Be a Neighbourhood Naturalist

Explore Nature with Activities and Experiments!

Labonie Roy Vena Kapoor Suhel Quader

juggernaut

INDIAN PITTA Kids

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Contents

Do you ever wonder why birds sing to each other, or why ants march in perfect lines? Or why some plants have green leaves and not others? We do, too!

As kids, we (Labonie, Suhel and Vena) went to school, read books and watched TV. We spent time playing with our friends, in our homes and outside. While doing this, we saw little things that you probably see as well: the occasional trail of ants on the floor, a big bird poop on a ledge or a tiny spider climbing up a wall. Everyday, normal things, right? But each of us **felt a spark** – a question that we just had to know the answer to! What were the ants looking for? What was in the bird's poop? Would the spider build a big or small web?

Sometimes, we could find an adult or a book that gave us the answers, but it was much more satisfying to **find out for ourselves**. One of us (Labonie) secretly left out piles of sugar in her house to see how ants find food. Another (Suhel) found seeds in bird poop and planted them to see what the bird had eaten. And another (Vena) carried a measuring tape everywhere to compare the sizes and shapes of different spider webs.

The more we noticed, the more questions we had, which led us on exciting explorations of nature around us. We observed, we created, we experimented; we played around with our ideas and worked with our hands. And we fell hopelessly in love with the amazing living beings that share our world. While doing so, we slowly **became naturalists**: people who are fascinated by the natural world and study it in one way or another. Eventually, we were lucky to be able to make nature our life's work – as artists, as scientists, as educators.

This book is for the naturalist in you! Through **questions about nature**, it guides you on an exploration of your surroundings, and the other living things that share them with you. Engaging experiments, observations, and creative activities will lead you to answers, and hopefully, to questions of your own. Through this book, you will:

Discover local nature: Through experiments, research projects, and stories, you'll discover your own natural habitat – your home and neighbourhood.

Spot, identify and learn: Identify common plants, animals and other living things, learn factual information about them, and expand your nature vocabulary.

Think like a scientist: Find out the whys and hows of nature by asking questions and finding out the answers.

Work with your head, heart and hands: Create science experiments using everyday materials found in your home.

Create a nature map: Build a record of the nature you have observed in your surroundings.

So dive in and begin your journey to
Be a Neighbourhood Naturalist!

How to use this book

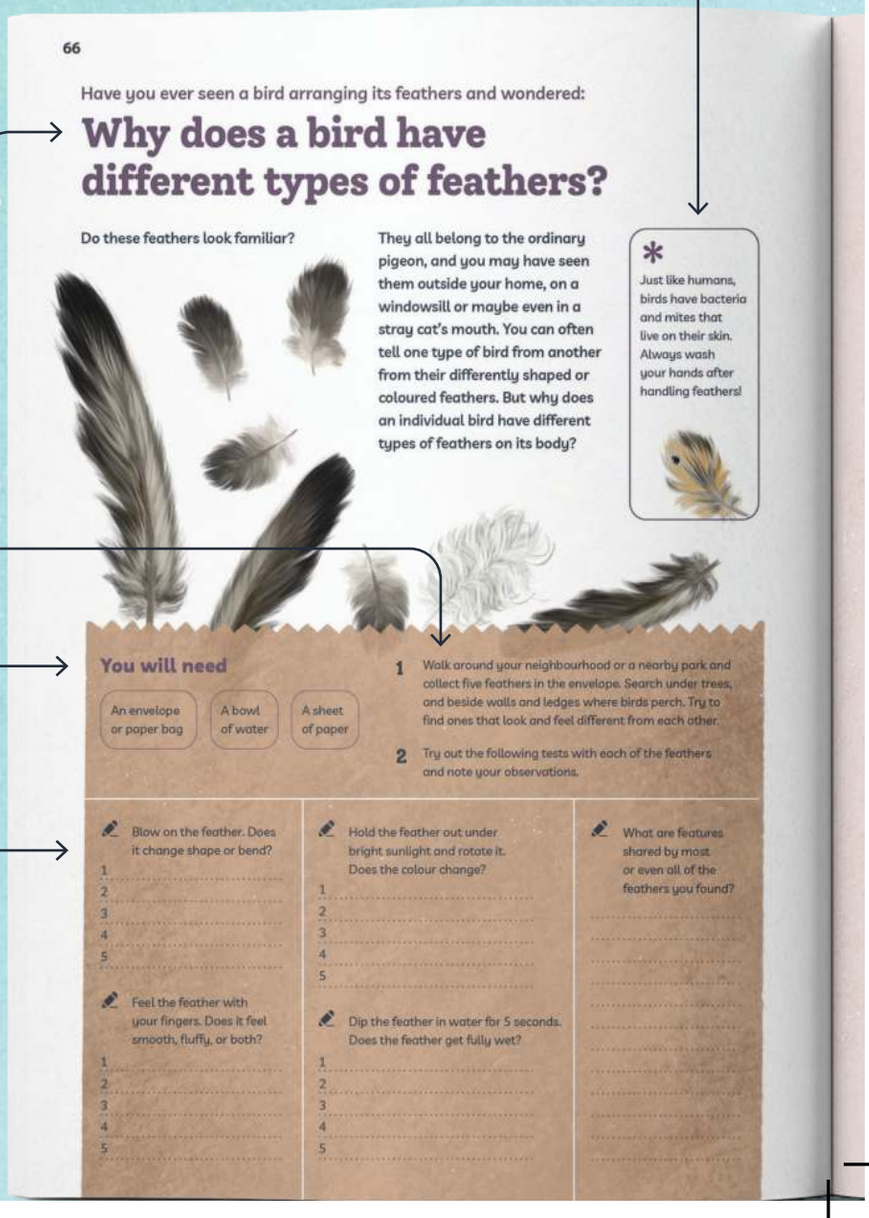
This book guides you on an exploration of nature around you by asking questions and helping you find answers through observation and science experiments! You can use this book by yourself, or with a group, to explore nature together. It can also be used by teachers and educators, in classrooms or outdoor settings. Each topic is introduced over two pages: an Activity Sheet and a Fun Facts page. The Activity Sheet falls on the left-hand side, except in some cases where it's important to learn more about the topic before diving into the activity.

Activity Sheet

Find clues to answer the Nature Question by carrying out the activity and writing down your observations.

For groups: In groups or classroom settings where multiple copies of the book aren't available, you can provide a photocopy of the Activity Sheet for each person. The teacher or facilitator can use the book to conduct a lesson, and read out information from the Fun Facts page.

Take care: Be a responsible naturalist! This bubble tells you the safest ways to interact with nature during observations and activities.


66

Have you ever seen a bird arranging its feathers and wondered:

Why does a bird have different types of feathers?

Do these feathers look familiar?

They all belong to the ordinary pigeon, and you may have seen them outside your home, on a windowsill or maybe even in a stray cat's mouth. You can often tell one type of bird from another from their differently shaped or coloured feathers. But why does an individual bird have different types of feathers on its body?

*
Just like humans, birds have bacteria and mites that live on their skin. Always wash your hands after handling feathers!

You will need

An envelope or paper bag

A bowl of water

A sheet of paper

1 Walk around your neighbourhood or a nearby park and collect five feathers in the envelope. Search under trees, and beside walls and ledges where birds perch. Try to find ones that look and feel different from each other.

2 Try out the following tests with each of the feathers and note your observations.

Blow on the feather. Does it change shape or bend?
1
2
3
4
5

Feel the feather with your fingers. Does it feel smooth, fluffy, or both?
1
2
3
4
5

Hold the feather out under bright sunlight and rotate it. Does the colour change?
1
2
3
4
5

Dip the feather in water for 5 seconds. Does the feather get fully wet?
1
2
3
4
5

What are features shared by most or even all of the feathers you found?

Nature Question: This is the question you will be finding the answers to through an experiment, craft or observation-based activity and some Fun Facts.

Nature Activity: Carry out this activity to see how nature works and find clues to answer the Nature Question.

You will need: All you need to do these activities are basic art materials and reusable waste from in and around your home or school. **(For groups:** Bring reusable materials needed for the activities from home).

What did you learn? Write down your observations and conclusions.

Things to keep in mind

1. When you venture out for observations, always keep this book and a pencil with you to write down what you see (and hear and smell!).
2. No measuring tape on hand? No problem! Use a unit you will remember – handspans, footsteps or even the length of your fingernail. You can use a string or a piece of paper to measure a distance (like the circumference of a tree) and compare it against a ruler or measuring tape later.

67

Feathers are a bird's best friend

Birds are the only animals that have feathers – which help them in many ways!

You may have noticed that the feathers you collected have a central stick-like shaft, attached to which are tiny branches called barbs.

On the bigger feathers, the barbs are firm and stitched together like tiny zippers, forming a smooth surface. The firm shaft of the feather doesn't bend even in strong wind. These feathers are found on the wings and tail of the bird, and help the bird fly – which is why they are called **flight feathers**.

Down feathers

Under the brightly coloured feathers, birds have a layer of much smaller feathers with soft barbs. These are called **down feathers** and act like an undershirt, keeping the bird warm.

Flight feathers

Shaft

Barb

A scientist who studies birds is called an **ornithologist**, and would not mind being called a 'birdbrain'!

Contour feathers

Some feathers shine with fantastic colours as the angle of light reflecting off their barbs changes. This phenomenon is called **iridescence**. Peacocks, sunbirds and even the familiar pigeons have some iridescent feathers.

Some birds use the colours and patterns on their feathers to hide from predators, while others use them to attract mates or to scare off their rivals. As you may have observed, feathers with firm barbs also repel water, acting like a colourful raincoat.

Some feathers have a mixture of both firm and soft barbs, and are smaller than the tail and wing feathers. These are called **contour feathers**, and are found on parts of the bird's body other than the tail and wings. They give the bird its colour and pattern.

Fun Facts page

This page has some exciting scientific information about the topic.
Using your observations and this information, can you answer the Nature Question?

Nature words: Learn a new word with each new topic.

For groups: Ask the Nature Question again after completing both pages – we are sure the answers will be very interesting!

Have you ever seen a lizard on your ceiling and wondered:

Why do geckos live in our homes?

Did you know you share your home with a wild predator? This fascinating creature is none other than the Common House Gecko. They can be seen scurrying across walls and ceilings, and may make surprise appearances while you reach for your favourite book from the shelf or pick up the towel hanging in your bathroom. These remarkable reptiles are comfortable living almost anywhere inside our homes – but why do they like it so much?

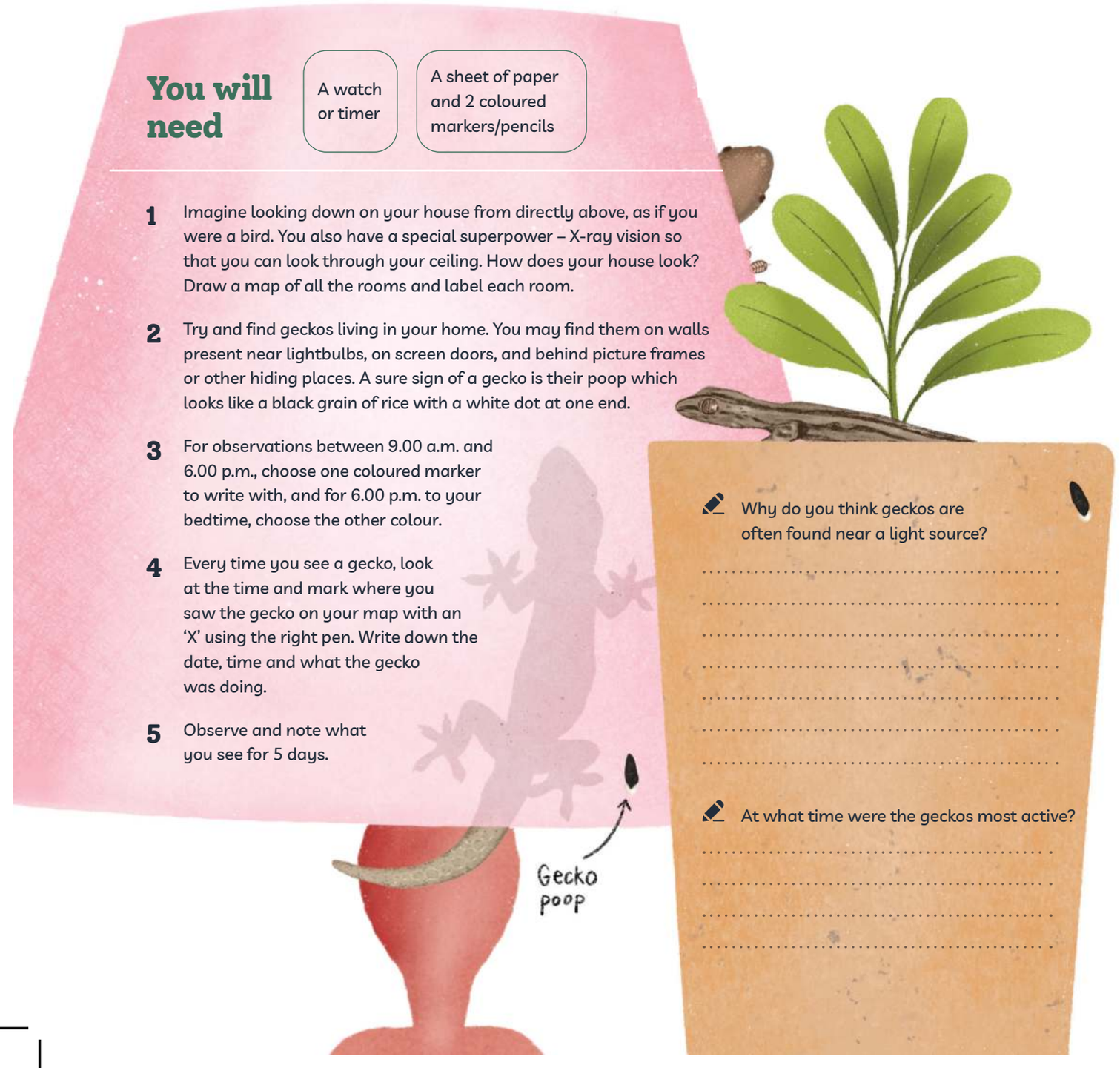
*

House geckos are harmless and do not bite! When they feel threatened, geckos can drop their tails to distract a predator. Their tails wiggle even after getting detached, and the geckos make a quick getaway. For their safety, do not try to catch or handle them.

You will need

- A watch or timer
- A sheet of paper and 2 coloured markers/pencils

1. Imagine looking down on your house from directly above, as if you were a bird. You also have a special superpower – X-ray vision so that you can look through your ceiling. How does your house look? Draw a map of all the rooms and label each room.
2. Try and find geckos living in your home. You may find them on walls present near lightbulbs, on screen doors, and behind picture frames or other hiding places. A sure sign of a gecko is their poop which looks like a black grain of rice with a white dot at one end.
3. For observations between 9.00 a.m. and 6.00 p.m., choose one coloured marker to write with, and for 6.00 p.m. to your bedtime, choose the other colour.
4. Every time you see a gecko, look at the time and mark where you saw the gecko on your map with an 'X' using the right pen. Write down the date, time and what the gecko was doing.
5. Observe and note what you see for 5 days.



Why do you think geckos are often found near a light source?

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At what time were the geckos most active?

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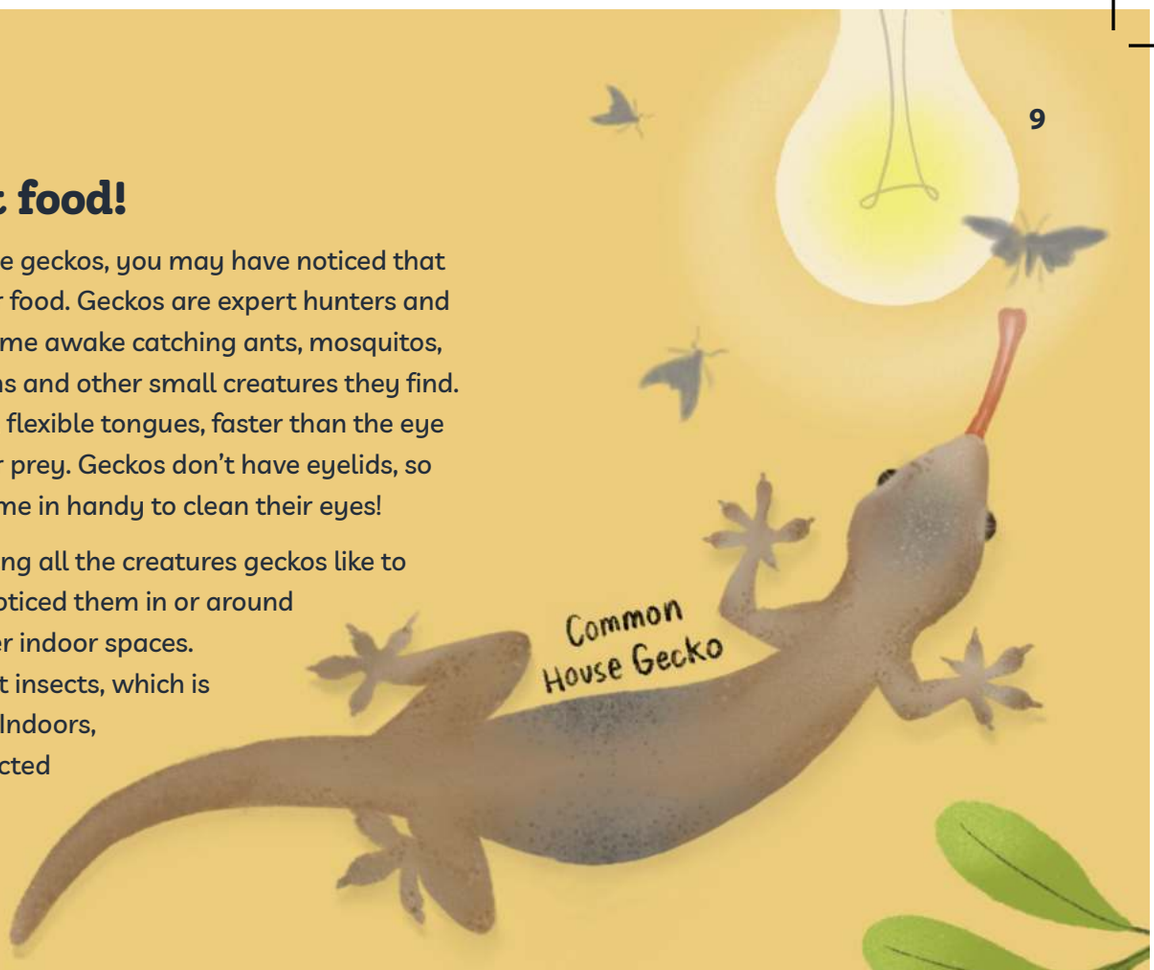
It's all about food!

While observing house geckos, you may have noticed that they were hunting for food. Geckos are expert hunters and spend most of their time awake catching ants, mosquitos, spiders, beetles, moths and other small creatures they find. They flick their sticky, flexible tongues, faster than the eye can see, to catch their prey. Geckos don't have eyelids, so their tongues also come in handy to clean their eyes!

What's common among all the creatures geckos like to eat? You may have noticed them in or around your house, or in other indoor spaces. At night, lights attract insects, which is a feast for the gecko! Indoors, geckos are also protected from animals that want to eat them, like birds, cats and snakes.



Adapting to urban life

Many species of geckos have adapted to urban environments.

You may find darker-coloured geckos on darker surfaces like tree trunks and lamp posts.

Lighter-coloured geckos can be spotted on walls.

They are also famous for being able to walk upside down on most surfaces without falling, thanks to thousands of tiny hairs on their feet that act like velcro.

A scientist who studies amphibians or reptiles like geckos is called a **herpetologist**.

Have you ever looked at a little bug and wondered:

What exactly is an insect?

There is an astonishing variety of 'bugs' and 'creepy-crawlies' around us. Millipedes get around on many little legs, but ants have only six. Beetles have smooth, shiny bodies, but worms are soft and squishy. Butterflies flutter by on papery wings, but slugs and snails slowly make their way on a trail of slime. Are all these different animals a part of the grand group we call insects? What exactly is an 'insect'?

Write down the words that come to mind when you think of 'insects'.

Look carefully at these pictures and note your observations.


Common Mormon Butterfly


Indian Black Ant

If possible, try and find a real (live or dead) insect and compare it with the insects in the photos above.

How many legs does each have?

Butterfly .....

Ant .....

How does each move around?

Butterfly .....

Ant .....

Do they have distinctly separate sections of their bodies? How many such sections do you see?

Butterfly .....

Ant .....

Observe the heads closely. Do you see any similarities?

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Using your observations, make a list of features common to both of them:

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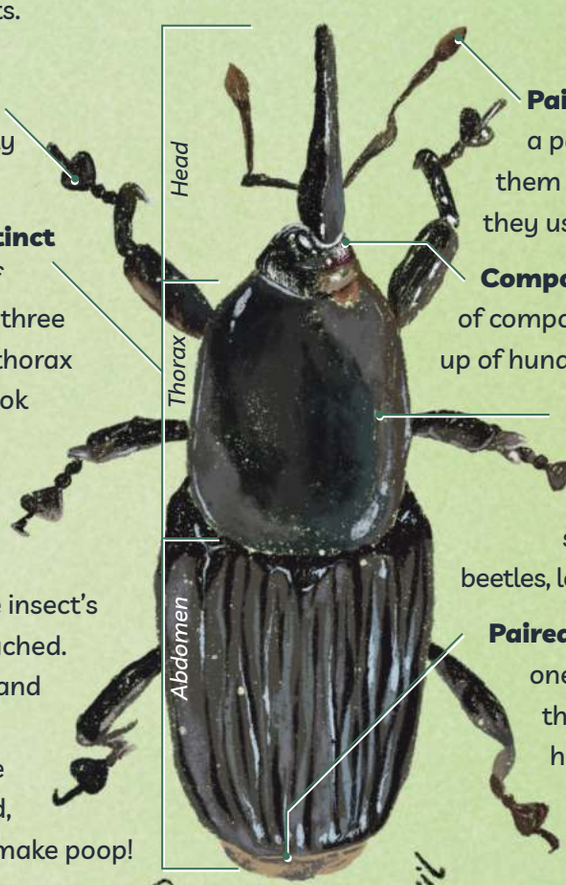
Butterflies and ants clearly have a lot in common – with each other and also with a whole group of animals called insects.

Six legs (three pairs): Each leg also has clearly identifiable sections.

Body divided into distinct sections: The bodies of insects are divided into three parts, called the head, thorax and abdomen. These look slightly different in different insects. The head has the eyes, mouth and antennae. The thorax is where the insect's legs and wings are attached. The abdomen is softer and sometimes covered by the wings. This is where insects digest their food, and – you guessed it – make poop!



Paired antennae: All insects have a pair of antennae (we might know them as 'feelers') on their heads, which they use to smell and find food.

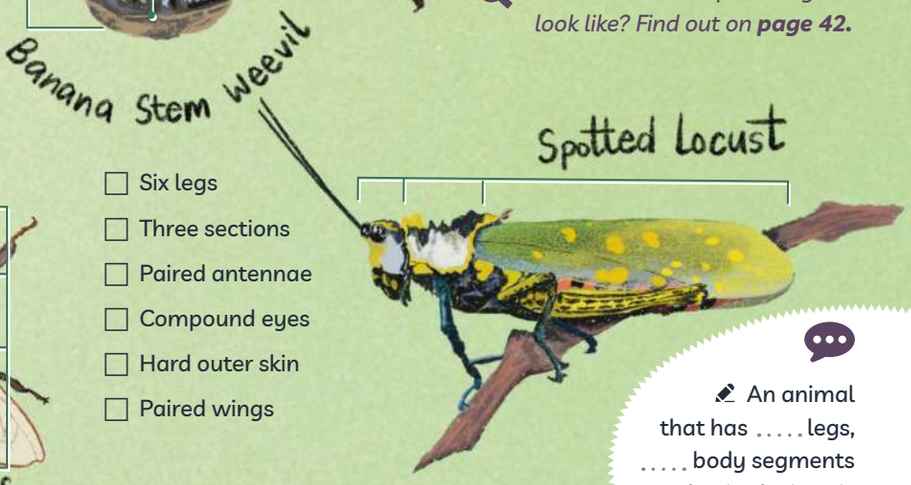
Compound eyes: All insects have a pair of compound eyes, each of which is made up of hundreds or thousands of tiny units.

Hard outer skeleton: Insects have a hard outer skeleton to protect their bodies. This layer makes some insects, like ants, wasps, and beetles, look smooth and shiny.

Paired wings: Most adult insects have one or two pairs of wings. Some are thin and transparent, while others have beautiful colours and patterns.

*What does a compound eye look like? Find out on **page 42.***

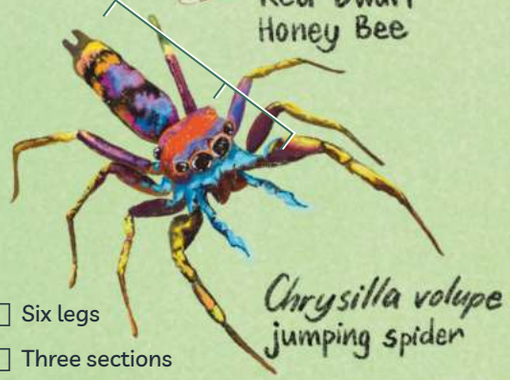
Which of these are insects?



- ☐ Six legs
- ☐ Three sections
- ☐ Paired antennae
- ☐ Compound eyes
- ☐ Hard outer skin
- ☐ Paired wings

- ☐ Six legs
- ☐ Three sections
- ☐ Paired antennae
- ☐ Compound eyes
- ☐ Hard outer skin
- ☐ Paired wings

An animal that has ..... legs, ... body segments and paired wings is called an **insect**.



- ☐ Six legs
- ☐ Three sections
- ☐ Paired antennae
- ☐ Compound eyes
- ☐ Hard outer skin
- ☐ Paired wings

- ☐ Six legs
- ☐ Three sections
- ☐ Paired antennae
- ☐ Compound eyes
- ☐ Hard outer skin
- ☐ Paired wings

You may have observed that spiders and millipedes have some similarities to insects – making them cousins but not true insects. Snails and worms are entirely different, and much further away in the family tree. So, the next time you see a 'bug' or 'creepy-crawly', think through your list – is it an insect?

Have you ever seen a group of ants walking in a straight line and wondered:

How do ants work together?

Ants live in large groups called colonies with anywhere between thousands and millions of ants. They all work together towards the same goal – making sure they have a safe home and lots of food so that the colony can grow. Most ant species also build elaborate nests to house the colony – tall anthills, underground tunnels or even hanging nests made from leaves! If you have ever done a group project or played sports as part of a team, you know that it takes a lot of conversations and coordination to work together to get things done. So how do ants do it?

*

Yes, some ants do bite, but only to protect themselves! So, for your own safety as well as the ants', do not touch them and watch where you step!

You will need

- A spoonful of food (sugar, atta, rice or a chopped boiled egg)
- A watch or timer

1. Look around for a trail of ants in your home, or open spaces nearby. Your kitchen, near a food source or the base of a tree are good places to start.
2. Place a spoonful of food 2 handspans away from the ant trail you have found. Note the time on your watch.
3. How long does it take for ants to find the food? If they don't find the food in 5 minutes, move it a little closer and note the time on your watch again. How does the first ant behave after finding the food? What do the other ants do when they find it?
4. Check again every 2 minutes, note how many ants are at the food as well as the details of their behaviour. Are there more or fewer ants than the last time you checked? How are they carrying the food? Note how many ants are there. Observe for 10 minutes, or if you can, until the food is gone.

How do you think the first few ants discovered the food?

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How do you think the other ants found out about it?

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Number of ants

after 2 minutes .....

after 4 minutes .....

after 6 minutes .....

after 8 minutes .....

after 10 minutes .....

Ant language

Similar to how you speak with your friends, ants have their own ways of communicating. While observing ants, you may notice that they use their antennae to sweep the surface they are walking on or to tap each other when they meet. Ants can smell and feel through their antennae and even their feet, and communicate using scents. When a worker ant finds food, she rushes back to the nest, leaving a trail of scent by tapping her abdomen on the ground. Other ants use their antennae to tap her and catch the scent, then trace it back to the food. Some types of ants even make high-pitched sounds by scraping their legs against their bodies. Using these methods of communication, ants work so well together that scientists consider ant colonies a **super-organism**, because the whole colony functions as one.

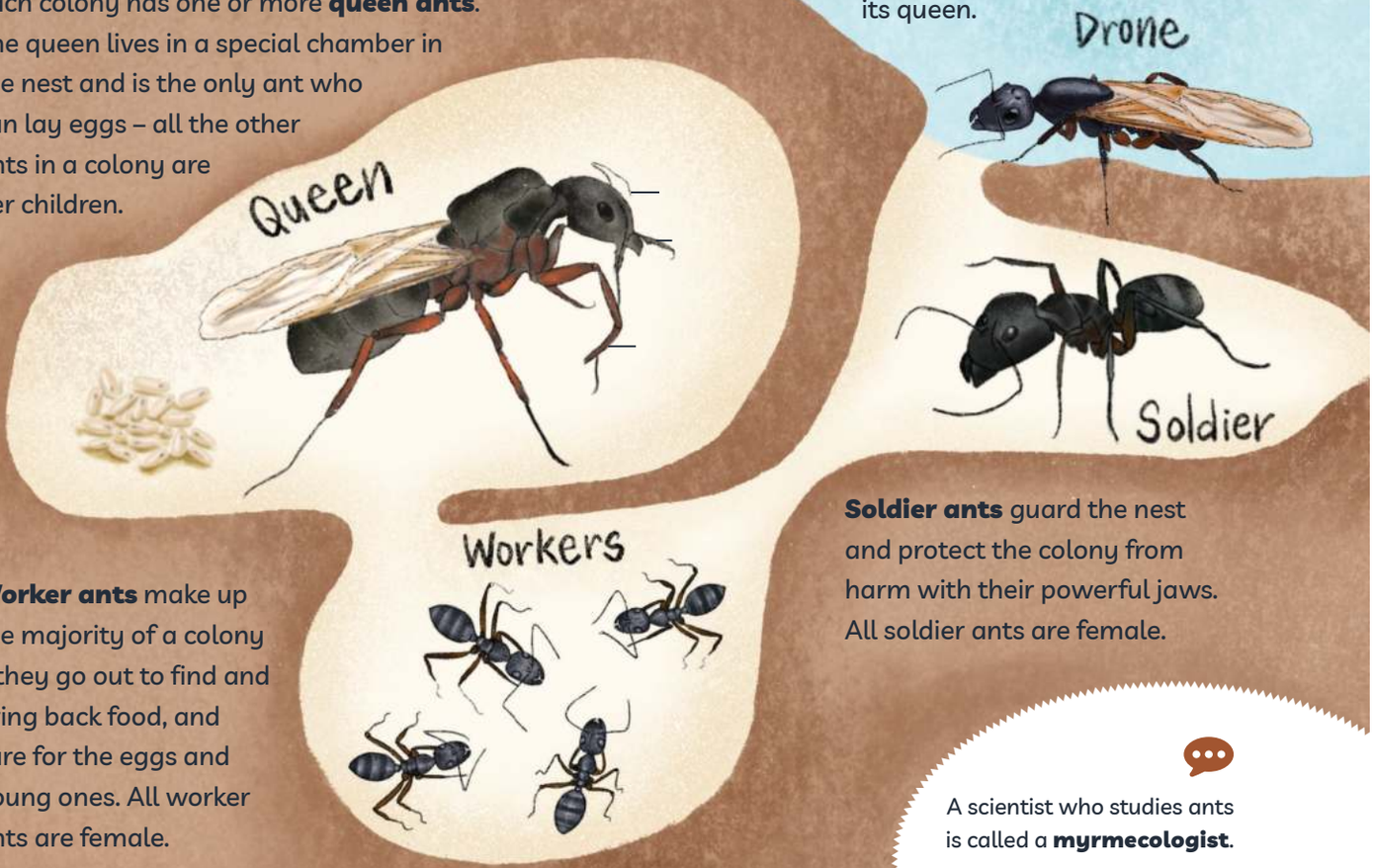
*Do other animals also use scents to communicate? Find out on **page 36**.*

Inside an ant nest

When observing an ant colony, you may have noticed that some ants from the same colony look different from each other. Some have bigger heads and mouthparts, and in the rainy season, you may even see winged ants! Most ant colonies have four types of ants, each with a specific responsibility.

Drones are winged male ants. When the time comes, the drone and princess ants fly out of the nest to mate. The drone dies soon after, while the princess sheds her wings and lays her eggs in a safe place to start a new colony, becoming its queen.

Each colony has one or more **queen ants**. The queen lives in a special chamber in the nest and is the only ant who can lay eggs – all the other ants in a colony are her children.



Worker ants make up the majority of a colony – they go out to find and bring back food, and care for the eggs and young ones. All worker ants are female.

Soldier ants guard the nest and protect the colony from harm with their powerful jaws. All soldier ants are female.

A scientist who studies ants is called a **myrmecologist**.

Have you ever seen a delicate circular spider web and wondered:

Do all spider webs look the same?

At first glance (before you get entangled), all spider webs may look similar. But their webs vary from simple flat sheets to silken cities! Not all spiders build webs, but they all have the ability to produce seemingly endless quantities of fine silk. Each spider can make several kinds of silk that it uses for different purposes – to wrap its prey, as a protective cover for its eggs, as an anchor, and even to lay scented trails for its mates to follow. And of course, spiders use their stickiest silk to trap insects and other prey in complex webs.

*

Most spiders are harmless to humans and would prefer to be left alone to catch insects in peace. It's best to avoid touching spiders or their webs!

When an insect flies into a spider web, it sticks to the silk, entangling itself as it tries to get free. The movements make the strands of the web vibrate, alerting the spider to exactly where the insect is. The spider scuttles smoothly across, its hairy legs protecting it from sticking to the silk. It bites the prey, injecting it with immobilising venom. Using a thicker silk, the spider wraps up its food – to be eaten immediately or later!

Spiders may be small, but they can travel large distances. Spiders shoot strands of silk into the air, which are caught by the wind that then whisks them off to new places. This is called **ballooning**.

You will need

Sheets of paper

A pencil

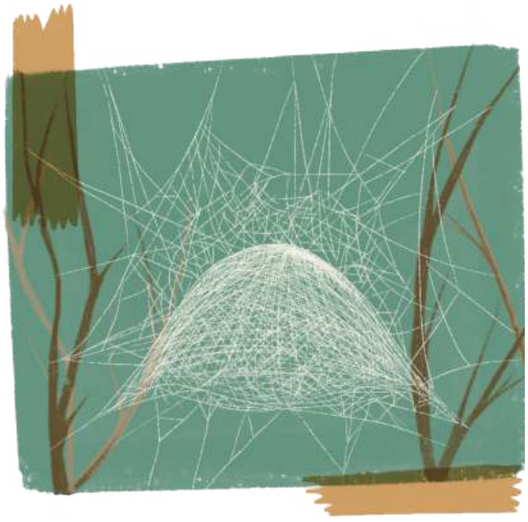
1 Take a walk in a nearby park, garden or an undisturbed patch of plants. Look carefully for signs of silken webs. You may find them on plants, grass or even on the ground.

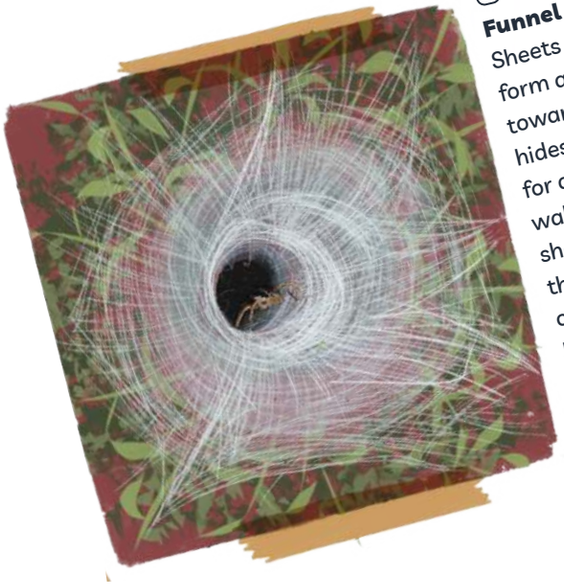
2 Observe each web you find. Based on what you know, what type of web is it? Tick the type of web you have seen. Draw and label each web – and don't forget to look for the spider!

☐ **Orb webs:** Most commonly found outdoors, and in movies and storybooks. These are neatly circular and have lines coming outward from the centre, like a bicycle wheel. The web is woven in a single spiral, and the silk lines are close together to catch flying insects such as bees and flies. Giant wood spiders can build orb webs up to a metre wide, strong enough to accidentally trap small birds that fly by! Signature spiders are a family of orb weavers that use a thick type of silk and weave an X at the centre of their webs.

☐ **Cobwebs:** Commonly found indoors – in the corners of ceilings or under furniture. These tangled webs are built by the commonly found long-legged house spiders to catch small insects such as flies and ants.

☐ **Tent webs:** Shaped like a dome or tent with a silken floor, commonly found among plants. The spider typically hunts from the top of the web. Some tent web spiders lay their eggs in a strand, much like a necklace, at the centre of the web.





☐ **Funnel and sheet webs:** Sheets of closely woven silk that form a funnel-shaped structure towards the back. The spider hides inside the funnel, waiting for an unsuspecting insect to walk across the extended silken sheet. When it feels the silk threads vibrating, it darts out, catches its prey and drags it back into the funnel.

☐ **Social webs:** Some spiders work together to build giant webs. These can host thousands of individuals who also share the prey caught in the web. Their webs can cover entire shrubs and sometimes, even trees!

While gazing up a towering tree, have you ever wondered:

What do plants eat?

From a tiny seed to a giant tree, plants continue growing throughout their lives. But how do they get all the nutrition required to grow so big without hands, mouths and being unable to move around?

You will need

- 3 spoonfuls of coriander (or mustard) seeds
- 3 identical containers filled with soil and compost (or moist soil from a garden or park)
- 2 cardboard boxes big enough to cover the containers
- A pair of scissors
- A marker pen or sticker

1. Sprinkle 1 spoon of seeds evenly into each container, and cover the seeds with a thin layer of soil. Sprinkle 2 or more spoons of water over the seeds, so that the soil remains moist. Place the containers on a windowsill or another place where they can get indirect sunlight.
2. All your seeds now have soil, compost, water and air. Mark the first container as 'Sunlit Seeds'.
3. Using the scissors, carefully punch 10–15 holes on one side of a cardboard box. Widen each hole using a pen so that your finger can fit through. Cover the second container with this box and mark it as 'Partly Sunlit Seeds'.
4. Cover the third container with the remaining box, making sure no light reaches the seeds. Mark the box as 'Sunless Seeds'.
5. Make sure to gently water all three containers everyday, but put the boxes back on the Partly Sunlit Seeds and Sunless Seeds immediately after watering them!
6. Continue to water and observe them until the Sunlit Seeds have grown into tiny plants a couple of inches tall with 2 leaves. Now, remove the boxes from over the other 2 containers and compare the growth.
7. After the experiment, you can harvest the plants by cutting the stems just above the soil. Use them in salads or other dishes!

Which set of seeds grew the most and which grew the least?

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Why do you think this happened?

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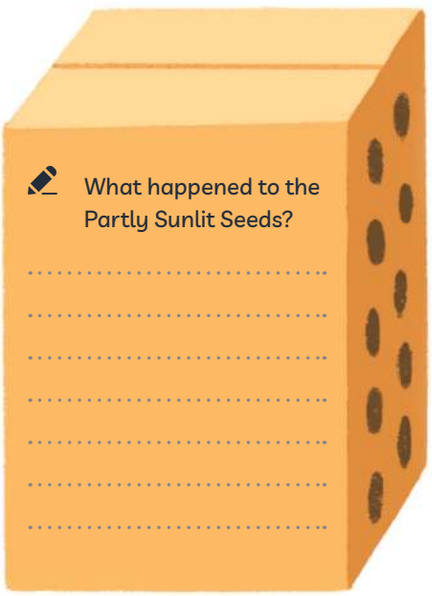

What happened to the Partly Sunlit Seeds?

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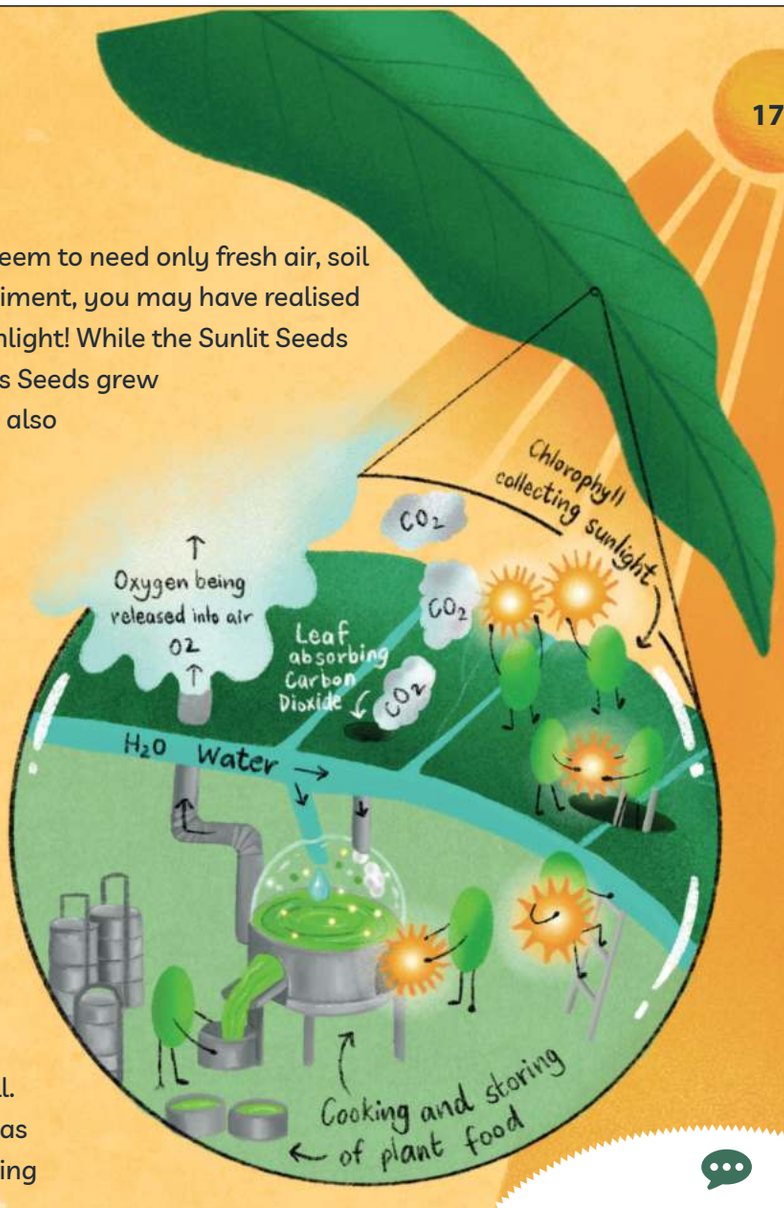
Air, water and sunlight!

Unlike humans and other animals, plants seem to need only fresh air, soil and water to grow. But through your experiment, you may have realised that there's something else they need – sunlight! While the Sunlit Seeds grew into leafy green seedlings, the Sunless Seeds grew very slowly, or maybe not at all. They may also have grown thin and white stalks without leaves. Between the two sets of seeds, the only difference was that one had sunlight and the other didn't! You may also have observed your Partly Sunlit Seeds leaning towards the side of the box with holes as they grew into baby plants. The tiny plants were growing towards the sunlight!



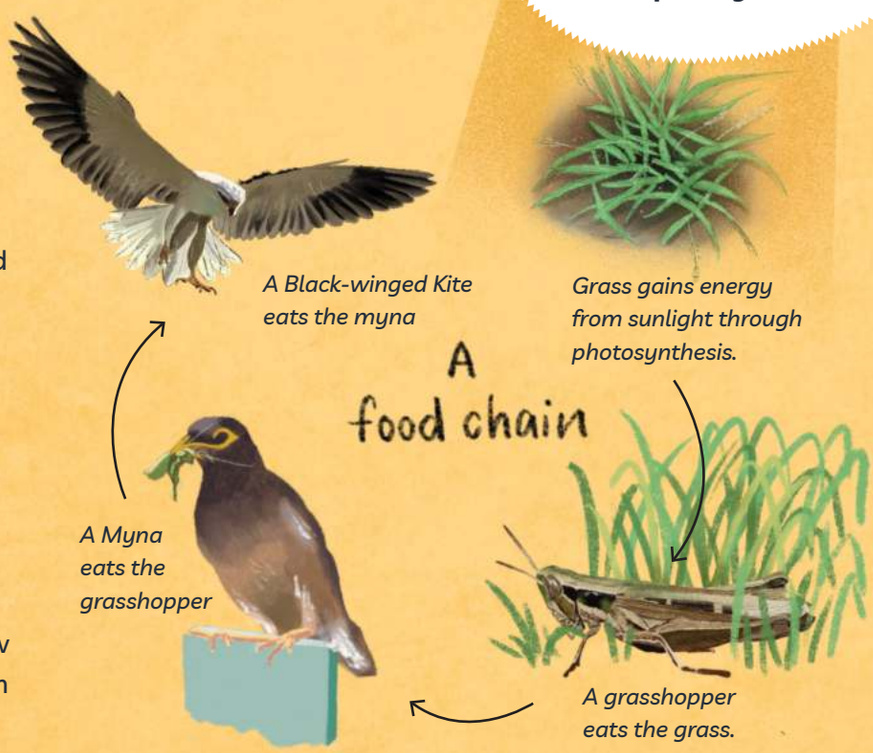
Why do plants need sunlight and how do they grow without eating? The answer: plants use sunlight to make their own food! The leaf is the plant's kitchen where all the magic happens. Using minerals from the soil, plants produce a green pigment called chlorophyll. Chlorophyll makes plants green and also has the important job of collecting sunlight. Using sunlight as energy, water from the soil and carbon dioxide from the air are cooked together to create plant food! During this process, plants release life-giving oxygen into the air.

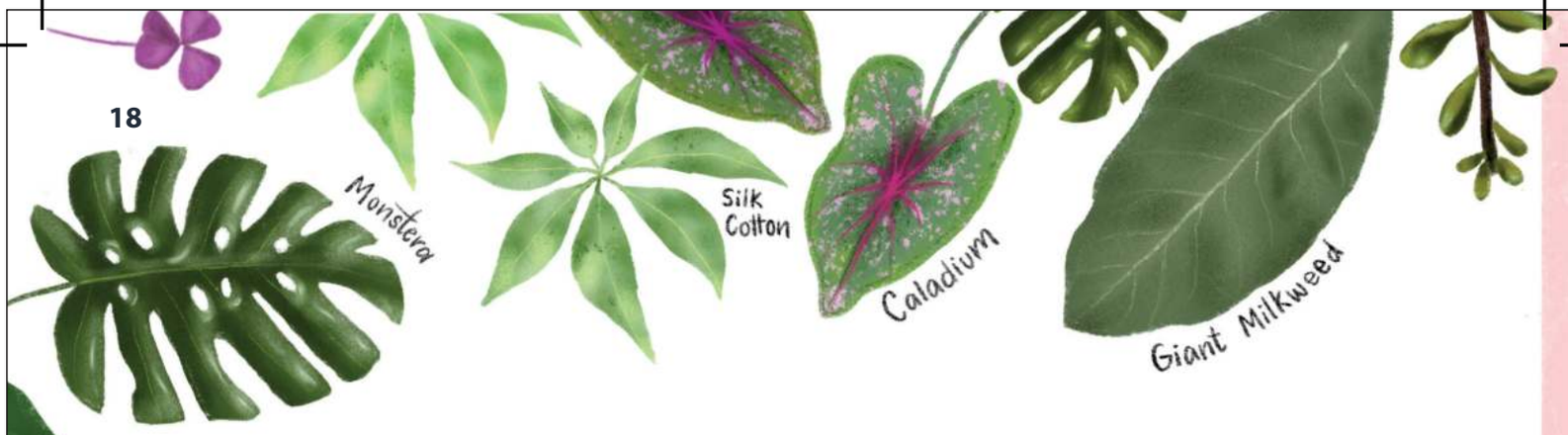
The process by which plants make their own food using water, carbon dioxide and sunlight is called **photosynthesis**.

From sunlight to you

All living beings need food to grow. As we have seen, plants use energy from sunlight to make their own food. Animals can't do this, so they eat plants for energy. Some animals, called herbivores, eat only plants. Others, called carnivores, eat animals who eat plants. Omnivores (like humans) eat plants and other animals.

The process of energy travelling from the sun to an animal's body is called the **food chain**. At your next meal, try to trace each ingredient back to sunlight. You might be surprised at how many steps it takes for the energy from sunlight to reach your plate!





Have you ever looked at a variety of plants and wondered:

Why do leaves look different from each other?

Leaves are where the magic happens in a plant – they take in carbon dioxide from the air, water and nutrients from the soil, mix in a little bit of sunshine and make plant food! But if all leaves do the same thing, why do they look so different from each other?

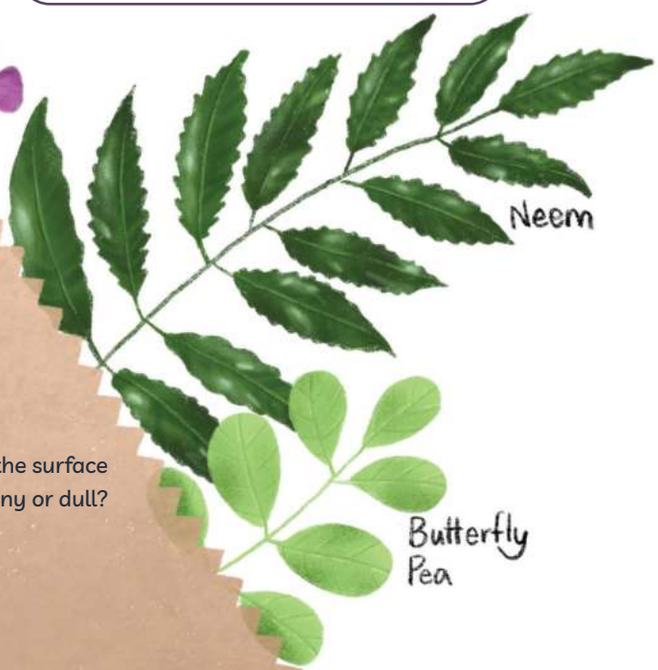
*

Some plants may have sticky, white sap that oozes out when a stem is injured and broken. Avoid contact with hands and eyes, and wash your hands.

What could this sap be?
Find out on ***page 36.***

You will need

A paper and pencil



1. Collect leaves from 5 plants around you. Try to make sure that they look as different from each other as possible in terms of colour, shape and size.

2. Create a simple observation sheet to compare the leaves, with the following information:

Trace the outline of the leaf and draw the pattern of the veins.	Length of the leaf in centimetres (cm) – measure along the central rib from base to tip.	Colour description – For both upper and lower surfaces, what colour are they most similar to?	Is the surface shiny or dull?

3. Try to find out what the plant is called – ask your friends, family members, and community workers like gardeners, domestic workers and security guards.

What do all these leaves have in common?

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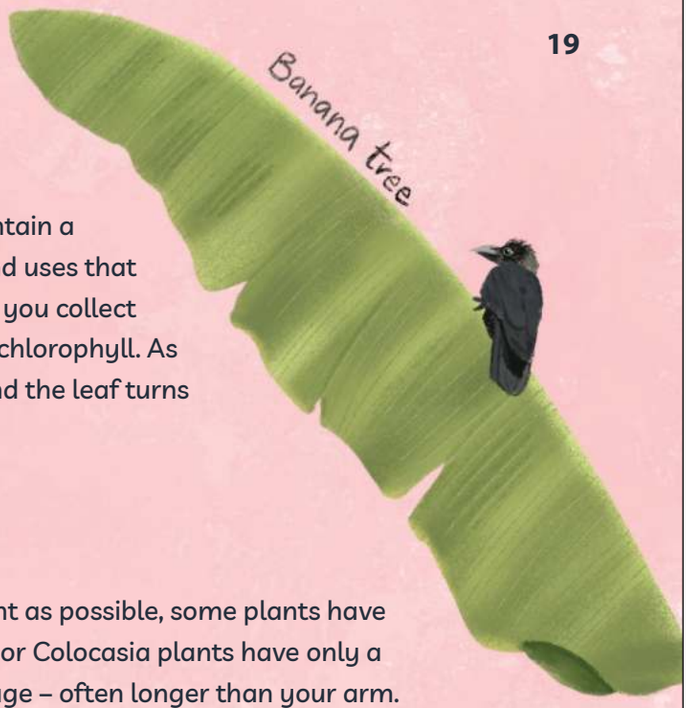
Colour me green

The leaves are often called the 'kitchen of the plant' – this is where all the ingredients mix to make plant food. Plants contain a green pigment called **chlorophyll** that absorbs sunlight and uses that energy to make food out of air and water. Even if the leaves you collect are mostly red, yellow, brown or purple, they contain some chlorophyll. As the leaves of a plant age or die, the chlorophyll degrades and the leaf turns yellow or brown.



Big and small

To soak up as much sunlight as possible, some plants have huge leaves. Banana trees or Colocasia plants have only a few leaves, but they are huge – often longer than your arm. Other plants like the Gulmohar tree have hundreds of leaves with thousands of tiny leaflets to help absorb sunlight.

Keeping the moisture in (and out!)

Plants draw water through their roots right up to their leaves. While observing your leaves, you would have noticed a pattern of lines – these are the veins of the leaves. They are like plumbing pipes that transport water through the leaf. Some of this water is used by the leaves to make food for the plants and the rest is released into the air.

A leaf made up of many tiny 'leaflets' joined to a single stem is called a **compound leaf**.

Some plants like the rubber tree have a shiny, waxy coating on their leaves to prevent drying. Shade-loving plants have softer, non-waxy leaves.

Plants like cacti and succulents grow in dry places and need to save as much water as they can. To protect the water stored in their stems, they have converted their leaves into spines.

Some plants have also adapted to handle heavy rainfall. Their leaves have developed narrow tips called drip tips, which let water roll off easily.

Plants shape their leaves so that they can make the maximum amount of food while staying healthy and comfortable in their surroundings – whether it's hot, cold, rainy or dry. In fact, if you move a plant from one space to another, it may shed all its leaves and grow new leaves to suit its surroundings better. Try moving an indoor plant outside to a space with soft sunlight and observe what happens over a few months!