Teacher activity sheet

Green: the story of plant life on our planet

This is one of a series of activity sheets to use alongside the books which have been shortlisted for the Royal Society Young People's Book Prize 2025.

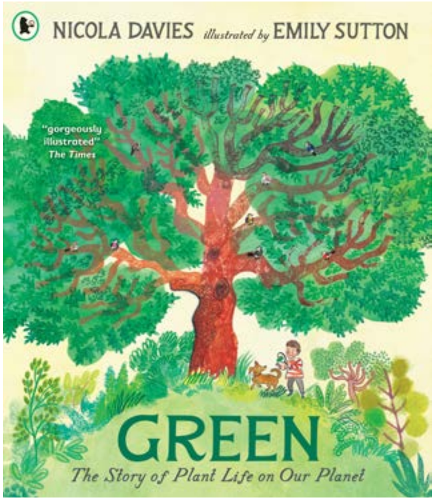


Illustration © 2024 Emily Sutton

Each activity sheet contains ideas for activities to do with your pupils, provides information relating to careers, and has a maths focus to help pupils understand the importance of mathematics education across the curriculum.

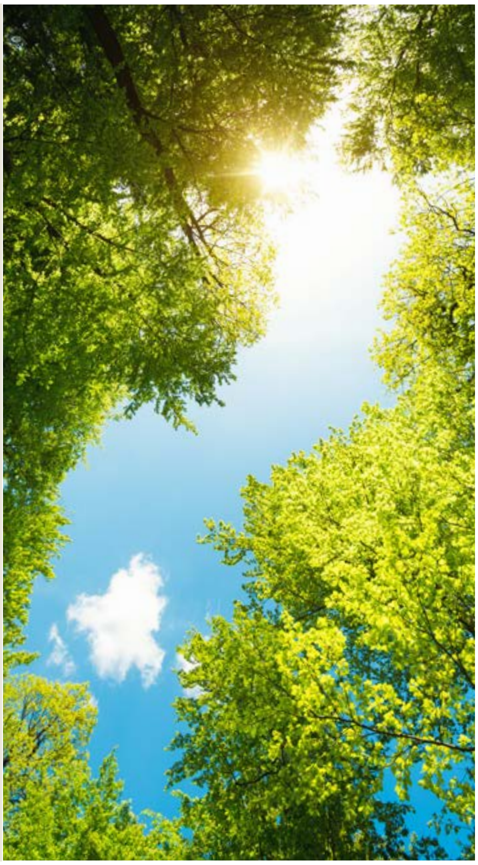
Working with scientists

These investigations can be done as standalone activities or carried out as an in-depth sequence to develop pupils' disciplinary and substantive knowledge. The deeper learning and science capital development of your pupils could be made more memorable through collaboration with a scientist such as a climate scientist or botanist. You could do this by applying for a Royal Society Partnership Grant of up to £3,000. For more information, visit: **royalsociety.org/grants/partnership-grants.**

The importance of green

The final page of the book tells us that green is the most important colour in the world. What do pupils think about this? Ask them to discuss it in small groups, highlighting some examples from the book of the importance of green, such as plants as food, oxygen production, and shelter from the hot sun. Groups each choose one idea they feel strongest about and explain it to the class. Pupils then vote on whether they agree, partly agree, or disagree, giving reasons for their choices. Ideas might include plants feeding almost every animal on Earth, or simply that without green plants, humans couldn't survive. Finish by asking pupils to write one sentence about what the colour green now means to them, and consider having them write onto pre-cut green paper leaves. This would make a wonderful display.

When discussing plant functions, take care to keep explanations appropriate to your pupils' stage of learning. For younger pupils, focus on simple ideas like 'plants help keep the air healthy' rather than detailed scientific processes. If working with older pupils, you may choose to explore these concepts in more depth in line with their curriculum.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Plant powers

Provide a range of plant samples for your pupils to draw. Make sure to include whole plants so root structures can be viewed (see the list below for interesting examples). Ask pupils to spend a few quiet minutes observing their specimen closely, noticing shape, texture, colour and any tiny details such as veins or edges. You could make hand lenses or digital microscopes available to support close observation.

dandelion • clover • moss • succulents • radish • fern • grass • daisy • nasturtium

Pupils will then make a careful scientific drawing, labelling features like the stem, veins and leaf surface. As they draw, prompt pupils to jot down what environmental jobs this plant might do, for example, providing food or shelter, protecting soil, or helping clean the air. Once finished, pupils share their drawings in small groups and compare the different roles their plants might play in the environment. Display the drawings as a 'plant powers gallery' to celebrate how many jobs plants do quietly around us every day.

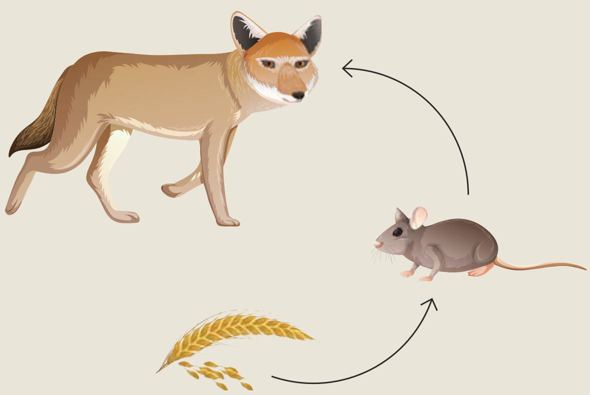
Food chain challenge

Look at the food chain illustration on page 8 of the book. Draw attention to how the arrows point to what each creature eats. Explain in a scientific diagram, the arrows go the opposite way and point to what each thing 'is food for'. For example, a dead leaf is food for an earthworm, and an earthworm is food for a sparrow.

Print, or ask pupils to create, a set of cards featuring the plants and animals shown in the illustration on page 8 of the book. Challenge them to arrange the cards to make as many different food chains as they can, or the longest food chain possible. They can sketch their findings, then annotate their sketches using the phrase 'is food for' to demonstrate their understanding.

Take pupils into the school grounds or local park for a live food-chain hunt, finding real plants, and noting what each plant 'is food for'. Pupils count how many complete food chains they can find. For any incomplete food chains, they can carry out research back in the classroom.

Once finished, discuss how all the animals ultimately rely on plants for survival, highlighting how humans' actions and habitat loss could disrupt these chains. Finish by asking pupils to suggest actions they could take to protect plants in their local environment.



Fossil fuel timeline

On pages 17 – 18, the illustration depicts the process of plants dying and becoming fossil fuels over many millions of years. On page 21 we learn the startling fact that, "In just 200 years we have released all the carbon dioxide that those ancient forests had locked up in over 60 million years!" Give pupils a sense of the scale of time over which fossil fuels were formed versus the alarming rate at which they are being consumed. Are pupils aware of the things we use fossil fuels for in our daily lives? Explain that they are used to generate electricity, power vehicles, heat buildings, cook food, and create many products we use every day.

Stretch a long rope across the playground or hall, marking one end as '4 billion years ago' and the other as 'Today'. Mark each metre along the way; each mark represents 400 million years. Give pupils cards showing key events: first plants, first forests, formation of coal deposits, early dinosaurs, first humans, first use of coal, and widespread oil and gas use. In small groups, pupils decide where each card should go on the rope, spacing them according to how far apart the events were in real time. Discuss their ideas and agree on final placement. Then pupils walk the rope from start to finish to experience how tiny the section is where humans use fossil fuels compared to the vast time it took for those fuels to form.

Finish by asking pupils to place one more card: 'Future Choices'. They discuss and identify actions they can take to reduce their reliance on fossil fuels. Can they expand any of their ideas to include actions for their family, school, or wider community? Pupils could present their ideas to the school council or head teacher.

Here are some approximate scaled placements for the events using a 10m rope:

First plants appear

470 million years ago
1.2m from the start

First forests form

385 million years ago
1.5m from the start

Coal deposits begin forming

300 million years ago
1.7m from the start

Early dinosaurs appear

230 million years ago
1.9m from the start

First humans

2-3 million years ago
9.9m from the start

First use of coal by humans

Few thousand years ago
9.99m from the start

Widespread oil and gas use

150 years ago
A few mm from today

Career links

- **Environmental logistics engineers** are master planners who figure out the best way to move things from one place to another. They make sure products travel safely and arrive on time whilst looking for smarter, faster, and greener ways to deliver everything. Their green solutions might include using vehicles that run on electricity or cleaner fuels, and planning routes that use less fuel by avoiding traffic or reducing the distance.
- **Sustainability specialists** help organisations, including schools, find ways to look after the planet while getting their work done. They might look at how to save energy, reduce waste, protect local wildlife, or choose materials that are better for the environment. Their job is to come up with practical ideas that help people make greener choices every day.
- **Sustainable packaging technologists** are problem solvers who design bottles, boxes, and wrappers to keep products fresh and safe; testing different materials to make sure things don't break, or spill. They work to reduce packaging and make it kinder to the planet by using less plastic and more recyclable materials like paper and bioplastics which aim to be biodegradable.

Pupil activity sheet

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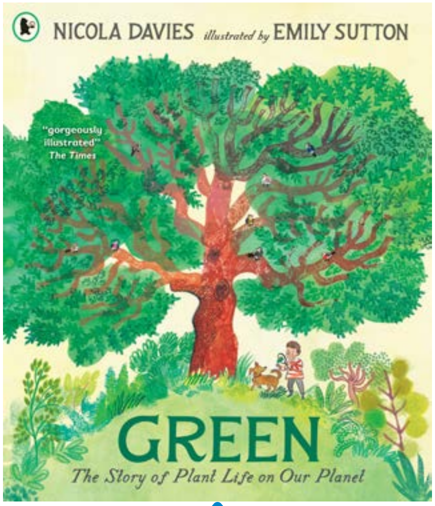
CENTRE *for* INDUSTRY EDUCATION COLLABORATION

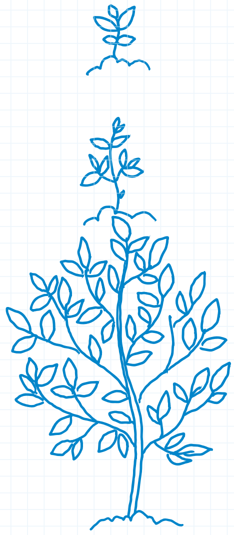


"In just 200 years we have released all the carbon dioxide that those ancient forests had locked up in over 60 million years!"

Green: the story of plant life on our planet tells the story of how plants first appeared on Earth, how they make their own food using sunlight, and how they shaped our whole planet. They even created the fossil fuels we use today. It shows how every leaf, tree and tiny plant plays a vital role in keeping our planet alive. If you like discovering the wonders of nature, this book will draw you in from the very first page.

Mathematics challenge: One… two… tree!

Find a tree and select a small twig. Estimate how many leaves are on it, then check your guess by counting to see how close you were. Use that number to estimate how many leaves might be on a whole branch and then scale up again to imagine how many leaves could be on the whole tree. Keep going by estimating how many leaves might be in a woodland or forest, or on all the trees you can see from your window or in a local park. Challenge yourself to make a bold final estimate for all the trees in your town, country, or even the world, explaining how you made each jump. Finish this challenge by writing one sentence about which estimate surprised you the most and why.



Plant detective

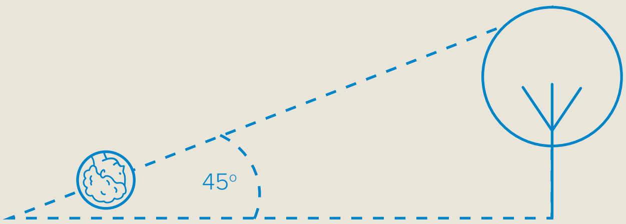
This activity can act as a follow up to the Plant powers activity or can stand alone. Go on a plant-hunt in your garden, or go with an adult to your local park. Try to spot at least five different plants including trees. For each one, sketch it or take a quick note of its size, leaf shape, and where it's growing. Write down what you think its environmental 'jobs' might be, such as providing food or shelter to animals, keeping soil in place, or providing shade. Focus on one plant you think is especially important and explain why in a short paragraph or a video diary. Compare your notes on all the plants to see how many different ways plants help the environment without us noticing. Decide on one small action you could take at home to help protect the plants around you.

Measuring trees at 45 degrees

What do climate scientists need to know about trees? Knowing a tree's height helps them understand how much carbon it can store; taller, larger trees usually hold more carbon. So how can they measure trees? One way is called the 45-degree angle method.

Facing away from a tree, bend forwards to view the tree through your legs. If you're close to the tree your view will be mainly trunk or a collage of leaves and branches, depending on the species. Walk several paces and repeat the viewing. Now you'll see higher up branches and perhaps some sky. When you can just about see the top of the tree upside-down, stop. You have reached the optimal viewing angle of approximately 45°.

The distance from your standing position to the tree is roughly equal to the tree's height. Mark your spot and measure the distance to the tree and record the estimated height. Try this method on a range of trees with different heights and compare the results, reflecting on which trees might store the most carbon and why. Healthy, tall trees also provide more habitats for wildlife and contribute more to cooling the environment by providing shade. Use your data and observations to design a poster to raise awareness of the importance of protecting mature trees for our planet.



How long does a leaf last?

After your Fossil fuel timeline activity in school, collect a handful of fallen leaves and place them in two jars: one kept dry, and one slightly damp but not soggy. Leave both in a safe spot. Each week observe how the leaves change, break down, or stay the same, sketching what you notice. Does the material change shape, texture, or colour as it slowly breaks down? After several weeks, compare the jars and think about which one changed fastest and why this might be. You'll see firsthand how long leaves take to decay. Fossil fuels, formed from ancient plants, were buried under heat and pressure for far longer than your compost needs. Imagine how many millions of years of being buried underground would be needed before plant material could ever turn into fossil fuels!

Safety tips: Keep your jars closed once your investigation begins, wash your hands after handling the jars, and place them somewhere out of the way so they won't be easily knocked over.

Scientist profile

Nicola Davies is a writer with the curiosity of a scientist and the heart of an explorer. Before becoming an author, she trained as a zoologist and spent years studying animals in the wild, from tiny insects to giant whales. Her scientific work and time as a presenter for *CBBC*'s *The Really Wild Show* took her around the world, helping her understand how living things survive, grow, and depend on their habitats. That knowledge shines through in her books, including *Green: the story of plant life on our planet,* where she explains complex ideas in ways that make sense to young readers. Nicola believes science belongs to everyone, and she uses storytelling to show how amazing (and fragile) our planet really is.

In September 2025, Nicola was appointed the Children's Laureate for Wales where she promotes children's literature and poetry. Reflecting on her hopes for her time in the role, she said: 'I want all children in Wales to experience the pleasure of reading, the superpower of writing, and to find their own voices as creative change-makers and advocates for a fairer, and more sustainable future.'

Patience: a slowdown book

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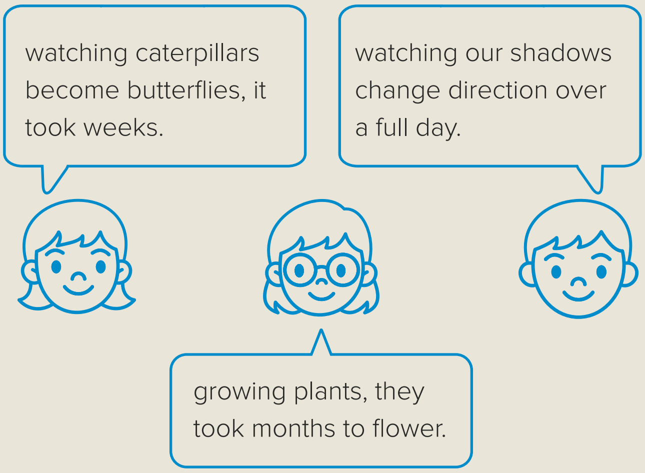
Wait a minute

Pupils will have taken part in many investigations where they observed changes over time. Ask them to think about any investigation they can remember from their time in school. Use the talking heads image below to prompt them.

I remember ...



In small groups, ask pupils to make a list of the investigations they remember, noting what changed, how long it took, and what they learned. Encourage them to discuss similarities and differences between investigations asking:

- Which changes happened quickly?
- Which took weeks or months?
- How did we measure or record those changes?

Ask each group to choose one investigation to share with the class and explain what they observed, what patterns they noticed, and why observing these changes over time is important. If there is time, pupils might like to plan and carry out their chosen investigation again or vote on one to try as a class.

Time for growth

Page 70 introduces some of the ways humans grow and change as they age. In this activity, pupils investigate how human height changes as they grow. Sample data has been provided but pupils can collect their own by measuring pupils at school and collecting them in a table like the one shown. With several height measurements for each age, the mean average can be calculated to provide one overall value for each age group.

Average values can then be plotted on a line graph to show how height up to adulthood increases over time. Once finished, ask pupils to write a couple of sentences to explain any patterns they find and what it tells them about how humans grow.

This Oak National Academy video (**https://shorturl.at/mhDua**) has some great tips on how to support pupils to work scientifically during this activity. For more context about this activity take a look at the Oak lessons: Finding out about human height and Representing data about human height **(https://shorturl.at/fyyeE)**.

	height (cm)				
age (years)	**first person**	**second person**	**third person**	**fourth person**	**mean average**
2	86	88	82	87	
4	100	95	102	101	
6	110	116	116	112	
8	129	125	124	122	
10	130	138	139	138	

Changes over time

Everything takes time, be it a minute, a year, a century, or an eternity. Ask pupils to explore how different processes take different amounts of time, building on the idea of observing changes over minutes, hours, and longer. Ask pupils to choose a simple process to observe for one minute, such as counting how many breaths they take, how many steps they can walk, or how many words they can read. Next, select a process to observe for one hour, like tracking cloud movement, recording traffic on a nearby street, or monitoring how many different birds visit a feeder.

Pupils should record their observations carefully using notes, drawings, or photographs. Encourage them to compare the changes they saw in one minute versus one hour and describe what changed, what stayed the same, and what they might notice over a day, week, a month, or a year. Pupils then create a simple timeline or table showing the processes, the time observed, and the changes noted. They can discuss why some changes happen quickly while others take much longer.

Evolution takes time

The Galápagos Islands have witnessed many wonders of evolutionary nature, like the Galápagos giant tortoise we meet on page 75. When the world-famous English naturalist Charles Darwin explored the islands in 1835, he noticed differences in beak shapes of finches living there, which had adapted over generations to suit the types of food in this specific environment. These observations played a key role in the development of his theory of evolution by natural selection.

Guide pupils in an investigation exploring how beak shape affects a bird's ability to feed. Provide a range of 'beaks' (tweezers, pegs, spoons, chopsticks, tongs, knitting needles, crochet hooks) and assorted 'food' items (rice, raisins, pasta, beads, marbles, and lentils). Ask pupils to predict which beak type will be most effective for each food before testing their ideas. Pupils carry out time trials, counting how many 'food' items they can collect in 30 seconds with each beak type. Pupils record their results in a comparative table to allow them to identify patterns. Ask the class to use their evidence to explain how certain beak shapes are better suited to particular environments. Conclude by linking their findings to adaptation, natural selection and the evolution of different finch species.

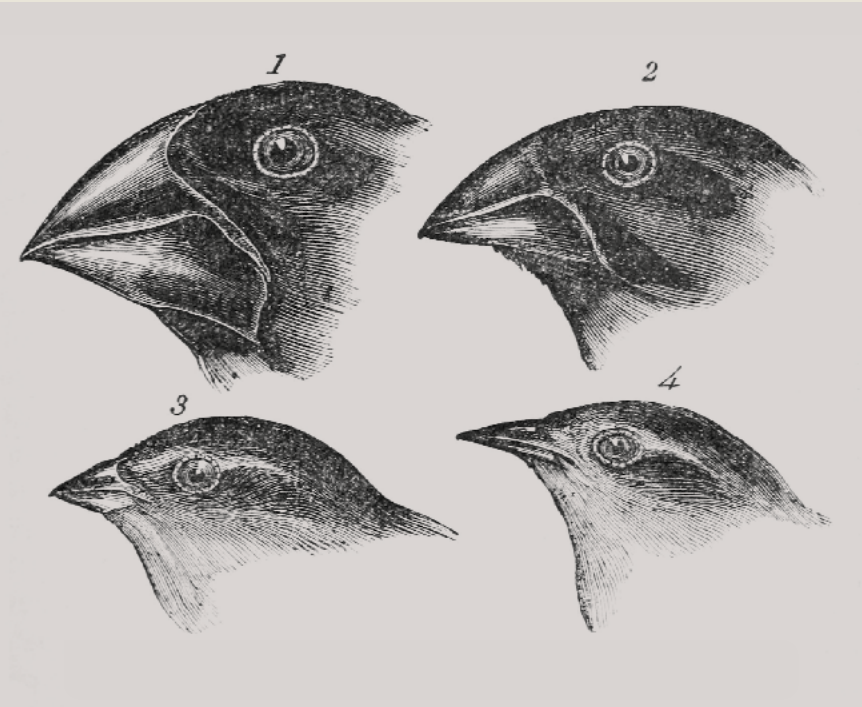


Image: *Voyage of the Beagle*. Charles Darwin, 1845.

Career links

- **Coral reef ecologists** study how coral reefs work, including the animals, plants, and tiny organisms that live there. Their research focuses on the biodiversity, and ecosystems which can be found there, and they investigate to find out what keeps reefs healthy and what harms them, such as pollution, warming oceans, and overfishing. The ecologists' work helps to protect and restore these colourful underwater ecosystems so they can survive for the future.
- **Phenologists** study when natural events in nature happen and how they are affected by weather and climate. They watch for changes in the seasons and record things like when flowers bloom, when birds migrate, and when animals go into hibernation. Their work helps us understand how nature is changing over time, including the effects of climate change.
- **Gerontologists** study how people grow older and what helps them stay healthy as they age. They look at things like how bodies and minds change over time. Their work helps older people live safer, happier, and more comfortable lives.

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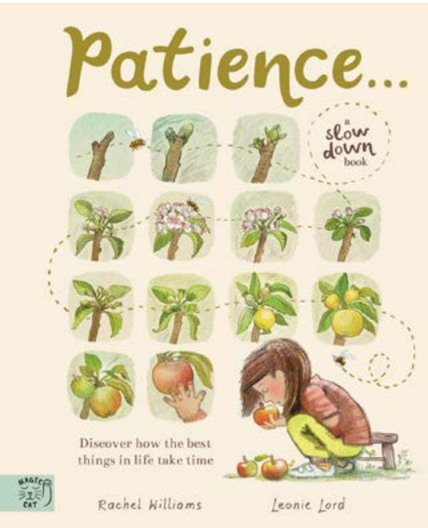


"From a single minute to a full century, hearts beat, trees bloom – and a human lives a lifetime. Follow the life cycles of plants, trees, animals and people, as you discover that good things are worth the wait."

Have you ever wondered what can happen in just one minute, or what might change over a whole century? *Patience* is a book that takes you on a journey through time, from the tiniest moments to the longest lifetimes on Earth. You'll encounter a heart beating, watch a seed push through the soil, and discover how forests, animals and entire landscapes grow and change over years, decades and beyond.

This book shows that some things happen fast, some things take ages, and some things are worth waiting for. Patience reveals the hidden stories happening all around us, even when we're not looking. If you're curious, you enjoy discovering how the world works, or just like seeing amazing things unfold, this is the book for you. Take your time... and prepare to see nature in a whole new way.

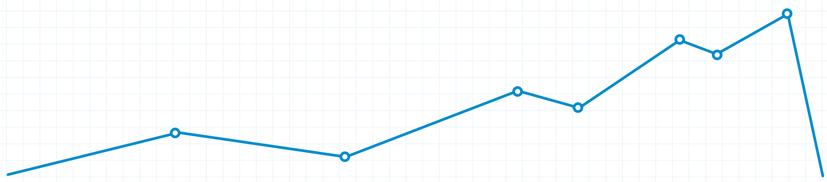
Mathematics challenge: How long?

On page 70, we start thinking about how time passes, but can you feel how long a minute is without checking a clock? To test how accurately you can sense 60 seconds:

- start a timer
- stop it when you think a minute has gone by
- write down the time you reached

Repeat this at least five times. Then work out your 'mean average error' by adding up how far away each attempt was from 60 seconds and dividing your total by the number of tries. Plot your result on a line graph with your age on the x-axis and your mean average error on the y-axis. Ask your teacher for some squared paper if you don't have any at home.

Next, ask family members of different ages to have a go and add their results to your graph. Finish by writing a short explanation about whether age seems to make a difference to how well people can sense time.



Just a minute

A lot can happen in our bodies in one minute; page 6 tells us our hearts beat 60 – 100 times a minute. Explore those changes for yourself by investigating how your heartbeat responds to different levels of exercise.

Find your resting pulse by counting your heartbeats for 60 seconds while sitting still. Next, repeat the measurement after some exercise. You could go for a gentle walk, do star jumps, try skipping, play your favourite sport, sprint on the spot, or anything else you can think of. Make sure you measure your heartbeats for exactly one minute each time.

Record all your results in a table, then turn them into a bar chart to show how your pulse changes with activity level. Finally, write a short explanation of why your heart beats faster during exercise, linking it to how your body moves oxygen around.

Patience in the kitchen

Change happens all around us, all the time. Some changes are quick, some take longer. Some changes can be undone and some cannot. The kitchen is a great place to explore reversible and irreversible changes using everyday processes. With adult supervision, observe five simple actions: boiling water from cold, melting chocolate, freezing juice, cooking an egg and dissolving sugar. For each one, record what happens and decide whether the change can be undone (reversible) or cannot be reversed because a new material has formed (irreversible). Make notes explaining the evidence you used to make your decision. Use your observations to create a table showing each process, the type of change, and any new materials produced. You could sketch or photograph each change and make a changing materials collage with captions. Imagine how many millions of years of being buried underground would be needed before plant material could ever turn into fossil fuels!

A week of watching

On page 62, we discover how gradual change over time can result in the regrowing of a tropical rainforest. What things are gradually changing in your local area? Pick one thing outdoors to observe for seven days: a plant bud, a bird feeder, a patch of soil, weather, the moon, etc. Record what you observe, using drawings, notes, photographs, and any questions you now have.

Think about these questions and discuss them with your classmates back in school:

- What changed in a week?
- What didn't?
- What might you see if you observed for a month or a year?
- What wouldn't you have noticed if you'd only observed for a day?

Feeling patient? Choose a tree in your garden, street or local park, observe it changing over a full year. Take a photo or sketch your chosen tree at regular intervals - every month would work well. At the end of your observation period, look at all of your images together.

Scientist profile

Dr Eleonora Moratto is a type of scientist called a biologist who studies tiny living things that can make plants sick, and she works on clever ways to protect important crops without using ingredients which damage soil. She also investigates how electricity might help stop plant diseases, which means her research could help farmers grow more food and keep our favourite plants healthy. Her work is a bit like being a plant detective; she has to uncover how diseases attack and find new ways to fight them.

Dr Moratto isn't just a scientist in a lab, she's also a professional ballet dancer who started the SciBallet Project **(https://shorturl.at/b8GUE)**, where she uses dance to explain scientific ideas. She performs at events where science and art come together, showing that you can follow more than one passion and that science can be creative, active, and full of surprises. Her story proves that being a scientist can take you in all kinds of exciting directions, and that your own talents might help.

The animal body book

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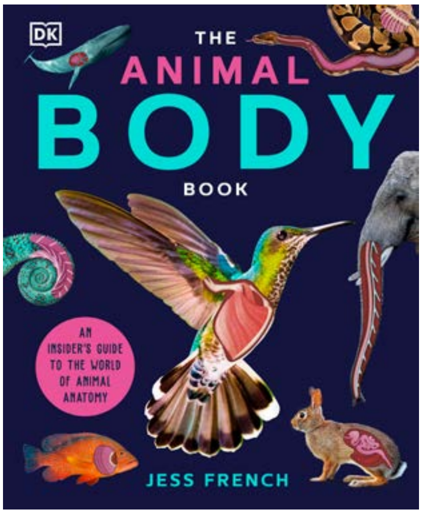

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Museum of teeth

When we think of teeth, we typically think about chewing food with our pearly white incisors, molars, and canines so we can begin to digest food. However, pages 88 – 89 present us with a fascinating array of teeth with wildly different functions from across the animal kingdom, from venom-injecting snake fangs and orange-hued beaver teeth to prey-stunning narwhal tusks and the conveyor belt of serrated teeth inside a shark's monstrous mouth.

Challenge pupils to explore how teeth can have different jobs by researching animals with 'unusual' teeth to find out how their teeth are configured and what they are used for. Using coloured modelling clay or salt dough, pupils will then create a scaled model of an animal's distinctive teeth or tusks, shaping them to show special functions such as piercing, gripping, slicing, injecting or grinding. Pupils label the key features and write a short explanation of how the shape links to the animal's lifestyle and diet. Task a couple of pupils with modelling human teeth for comparison purposes. Finish with pupils comparing models to identify patterns between tooth shape and behaviour. The models would make an excellent 'Museum of Teeth' to showcase what they have discovered.

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Digestive differences

The digestion section (starting on page 76) introduces us to some weird and wonderful digestive differences. Ask pupils to explore how some animals have strange stomachs or intriguing intestines by creating and comparing simple fact cards about a range of species. Working in groups, pupils sort the animals into categories based on features like number of stomach chambers or length of intestines. There are some suggestions in the list below of animals that will spark intrigue. Animals that pupils are more familiar with, such as cats and dogs, should also be included for comparison. Ensure pupils are familiar with the terminology carnivore, herbivore, and omnivore to support their scientific discussions and explanations.

Labelled diagrams or models can be created showing how an animal's digestive system is specially adapted to what it eats and how it lives. After sharing their work, pupils compare the animals to find patterns between digestive design and diet, for example, herbivores needing longer or more complex systems. Finally, they discuss how these adaptations help each animal survive in its particular environment.

Animals: rabbits • cows • snakes • whales • seahorses • hibernating bears • sea urchin • koalas • platypus • owls • chickens • sea anemone • coral • flamingos

Digestive differences: teeth • length of time to digest • feeding regularity • number of stomach chambers • length of intestines • specialised diets • gastrovascular cavity • crops and gizzards

Imbalanced bodies

On page 8 we learn most animals appear symmetrical on the outside, but this is not true for all animals. Some animals we may think are symmetrical at first glance, but closer observation reveals subtle differences; for example, a snail's shell spirals to one side, and some honey badgers have one more tooth on their left side than their right.

Provide images of symmetrical and asymmetrical animals for pupils to sort. They can decide their own initial sorting criteria before being asked to sort based on symmetry, identifying key features that make each example unusual. Include animals with bilateral (reflective) and radial (rotational) symmetry, to spark a more nuanced discussion.

Once images are sorted and discussed, pupils choose one asymmetrical animal and create a simple model or annotated drawing showing how its uneven body shape helps it survive. Ask pupils to compare their selected species to explore why asymmetry can be an advantage in certain environments but not in others and what this tells us about adaptation.

Some possible examples to explore:

- **fiddler crabs**—one oversized claw;
- **narwhals**—a single tusk on the left side;
- **flatfish**—both eyes on one side of the head;
- **owls**—one ear larger and higher than the other;
- **crossbill finches**—the tips of the upper and lower beaks cross over.

Career links

- **Anatomists** study the insides of living things, like bones, muscles, and organs. They learn how bodies are built and how all the parts work together. This helps doctors and scientists understand and take care of people and animals.
- **Veterinary surgeons,** or vets, take care of sick or injured animals. They give medicine, carry out operations, and help keep animals healthy. They also give advice to people on how to care for their pets or farm animals.
- **Zoologists** study animals and how they live in the wild or in captivity. They observe what animals eat, where they live, and how they behave. Their work helps protect animals and their habitats.

The animal body book

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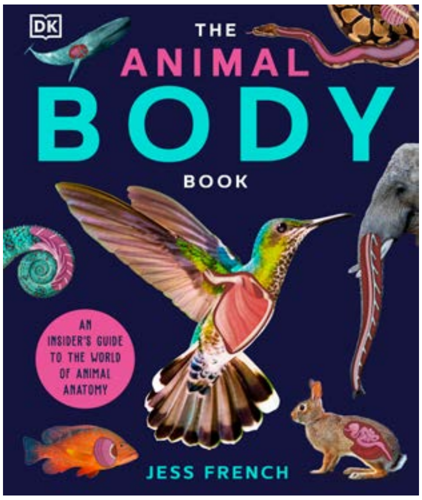


The animal body book is a fascinating journey inside the bodies of animals, revealing how skeletons, teeth, and digestion work. Packed with amazing facts, incredible illustrations, and stunning photographs, it shows how different creatures are perfectly designed for their lives. If you love discovering how animals live, eat, and move, this book will surprise and inspire you.

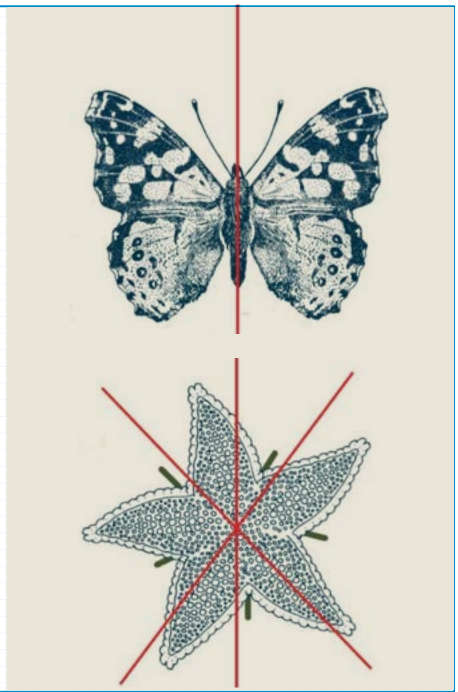
"I have been fascinated by animal bodies for as long as I can remember, from collecting dry, dusty bones I found on walks in the countryside to peering intently into my pets' mouths and ears to learn more about the way they worked."

Mathematics challenge: Symmetry in nature

Following your Imbalanced bodies activity exploring asymmetrical animals in school, choose six animals to research at home. Your inspiration might be pets or wildlife, TV shows, reliable websites, library books, or your teacher might provide a photograph with a short fact file.

Fold a hand-drawn or printed picture of each animal down the middle to check if both sides match. If they do, this is an animal with bilateral (or reflected) symmetry. Can you find two or more animals with radial (or rotational) symmetry, such as starfish, sea anemones, or jellyfish? Draw them and mark the lines where they can be divided into matching sections.

Make a mini booklet showing all your examples clearly labelled with a few sentences about each to explain how each type of symmetry might help the animal survive. Add one question you're still curious about to share at school.



Skeleton models

The skeletons chapter starting on page 18 showcases an incredible variety of vertebrate structures whose shapes are defined by their internal (and sometimes external) bone and cartilage frames. Choose an animal that captures your interest and build your own skeleton model using whatever materials you have. Pasta shapes, paper straws, rolled-up paper tubes, card, or modelling clay all work brilliantly. Your model can stand upright or lay flat, and you should aim to keep it accurate but simple.

Label the main bones, including the skull, spine, ribs, and limb bones, and add any special features your animal has, like wings, fins, or an extra-long backbone. Use books, safe online sources, or ask your teacher to print you a fact file to research a second animal and sketch its skeleton so you can compare it with your model. Make a short comparison table to show what is similar and what is different between the two skeletons. Explain how each skeleton helps the animal move and survive in its environment.

Tooth test

Choose three safe kitchen utensils, such as a fork, a blunt butter knife, and a potato masher, to represent different types of teeth (incisors, canines and molars). Pick three soft foods that you're allowed at home like apple slices, banana, and bread to test each 'mock tooth'. Try each utensil with each food and note whether it works best for piercing, slicing, tearing, or grinding. Record your results in a simple table and decide which animal tooth type each utensil behaves most like. Write a few sentences to explain which utensil was the best 'tooth' overall and what this tells you about how different animals eat. Include at least one example of a carnivore, a herbivore, and an omnivore.

Scientist profile

Jess French is a vet, naturalist, wildlife presenter, and award-winning author. She trained in veterinary medicine and spent years caring for animals of every shape and size, giving her a close-up view of how bodies work and why each species is uniquely designed for its environment. She loves sharing her knowledge about animals, from tiny insects to giant mammals.

Jess's passion is protecting wildlife and helping us understand the amazing biology behind the creatures we love. Her books help children explore how animals live, eat, and survive. She has a special interest in conservation and inspires young readers to observe, care for, and protect the natural world. Through her books and TV work, she shows that science isn't just facts, it's a way of exploring the world with curiosity and respect.

The history of information

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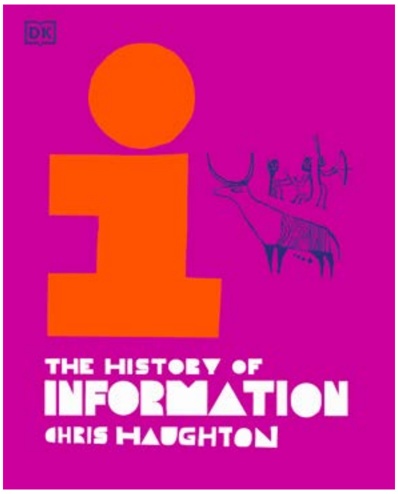
CENTRE for INDUSTRY EDUCATION COLLABORATION



Each activity sheet contains ideas for activities to do with your pupils, provides information relating to careers, and has a maths focus to help pupils understand the importance of mathematics education across the curriculum.

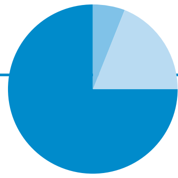
Working with scientists

These investigations can be done as standalone activities or carried out as an in-depth sequence to develop pupils' disciplinary and substantive knowledge. The deeper learning and science capital development of your pupils could be made more memorable through collaboration with a scientist such as a data scientist or an engineer specialising in robotics or artificial intelligence. You could do this by applying for a Royal Society Partnership Grant of up to £3,000. For more information, visit: **royalsociety.org/partnership-grants**

Scientific collaboration

In 1662, the Royal Society was formed when scientists in London began meeting to share ideas. You can find out more at the bottom of page 57. Explain that the Royal Society still exists today and it promotes and supports excellence in science. This includes inspiring young people through activities such as the Young People's Book Prize.

Encourage groups of pupils to set up their own "science societies" to share their scientific questions and ideas to encourage others to develop an interest in science. They could make a list of things to discuss and share at their first meeting.



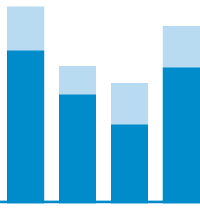
Collecting and using data

Read on pages 58 – 59 about how science depends on carefully recorded data. Explain to pupils that data can be numbers, words or pictures, and that scientists collect and record data to help them to learn more about the world and answer their questions.

Ask pupils to work in small groups to collect and record their own data by choosing something simple to count or measure, for example:

- Survey classmates about their favourite fruit or animal.
- Count how many cars of each colour are in the school car park.
- Measure how much ice melts in a container left in the classroom for 20 minutes.

Pupils should think about which type of graph, like the ones William Playfair invented, will best help others to understand their data. They could choose a bar chart, line graph, pie chart or something else, and then have a go at presenting their data using this type of graph.



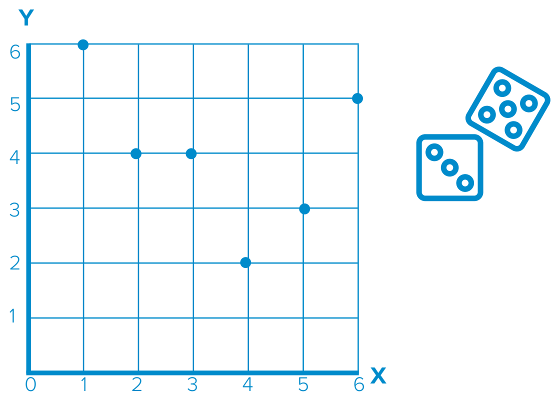
The story of a graph

Give pupils graph paper with both axes drawn and numbered 0 – 6.

Pupils roll a dice six times and use the numbers they roll to plot six points on the vertical axis, placing them at horizontal positions 1 to 6. They then join the points with straight lines to create a line graph.

Explain that their graph represents data collected over six days, showing the amount of money in a money box. Pupils should label the horizontal axis: Time (days) and the vertical axis: Amount of money (pounds). Ask them to describe 'the story' of their graph to a partner, using their own ideas to interpret what the data might mean, for example: On day one I earned £4 by doing jobs at home, but on day two I spent £2 on sweets.

What different stories might pupils create?



Disinformation

Have pupils heard about fake news? Do they know what it is and why it exists?

Explain that fake news can be a type of disinformation or misinformation. Disinformation is when information is made up or changed on purpose whereas misinformation is not deliberate, it is spread by a mistake. Discuss with pupils how not everything they read online can be trusted.

Support pupils to evaluate this post from an online influencer: 'Like and subscribe to my vlog for homework tips that will get you full marks on your next science test.'

When evaluating sources of information, encourage pupils to think about: who wrote it, why it was written and what evidence was used.

You could use this lesson about using reliable sources of information; developed by CIEC for the Oak National Academy:
https://shorturl.at/aHzjE

Career links

- **Data scientists** are 'number and information detectives' who find hidden patterns and answers to big questions. They use computers and maths to help people make smart decisions, like predicting the weather or finding the best video to watch next!
- **Robotics engineers** design, build and test robots and robotic systems that can perform tasks humans might find difficult, dangerous, or repetitive, from factory robots that build cars to medical robots that assist in surgery. These engineers need to understand machines, electricity and computers.
- **Machine learning engineers** need to know about artificial intelligence (AI). They design and build computer systems that can learn from data and make decisions on their own. Some examples include programming computers to recognise faces, translate languages or drive cars safely.
- **Bioinformaticians** combine biology, computer science and information technology to analyse data about plants and animals. They work closely with medical professionals, and use computer programs, to make sense of large sets of data. They can help with developing new medicines and treatments for people with complex diseases.

Pupil activity sheet

The history of information

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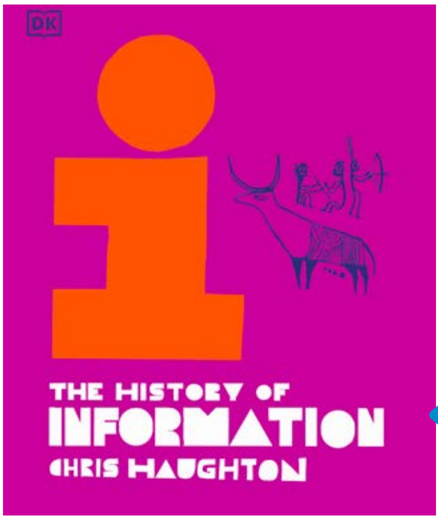


The history of information takes you on a fast-paced journey from cave paintings and ancient scrolls to computers, the internet, and beyond. Packed with eye-catching illustrations and surprising facts, it shows how humans have shared ideas across time and the world. You'll discover how messages shaped history and how the way we communicate keeps changing. It's like a time machine for your brain.

"Today our species dominates the globe, and our technologies have transformed the world. How did this happen? How did such an extraordinary change come about?"

Mathematics challenge: Using symbols

Thousands of years ago, humans began using simple marks and shapes to communicate their ideas. These early symbols were the first steps towards writing. Symbols are still used in maths today because they make problems easier to write, read and understand, for example, writing + is much faster than writing 'add these two numbers.'

What other symbols have you used in maths? Make a list of symbols and think about of what ideas they represent.

Symbol	Idea / meaning
+	adding

Do you recognise these symbols used in maths? Do you know, or can you find out, what they mean, and add them to the table of symbols that you have started?

% ° < ≥ ≠ ( )

Have a go at making some true or false questions using mathematical symbols. Challenge a friend or family member using your questions and the ones below:

7 + 2 = 10

9 ÷ 3 = 3

5 × 2 < 12

50% of 100 is 20

2 (3 x 4) ≠ 14

Symbols for science

Scientists use symbols to communicate information for everyone to understand, such as weather conditions and components in an electrical circuit.

Tip: The symbol does not need to look exactly like the real thing, for example:

Can you think of other symbols used in science?

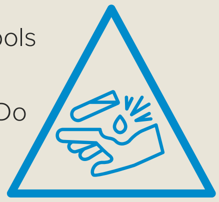
What symbols would you use to help communicate the meaning of these science words?

melt	gravity	deciduous tree	transparent
opaque	observe	question	change

Symbols for safety

Symbols can be used to communicate danger, or hazards, in quick, easy-to-understand ways. In the UK, hazard warning road signs are triangle shaped with a red border. Do you know what the dangers ahead could be from their warning symbols?

Scientists use hazard warning symbols to warn people around harmful materials, equipment or situations. Do you know what this hazard warning symbol means?



Try this hazard warning activity: What's in my kitchen cupboard? from CIEC's Kitchen Concoctions publication: **york.ac.uk/ciec/resources/primary/kitchen-concoctions/**

The art of remembering

Before writing was invented, all information had to be remembered and passed on by speaking. To do this accurately, people relied on observation and memory skills. Try this for yourself… ask a partner to find ten small everyday objects and place them under a towel. Remove the towel and look carefully at the objects for 30 seconds. Try to remember what you see because writing is not allowed.

Replace the towel and try to name as many objects as you can. Reveal the objects again and compare what you remembered with what is actually there. How easy was it to recall everything? What helped you to remember?

Author profiles

Chris Haughton is a designer, illustrator, and children's author who uses bright colours and creative storytelling to help young readers understand big ideas. He began his career as a designer working around the world before turning his love of art and stories into award-winning picture books. His latest book, *The history of information,* takes readers on a journey from cave paintings and early languages all the way to today's digital world, showing how humans have shared and stored information through history. Watch this video of Chris Haughton at work to find out more about his illustration process: **vimeo.com/177450574?fl=pl&fe=vl**

Loonie Park is a former journalist, now working as a non-fiction author. She helped make *The history of information* easier to understand by adding clear explanations about how science and technology have changed the way people share knowledge. She also researched real scientific discoveries to make sure the book's facts were correct and exciting for young readers.

Teacher activity sheet

The rocks book

This is one of a series of activity sheets to use alongside the books which have been shortlisted for the Royal Society Young People's Book Prize 2025.

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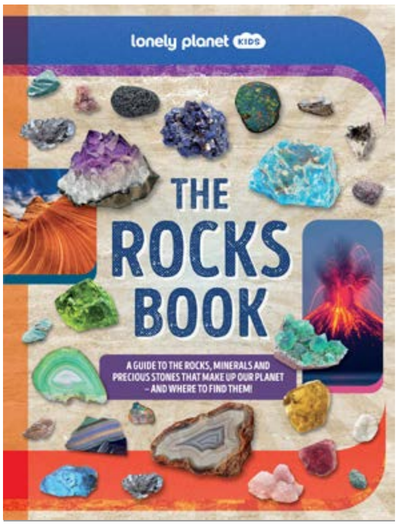

Testing rocks for hardness

Some types of rocks need to be harder than others so they can hold up under pressure and last a long time without breaking. Pupils can carry out a simple harness test by using everyday items like a coin, nail or golf tee to scratch the surface of different rocks and observe which rocks can and cannot be scratched easily. As they compare results, pupils should discuss which rocks would be more suitable for building strong structures such as houses, walls, roads, bridges and tools.

Each activity sheet contains ideas for activities to do with your pupils, provides information relating to careers, and has a maths focus to help pupils understand the importance of mathematics education across the curriculum.

For the following activities, you will need a collection of common rocks for classroom investigation. These may be bought from educational suppliers, donated by local gardeners or builders, or found in the local and wider environment ensuring collection is legal and environmentally responsible.

Working with scientists

These investigations can be done as standalone activities or carried out as an in-depth sequence to develop pupils' disciplinary and substantive knowledge. The deeper learning and science capital development of your pupils could be made more memorable through collaboration with a scientist such as a geologist, geographer or palaeontologist. You could do this by applying for a Royal Society Partnership Grant of up to £3,000. For more information, visit: **royalsociety.org/grants/partnership-grants.**

Rock texture

When geologists talk about a rock's texture, they don't just mean what it feels like to touch. Rock texture has more to do with the size of the tiny parts, called grains, that make up the rock and how they are arranged. Pupils should have a close look at different rocks with and without a hand lens. Can they see the different grains? Are they big or small? Are they all the same size or are some bigger than others? What do pupils think different textured rocks could be used for?

Fine-grained rocks have tiny grains that are packed closely together. They are usually smooth and strong which means they are good for building, paving or making statues.

Coarse-grained rocks have big, visible grains which can make them easier to break apart or see the minerals inside. This makes them good for learning about rocks and decorating gardens or paths.

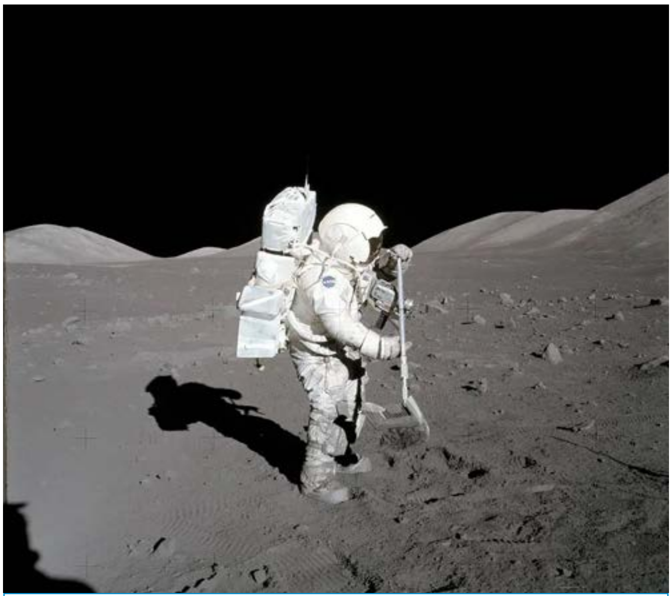

Image: Scientist-astronaut collects lunar rake samples © NASA

Testing rocks for magnetism

Read about Harrison Schmitt on page 85; an astronaut who travelled a very long way to find rock samples. As part of the Apollo 17 mission in 1972, he collected rock samples from the surface of the Moon to bring back to Earth. One of these rocks gave scientists evidence that the Moon may once have had an invisible magnetic force around it.

Pupils could try holding a magnet near to different rock samples. If the rock is attracted to a magnet, it's a sign that the rock contains iron, or minerals containing iron. A common example of a magnetic rock is the black or dark brown mineral called magnetite that can be found as 'black sand' on certain beaches in the UK. Pupils can read more about magnetite on page 130 of *The rocks book*.

The acid test

Some types of rocks will fizz or bubble when exposed to acid and this helps us to know what the rock is made of. Geologists use a strong acid called hydrochloric acid that requires specialist conditions to use. Pupils can replicate this test by placing a rock in a beaker or bowl and dripping a few drops of a weak acid such as lemon juice or vinegar onto the rock. Pupils may need to use a hand lens to observe any fizzing, or they could try scratching the rock to make a little powder, which can help create a stronger reaction.

Take it further

Did you know that soil is made up of tiny bits of rocks? Over a long time, rocks break down into smaller pieces after exposure to wind, rain, ice, and changes in temperature. These tiny pieces mix with dead plants and animals, water and air to make soil that plants can grow in.

CIEC's *Is There Anyone Out There* **(york.ac.uk/ciec/resources/primary/is-there-anyone-out-there/)** activity pack includes an opportunity for pupils to work like a geologist and investigate 'Martian soil' samples to decide which is most like the soil on Mars.

Career links

- **Geologists** are scientists who study the materials that make up Earth, including rocks and soils. They look closely at the appearance and physical properties of rocks and for clues about fossils, volcanoes, earthquakes and how our planet works.
- **Geographers** are scientists who study land, water and people on Earth to understand how they are all connected. They explore places, maps, and environments to learn how people live and how we can take care of our planet. Read about geographer Eman Ghoneim on page 35 of *The rocks book*.
- **Petrologists** are rock detectives who figure out how rocks were made and how they've changed over time. They explore the outdoor world, collect rock samples, and use special tools to uncover clues about volcanoes, mountains, and Earth's past. They carry out lab tests, use microscopes, do fieldwork, and help with things like finding metals, locating fuels such as oil found in rock layers, and understanding natural hazards like earthquakes and landslides.

Pupil activity sheet

The rocks book

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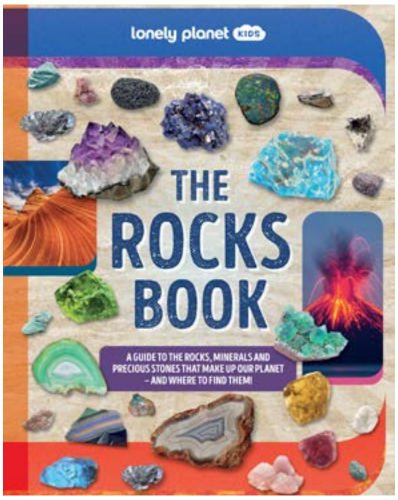
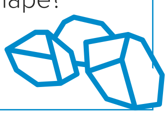


The rocks book, turns ordinary stones into extraordinary clues about Earth's history, from fiery volcanoes to crashing continents. With clear explanations, brilliant photos, and hands-on facts, it shows how rocks are made, changed, and discovered. You'll never look at the ground the same way again.

> " The more you learn about rocks and minerals, the more you'll begin to sound like a professional geologist out at work in the field!"

Rocks are everywhere

Go on a rock hunt around your local area with an adult, to see where different rocks are used in buildings, walls, pavements and statues. Take photos or make sketches of what you find, and record what each rock looks like including its colour, texture and any patterns. You could use the information about rocks at the back of the book (from page 100) to try to find out what types of rocks you have spotted. Talk about why you think each rock is suitable for its use. For example, does the object made from rock need to be hard-wearing, water-resistant or easy to shape?

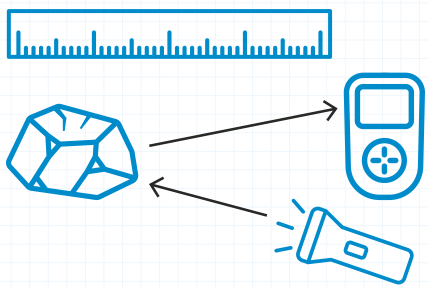


Mathematics challenge

Geologists call the shininess of a rock its lustre. This can be found by measuring how much light is reflected from the surface of a rock. To investigate the lustre of rocks, ask an adult if they can download a free light sensor app to an electronic device, such as a phone or tablet.

Dim the lights and position a light meter at an agreed distance, such as 10 cm, from a rock. Place a torch either beside the meter or just behind or above it, then switch it on. The beam will illuminate the surface of the rock, and the reflected light will reach the sensor. Record the measurement of reflected light in lux, and repeat for other rocks in your collection.

Rock	Reflected light (lux)



Rock battle

Choose ten of your favourite rocks from the fact files at the end of the book (from page 100 onward). Use the information provided and other secondary sources to make your own 'rock battle' card game. Include categories such as rock name, texture, hardness, lustre and common use.

Play the 'rock battle' game in small groups or pairs by taking turns to choose a property and compare your cards. Each round, the person with the highest value for the chosen category takes the cards from the other players. The game ends when one player wins all the cards.

We need geologists!

The work of geologists is incredibly useful. Your challenge is to write a short, exciting job advert to encourage more people to become geologists. Include what a geologist does, why their job matters, location of work and what qualities and skills they would need. Make it sound so interesting that everyone will want to choose this career.

Be a rock collector

The world is full of interesting rocks. You can buy samples of polished rocks in shops, but it is more fun to collect your own!

Professional geologists have all kinds of tools to help them explore Earth's rocks, but you don't need any equipment to get started. Just keep your eyes peeled next time you are outdoors. You will see rocks of different shapes, sizes, colours and textures.

There are so many rocks out there to search and collect but always check before you take any samples home. If you see an interesting rock and you are not allowed to keep it, take a photograph of it instead. Read about *'Whose land is it?'* on page 80 of *The rocks book*.

Safety note: Only go rock hunting with an adult. You will need to know the risks and how to avoid dangerous situations. Read about responsible rock collecting on pages 80-85 of *The Rocks Book* and find out about what you can collect and where.

Scientist profile

Professor John Brodholt is a scientist who studies rocks and minerals at University College London. He has helped other scientists understand Earth and how its rocks behave when heated or squeezed under pressure. Professor Brodholt's research helps us to understand that studying rocks can be exciting, and that scientists can help people of all ages learn about rocks in the world around them. As a rock expert, he has worked with the author of *The Rocks Book* to make sure the information about rocks and minerals is accurate and interesting to read.

Teacher activity sheet

The wild life of dinosaurs and other prehistoric animals

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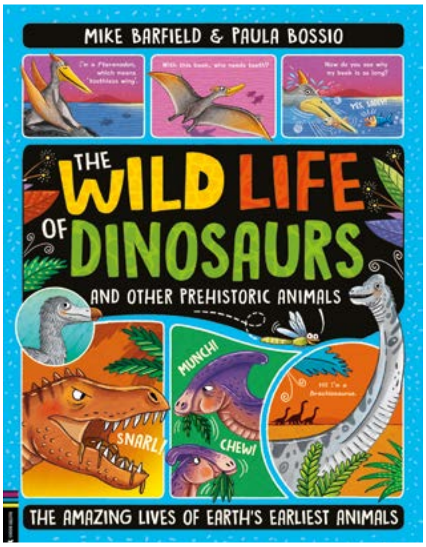

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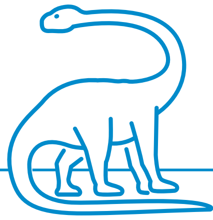

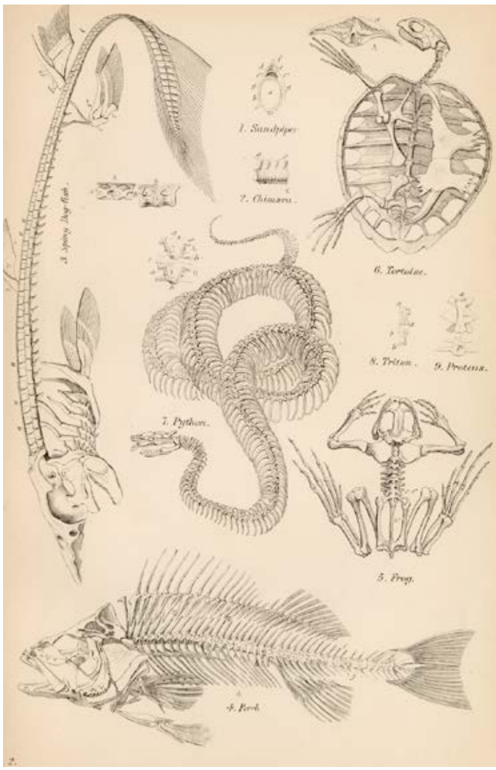

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Classifying vertebrates

Scientists called taxonomists classify all living things into broad groups. This makes it easier for us to organise and learn about the many kinds of plants and animals on Earth.

Animals that have a backbone (spine) inside their body belong to the broad group called vertebrate animals. There are different groups of vertebrate animals with different features.

Ask pupils which groups of vertebrate animals they can name (clue: there are five groups).

Working in pairs, invite pupils to write a short description of the features shared by animals in each vertebrate group, for example all animals in the bird group have feathers. Next, they should compare their ideas for amphibian, bird, fish, mammal and reptile with the descriptions in the glossary at the back of the book. How accurate were pupils with their descriptions? What information do they need to add or change?

Prehistoric animal examples

Challenge pupils to find at least one example from the book for each vertebrate group. They could record their findings in a simple table like the one below.

Invite pupils to create a model of one of the prehistoric animals they have recorded in the table, using modelling dough and craft or recycled materials. They could challenge their classmates to identify which animal in the book they have created based on the features of their model.

Make a display of everyone's prehistoric animals and ask pupils to have a go at sorting them into different groups based on the observable features of the models.

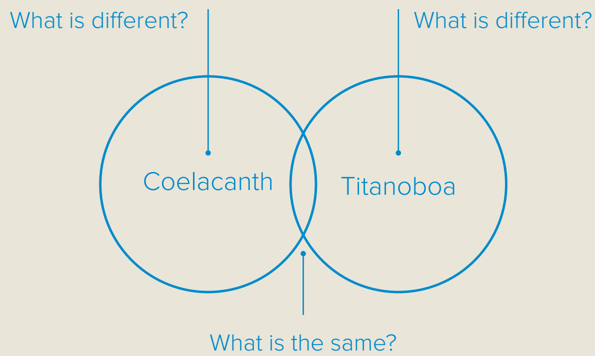
animal group	page number	animal name	features
amphibian	35	Diplocaulus	boomerang shaped skull, wide head
bird			
fish			
mammal			
reptile			

Comparing animals past and present

Pupils should think about the prehistoric animal they have chosen to model and then select an animal alive today from the same vertebrate group to compare it with. For example:

- Coelacanth (prehistoric fish: page 23) compared with a trout (fish living today)
- Titanoboa (prehistoric reptile: page 72) compared with an adder (reptile living today)

Ask pupils to research and compare features such as the animals' body parts and structure, skin covering, movement, diet and habitat. To complete the activity, invite pupils to share how the prehistoric and modern animals are similar, and how they may have changed over time to become different.



Career links

- **Ichnologists** study evidence of ancient life like footprints, burrows, trails, and fossilised poo. They find clues which tell them about how animals moved, if they lived alone or in groups, and what they used to eat. Ichnologists work outdoors at fossil sites and indoors studying evidence in detail. It's a good career choice for people who enjoy careful observation and discovering stories hidden in stone.
- **Taxonomists** are scientists who help us to name living things, including plants and animals that lived many years ago, and decide which groups they belong to. They look at how plants and animals are similar or different to each other. Taxonomists help us organise and understand all the life on Earth.
- **Palaeontologists** are scientists who study fossils to learn about animals and plants that lived long ago. They use clues from bones, footprints and rocks to discover what life was like in the past. Palaeontologists help us to understand how dinosaurs lived, moved and became extinct.

Pupil activity sheet

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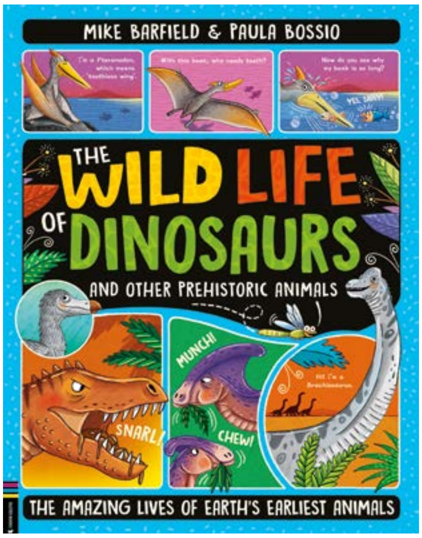
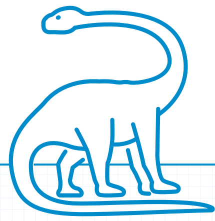


Step into a world where dinosaurs hunt, fight, and survive just like real animals in *The wild life of dinosaurs and other prehistoric animals*. Packed with dramatic scenes, fascinating facts, and stunning illustrations, this book shows what prehistoric life was really like. If you've ever wondered how these incredible creatures lived day to day, this book has the answers.

"This book uses the best information available to bring some of those amazing animals back to life and tell their stories. So, sit down, strap in and set the time machine controls to 'prehistoric' – you're in a for a wild ride!"



Mathematics challenge: Big numbers

Use the book to make a list of amazing dinosaur facts which include big numbers, for example: a Titanosaur could weigh 76,000 kg and the Spinosaurus lived about 95,000,000 years ago.

Can you:

- read the numbers aloud?
- say or write the numbers in words?
- identify the value of each digit?
- order the full set of numbers you have chosen from smallest to biggest?

Make number cards from 0 – 9 and choose seven cards at random and arrange them to make the largest number possible. Think about which dinosaur your number could describe, e.g. how many years ago it lived or how much it weighed. Try this again with the smallest number you can make with your chosen cards.

As an extra challenge, you could invent your own dinosaur and create a fact card including its fictitious height, length, mass and time period using big numbers written both in digits and words. Can you round your numbers to the nearest ten thousand, hundred thousand, million or more?

Word families

Prefixes can be added to the beginning of a word, and suffixes can be added to the end of a word, to make new words in the same 'word family'. This helps us to understand new words by looking at the part we already know.

The word prehistoric begins with the prefix 'pre' which means 'before'. This helps us to understand that prehistoric means something about the past.

What other examples can you find in the book where you can use the prefix or suffix to help you to work out the meaning of the word?

Use the information in the table below to help. There are blank rows for you to add any other examples that you find from the book.

prefix or suffix	prefix/suffix meaning	example word	word meaning
dino-	terrible or awesome		
tri-	three		
pre-	before		
mega-	huge or great		
bronto-	thunder		
-orni	bird		
-pod	foot		
-saur	lizard or reptile		
-raptor	thief or predator		
-ceratops	horned face		

Life lessons

Read about animals that have (or may not have) become extinct on page 90 of the book. Carry out some research to learn about other animals from the past that have become extinct. Try to find out why they became extinct.

You could also find out about endangered animals, which means animals living today that are in danger of becoming extinct. Choose an endangered animal, try to find out what threats it is facing and what might be done to help protect the animal from extinction.

Scientist profile

Dr. Jingmai O'Connor is a palaeontologist who works at the Field Museum in Chicago, USA. Her job is like being a detective for prehistoric life on Earth. Dr. O'Connor is an expert in theropods, which are dinosaurs closely related to birds. She looks at fossils and other evidence to suggest what flying dinosaurs and prehistoric birds were like, including how they flew, how their feathers worked and the structure of their bodies. Because of her excellent work and research, she helps other scientists understand how some dinosaurs evolved into the birds we see today.