

HOW WAS THAT BUILT?

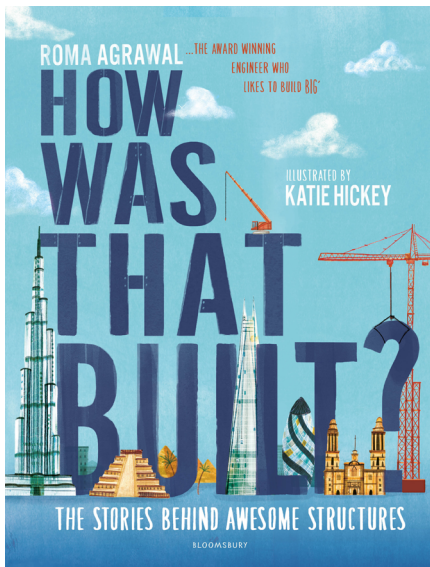
Teacher activity sheet



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 2022.

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

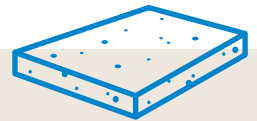


Take care

Cement powder is an irritant; masks and goggles should be worn. If gloves are not worn hands should be washed immediately after doing this activity.



Set in concrete



Concrete is made by mixing cement, ballast (a mixture of sand and gravel) and water together. It can be done on a small scale in the classroom. Materials may be purchased from a builder's merchants. However, the quantities needed are so small that a local builder may be willing to donate some to you.

What to do:

1. Use the plastic spoon to measure out some cement and ballast into the margarine tub. A good starting ratio is one part cement to four parts ballast. You will need enough to half fill one of your small containers.
2. Stir a small amount of water into your mixture. You need to add enough water so that you have a 'slack' mixture (a little runnier than cake mixture).
3. Pour the mixture into the smaller container. You will need to leave it undisturbed for about 2 days until it is completely set.
4. If you plan to test the concrete for strength you will need to create a thin layer, no more than 1cm in depth, as a thicker block will be too strong to break.
5. Repeat, but try some variations such as altering the ratio of ballast to cement or adding additional materials such as chopped straw, powdered paint or PVA glue.
6. Compare the finished concrete blocks. If testing for strength, one approach is to see how much weight the different formulations of concrete will bear.

You will need:



Masks



Goggles



Cement powder



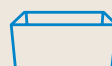
Ballast (mixture of sand and gravel)



Spoons



Small containers (yoghurt pot)



Large container (margarine tub)



Measuring jug

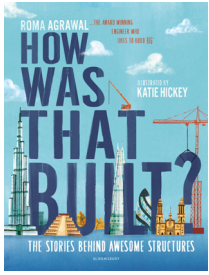


Petroleum jelly to line the mould



Optional sawdust, straw, PVA glue or powder paint)

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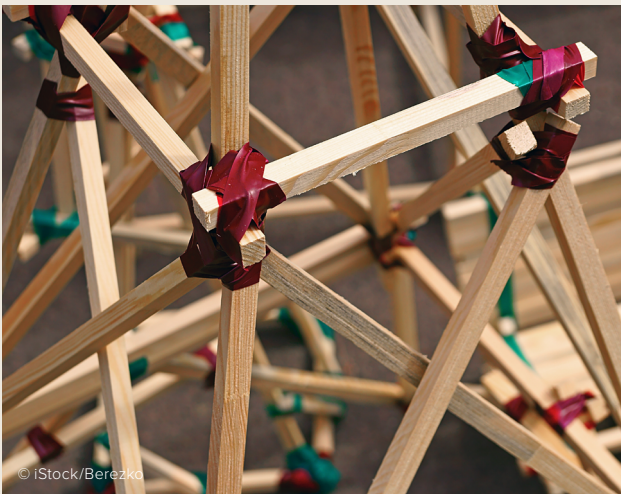
HOW WAS THAT BUILT?

Teacher activity sheet (continued)

Stable structures



Challenge children to build a structure capable of holding a weight such as a dictionary. They could use commercial construction kits, 10mm square section wood or dowelling, paper or any other materials. The completed standard of work is likely to be higher if children are given time to explore the construction material and to plan their structures in advance of the main activity. Alternatively, this could be set as a homework challenge to do with families. Children could then bring their completed structures into school for testing and to explain their design decisions to each other.



Location, location, location



Children may be surprised to learn that the way that a building is constructed can depend upon where it is built, as the underlying geology may present extra challenges. For example, foundations built on sand are liable to sink, foundations on clay need to withstand significant movement as clay shrinks and expands in response to varying amounts of water.

Using the structures from the previous activity, explain to children that they are going to be built in a place with a very sandy soil. Place the structures (including the weight that they have been designed to hold) into a tray of sand and observe what happens. Explain that architects and engineers often need to overcome problems such as structures sinking into soft ground and challenge them to come up with a possible solution for their own structures.

Encourage children to look at the work of other groups as they try to solve this problem. Explain that in real life, teams of architects and engineers may be in competition with each other but are also inspired by, and learn from, what others do. For a real life context for this activity and detailed teacher guidance you may find the activities 'A model platform' and 'Sinking in sand' from the free resource [Oil for Beginners](#) helpful.

Career links

• Engineer

Most people do not realise just how many different types of engineer there are. From chemical engineers to civil engineers they all use different sorts of scientific understanding to solve real world problems. On page 80 of this book the author and engineer, Roma Agrawal introduces us to some real engineers and explains a little bit about what their role involves.

• Supporting teams

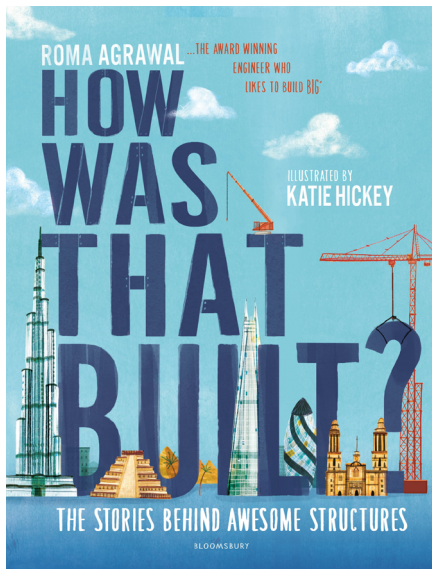
The Halley VI research station (described on pages 70 – 71) needs the collaboration of many different professionals to ensure its success. Do you think that you have got what it takes to work in the extreme conditions of the Antarctic? In which case you might consider working there as a chef, a doctor, a mechanic or a ventilation engineer, or one of the research scientists that this team support.



HOW WAS THAT BUILT?

Pupil activity sheet

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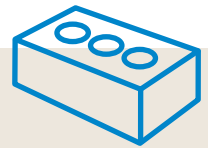


“Humans have been building for tens of thousands of years – in fact, we spend most of our time inside the structures we’ve created, from the places we live, study and work, to the bridges and tunnels we use to get around.”

How was that Built?

Read fascinating stories about people who have changed the world by making it a more exciting and fun place to live, in the incredible *How was that Built* by Roma Agrawal, illustrated by Katie Hickey.

Strong and stable

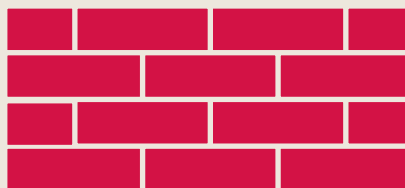


A common building material is brick. You may have noticed that usually the rows of bricks are not stacked exactly on top of each other but are staggered so that the joins between the bricks do not line up. Have you ever wondered why this is? Try making two walls using stackable bricks such as Lego or Duplo. Make sure that the walls are the same size as each other. One of the walls will need to be built with the bricks stacked in columns and the other so that the bricks are overlapping.

You now need to plan a way to test if there is any difference in how strong or stable the walls are. What do you notice? Now you know why builders overlap their bricks the way they do. This is called bonding the bricks. Most walls that you see will be made of two layers of bricks as this is even stronger and better for insulation. When you see what looks like a smaller brick that is because a normal sized brick has been placed with its end facing outwards; this is called a header. When bricks are laid so that you can see the length of them this is called a stretcher. Some patterns of bricks are stronger than others and some patterns are particularly decorative. You can read more about them [here](#).

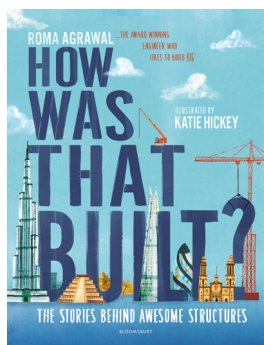
When you are walking around your local area, look out for different patterns of bonding. Take photographs of each different brick pattern to share in school. Ask your teacher how you can share these photos so they can be printed and added to a class display.

Stretcher bond



Stacked bond





HOW WAS THAT BUILT?

Pupil activity sheet (continued)

Tall towers

With just a tub of cocktail sticks and small balls of blutak or plasticine it is possible to build a structure as shown in the illustration. Challenge your friends to see who can make the tallest building in this way.

What do you notice about the strongest structures? What do they have in common that helps to make them strong? If you were to start again is there anything that you would change about your design?



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Mathematics challenge



The average height of a two-storey home is about 7 meters. Compare that with the height of some of the buildings mentioned on pages 18 and 19. Do you think that you would be able to show the comparative sizes of some of these buildings using a bar chart? You would need to think very carefully about what scale to use. First, decide which is the tallest building that you are going to show and decide how many meters each square will have to represent so that it will fit on the paper. You might find that you will need to use less than one square to represent the house!

You could add some other buildings to your chart such as the Shard (on pages 14 and 15). You could also research the height of other tall buildings such as the Eiffel Tower or Big Ben and see how they compare with some of the tallest buildings in the world.

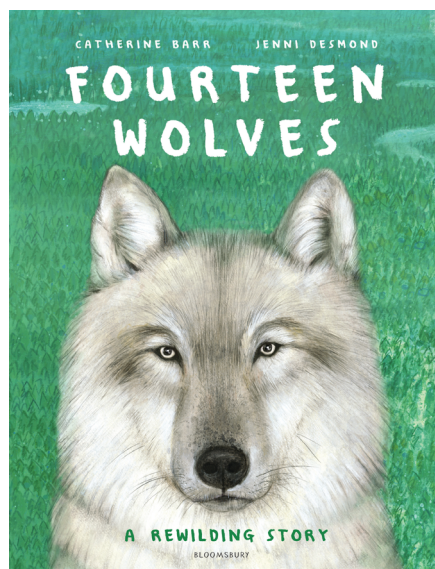
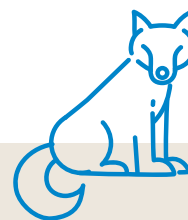


FOURTEEN WOLVES

Teacher activity sheet

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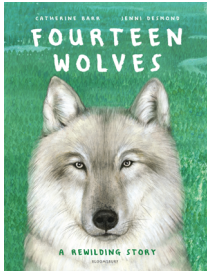
Rewilding Britain

Wolves have been extinct in the UK since the 15th century, and there are no plans to bring them back at the moment. However, other animals have been introduced in some areas. Most recently [European bison](#) have been introduced into some woods near Canterbury. Before that [beavers](#) have been released in several places including Argyllshire in Scotland, [red kites](#) in the south of England and [sea eagles](#) in Scotland.

Challenge your children to find out more about one of these animals and make a poster about them.

[We are the ark](#) is a project that encourages everyone to share whatever land they have with creatures large and small. It contains tips for rewilding a part of the school grounds. Challenge your children to find out more about one of these animals and make a poster about them.





FOURTEEN WOLVES

Teacher activity sheet (continued)



Two sides to an argument



In *Fourteen Wolves* we learn that not everyone was pleased that the wolves had been returned to Yellowstone Park. Local ranchers feared that they would eat their animals and hunters worried that there would be fewer elk left for them to hunt. Part of the job of conservationists is to convince people that the advantages outweigh the disadvantages and, in this case, help people learn to live alongside wolves again.

It is the same when animals are reintroduced to the UK. Some farmers are angry that sea eagles sometimes predate on new-born lambs. While some landowners welcome beavers onto their land others are worried that they will lead to unacceptable flooding which will ruin their crops. As a result, many beavers in Scotland have been shot. Ask your children to research the arguments for and against reintroductions of different animals. Having heard the arguments, what do they think?

Challenge them to take part in a debate. Support them to listen carefully to the alternative point of view as well as working to explain their own. This is even more challenging if children are asked to argue for an opposing view to their own. Being able to do this can make them more effective when it comes to defending their own position.

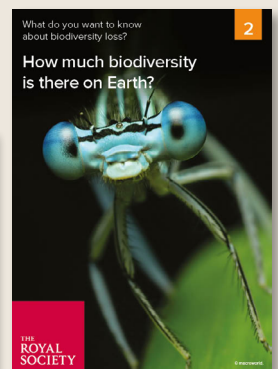
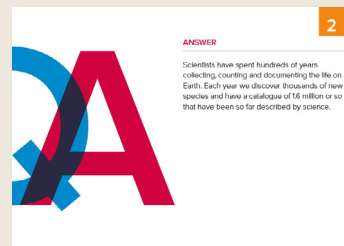


The importance of biodiversity

The Royal Society has produced an [informative 5-minute film](#) which is ideal for sharing with children. It is voiced by Sir David Attenborough, and highlights both the dangers of biodiversity loss, while ensuring that children understand that they are not completely powerless to make a difference.

The film highlights that although it is important that we do something to tackle biodiversity in certain hot spots in the world, there are also things that we can do in our own locality; even a window box might provide some much-needed nectar for pollinating insects or caterpillars for hungry birds.

They have also created these Q&A posters, designed for young people, to use in the classroom, which can be found on this page: [What do you want to know about biodiversity loss?](#)



Career links

- **Environmental scientists**

Study the impact of human activity on the environment, and identify ways to minimise negative impacts, such as air pollution.

- **Environmental lawyer**

Not everyone agrees about how we should be using the environment, and this can lead to disputes (for example between conservationists and hunters when the wolves were returned to Yellowstone Park).

Environmental lawyers help to ensure that the law is used to protect the environment and the plants and animals that rely upon it.

- **Computer modeller**

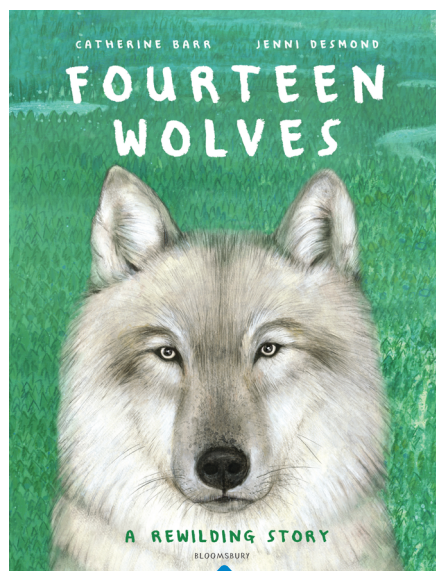
Can predict what might happen to populations of different plants and animals when something changes in the environment. This can help conservationists decide whether the reintroduction of a species is likely to be beneficial.



FOURTEEN WOLVES

Pupil 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 2022.



“Shrouded in myth, this legendary predator has been shot, caught and captured by humans for thousands of years... But for many people, the wolf’s haunting howl carries a wild magic – a magic that once restored a barren land.”

Fourteen Wolves

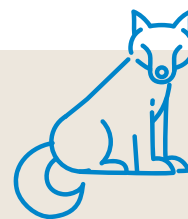
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Read fascinating stories about people who have changed the world by making it a more exciting and fun place to live, in the incredible *Fourteen Wolves* by Catherine Barr, illustrated by Jenni Desmond.

Biodiversity around us

When we read inspiring stories about the wolves at Yellowstone Park, sometimes it feels as if only big actions matter and that there is nothing that we can do to make a difference. However, we can make a difference to the wildlife around us in parks, gardens, school grounds and even in roadside verges!

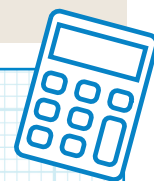


Many insects, including bees, butterflies, moths and beetles rely on flowers as a source of food from nectar and pollen. Sadly, the way that we look after our environment often means that there aren't enough different types of flowers. One thing that we can do to make a difference is to mow the grass less often. If you have a school playing field or garden try marking out a small area and asking the person who usually cuts the grass to leave it alone. Keep a record of the number of plants that flower compared to the mown grass. You can find out more on the [Plantlife](https://www.plantlife.org.uk) website.

You could write to your local council and ask them to reduce the frequency of mowing the grass verges.

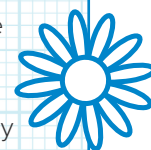
Mathematics challenge

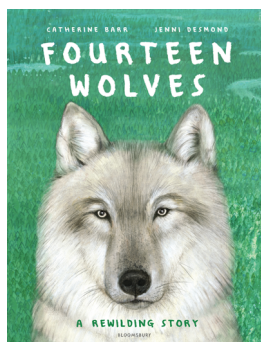
How many daisies do you think that there are on your school playing field? Would you like to count them to find out? We thought not! Fortunately, scientists have thought of an answer. Instead of counting ALL the plants in a field they use something called a quadrat. This is a frame, most often a metre square. However, it doesn't need to be a square and in school we can use hoops; the important thing is that we are comparing areas of the same size.



Using a quadrat or hoop we can compare different patches of grass. For example, are there as many different species of plants growing on the football pitch as by the hedge? What about in your garden or the local park? Does it make a difference how often the grass is mown?

Once you have carried out your survey you will need to think of a way of sharing your results. You might find these results useful if you are trying to persuade other people to change how they care for grass.

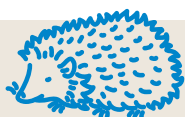




FOURTEEN WOLVES

Pupil activity sheet (continued)

Hedgehog highways

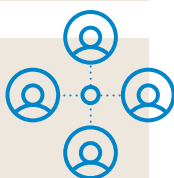


Did you know that hedgehogs are on the '[red list](#)' in the UK? This means that they are endangered. Since the year 2000 their numbers have dropped by up to 75% in some parts of the country. Wouldn't it be terrible if they became extinct in Britain in the way that the wolves did in Yellowstone Park?

One of the difficulties faced by hedgehogs is the garden fence. They need to be able to roam over a large area of land each night to find enough food to eat so one garden isn't big enough. Sadly, modern fences often have a concrete base leaving no way through for hungry hedgehogs and most people do not realise how important it is to leave a way for hedgehogs to get through.

This is where 'hedgehog highways' come in. These are small gaps left in fences that are just the right size for a hedgehog to pass through. You can find out more about them at [Hedgehog Highways](#). Why don't you make a leaflet to advertise the importance of these holes for hedgehogs? Let all your family and friends know and check out your school grounds to make sure that our prickly friends can pass through. Maybe you will even become a [hedgehog champion](#).

Citizen science



Have you heard of citizen science? This is when lots of people collect data on behalf of research teams. This helps them see patterns that wouldn't be obvious with a smaller amount of data. For example, some people record the first signs of spring every year, and this has helped scientists to show that spring has been getting earlier over recent decades.

There are lots of opportunities to contribute to this important work. Find out more at [The Wildlife Trusts](#), [Butterfly Conservation](#), [The Woodland Trust](#) or [Plantlife](#) for example.

The web of life

Did you know that all food originally comes from plants? Plants use sunlight to make food. They are known as **producers** because they make all the food in a habitat.

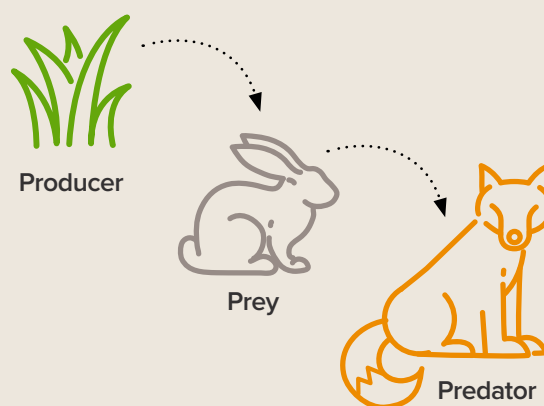
The nutrition in the plants is then eaten by animals such as elks, rabbits, and caterpillars. The food that was made by the plant gives them all of the nutrition that they need to stay alive and to grow. Animals that eat plants are called herbivores.

Meat eating animals (known as carnivores) eat other animals to get the nutrition that they need. Carnivorous animals that hunt and eat other animals are known as **predators**. The animals that they catch and eat are known as **prey**.

Scientists use food chains to show how living things in an environment are connected by how they create and use food.

In this illustration you can see how the nutrition that had been created by the grass was eaten by a rabbit. The nutrition was then passed on to a fox when it ate the rabbit.

Can you use the story of *Fourteen Wolves* to recreate some of the food chains in Yellowstone Park?

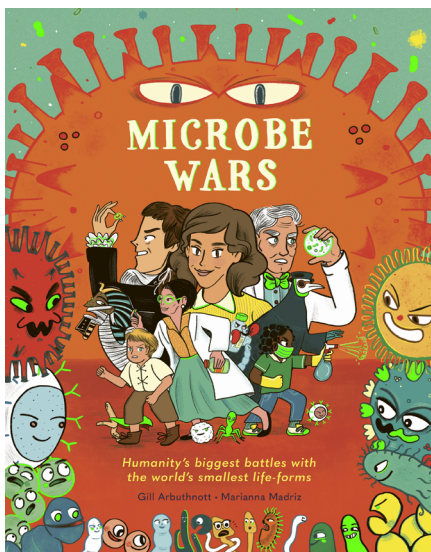


MICROBE WARS

Teacher activity sheet

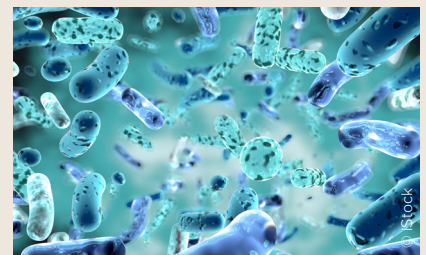
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The art of science

Choose an image of a microbe (for example from the [science photo library](#)) and show it to children without telling them what it is. Encourage them to describe it, notice details, and speculate as to what it might be.



Use the image to inspire written work, such as poetry, and artwork in various media. The best results occur when children are given time and support to follow up their ideas. This approach can lead to a high standard of work in both art and English. Moreover, an important aspect of working scientifically is close observation which this strategy promotes. You can find out more about this approach from the [SAW trust](#).

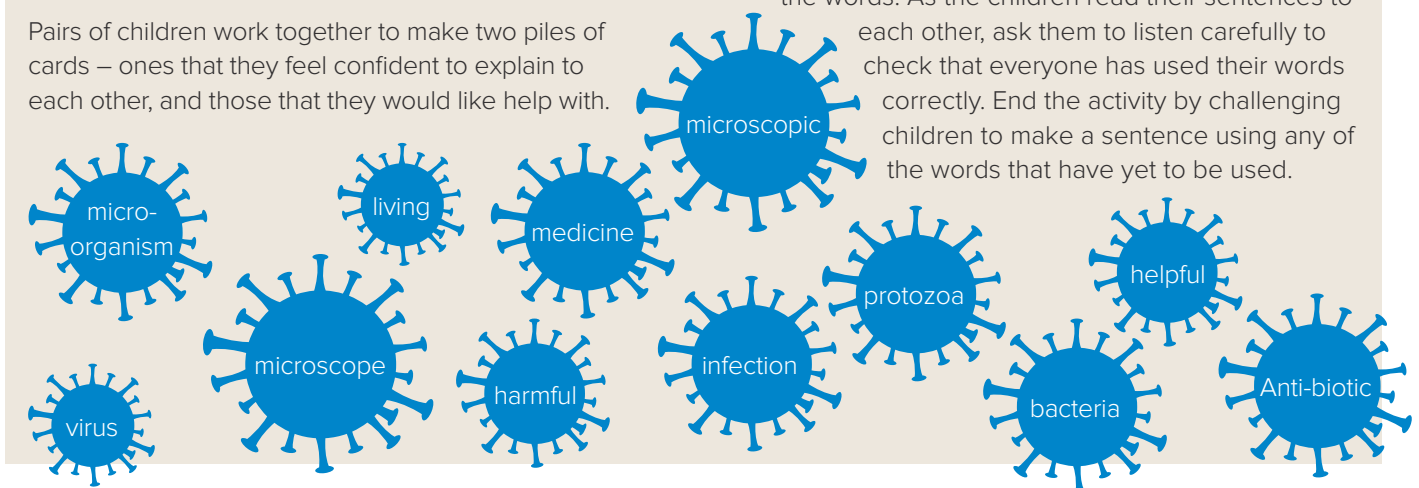
The power of words

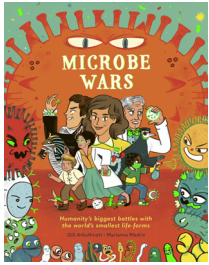
Give children a set of word cards showing some of the vocabulary used in the topic. There are some suggestions below. However, the words will vary depending upon the age of the children.

Pairs of children work together to make two piles of cards – ones that they feel confident to explain to each other, and those that they would like help with.

More confident children can then explain any words to the class that others do not understand.

Children then make a sentence using two or more of the words. As the children read their sentences to each other, ask them to listen carefully to check that everyone has used their words correctly. End the activity by challenging children to make a sentence using any of the words that have yet to be used.





MICROBE WARS

Teacher activity sheet (continued)

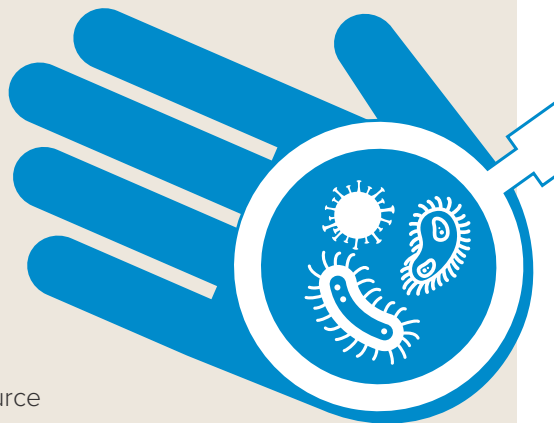
Hands up

In recent years we have all become much more aware of the importance of keeping our hands clean to avoid disease. However, it can still be hard for children to understand that apparently clean hands can be home to microbes that could make them ill. This activity demonstrates that these organisms are real, even though they are not visible to the human eye.

Each child taking part will need an untouched slice of bread and a new zip-lock bag. After coming in from playtime, before washing their hands, half the children will need to handle their bread before sealing it in a bag. The other children will do the same except that they will first thoroughly wash their hands.

Over the course of a week or two children will be able to see the difference in the amount of mould which grows on the bread handled with dirty hands as opposed to the slices only touched by clean hands.

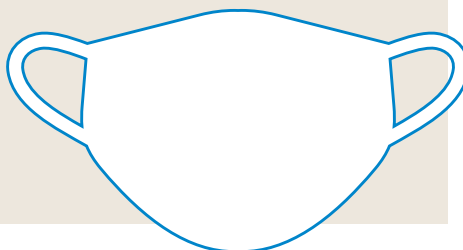
More detailed instructions can be found in the activity 'Which Soap?' in the CIEC resource [Sustainable Stories](#).



What was your experience?

Although the pandemic led to children missing out on a lot of experiences that they would normally have had it has also given them a unique insight about what it feels like to live during a pandemic. Children may have had wildly different experiences depending upon their home circumstances and whether they experienced a bereavement.

Encourage children to reflect upon their own experience of the pandemic. Give each one a disposable face mask and ask them to decorate it in a way that gives a flavour of some of their experiences whether they were negative or positive. These could be shared on a display board, perhaps alongside some related poetry or other creative writing from an English lesson.



Career links

Vaccinologist: Vaccinologists develop new vaccines to help give people (and animals) immunity against diseases. In recent years one vaccinologist, Dame Sarah Gilbert, has been widely recognised because of her pioneering work on one of the first effective vaccines against COVID-19.

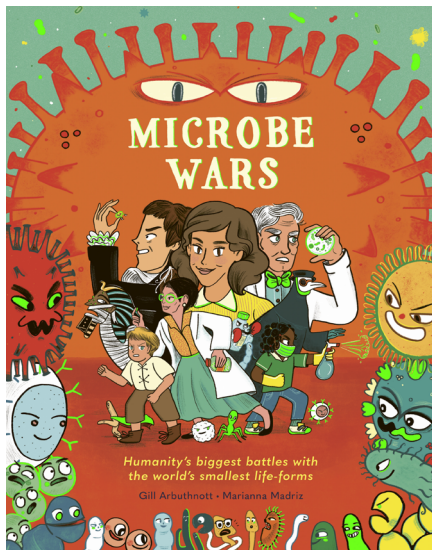
Chief Scientific Officer: A chief scientific officer oversees a group of scientists working for a large organisation or company. During the recent pandemic, the Chief Scientific Officer for England was Professor Chris Whitty. He helped to advise the government on the best course of action to prevent the spread of the disease.

Epidemiologist: An epidemiologist is someone who studies patterns of disease in large populations. For example, in the last century epidemiologists were the first to notice a pattern of increased lung cancer and other diseases in people who smoked. One of the first epidemiologists was John Snow who you can read about on page 26.

MICROBE WARS

Pupil activity sheet

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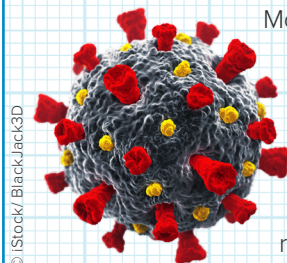


“Humanity’s biggest battles with the world’s smallest life-forms.”

Microbe Wars

Read fascinating stories about people who have changed the world by making it a more exciting and fun place to live, in the incredible *Microbe Wars* by Gill Arbutnott, illustrated by Marianna Madriz.

Mathematics challenge



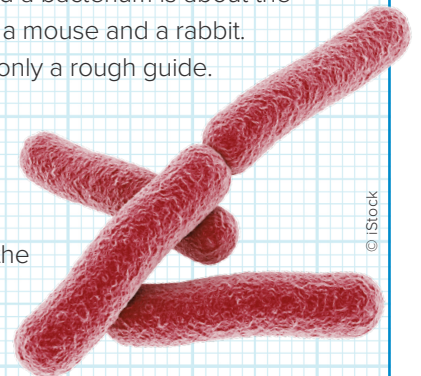
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Most viruses are a lot smaller than most bacteria.

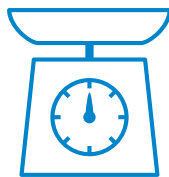
On page 11 we learn that the relative difference between a virus and a bacterium is about the same as between a mouse and a rabbit.

This is, of course, only a rough guide.

Just as mice and rabbits can come in different sizes so can viruses and bacteria. However, this gives us a good starting point to try and imagine the difference in size as a rabbit is about 80 times heavier than a mouse.



© iStock



Using some sensitive scales measure out a gram of playdough or plasticine. Now, measure out a piece that is 80 grams. This will help you to visualise the difference in size between them. You could use the larger piece to make a model of one of the bacteria shown in the book.

Famous victims

Smallpox is the only disease that we have managed to completely remove from the world. In the past though it was a deadly disease; people who caught smallpox often died. Those that survived were left with horrible scars or ‘pock marks’ on their face. On page 18 we learn about some famous people from the past who caught this terrible illness. Choose one of these people and find out more about them. How do you think that history might have been different if they had died when they caught smallpox?





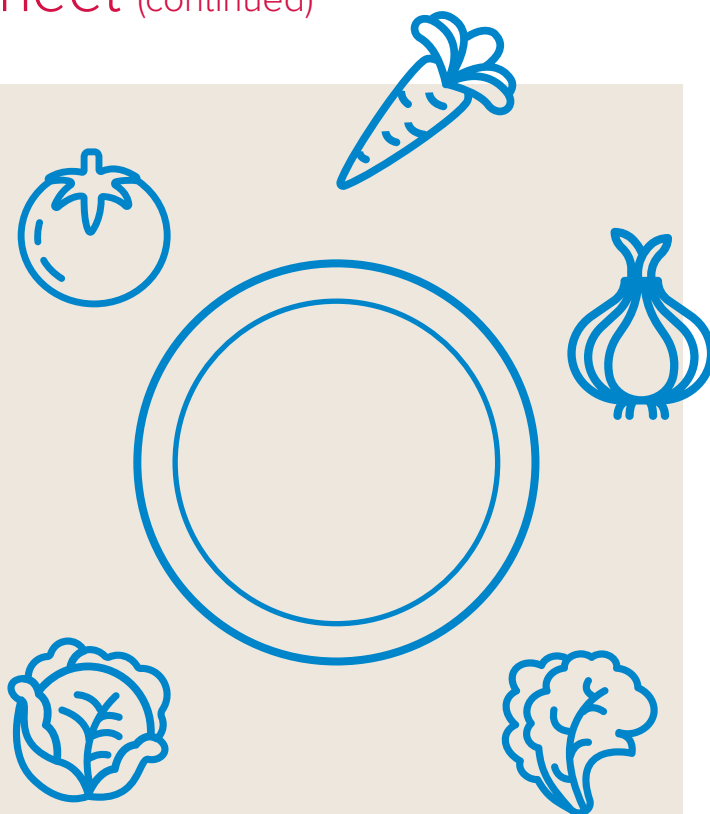
MICROBE WARS

Pupil activity sheet (continued)

Recruiting an army

On page 55, read about the importance of diet in creating a population of microbes that help to keep us healthy. You will see that it is important to include as many different plant-based foods as possible and to avoid too many processed foods.

Could you design a meal that contains as many different plants as possible? Choosing plants that are in season will be cheaper and more sustainable than choosing ones that need to be grown in glass houses or flown from distant countries. This means that in January it would be better to choose cabbage, carrots and onions rather than lettuce, strawberries and tomatoes! But don't worry, carrots, cabbage and onions are tasty too; why not grate them all finely and mix them with a little mayonnaise to create a delicious coleslaw?



Eat the rainbow

It is a good idea to eat as many different coloured fruit and vegetables as possible as each colour tends to have different nutrients and will help you and your microbe army to thrive. Can you think of some extra fruit and vegetables to add to this table?



© iStock/ansonsaw

Red	Orange	Yellow	Green	Blue	Purple	White
Beetroot Radish	Tangerines	Pepper	Brussel sprouts	Blueberries	Blackberries Purple carrots	Onion Banana

FANTASTICALLY GREAT WOMEN SCIENTISTS AND THEIR STORIES

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 2022.

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



This book shines an important light on a wonderful array of women who achieved great things in their various scientific fields. They did so despite the male-dominated environments, but occasionally as a result of men in their lives using their influence to ensure others saw and valued their contributions. When using this book with a class, it is important that we strive equally to enthuse and raise the aspirations of all children.



Lava layers

Children can read about Katia Krafft's brave adventures as a volcanologist on pages 80–103. Inspire them to have their own volcanic adventure exploring lava flow with CIEC's [volcanoes and lava](#) activity. This activity would work equally well in the classroom or as a home learning challenge. The teachers' notes and activity sheet provide all the information you need to make a chocolate volcano, from which children can then take 'core samples' using an apple corer; mimicking the work of scientists who carry out this kind of research.

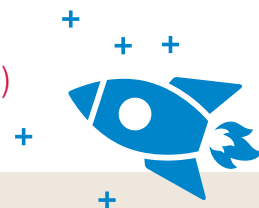
Creative biographies

Some other fantastically great people feature on pages 172 – 173. Ask children to select a scientist from this group and produce a biography in the style of the author Kate Pankhurst. Her informal style and captivating illustrations would have widespread appeal. Integrating aspects of storyboards, newspaper articles, diagrams, instructions, and comic strips, alongside more traditional paragraphing, would play to the strengths of those with artistic flare and including factual diagrams and other scientific content would draw in those who prefer non-fiction writing.



FANTASTICALLY GREAT WOMEN SCIENTISTS AND THEIR STORIES

Teacher activity sheet (continued)



Astronaut adventures

Mae Jemison began her astronaut training in 1987, but it was not until 1992 that she embarked on her big adventure on board the space shuttle Endeavour. During this time, she had to undergo special training to prepare her for her mission.

Do you have some space fanatics in your class? Nurture their astronomical ambitions by signing up for [Mission X – Train like an astronaut](#). Pupils learn the key elements of keeping fit and staying healthy in space and on Earth. A range of hands-on physical and scientific activities will teach children about a whole range of STEM skills, nutrition, and exercise. The project is great for classroom learning but it can also be used for themed days, homework activities, and STEM clubs.

Once in space, Mae spent lots of time working in zero gravity and carried out lots of experiments on the effects of weightlessness. This [Planetary Picnic activity](#) from the Ogden Trust is a good way to introduce your class to how the force of gravity varies around our solar system by feeling how the weight of a familiar object would be different on different planets.

Career links

Astronauts like Mae Jemison need to stay in peak physical condition, so they train and keep their bodies fit and healthy. They can spend weeks or months in space carrying out experiments such as the effect of the weightlessness of space on the human body and the growth of plants and animals. Since the 1960s, there have only been around 600 astronauts visit space from the entire world population, due to the tough selection process! However, there are many science jobs for those involved in space missions from the safety of planet Earth.

Astronomers like Caroline Herschel study the universe in different ways. From their workplaces on Earth, they use equipment such as telescopes and computer programs to monitor planets, stars, distant galaxies, asteroids, and black holes. They work in university laboratories, observatories or national agencies like NASA, CERN, and the ESA.

Botanists like Janaki Ammal study all forms of plant life including grasses, flowers, trees, and fungi. They can work in a laboratory or in the natural environment. Their work is important to lots of different industries such as farming, environmental conservation, forestry, medicine, and food. They might test plant samples for the effects of weather, pollution, pests, and other problems to try and find environmentally friendly solutions.

Volcanologists like Katia Krafft, are specialist geologists (people who study rocks). They record, and learn all about volcanoes, taking photographs of eruptions, monitoring vibrations in the ground, and collecting samples of lava and ash. They need to take care when visiting dormant volcanoes and be on the lookout for any signs that the volcano is becoming active, such as flying rocks and lava flows. Their work can save lives by predicting when eruptions will happen and warning others.



FANTASTICALLY GREAT WOMEN SCIENTISTS AND THEIR STORIES

Pupil 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 2022.



“Be inspired by their epic adventures and life-changing discoveries. You have the power to change the world too.”

Fantastically Great Women Scientists and their Stories

Read about the life stories of eight incredible women who dreamed big, embarked on epic adventures, and made ground-breaking scientific discoveries in *Fantastically Great Women Scientists and their Stories*, written and illustrated by Kate Pankhurst.

Mathematics challenge

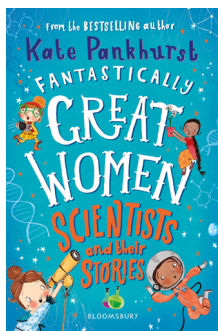
With all the fantastically great things these notable women scientists achieved in their lives, it can be easy to just think of them as having lived ‘in the past’. Some did, but lived decades or even centuries apart, whilst others are still alive. Let’s spend some time working out when these women were around in relation to each other.

1. Cut 2 pieces of A4 paper or card into quarters – giving you 8 small squares.
2. Write the names and dates of birth of the scientists onto the cards – one per card.
3. Place the cards into a timeline. Think about the scale of your timeline and the space you should leave between one scientist and the next. Were they born at a similar time or a long time apart?

Name	Date of birth
Mae Jemison	17 October 1956 – present
Marie Curie	7 November 1867 – 4 July 1934
Elizabeth Blackwell	3 February 1821 – 31 May 1910
Janaki Ammal	4 November 1897 – 7 February 1984
Katia Krafft	17 April 1942 – 3 June 1991
Caroline Herschel	16 March 1750 – 9 January 1848
Tu Youyou	30 December 1930 – Present
Rosalind Franklin	25 July 1920 – 16 April 1958

Take it further

- Can you work out how old the scientists were/are?
- What historic events or important scientific achievements could you add to your timeline? E.g. WW1 and WW2, the first person on the moon, or the invention of the internet?



FANTASTICALLY GREAT WOMEN SCIENTISTS AND THEIR STORIES

Pupil activity sheet (continued)

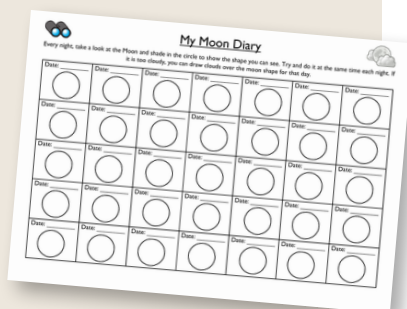


Observe the night sky

Mae Jemison's dream of becoming an astronaut all began when she watched the first space missions on TV as a young girl. She imagined herself among the stars and never gave up on her aspirations. Mae has also made it her mission to inspire more children to study science through her international space camp.

Have you ever tried stargazing? It is easier to do when it's dark and ideally away from city lights that mix with the starlight so autumn and winter are great times to give it a try. There are many smart phone apps like the Nasa App or Sky Map which you can point up at the night sky and they will reveal the location of the planets in our solar system, or show you spectacular star constellations. Perhaps you could visit your nearest observatory to find out about the night sky from the experts. There are more observatories than you might think! Find your nearest using this [interactive map](#).

A great low-tech way to get to grips with your celestial surroundings is to monitor the changing shape of the moon over the course of its 28-day cycle. Divide an A4 piece of paper into 5 rows of 7 squares and draw what you see each night. Then try comparing it to this [moon calendar](#).



Growing plants

Read about brilliant botanist Janaki Ammal on pages 64 – 79 and get hands-on with your own botanical survey. What plants grown in your garden, near your home, or on your way to school? Don't forget to include grasses and trees as well as flowering plants.

If you have some space to grow plants in a garden or in pots, try planting some bulbs or seeds and see which are easiest to grow? Think about whether plants require different amounts of water, light, and space?

Janaki Ammal was asked by the Prime Minister of India to grow useful plants which could be sold or used to make things. Which plants do you think are the most useful and why? Which is the most useful plant in the world?

Think about:

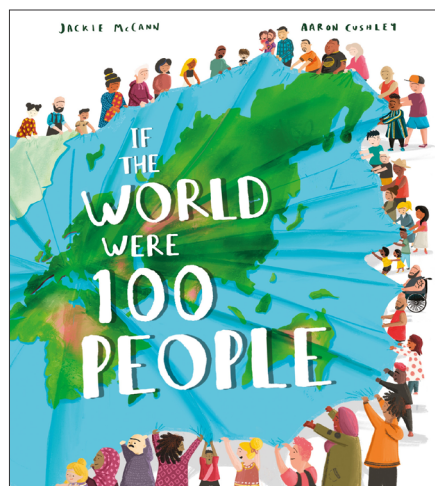
- Plants producing foods we can eat like grains, fruits, and vegetables
- Herbs used to add flavour to our food
- Trees used for timber to build with or to make paper
- Plants used in medicine to help us heal
- Grasses used to feed farm animals and create sports pitches
- Cotton plants used to make clothing
- Flowering plants to attract pollinators like bees and butterflies

IF THE WORLD WERE 100 PEOPLE

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 2022.

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



What are the Big Questions?

Near the back of the book there are several 'Big Questions' to engage your class in discussion about the future of our global village. You will find some additional Big Questions in this activity sheet to encourage discussion around the suggested activity topics. These would work well to engage children in discussion after they have completed the activity.

Big Questions are a great way to encourage children to use higher order thinking skills as they delve more deeply into a discussion topic. For more information on how to use Big Questions in your teaching, take a look at this [Bright Ideas Time CPD resource](#) from the Primary Science Teaching Trust.

Global goals

Many of the questions in this book encourage children to think about their lives and experiences compared to other, perhaps less fortunate people around the world, focusing on some of the things we might take for granted such as clean water, education, and internet access.

The United Nation's (UN's) Sustainable Development Goals (also known as the Global Goals) are 17 goals adopted by the UN in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people around the world can secure a better and more sustainable future. The Global Goals address the global challenges we face including clean energy, inequality, and climate change.

THE GLOBAL GOALS

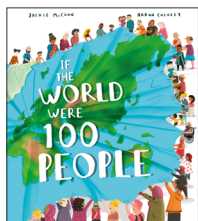


Introduce your class (or your whole school) to the UN's 17 Global Goals with the [Introducing the Global Goals classroom resource](#). This 30-minute lesson (or assembly) plan uses a short [Global Goals video](#) to teach children about the biggest challenges faced by communities around the world and the shared plan to solve them.



How can we improve the way we share the food we have?

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IF THE WORLD WERE 100 PEOPLE

Teacher activity sheet (continued)



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How different are we?

Ask your pupils; Do you look exactly the same as anyone in your class? How about your family? Even if anyone has an identical twin, they will all look unique. They may share some things in common with their friends like height or eye colour.

Carry out a class survey of hair and eye colour and consider extending the survey to other/all classes in school. Compare the data collected to the 'global village'. The activity can be extended by giving children a calculator to work out the approximate numbers for the world.

Eye colour	My family/ class	Our 'global village'	The world
Brown		76	
Blue		9	
Amber		5	
Hazel		5	
Grey		3	
Green		2	

Remember, in our global village, 1 person = 80 million people (80,000,000).

Children can then be asked to think about how to present their data, such as a pictogram, a bar chart, or another method to visually represent your findings.

Use **#YPBP2022share** to compare your class data with other classes around the country and perhaps beyond.



How can we reduce food wastage?

Clean water in homes around the world



If children carry out the 'clean water' maths challenge on the pupil sheet, the following ideas provide great follow-up activities. Some people only have access to dirty water, and this leaves them at risk of catching diseases. [The Ditch the Dirt activity](#) from Practical Action encourages children to investigate ways of making dirty water cleaner through sieving and filtering.

Take care

Even after filtering, the water will not be safe to drink and pupils will need to wash their hands.



Your class can also watch the [Filtration videos](#) from the Brian Cox school experiments for an insight into water filtering to keep our river water clean, and try CIEC's [Filter fun! investigation](#) to see how filtering is used in STEM industries.



How can we use less water?

Career links



Data analysts look at huge sets of numbers and make decisions about what they mean. They find ways to make this important information easy for others to understand.

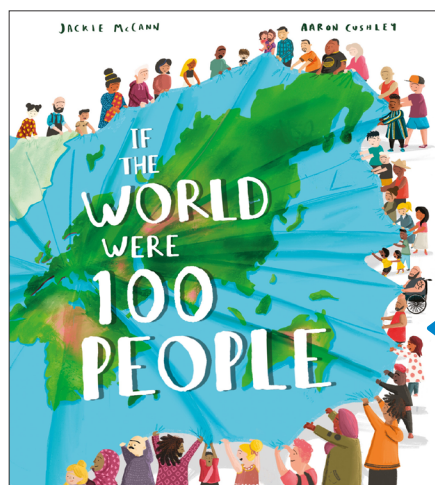
Graphic artists are expert communicators. They combine art and technology to create images capable of making complicated information easy for people to understand using graphs and images.

Water engineers work to make sure water supplies are clean and safe to drink. They design and build ways to dispose of wastewater and sewage, and they find ways to prevent flood damage in towns and cities.

IF THE WORLD WERE 100 PEOPLE

Pupil 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 2022.



Discover a thought-provoking world of fascinating facts and figures which reveal the disparities and inequalities experienced by some members of our diverse 'global village' in *If the world were 100 people* by Jackie McCann, illustrated by Aaron Cushley.

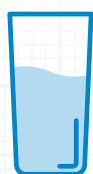
"The human race faces many challenges that cannot be solved quickly. But if we work together to find solutions, then we can build the future we want for our global village."

If the world were 100 people

Mathematics challenge

Do you have clean water at home?

We rarely think about where our water comes from because for most of us, it's as easy as turning on the tap and it appears. How much water have you used today?



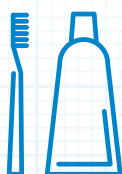
Drinking water

2 litres
(per day)



Washing hands

2 litres
(per clean)



Cleaning teeth

18 litres
(per clean)



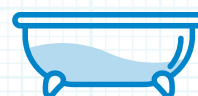
Flushing toilet

42 litres
(per day)



Shower

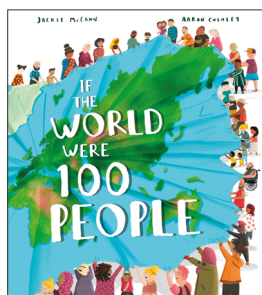
45 litres
(per shower)



Bath

80 litres
(per bath)

Some people are not lucky enough to have clean water piped directly to their homes and must walk a long way to find it. On average, each person in the UK uses an incredible 150 litres of water a day; that's enough to fill 75 large (2-litre) pop bottles! How would you feel if you had to collect and carry that much water for yourselves every day? Have a go at creating a bar chart or pie chart to share this information with others. You might want to include your chart in a poster, and suggest ways in which water can be saved.



IF THE WORLD WERE 100 PEOPLE

Pupil activity sheet (continued)

Waste not, want not?

Is there enough food to go round?

How often are you told to finish your food so that it doesn't go to waste? Does the last strawberry always get eaten before it goes mouldy? And does every slice of bread get used... even the crusts?

There is enough food on our planet to feed everyone but not everybody gets what they need. More than 1 in 10 people don't have enough to eat whilst those of us who do, sometimes waste what we have.

How could we reduce waste?

Have a go at planning a meal using leftover ingredients. Get involved in your family's meal planning and shopping to see if you can plan meals which cut down on waste – for example, planning two meals in the same week which use peppers so the whole pack gets used.

Remember it is important to eat a balanced and nutritious diet because the food we eat has an effect on our health. You could use this interactive [Eatwell Plate](#) to help you plan a healthy meal.



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Hello world

Hello! Bonjour! Olá! Marhabaan!

There are around 7000 languages in use in the world today. If you've been on a trip abroad, use other languages at home, or learn a language in school, you may already know how to say hello in more than one language.

Make a list of all the different ways of saying hello that you know, there are plenty in this book to get you started. Ask your friends and family members to see if they know any more greetings from other languages, or search online ([you could watch the video: How to say hello in 15 different languages to get you started](#)). Why not encourage your friends to do the same and see who can learn how to say hello in the most languages.

"In 2050 there will be roughly 10 billion people in the world which is the same as having another Europe and Africa on the planet. We already grow enough food to feed 10 billion people but we waste almost one third of all the food we produce.

How can we reduce waste and improve the way we share the food we have?"

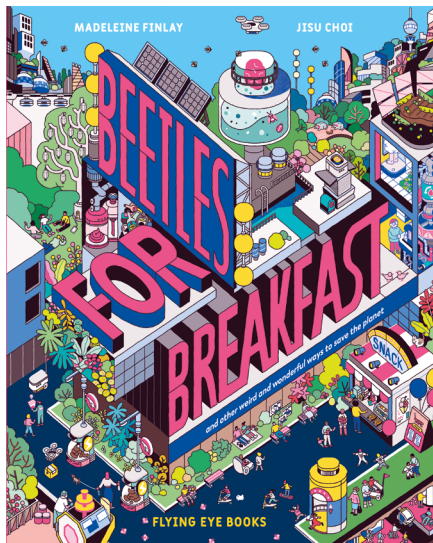
If the world were 100 people

BEETLES FOR BREAKFAST

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 2022.

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



Fabulous fungi

When it comes to fungi, children are often familiar with perhaps a few varieties of edible mushrooms, but these are just a small selection of the incredible range of living organisms which fall into this classification.

Their spider-web-like mycelium tendrils are described as we learn about 'mushroom meat' on page 16. These root-like underground threads are fermented, heated, and mushed up to make mock-burgers and fake-bacon. On page 73 we are introduced to the potential for ever-growing mycelium as a sturdy building material, one which NASA think would be great for building homes suitable for humans in space.



Did you know...?

The famous children's author/illustrator Beatrix Potter was a keen mycologist. You can read more about the work of mycologists in the careers section (overleaf).

Challenge your class to consider the benefits of following a more sustainable diet as an alternative to meat with CIEC's [Sustainable sources of food: how can we grow oyster mushrooms? activity](#). Children will grow a crop of oyster mushrooms and see first-hand how the mycelium sprout, spread, and intertwine.



BEETLES FOR BREAKFAST

Teacher activity sheet (continued)



Make a bioplastic

Children may be surprised to learn that over four billion items of single-use plastic cutlery are used each year in the UK alone. One sustainable solution to the waste generated by disposable knives and



forks is the 'spud spoon' on page 44. Starch extracted from waste potato peel can be extracted and turned into a wonderful bioplastic which decomposes once discarded, meaning the throw-away fork used to eat your nutritious meal can also go on to provide nutrients for the soil. A fantastic meal deal.

Check out CIEC's [Potatoes to Plastics](#) activity for a detailed lesson plan to get your class making their plastics from potatoes. Follow the rest of the lessons in the pack to provide children with a real-life context for creating bioplastics, and to introduce them to some of the amazing scientists who are working hard to find scientific solutions to real world problems like pollution, waste disposal, and our over-reliance on fossil fuels.

Make an eco-fridge

Turn to page 41 to learn about the incredible invention of the pot-in-pot refrigerator by Nigerian teacher Mohammed Bah Abba which can keep food cool without using any electricity. You'll even find some instruction for making your own eco-fridge. This would keep everyone's apples chilled until break time!



Career links



Environmental scientists gather samples and data out in the field and then carry out tests back in the lab. They might test water, soil, and air samples for signs of pollution and try to find the cause of the pollution with the aim of protecting the environment and people, plants, and animals living in it.

Mycologists are a special type of biologist who study fungi and how we can use them for food, fuel, medicine, and all sorts of eco-friendly applications such as vegan friendly meat substitutes, and myco-architecture which might one day be used to make bricks in space! The famous children's author/illustrator Beatrix Potter was a keen mycologist.

Agricultural engineers work to make farming more sustainable, safe, and environmentally friendly. They look carefully at the ways farmers work and develop new technologies and ways of doing things to improve land use, increase food production, and conserve natural resources, and find new uses for agricultural waste.

BEETLES FOR BREAKFAST

Pupil 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 2022.



Prepare to be amazed by the huge range of ingenious, yet often strange, ways scientists are working to find practical and imaginative solutions to tackle climate change and other Earth-altering problems in *Beetles for breakfast* by Madeleine Finlay, illustrated by Jisu Choi.

Solar supper

Whenever we are preparing food, we generally turn to ovens, hobs and microwaves which mostly rely on gas and electricity that use fossil fuels to power them. But what if we could use a more sustainable source of energy to cook up our favourite foods? On page 13 we discover that even though the sun is far away (over 90 million miles, in fact), its power can still be used to cook food with specially designed solar ovens that focus the sun's light with the help of lenses and reflective surfaces. Build your own pizza box solar oven and have a go at making some tasty treats!



Take care

Only use your solar oven under the supervision of an adult. Be careful of any potentially hot surfaces and do not use your oven to cook raw meat.



"The future doesn't have to be the worst-case scenario. It could be the best!"

Beetles for breakfast

Wildlife garden

On page 56 we find out about the farmers of Knepp Estate in the UK who decided to let their land be reclaimed by wildlife after it had become unfit for crops and grazing animals due to years of intensively farming it. A diverse range of trees, grasses, flowers, and wildlife soon made the land their home and brought it back to life. Now the farm animals have the perfect place to graze, and the farmers hardly have to lift a finger to raise their cows and pigs. Check out their fascinating [Knepp Rewilded video](#) on the homepage of their website.

Lots of local councils now plant wildflowers in grass verges and on roundabouts to make these spaces colourful and to attract pollinators like bees and butterflies. If you have a garden, or even just a plant pot in an outside space, perhaps you could cultivate your own small area of 'wild land'. Maybe your school has an outdoor space where you could explore the benefits of re-wilding.

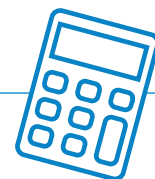


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BEETLES FOR BREAKFAST

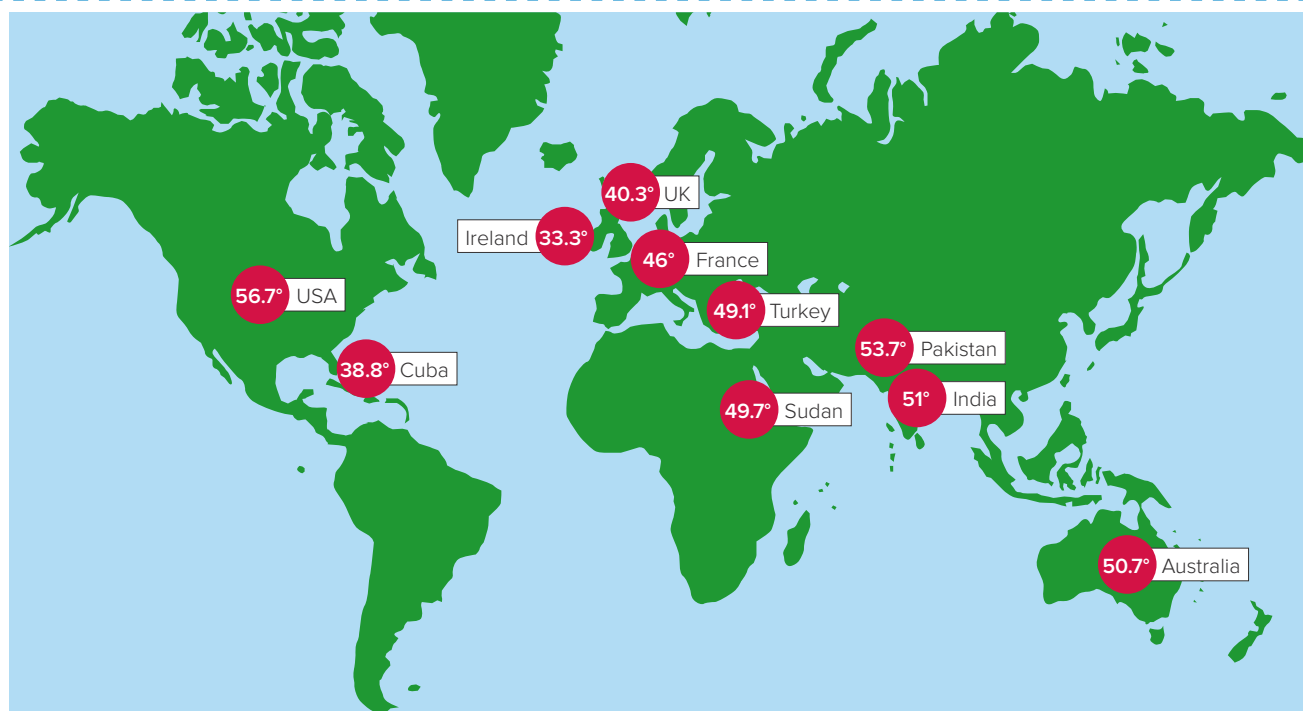
Pupil activity sheet (continued)



Mathematics challenge

On the 19th July 2022, the UK experienced its hottest day on record. Temperatures across the UK soared, and in the Lincolnshire town of Coningsby they reached a sweltering 40.3°C! To help keep safe everybody was advised to stay indoors, use fans to keep cool, and drink plenty of water. Trains were cancelled due to unsafe track temperatures, drivers were advised to avoid road travel, and some schools and businesses even closed for the day.

As global temperatures continue to rise due to climate change, it is possible we could see more record-breaking temperatures in the years ahead. Pages 40 and 41 explore some of the ways scientists are exploring to cool us and our surroundings down as the planet warms.



On the world map above you will find the record high temperatures for a selection of countries across the world.

1. Can you put the temperatures in order from lowest to highest?
2. Which country has the highest ever recorded temperature?
3. Can you use the 'less than' (<) and 'greater than' (>) symbols to compare the temperatures for these countries:

Cuba	UK
Turkey	Sudan
USA	Australia

Take it further:

Why not research online which years these record-breaking temperatures were recorded? How many of them are in the 21st century (years beginning with 20)? Why do you think that might be? Can you find out whereabouts in these countries the hottest temperature was recorded?