

DK



# The Lifespan of a Plant



BUILD UP YOUR KNOWLEDGE



**For linked activities in Purple Mash go to:**

Plants Category





### Non-flowering plants

These are the oldest plants, and include ferns and mosses, which reproduce using spores. Conifers, which produce naked (not enclosed) seeds, also belong to this group.

#### Liverworts



*Common liverwort*

#### Mosses



*Star moss*

#### Hornworts



*Smooth hornwort*

#### Lycopods



*Stiff clubmoss*

# The plant kingdom

There are around 400,000 different types of plant, and botanists – scientists specializing in plants – discover new ones all the time. Hundreds of millions of years ago, the first plants were small and did not flower. Over time, the process of evolution created a fantastic range of plants, from simple ferns to stunning cherry blossoms and spiky cacti. To bring order to this incredible variety, botanists divide up plants into non-flowering and flowering plants. Within these categories, there are many species, and some of them are shown here.

#### Grasses



*Little bluestem*

#### Daisies



*Figaro dahlia*

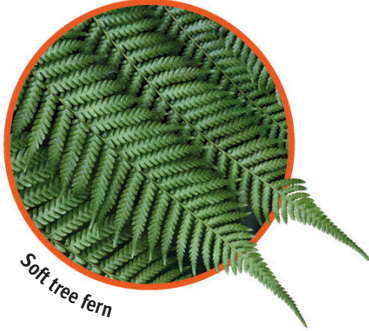


# PLANT KINGDOM

## Flowering plants

Angiosperms, or flowering plants, make up more than 90 per cent of all plants. They produce seeds that are protected by a hard casing.

### Ferns



Soft tree fern

### Gymnosperms



Lodgepole pine

### Angiosperms



Lupin

### Monocots

Monocots have just one seed leaf, which grows into a new plant. They often have long, narrow leaves. Grasses, orchids, and palms are examples of monocots.

#### Orchids



Vanda pink magic

#### Palms



Coconut palm

### Dicots

Dicots have two seed leaves, which appear together when a new plant starts to grow. They mostly have broad leaves. Dicots include daisies, roses, cacti, and legumes.

#### Roses



Chinese rose

#### Cacti



Old man of the Andes

#### Legumes



Snow pea





# What is a plant?

Plants come in all shapes and sizes – from tiny green mosses to giant trees – but almost all plants contain a green pigment called chlorophyll. This chemical harnesses the energy of sunlight to make the food (a sugar called glucose) that the plant needs to grow. As part of this process, called photosynthesis, plants take carbon dioxide gas from the air and turn it into food, while releasing oxygen, which all animals need to breathe.

**Flower** ▶ This colourful part of the plant contains the male and female cells that are responsible for producing seeds.



**Tendril** ▶ This plant has a specialized stem, called a tendril, which wraps round nearby objects, helping to support the plant.

## Not a plant



**Lichens**

A lichen is made up of algae and fungi living together. The algae help make food, while the fungi provide shade.



**Corals**

Corals are tiny, underwater animals with hard skeletons. To grow, they depend on algae in their tissues to make energy from sunlight.



**Algae**

Many algae are green, like plants, but do not have true roots, stems, and leaves. Algae can only live in water.



**Fungi**

Unlike plants, fungi get their food from the soil, or from other plants and animals on which they grow.





**Leaf** > This is the powerstation of a plant. Leaves use sunlight to make the energy the plant needs to grow.

**Stem** > The stem supports the plant. It can be short or tall, woody or non-woody.

## Cucumber plant

**Fruit** > A fruit contains the plant's seeds, protecting them from harm. Colourful fruits attract animals to eat them and then spread the seeds in their droppings.

## Flowering plant

This cucumber plant uses flowers to reproduce and make seeds for new plants. However, not all plants have flowers – simple plants, such as mosses and conifers, reproduce in other ways. It is sometimes difficult to tell what is a plant and what is not – seaweed and fungi, for example, are not plants.

**Root** > Plants use their roots to anchor themselves to the ground. Roots also draw water and nutrients from the soil to keep the plant alive.







# How do seeds grow?

Plants are rooted to the spot, so to reproduce and spread, flowering plants make seeds from which new plants grow. A seed contains a tiny young plant called an embryo, which lies dormant (inactive) until it senses the perfect conditions to germinate and grow into a new plant.

## The right conditions

Seeds need ideal conditions – warmth, air, and water – to germinate. Some need darkness to sense they are properly buried. Others need to detect light to know they are not buried too deep.



**Young shoot** ▶ Next a young shoot emerges from the seed, growing upwards until it breaks out of the soil. It quickly begins to make food using sunlight.

**Germination** ▶ A seed lies dormant until it detects moisture and warmth. It then absorbs water from the soil, and the seed springs to life, in a process known as germination.

**First root** ▶ Most seeds begin germination by sending a root downwards into the soil. The root absorbs water and nutrients from the soil, and passes them on to the developing shoot.

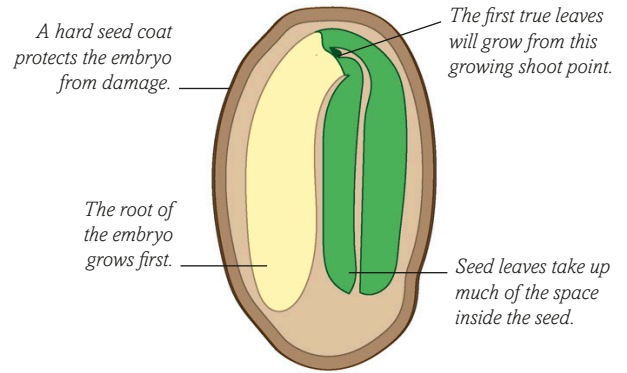






## Inside a seed

A seed is a perfectly packaged baby plant, called an embryo, protected by a hard outer coat. The embryo has a root and a shoot, and the first true leaves. It also has a food store for the embryo in “seed leaves”.



Inside a seed

## One leaf or two?

There are two main types of flowering plants, monocots and dicots, named for the number of seed leaves they have. Monocot seeds contain one seed leaf, while dicot seeds have two.

Two broad seed leaves grow out of a dicot seed.



Maize seed (monocot)



Germinating monocot seed

A single seed leaf emerges from the tip of the shoot.



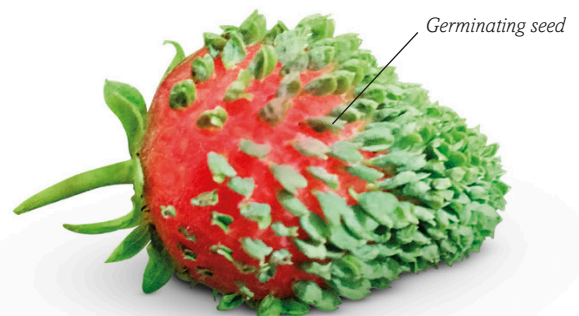
Haricot bean (dicot)



Germinating dicot seed

## Early germination

Sometimes seeds germinate before they have parted from their parent plant. This early germination may take the form of shoots growing on the outside of a fruit, as seen on this strawberry. In other fruits, shoots may even burst through the fruit wall from the seeds held inside.





# The life cycle of a plant

Flowering plants may have a lifespan of just months, or many years. A poppy will germinate, flower, set seed, and die within a year, and is known as an annual plant. Other flowering plants live for several years, building up the food reserves they need and storing it. These are called perennial plants. The harsher the climate, the longer it can take for a plant to complete its life cycle.



**8** The fruit develops and ripens. New seeds are dispersed by the wind and the cycle starts again.



**1** Seeds lie dormant (inactive) waiting for the right conditions to germinate.



**2** Germination begins when there is enough water, warmth, and light for the seeds to sprout their first root and then a shoot.



**3** Seedlings begin to produce leaves to gather light, and more roots to absorb water from the soil to help them grow.



**4** Flower buds develop. In plants that flower every year (annuals) such as poppies, the bud can form within a few weeks of germination.

## Late bloomer

High in the cold Andes Mountains of South America, the queen of the Andes plant grows very slowly. It takes more than 80 years to bloom and grows a massive flower spike nearly 10 m (30 ft) tall, with up to 30,000 flowers, dwarfing the surrounding plants. After shedding millions of seeds, it dies.

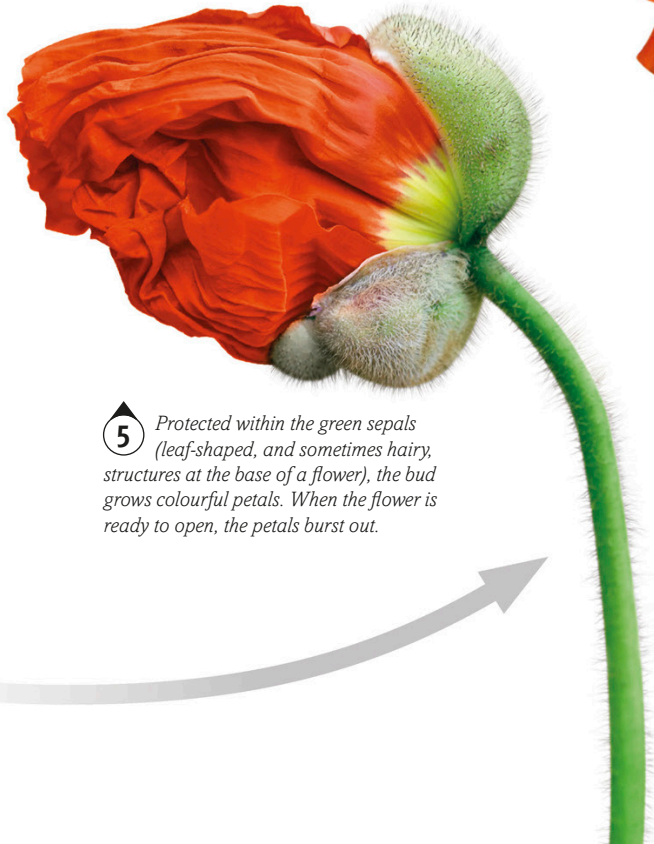




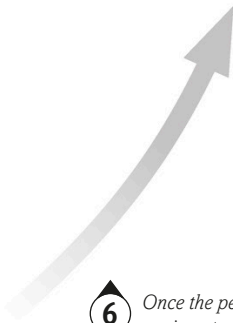
Poppy



7 As soon as a flower is pollinated, it sheds its petals. Seeds form inside the fruit.



5 Protected within the green sepals (leaf-shaped, and sometimes hairy, structures at the base of a flower), the bud grows colourful petals. When the flower is ready to open, the petals burst out.



6 Once the petals open up, insects, such as bees, are attracted to the sweet nectar inside and pollinate the flower.







# Plants and nitrogen

Plants use the energy of sunlight to turn carbon dioxide and water into the sugars they need to help them grow. To do this, they also need proteins that contain nitrogen. Although this vital gas makes up two-thirds of the air we breathe, plants cannot absorb nitrogen from the air. Instead, they rely on tiny organisms in the soil to make nitrates both from the nitrogen in the air, and from the decaying remains of living things.



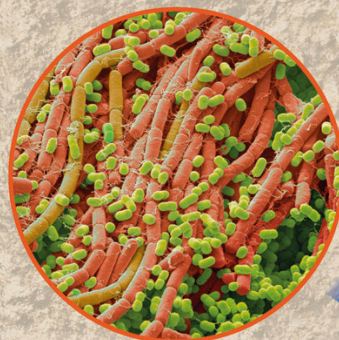
## Nitrogen cycle

All plants, animals, and other living things contain nitrogen. When they die, their remains are broken down by fungi and bacteria. This eventually forms nitrates, which plants can use to make proteins that can be eaten by animals. Nitrogen is recycled continuously between the air, soil, and living things in this way – a process called the nitrogen cycle.

**1** Nitrogen gas enters the soil from the air. Lightning can also change nitrogen gas into nitrates.

**2** Some bacteria in the soil can change nitrogen gas into ammonia, which can be turned into nitrates. Similar bacteria, called nitrogen-fixing bacteria, live in the roots of plants such as peas.

**3** Plants absorb nitrates dissolved in the water that their roots soak up from the soil. They use the nitrates to make the proteins essential for growth.



Nitrogen-fixing bacteria





## Nitrogen deficiency

If a plant is short of nitrogen, it cannot make enough protein and does not grow properly. It also cannot make enough of the chlorophyll that makes its leaves green, and the edges of its leaves turn pale or even yellow.



Nitrogen-deficient grape leaf

4 Animals, such as cows, eat plants. They digest the plant proteins to make the animal proteins their bodies need.

5 Animal waste, such as dung and urine, returns nitrogen-containing compounds that can be turned into nitrates to the soil.

7 Some kinds of bacteria in the soil turn nitrates back into nitrogen gas, which is released into the air.

6 Some fungi and bacteria living in the soil feed on animal waste, or on the decaying remains of dead animals and plants. They break down nitrogen-containing compounds to release nitrates into the soil.

Decomposing fungi





# What is a flower?

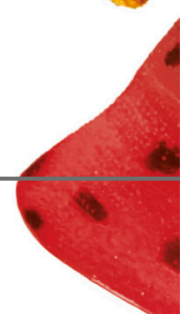
Many plants rely on animals, such as bees and hummingbirds, to help them reproduce. To attract these animals, many plants have flowers that are brightly coloured, have a sweet scent, and produce a sugary nectar for them to eat. When the animal visits the flower to find the nectar, it becomes covered in pollen. The animal, known as a pollinator, then transports the pollen to another flower.



**Stigma** > This is the female part of the flower and has either a sticky tip or fine hairs to trap pollen.



**Pollen** > The fine yellow grains of pollen, found on a tubular structure called an anther, contain the plant's male sex cells.

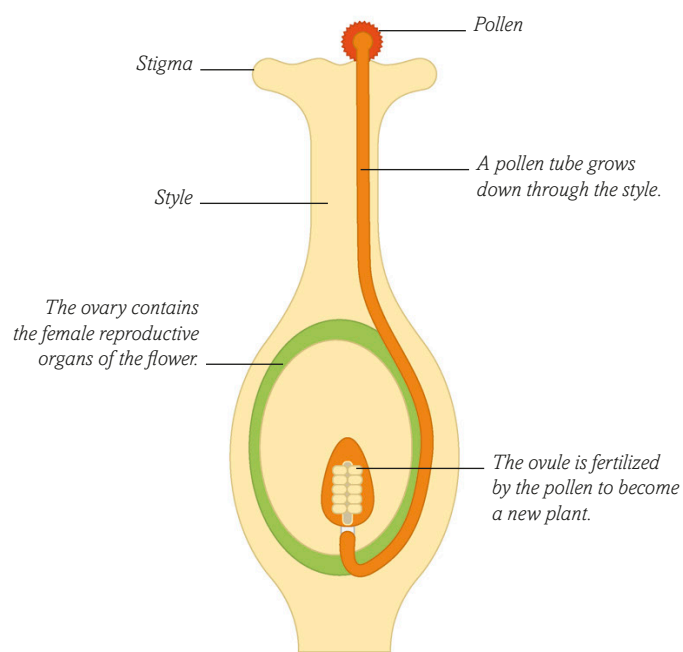


**Stamen** > Each stamen has a long filament with an anther on the top where the pollen is produced.



**Petals** > Colourful, often scented, petals attract pollinating animals to the flower. Petals come in all shapes and sizes, and often look brighter to insect eyes than to human eyes.

## Fertilization

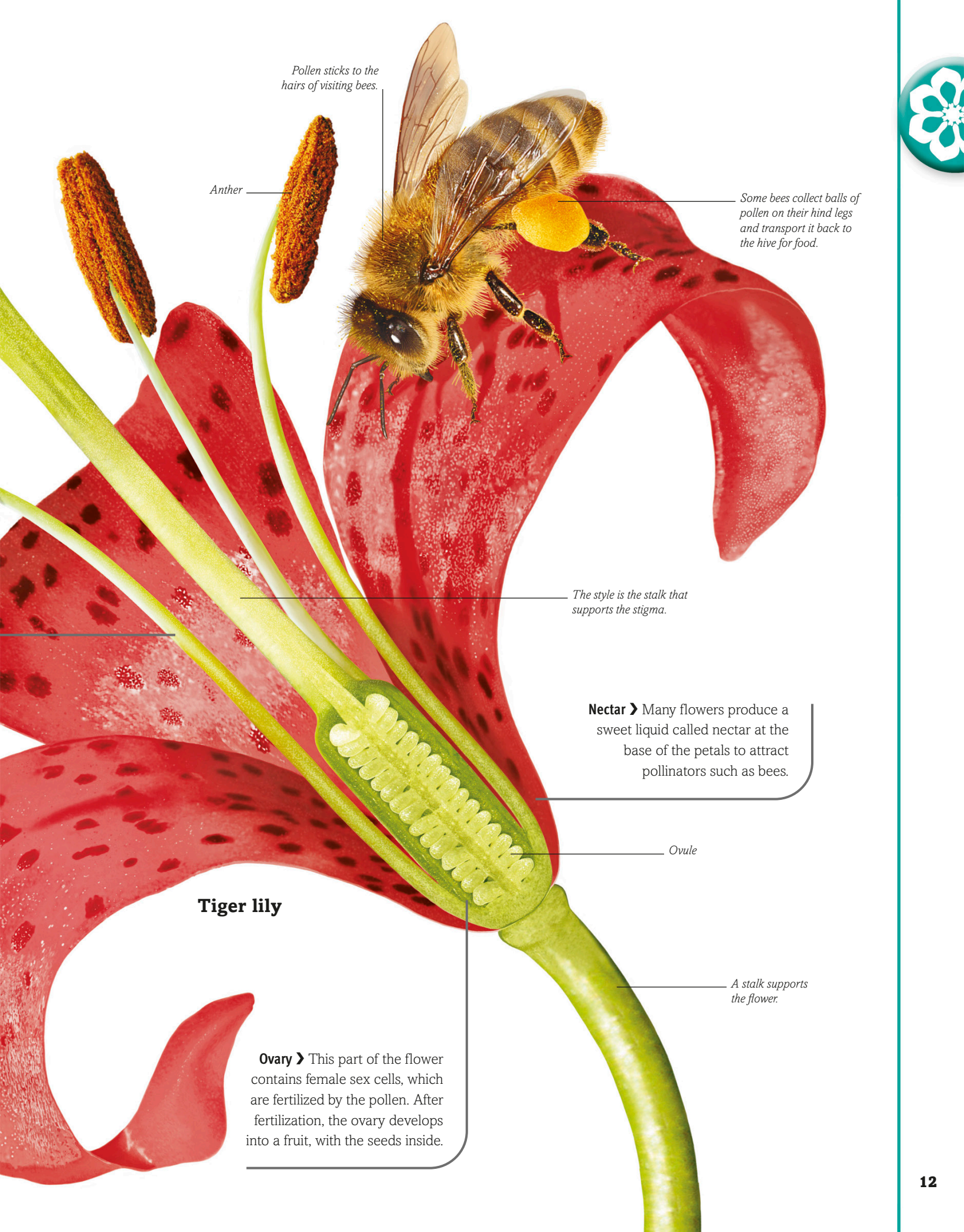


When pollen lands on the stigma of a flower, it grows a tiny tube that travels down through the style taking the male pollen cells to the ovary. Here, the male cells join with female cells in the ovules, which will become the seeds. This process is called fertilization.

## Pollination

A tiger lily has colourful petals and sugary nectar for animals such as this bee to eat. As it feeds, the bee brushes against the pollen, which sticks to its body. Pollen contains male cells. When the bee visits another tiger lily, the pollen will brush onto the new flower's stigma, and grow towards the female cells. This is called pollination.





Pollen sticks to the hairs of visiting bees.

Anther

Some bees collect balls of pollen on their hind legs and transport it back to the hive for food.

The style is the stalk that supports the stigma.

**Nectar** > Many flowers produce a sweet liquid called nectar at the base of the petals to attract pollinators such as bees.

Ovule

### Tiger lily

**Ovary** > This part of the flower contains female sex cells, which are fertilized by the pollen. After fertilization, the ovary develops into a fruit, with the seeds inside.

A stalk supports the flower.

## Acknowledgements

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