This role also includes analysing evidence during the process of solving crime.
- **Plant chemists:** solve the world's food crisis and ensure safe soil, they work with farmers to develop efficient farming practices and soil quality maintenance.
- **Biochemical engineers:** take exciting discoveries in life sciences and turn these into practical solutions to problems in human health and wellbeing.

Get students to discover more about these, and other careers related to chemistry, by doing a search online.