The cover features a composite illustration. In the background, a human heart is shown with its network of blue and red blood vessels. In the foreground, a large, detailed lily flower with orange and red spots is in bloom, with a bumblebee perched on one of its petals. The bottom portion of the cover shows a vibrant coral reef with various colors of coral.

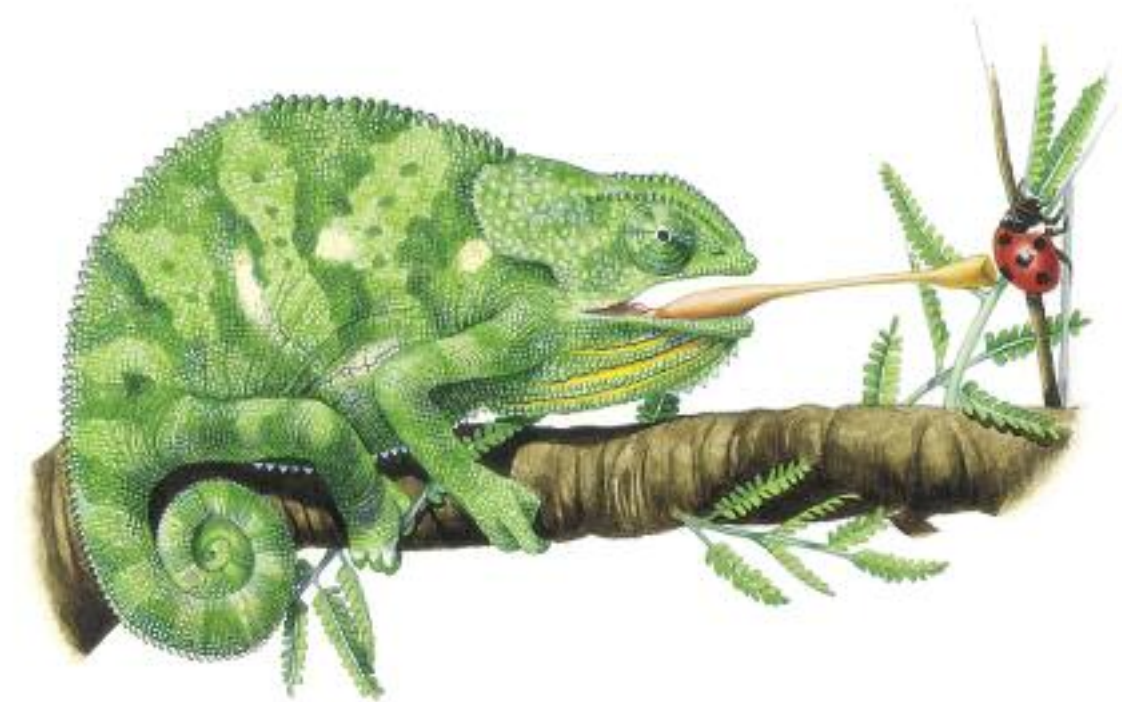
CHILDREN'S
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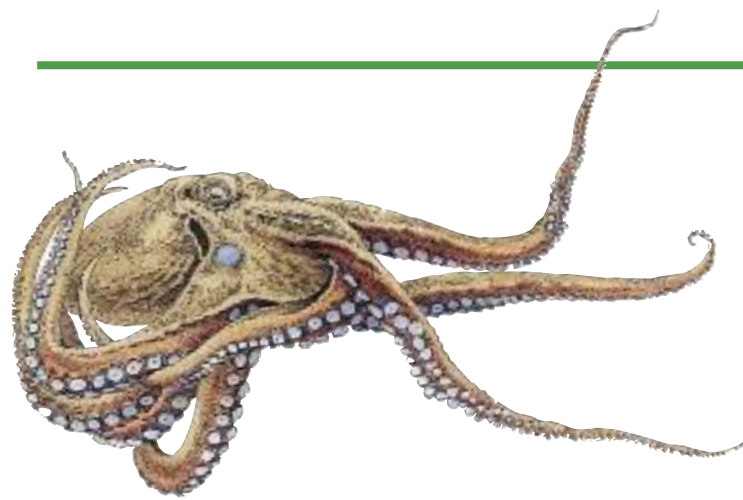
Animals • Plants • Human body

CHILDREN'S
LIVING WORLD
ENCYCLOPEDIA



CHILDREN'S LIVING WORLD ENCYCLOPEDIA





Created and produced by Claire Aston, Nicholas Harris, Sarah Hartley, Katie Sexton, Ruth Symons, Joanna Turner and Erica Williams
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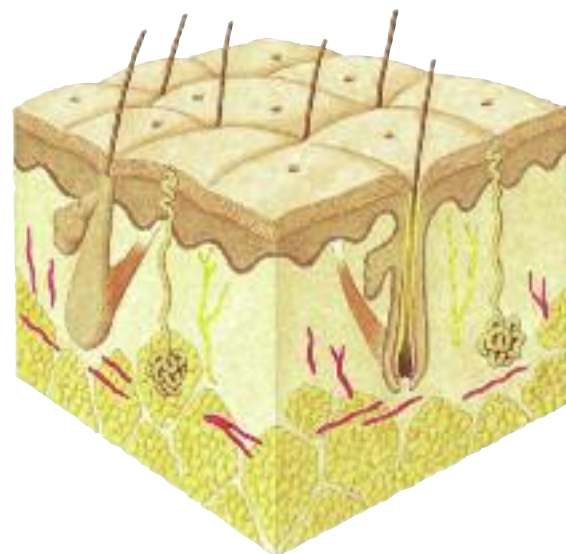
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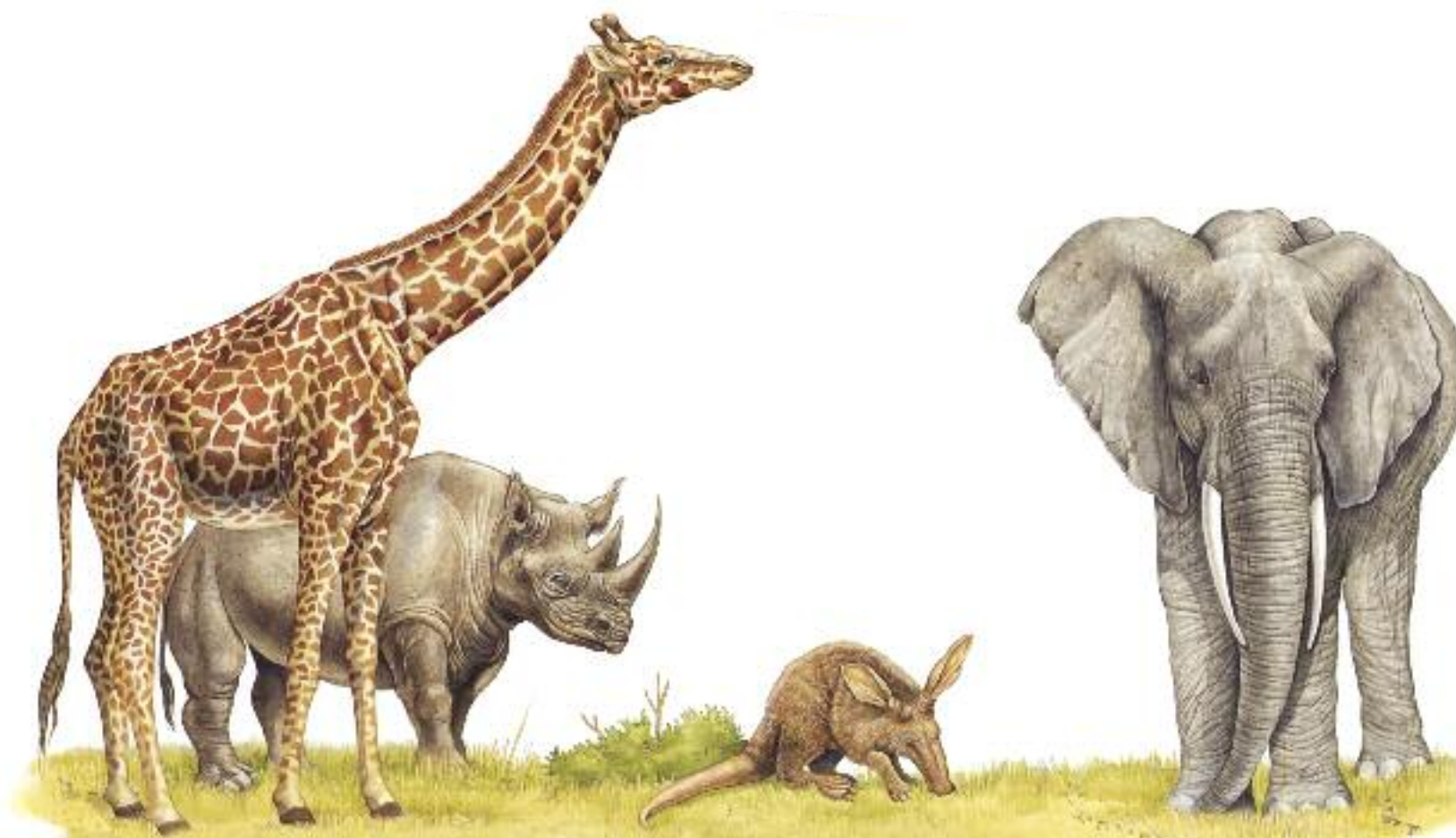
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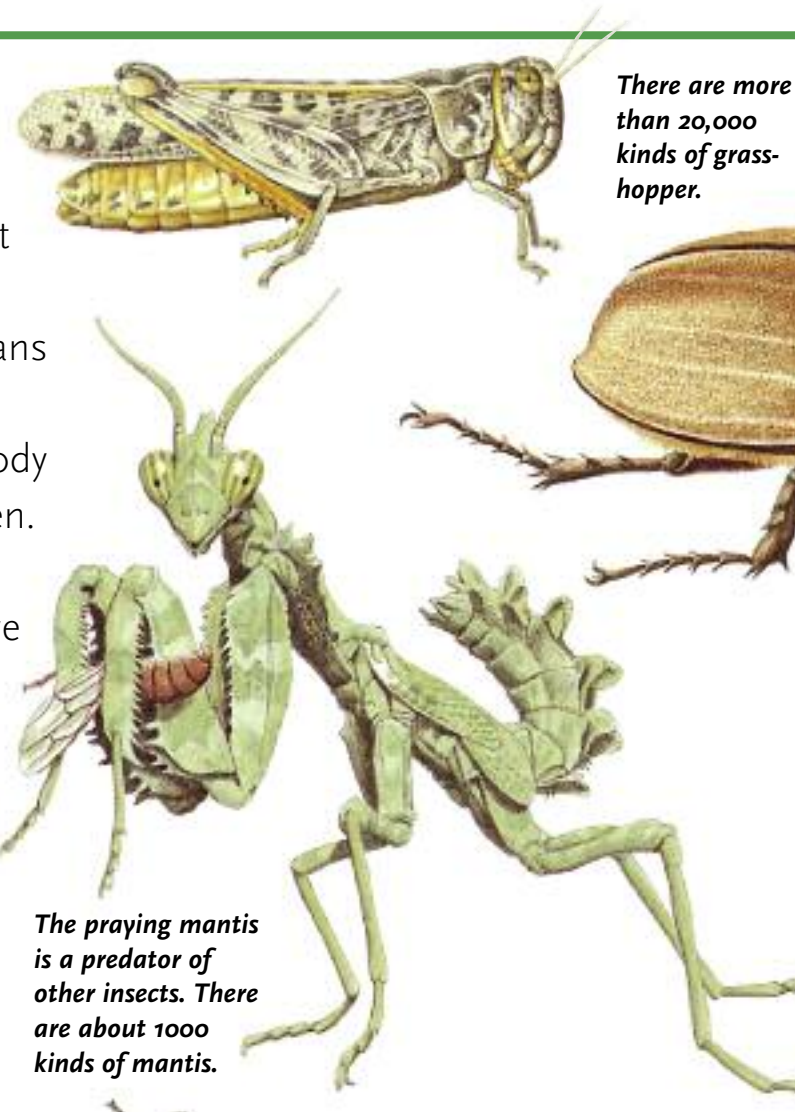
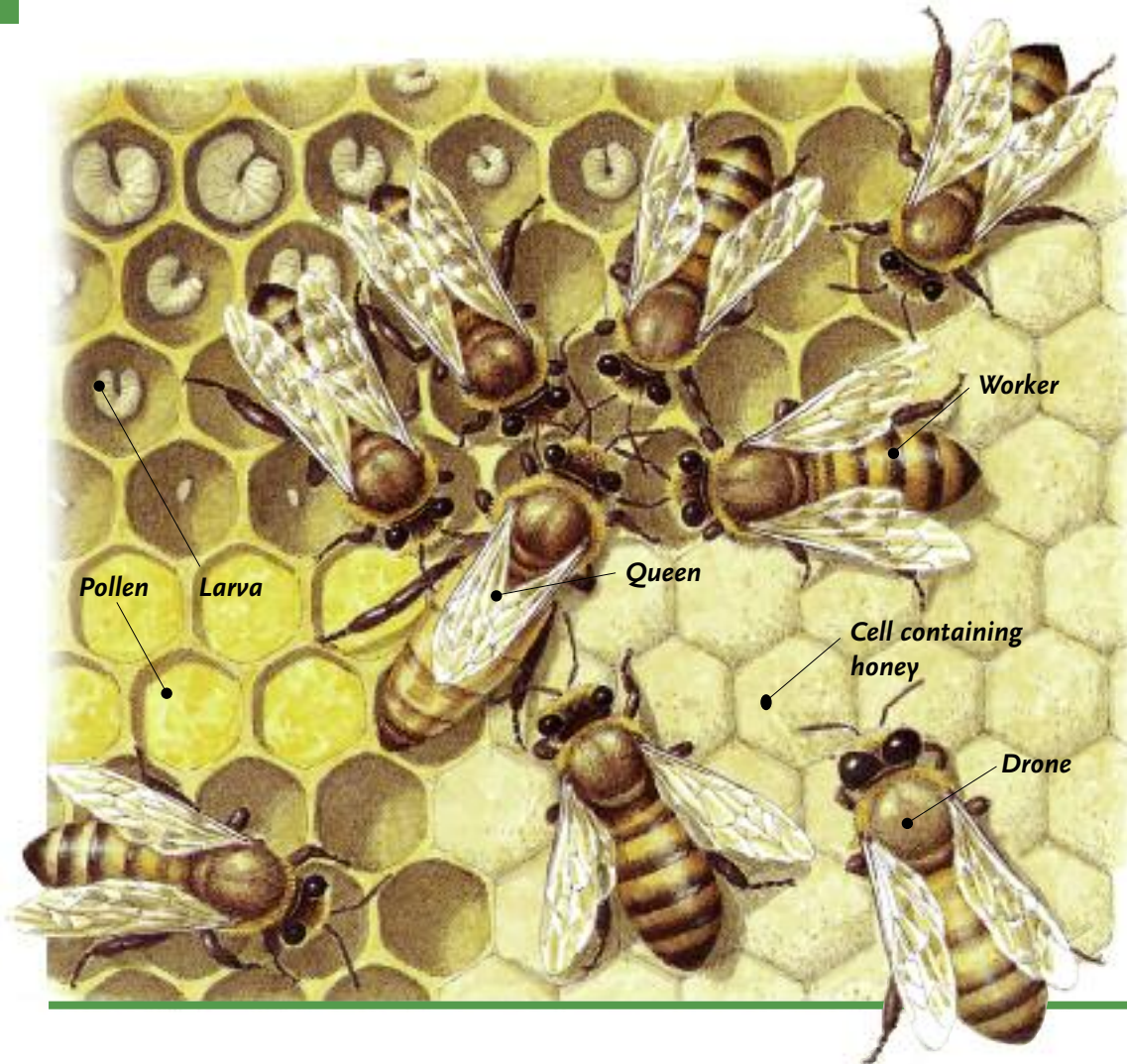


INSECTS

THERE ARE more different kinds of insect than of any other group of animal. They are found every-where except in the oceans and polar ice.

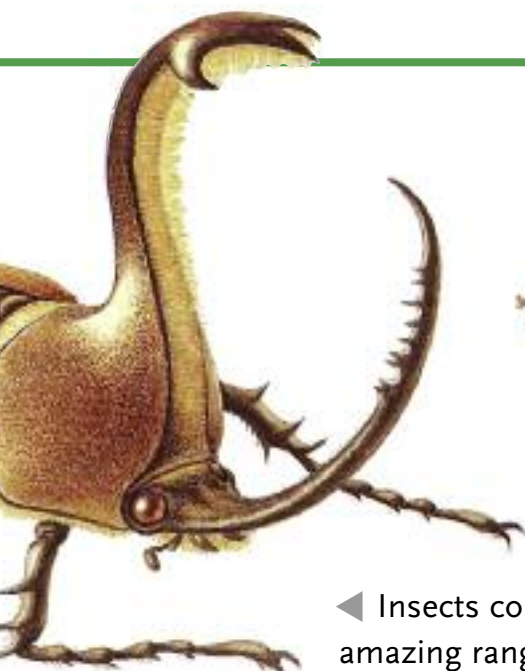
Insects have three pairs of legs and three body sections: the head, the thorax and the abdomen. Most insects have wings. They do not have a skeleton inside their body but instead they have a tough outer layer of "armour". They breathe through tiny holes in their sides.

Insects are born and develop in two different ways. Some insects hatch out from eggs looking like miniature adults. These are known as nymphs. Others hatch out as larvae and then later on change completely to become adults.



There are more than 20,000 kinds of grasshopper.

The praying mantis is a predator of other insects. There are about 1000 kinds of mantis.



A male rhinoceros beetle uses its horns to fight other males.



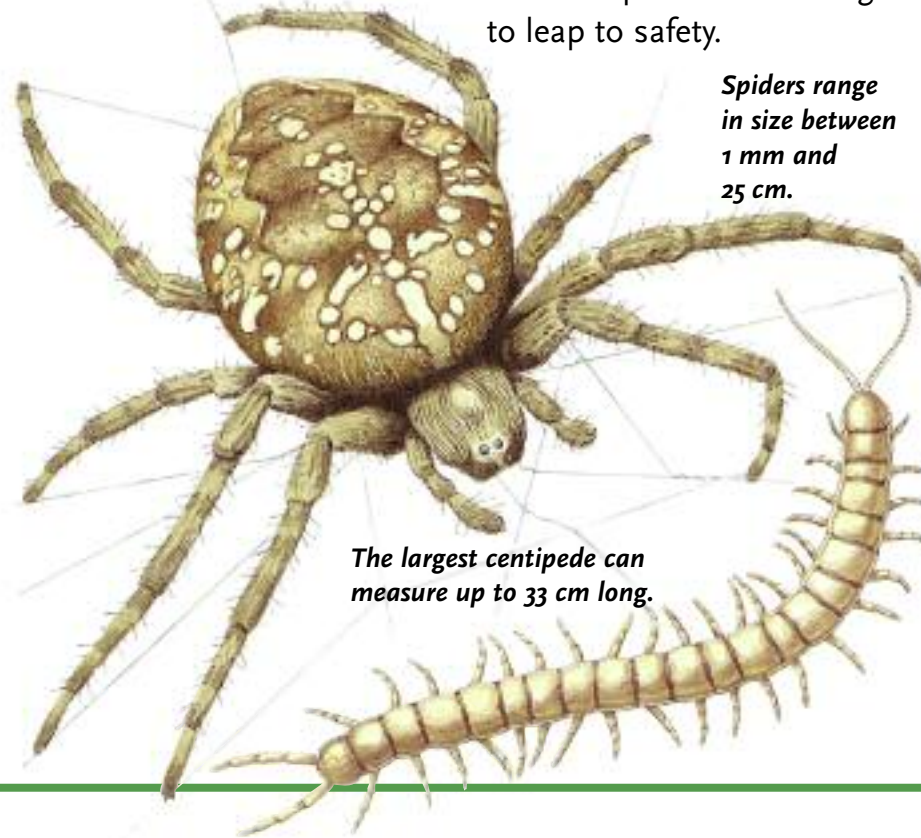
Normally only 1-2 mm long, most fleas live in the fur of mammals. They often carry diseases.



There are more than 5,000 different kinds of shield bug, so called because of their shape.

◀ Ants, termites and some wasps and bees live in groups called colonies. In a honeybee colony, the queen bee is the only one who lays eggs. All the other females are called workers. They build the nest and collect food. Male bees, or drones, do no work, but one will mate with the queen. The nest consists of wax combs with tiny six-sided holes, or cells. Here, the eggs hatch into larvae that later become adult bees. Also stored in the cells is the bees' winter food, honey made from flower nectar, and pollen.

◀ Insects come in an amazing range of shapes and sizes. The gigantic rhinoceros beetle can lift more than 800 times its own weight. The tiny flea can jump more than 100 times its own length. Some insects are killers. With its huge eyes and razor-sharp front legs, the praying mantis is a ferocious predator. To defend itself, the shield bug squirts out a terrible-smelling fluid. Grasshoppers and locusts use their powerful back legs to leap to safety.



Spiders range in size between 1 mm and 25 cm.

The largest centipede can measure up to 33 cm long.

BUTTERFLIES AND MOTHS



Swallowtail butterfly



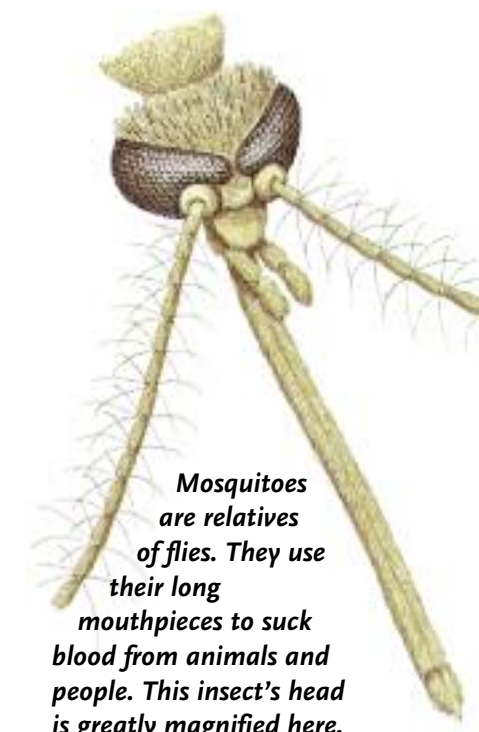
Hawkmoth

BUTTERFLIES and moths are flying insects with scaly wings and stalk-like feelers on their heads, called antennae. Butterflies usually fly during the daytime, moths at night. Moths' antennae sometimes have feathery branches. Butterflies and moths begin life as larvae, called caterpillars (below, 1). They feed constantly until fully grown. Then they spin a hard case (a chrysalis, 2) around themselves and their bodies change inside it. Finally, after a few weeks, an adult breaks out of the chrysalis (3).



◀ Not all creepy-crawlies are insects. Spiders and scorpions belong to a group called arachnids. All arachnids have four pairs of legs and only two body sections. Many spiders spin sticky webs to trap flying insects. They use a very strong substance called spider silk that they make inside their bodies.

Centipedes and millipedes are not insects, either. Their many pairs of legs are useful for burrowing into the soil.



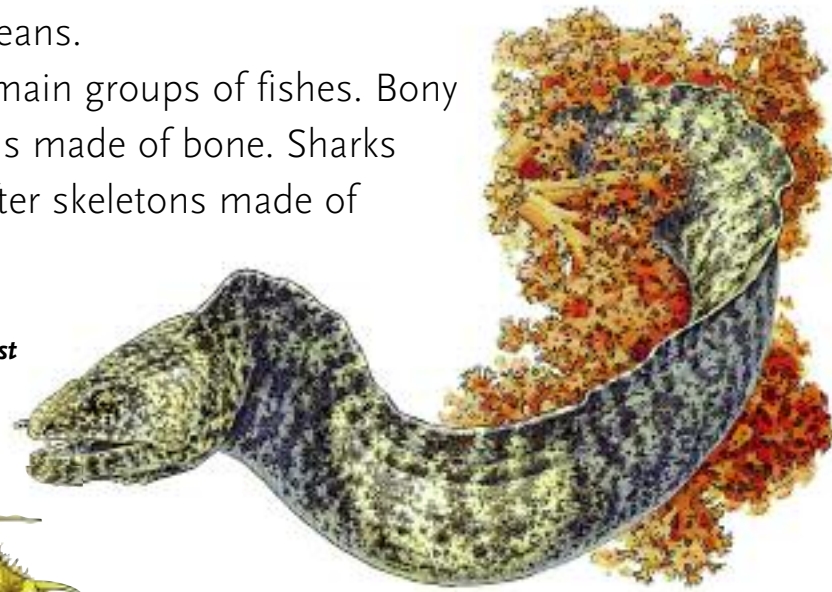
Mosquitoes are relatives of flies. They use their long mouthpieces to suck blood from animals and people. This insect's head is greatly magnified here.

FISH

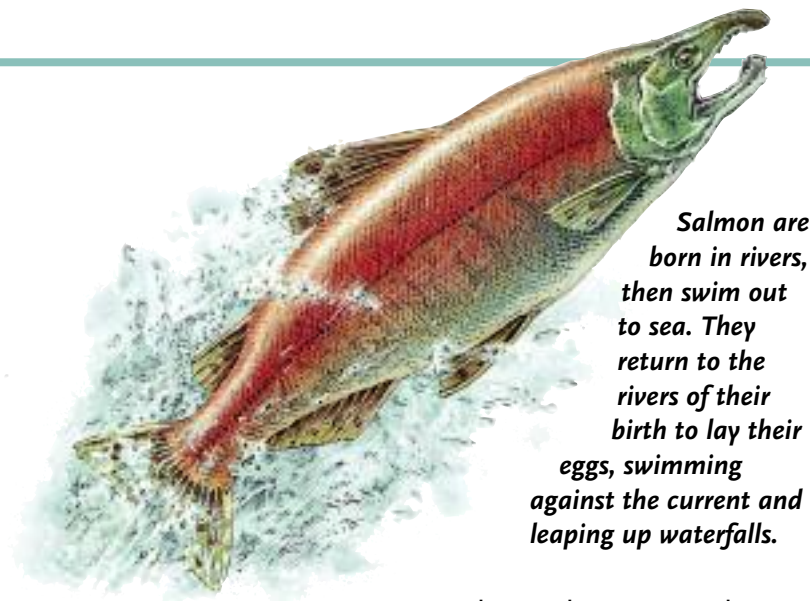
FISH live in water, but unlike other water-dwellers—mammals such as whales, or reptiles such as turtles—they do not breathe air. Instead, they use their gills to take in oxygen from the water around them. Fish have fins and tails, and many are covered with scales. Most fish lay eggs but some, like sharks, give birth to live young. There are some kinds of fish that live in fresh water—rivers and lakes—and others that live in the oceans.

There are two main groups of fishes. Bony fish have skeletons made of bone. Sharks and rays have softer skeletons made of cartilage.

A moray eel. The largest kinds can grow up to three metres long.

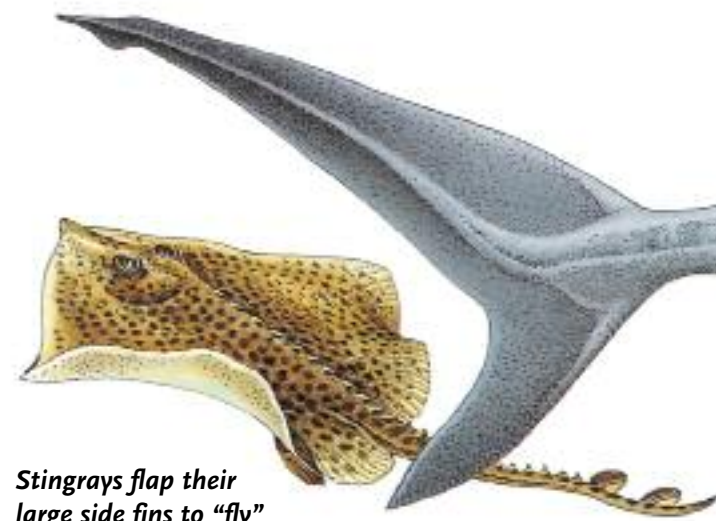


◀ Seahorses are very strange-looking fish. They swim slowly through shallow waters in an upright position. In fast-moving water, they hang on to vegetation with their long tails. Seahorses, which are thought to mate for life, have an unusual way of giving birth. The female puts her eggs into a pouch on the male's body. There they develop until one day the male "gives birth" to 50 or more baby seahorses!

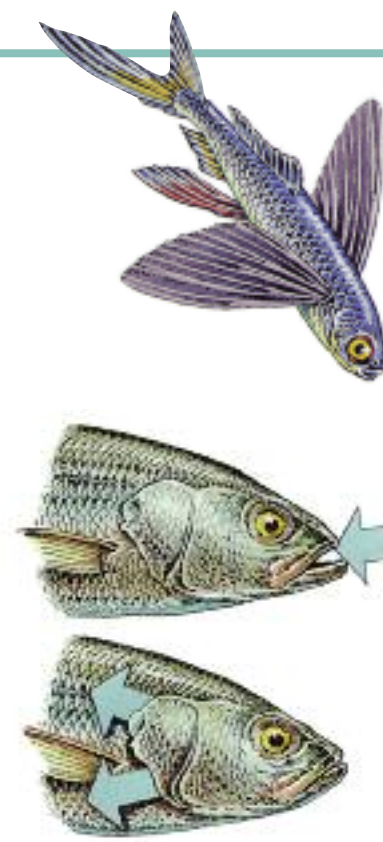


Salmon are born in rivers, then swim out to sea. They return to the rivers of their birth to lay their eggs, swimming against the current and leaping up waterfalls.

▼ Fish can be extremely dangerous creatures. Some are poisonous while others have a deadly bite. Moray eels hide in holes between rocks and shoot out to grab their prey with their sharp teeth. Stingrays have long, thin tails that they whip round to drive a venomous, sharp spike into their attackers. The stone-fish is the most poisonous fish in the world. The venom in its spines can kill humans. Tiger sharks are one of the few species of shark that actually kill and eat humans. They are large, powerful fish with huge jaws and teeth.

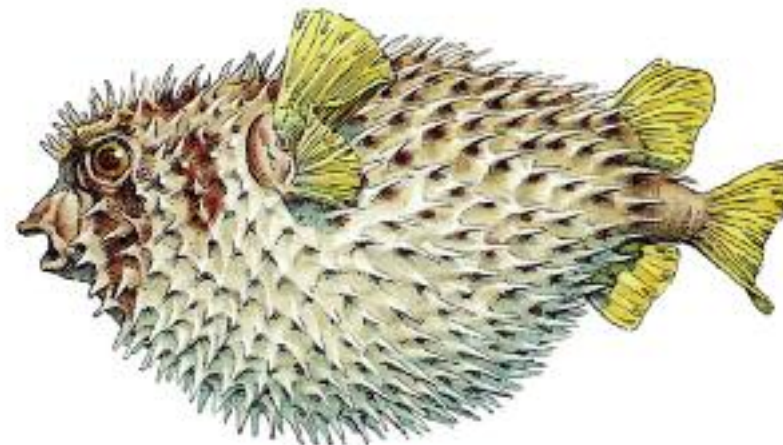


Stingrays flap their large side fins to "fly" through the water.



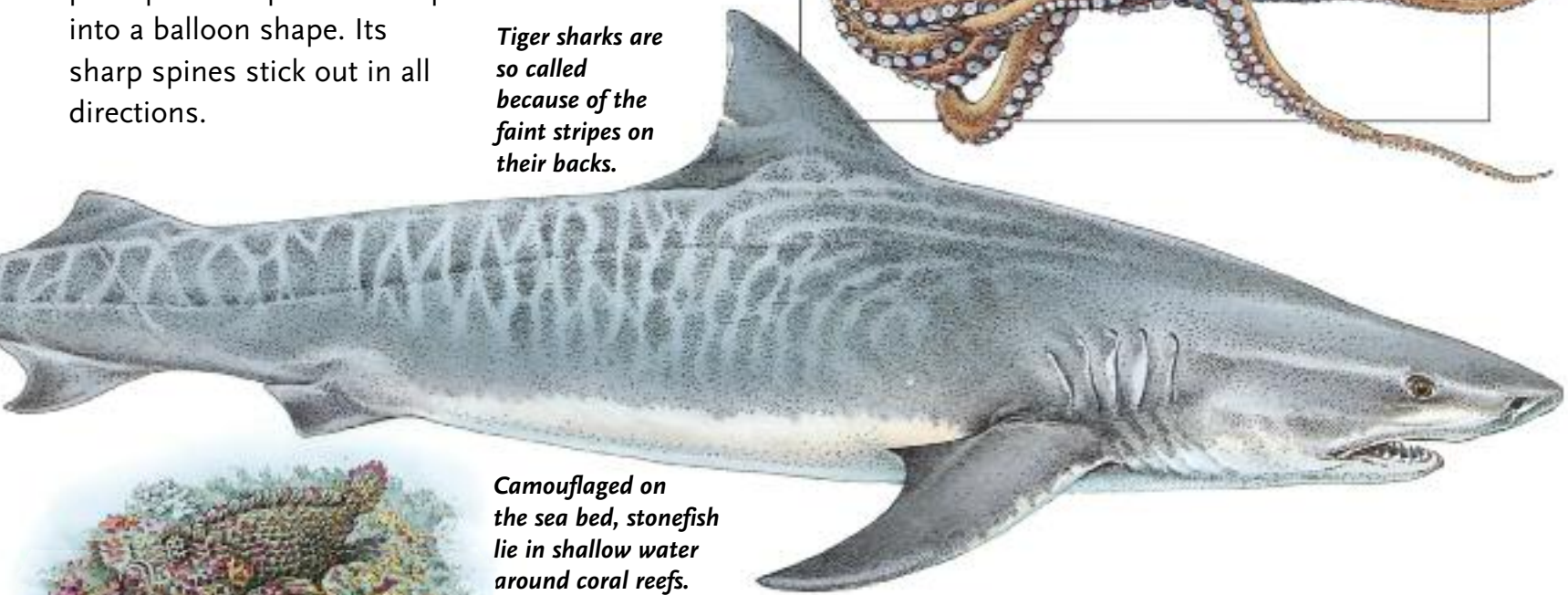
◀ Flying fish leap into the air to avoid predators. They use their large, wing-like fins to glide over the surface of the water. A flying fish can cover up to 90 metres in one "flight".

◀ Just like other animals, a fish needs to breathe in oxygen. It has a special way of taking the oxygen from the water. It allows water into its mouth. Then slits in either side of its head, called gills, strain out the oxygen as the water passes through them.



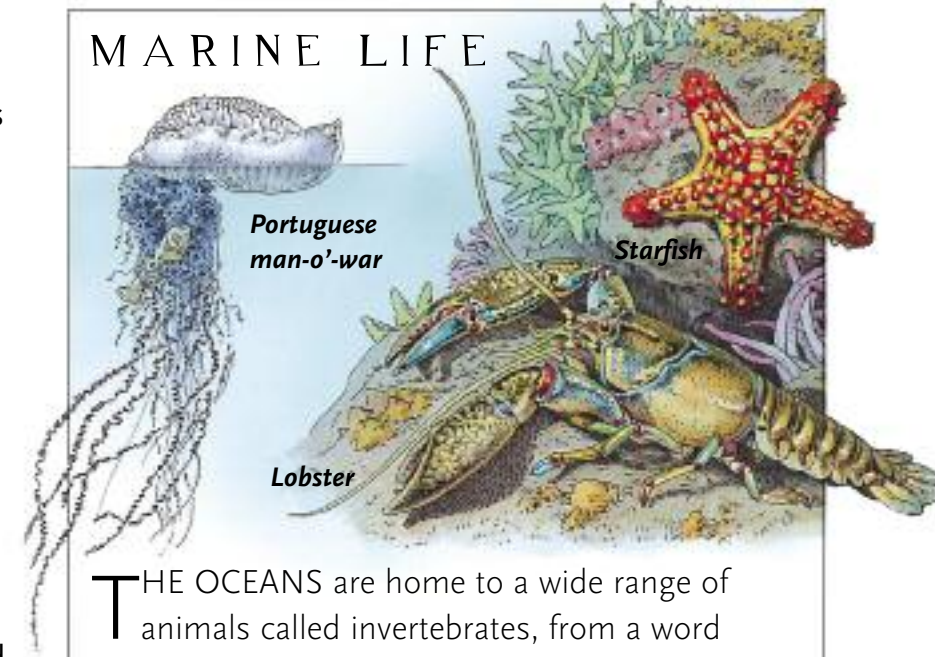
▲ When threatened, the porcupine fish puffs itself up into a balloon shape. Its sharp spines stick out in all directions.

Tiger sharks are so called because of the faint stripes on their backs.



Camouflaged on the sea bed, stonefish lie in shallow water around coral reefs.

MARINE LIFE

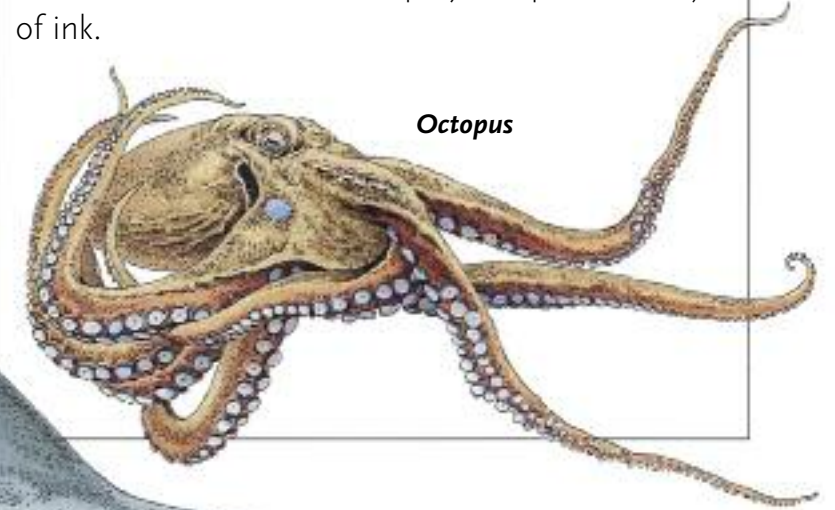


Portuguese man-o-war

Starfish

Lobster

THE OCEANS are home to a wide range of animals called invertebrates, from a word meaning "without a backbone". There are crustaceans, such as crabs, lobsters and shrimps, which have hard outer parts for protection. Jellyfish, such as the Portuguese man-o'-war, have long, stinging tentacles to kill fish. Starfish use their five suckered "arms" to prise shellfish apart. The eight-legged octopus, a mollusc, can change colour to blend in with its surroundings. To confuse both attackers and prey, it squirts out a jet of ink.



Octopus

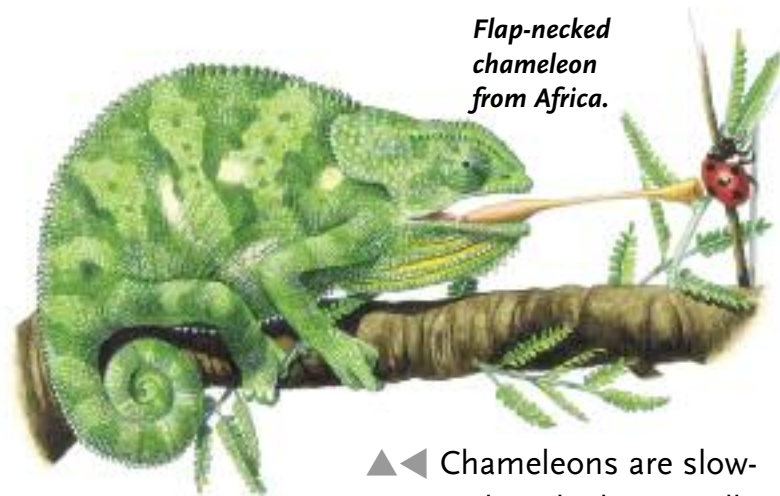
REPTILES AND AMPHIBIANS

MILLIONS of years ago, reptiles dominated the land, seas and skies. Some modern kinds have hardly changed since the days of the dinosaurs. There are four main groups of reptile: snakes, lizards, crocodiles and alligators, and turtles and tortoises.

Because they are cold-blooded animals, reptiles need to warm up in the sun before they have enough energy to move around. Reptiles have hard, scaly skins. They usually lay eggs, although some snakes and lizards give birth to live young.



Komodo dragon from Indonesia.



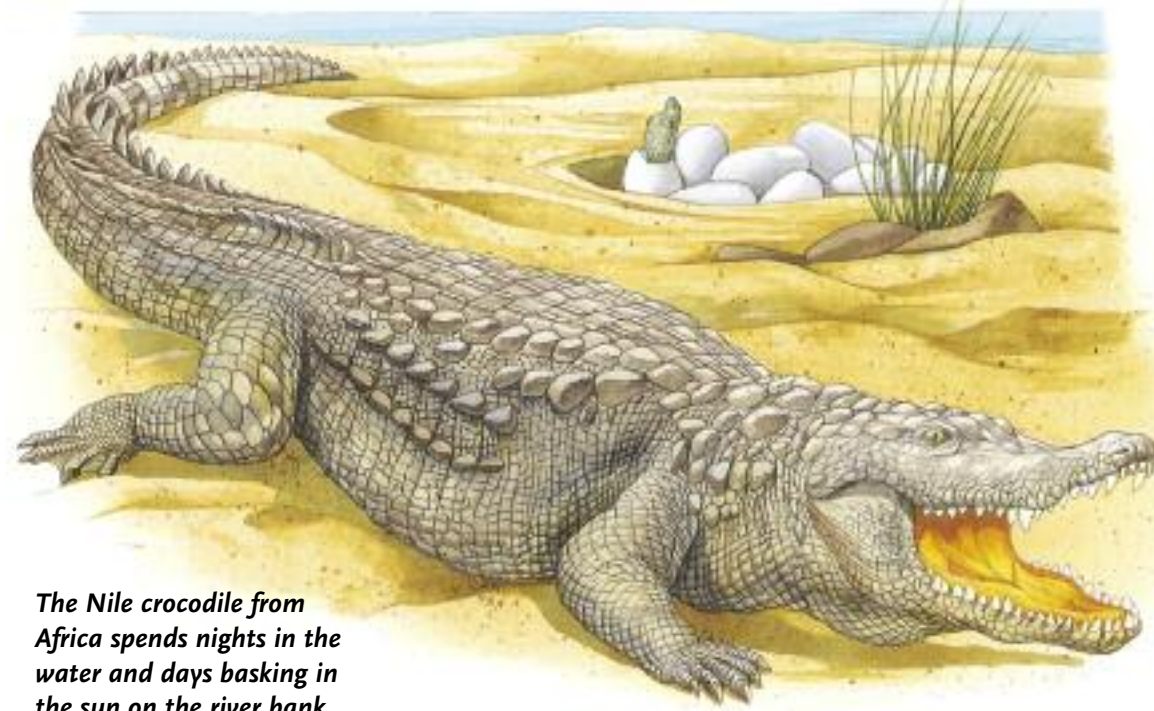
Flap-necked chameleon from Africa.

Common gecko from south-east Asia.

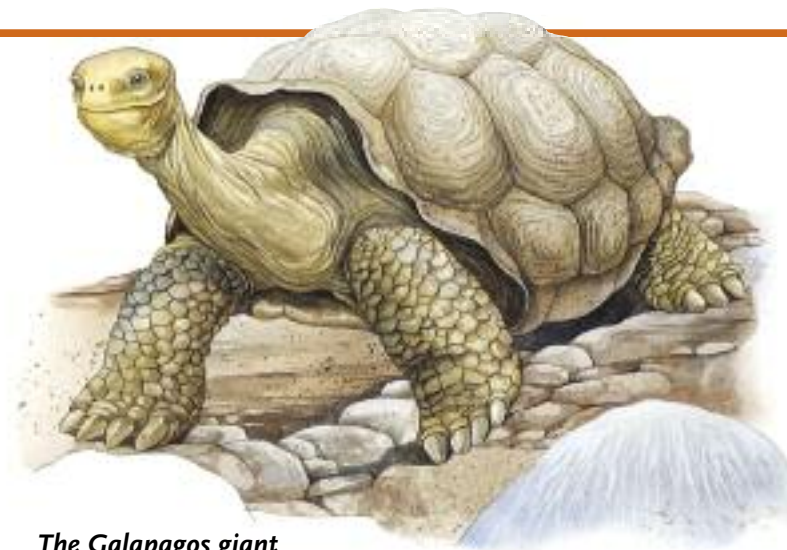


▲◀ Chameleons are slow-moving lizards that usually live in trees. They can camouflage themselves by changing colour. They shoot out their long, sticky tongues to capture insects. Other lizards, such as geckos, can break off their tails to escape from animals that attack them. A new tail will even grow in its place. The largest lizard of all, the three-metre-long Komodo dragon, has no need of such protection. It preys on deer and wild boar.

▶ Crocodiles and alligators lurk in tropical rivers and swamps and feed on animals that come down to the water's edge to drink. Their eyes, ears and nostrils are on the tops of their heads so that they can lie in wait almost completely under the water. (You can tell an alligator from a crocodile as an alligator's lower teeth are not visible when its mouth is closed.)

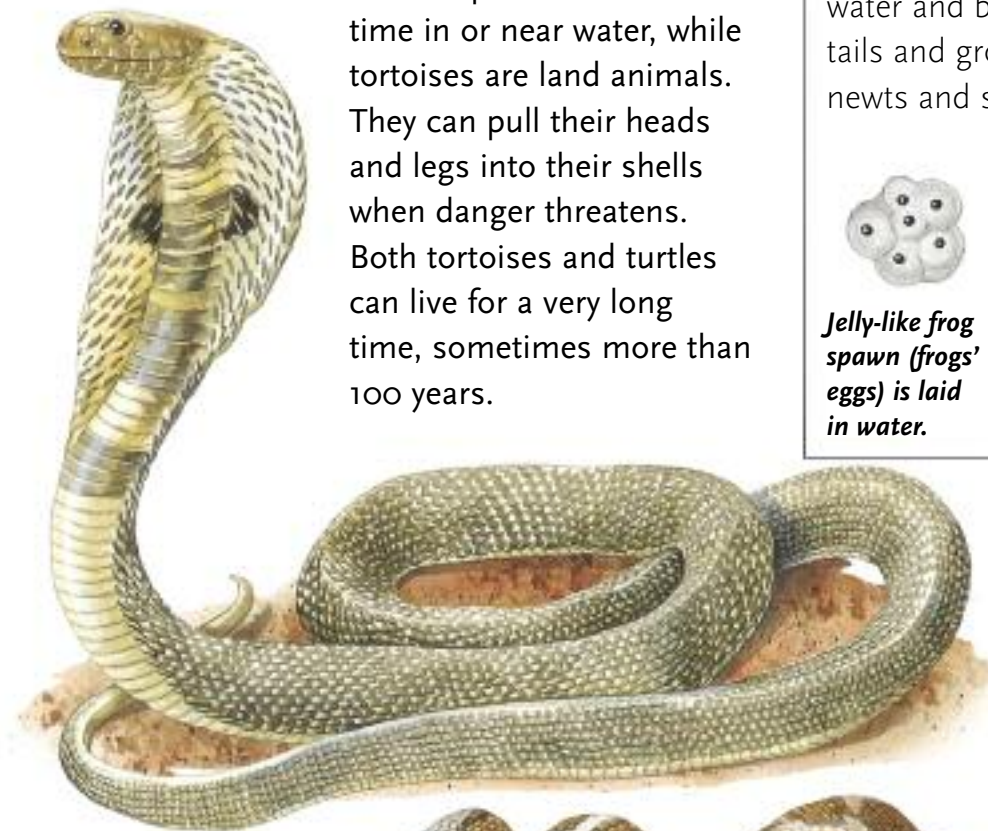


The Nile crocodile from Africa spends nights in the water and days basking in the sun on the river bank.



The Galapagos giant tortoise, from the Galapagos Islands off South America.

The king cobra, from south-east Asia, feeds mainly on other snakes. Up to 5.5 metres long, it is the biggest poisonous snake in the world.

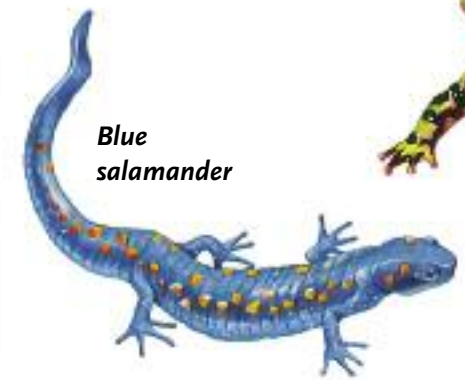


The Indian python, from south-east Asia, hunts at night. It preys on rodents and even small deer.



▲ Turtles and tortoises are a group of reptiles with strong, bony shells. Instead of teeth, they have horny beaks. Their shells protect them against predators. Turtles spend most of their time in or near water, while tortoises are land animals. They can pull their heads and legs into their shells when danger threatens. Both tortoises and turtles can live for a very long time, sometimes more than 100 years.

AMPHIBIANS



Blue salamander



Fire-bellied toad

FROGS, toads, salamanders and newts are all amphibians. Like reptiles, they are cold-blooded animals. Most have smooth, moist skin and live in or close to water. Amphibians hatch from eggs laid in water. They breathe and feed under water until they become adults. Their bodies change and they develop lungs, allowing them to live out of the water and breathe air. Frogs and toads lose their tails and grow legs when they become adults but newts and salamanders simply grow larger.



Jelly-like frog spawn (frogs' eggs) is laid in water.

The eggs hatch into fish-like tadpoles.

The tadpole loses its tail and grows legs.

The tadpole leaves the water as a tiny frog.

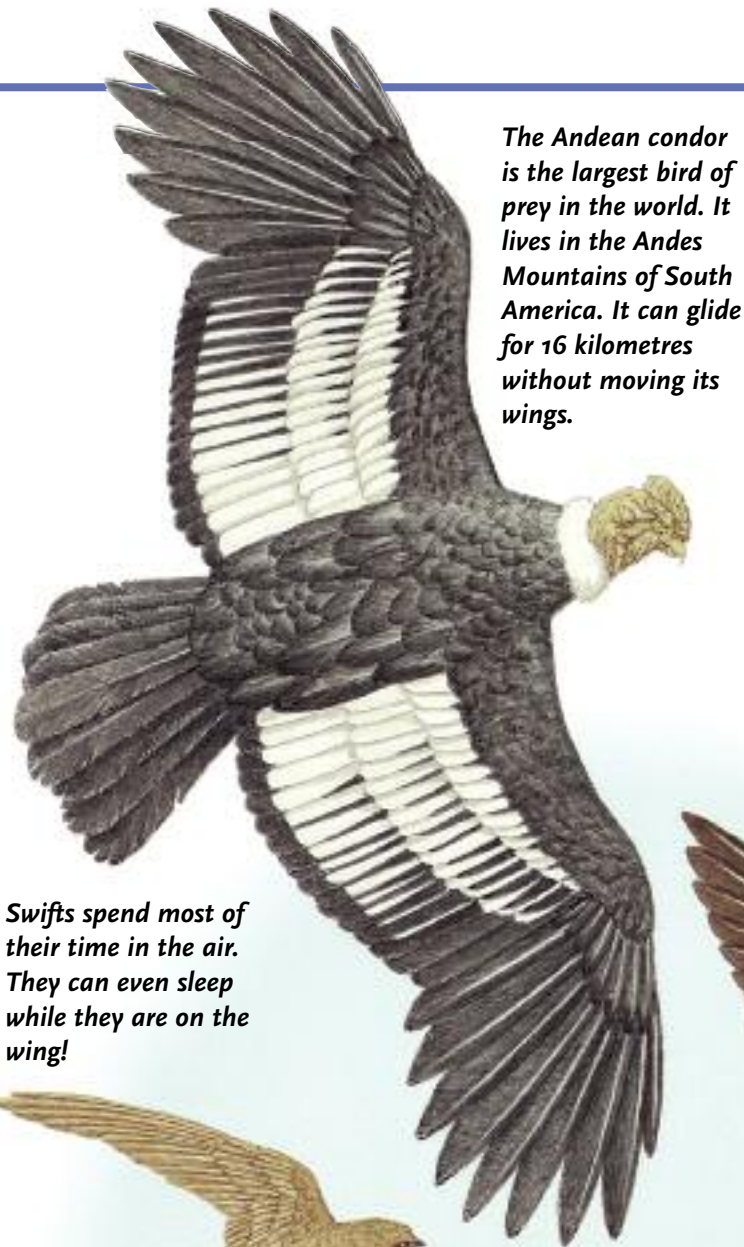
◀ Although snakes have no legs, they have strong, supple bodies that allow them to move quickly, to swim—and even to climb trees. Some snakes use their sharp fangs to kill their prey, often with a poisonous bite. Pythons and boa constrictors coil themselves around their victims and squeeze them to death. Snakes can stretch their jaws wide to swallow their prey whole.

BIRDS

BIRDS are the only animals that have feathers. They have an inner layer of short, soft feathers called down covered by long, smooth feathers that also make up their wings. Feathers keep the birds warm and dry in the coldest and wettest conditions. All birds have a pair of wings, two legs, a beak and claws. Most birds can fly, but a few, such as the ostrich and the penguin, cannot.

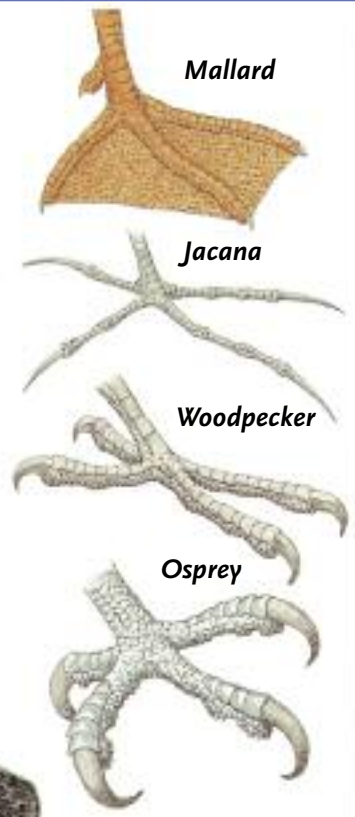
There are about 9,000 different kinds of bird in the world today. Most birds make sounds, or calls. Some birds produce patterns of notes which are like songs.

When the weather is cold, many kinds of bird travel long distances to warmer places around the world. This is called migration.



The Andean condor is the largest bird of prey in the world. It lives in the Andes Mountains of South America. It can glide for 16 kilometres without moving its wings.

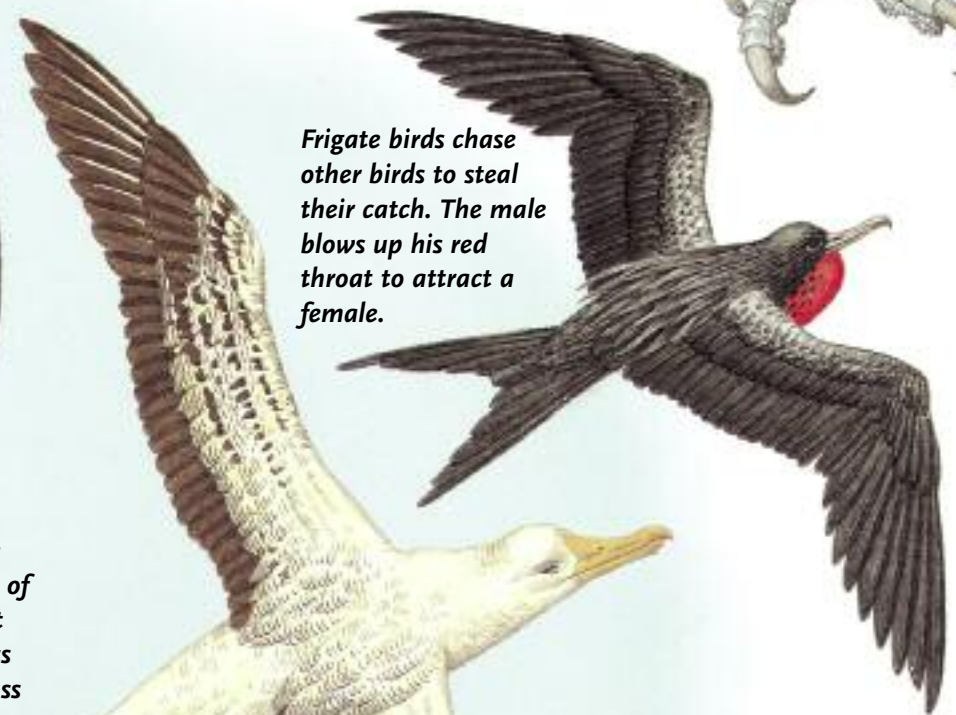
► Birds' feet can vary enormously from one kind to another. Mallards have webbed feet to help them push their way through the water. The jacana has very long toes which allow it to walk on floating lily pads. A woodpecker uses its strong claws to hold on to tree trunks. The soles of the osprey's feet are covered with tiny spikes to help it grip on to slippery fish.



Swifts spend most of their time in the air. They can even sleep while they are on the wing!



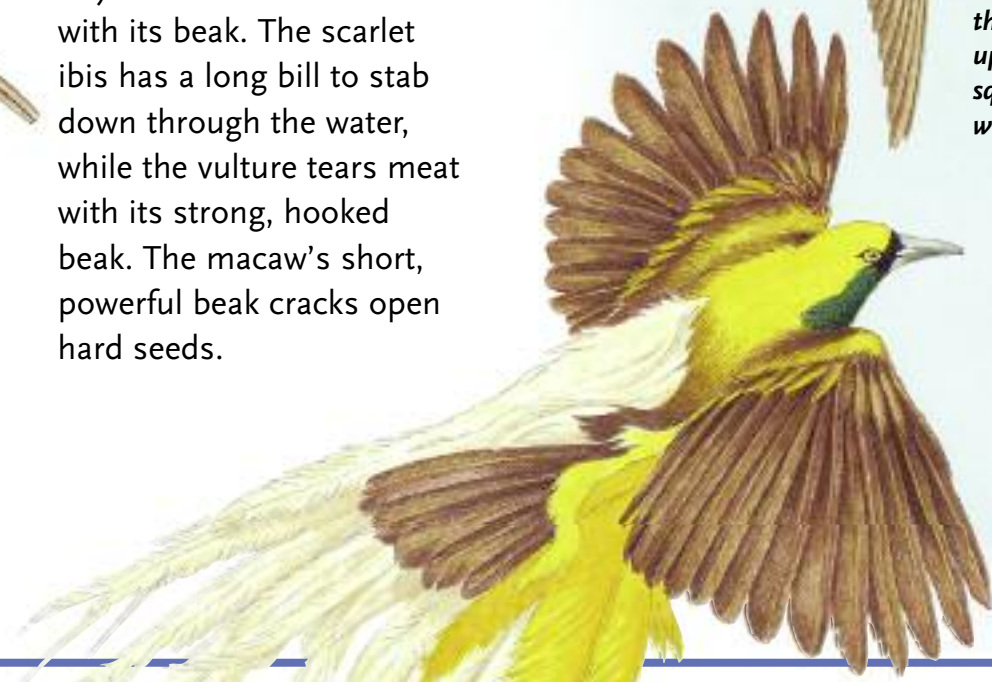
Frigate birds chase other birds to steal their catch. The male blows up his red throat to attract a female.



The wandering albatross has the largest wingspan of any living bird. It spends most of its time gliding across the sea, scooping up fish and squid from the water.



Many birds of paradise live in the forests of New Guinea. They have long, colourful tail feathers.



Snow buntings live in cold regions of northern Europe. They build their nests among the rocks.



GREAT AND SMALL

THE OSTRICH is the largest bird in the world. It is even taller than a human! Because it is so big, it cannot fly. However, with its powerful legs and two-toed feet it can run as fast as a racehorse. Ostriches lay the biggest eggs of all birds. They weigh about the same as 40 ordinary hen's eggs. The smallest bird is the hummingbird (right). The tiniest kind is no bigger than a bee. It hovers above flowers and drinks nectar from them. Its tiny wings beat so quickly that they make a humming sound.

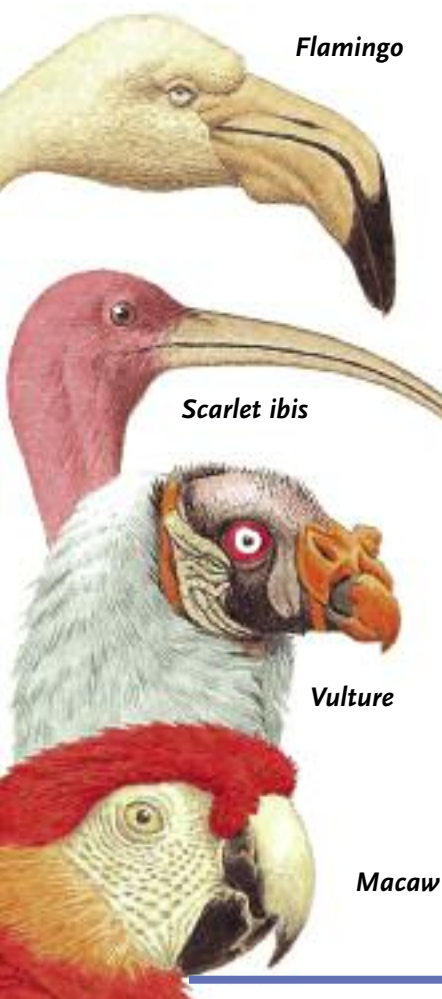


Ostriches have long necks and very good eye-sight. This helps them to watch out for danger. They spread their wings to warn off enemies.

► Some birds lay their eggs in holes, burrows, on a cliff edge, or simply on the ground. But most build nests. They collect twigs or blades of grass and weave them together. The female bird usually sits on the eggs to keep them warm until they are ready to hatch. Then the baby bird pecks open the eggshell and comes out into the world.



A baby bird inside an egg feeds on yolk.



Flamingo

Scarlet ibis

Vulture

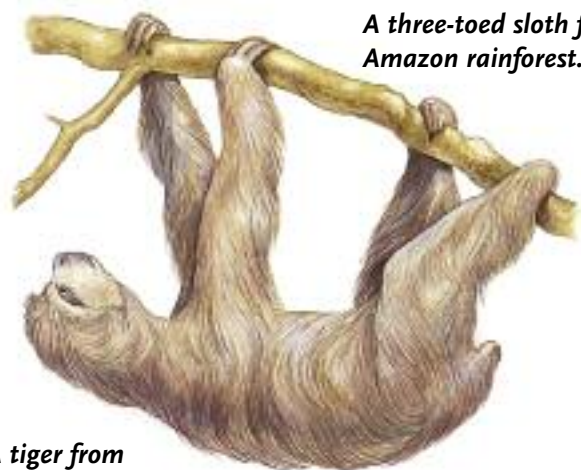
Macaw

◀ You can often tell what a bird eats from the shape of its beak. The flamingo holds its head upside down in shallow water and sieves out tiny animals from the water with its beak. The scarlet ibis has a long bill to stab down through the water, while the vulture tears meat with its strong, hooked beak. The macaw's short, powerful beak cracks open hard seeds.

MAMMALS (I)

MAMMALS are warm-blooded animals. They feed their new-born young with milk and protect them from danger during the earliest part of their lives. Most mammals develop inside the mother, instead of hatching from eggs. Except for some sea mammals, they all have four limbs and are covered with hair or fur.

There are about 4000 kinds of mammal living on the land, in the water or in the air. They range in size from tiny mice to giant blue whales. Mammals are the group of animals to which humans belong.

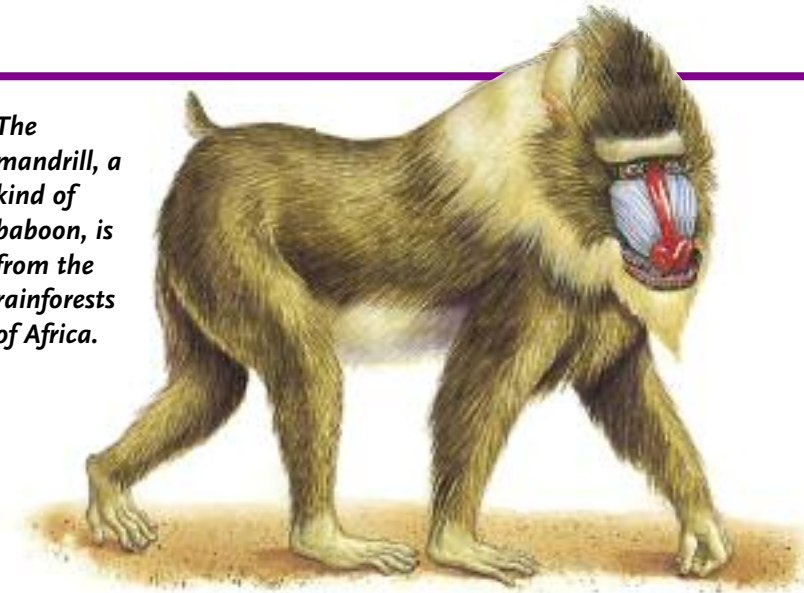


A three-toed sloth from the Amazon rainforest.

A tiger from south-east Asia.



The mandrill, a kind of baboon, is from the rainforests of Africa.



Giant pandas live in the mountain forests of China.



◀ Sloths spend much of their time hanging upside down from branches of rainforest trees. They can eat, sleep and even give birth in this position. For food they eat leaves.

◀ Tigers are the largest members of the cat family. They usually live and hunt alone, carefully stalking their prey before leaping to make a kill. Because of hunting by man and the destruction of their habitat, tigers are in danger of extinction.

▲ By day, the mandrill searches on the ground for fruits, seeds and insects to eat. It sleeps in the trees at night.

◀ The giant panda is one of the rarest mammals in the world. It is slow to breed and, when it does have young, only one survives. The giant panda's main food is bamboo. If there is a shortage, the pandas starve.

► These skulls belong to four mammals that eat very different things. Rats have long, hard front teeth for gnawing. The anteater has no teeth at all, just long jaws and an incredibly long, sticky tongue for lapping up ants. The grey wolf has strong jaws and sharp teeth for tearing through meat. Zebras have sharp front teeth to cut through grass stems, while their back teeth grind and chew.



Rat



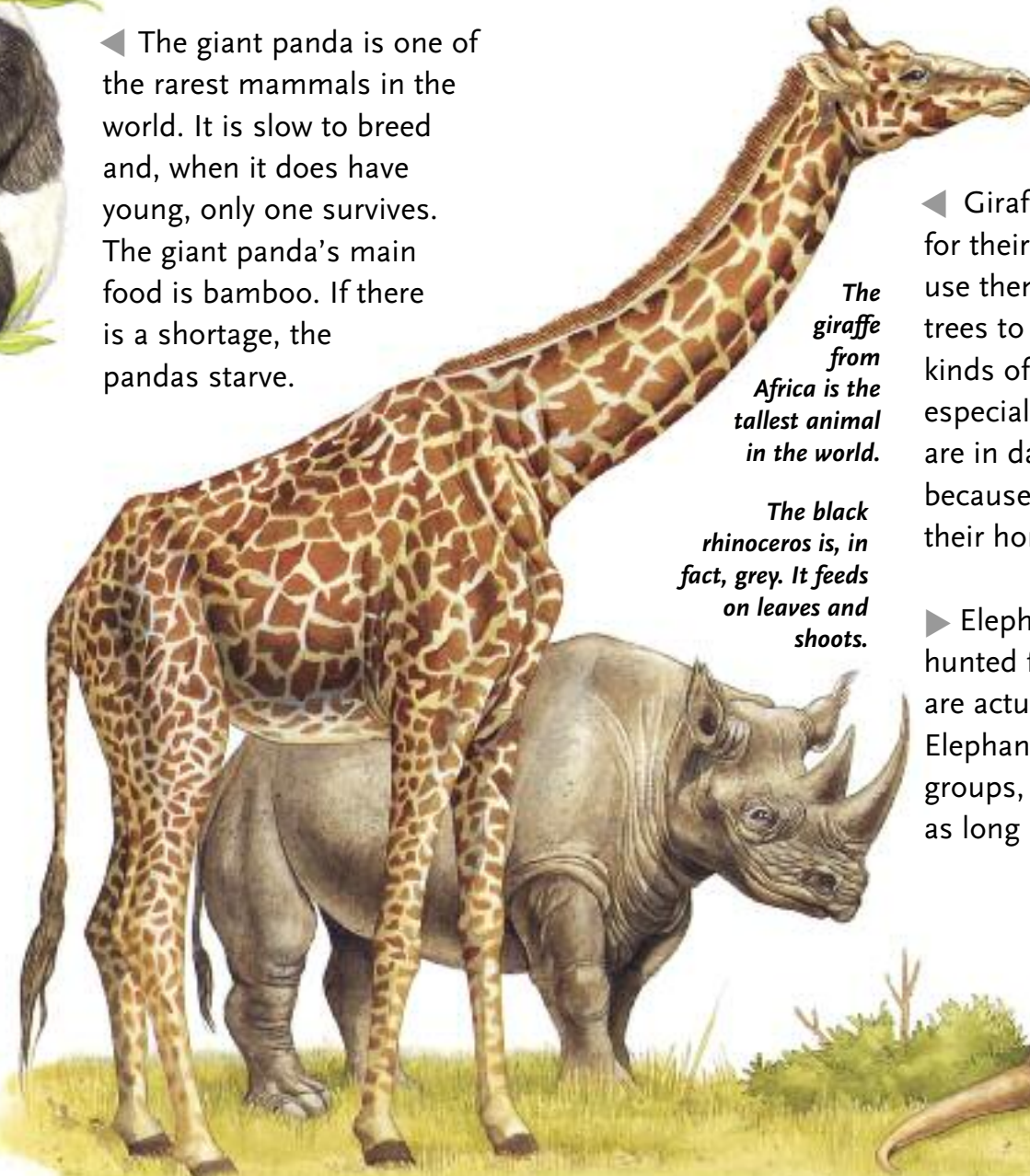
Giant anteater



Grey wolf



Zebra

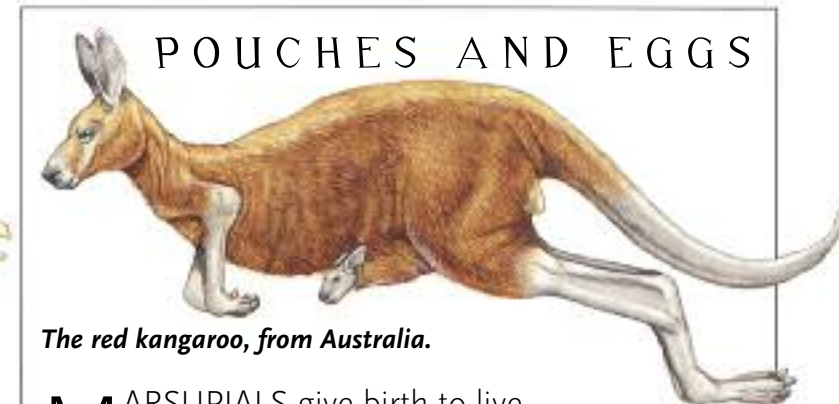


The giraffe from Africa is the tallest animal in the world.

The black rhinoceros is, in fact, grey. It feeds on leaves and shoots.

◀ Giraffes are well known for their long necks. They use them to stretch up into trees to eat leaves. Some kinds of rhinoceros, especially in south-east Asia, are in danger of extinction because they are hunted for their horns.

► Elephants, too, are hunted for their tusks, which are actually long front teeth. Elephants live in family groups, and can survive for as long as 70 years.



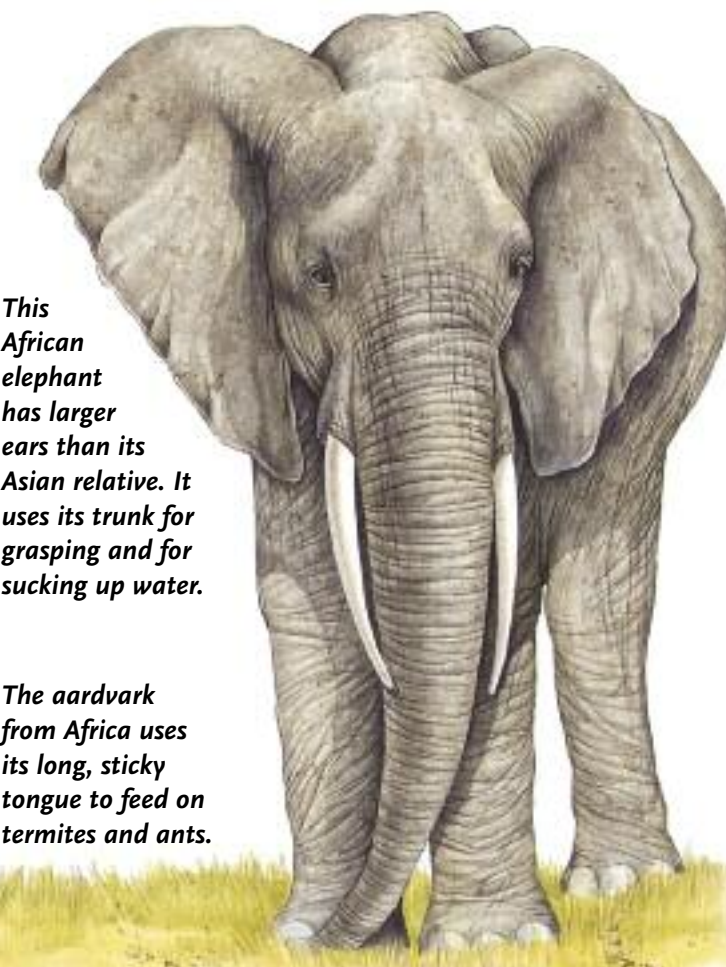
The red kangaroo, from Australia.

MARSUPIALS give birth to live young. But a newborn marsupial is hardly developed at all. It clings to its mother's body or is carried in a pouch where it feeds on its mother's milk. Kangaroos, wombats and koalas are all marsupials.

The monotremes are mammals that lay soft eggs. The duck-billed platypus (*below*), which lives in Australian rivers, is a monotreme.



Platypuses feed on crustaceans, insects and frogs.



This African elephant has larger ears than its Asian relative. It uses its trunk for grasping and for sucking up water.

The aardvark from Africa uses its long, sticky tongue to feed on termites and ants.



MAMMALS (2)

MAMMALS live in all kinds of environments, from polar ice to steamy rainforest. Some spend most or all their lives in water, while bats can fly in the air like birds.

Whales and dolphins live in the water all the time. Some whales have sieve-like parts called baleen in their mouths, which they use to trap tiny shrimp-like animals called krill. Other whales, and all dolphins, have teeth and prey on fish and squid.

Some mammals such as seals, feed in the water but breed and rest on land. Sea lions use their strong front flippers to move easily on land. Some can run faster than humans!

The northern fur seal's thick coat helps to keep it warm in the freezing waters of Alaska.



The common dolphin can easily be identified by the yellow stripe on its side.

◀ Seals and sea lions spend much of their time in the water hunting for food. Most eat whatever they can find, including krill, fish, squid and even birds. The leopard seal even eats other seals. Some seals can hold their breath under water for half an hour or longer.

Manatees are large, gentle plant-eaters that live in the shallow coastal waters, lakes and rivers of the tropics. Distantly related to elephants, and sometimes known as “sea cows”, they feed only on underwater vegetation such as seaweed or sea grass.

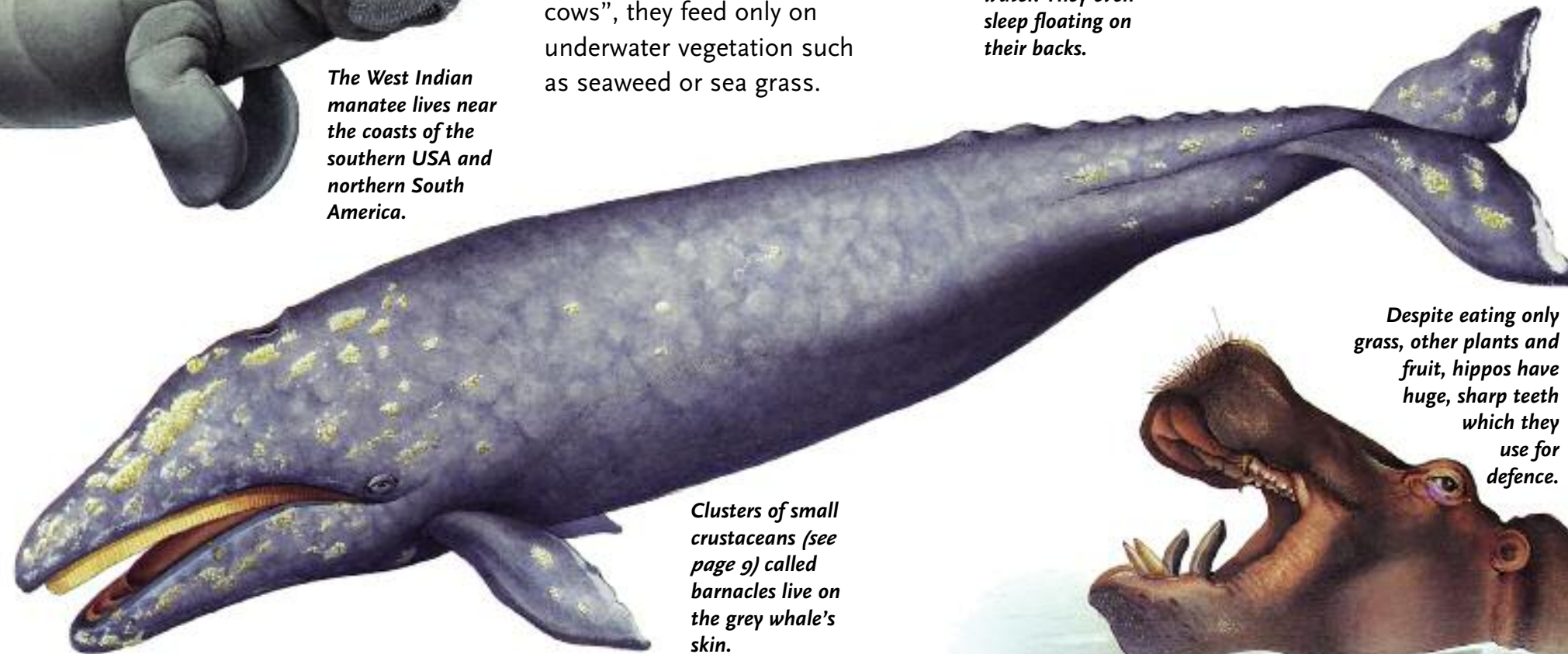
The West Indian manatee lives near the coasts of the southern USA and northern South America.

16

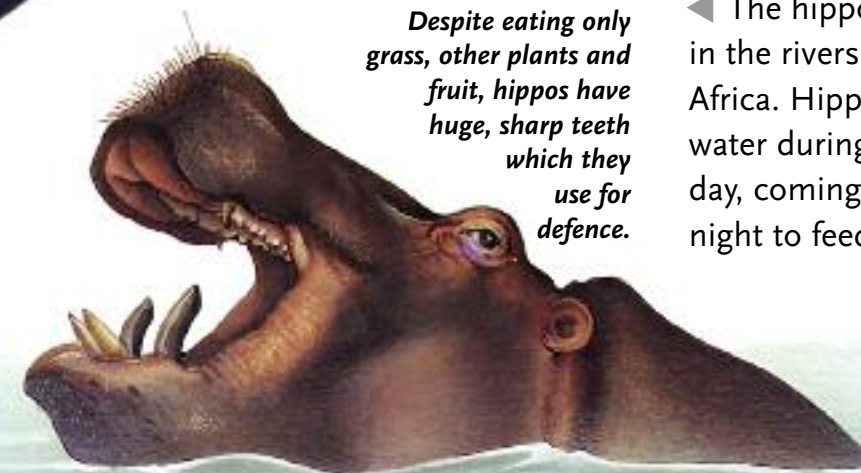


▶ Every year, grey whales make an amazing journey of migration. They travel from their feeding grounds in the Arctic to the warm waters off the coast of Mexico, where their calves are born. A few months later, it is time to swim all the way back again! This incredible journey of about 20,000 kilometres can take the whales up to three months to complete.

Clusters of small crustaceans (see page 9) called barnacles live on the grey whale's skin.



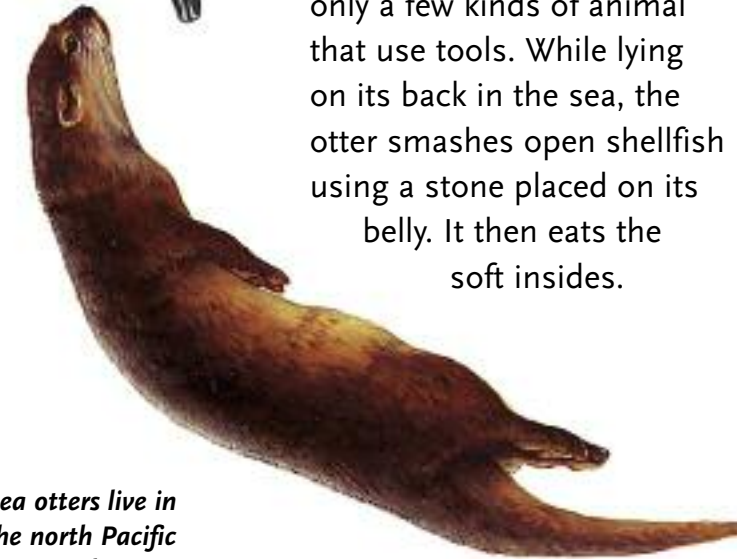
Despite eating only grass, other plants and fruit, hippos have huge, sharp teeth which they use for defence.



◀ Dolphins are well known for their speed and their acrobatic leaps out of the water. Sometimes hundreds of dolphins come together in large groups called schools. They can “talk” to one another using clicks and whistles.

▼ The sea otter is one of only a few kinds of animal that use tools. While lying on its back in the sea, the otter smashes open shellfish using a stone placed on its belly. It then eats the soft insides.

Sea otters live in the north Pacific Ocean. They seldom leave the water. They even sleep floating on their backs.



MAMMALS THAT FLY



The horseshoe bat takes its name from the strange shape of its nose.

BATS are the only mammals that can fly. There are hundreds of different kinds of bat—more than any other kind of mammal. They live everywhere but the coldest parts of the world.

Bats' wings are actually flaps of skin stretched over very long fingers. Bats live in groups in caves, trees—even in roofs! They usually sleep during the day, hanging upside down with their wings wrapped around them. At night, they go hunting. A bat finds its way in the dark by using its extraordinary sense of hearing. It makes very high-pitched sounds that echo back from objects, giving the bat a picture of its surroundings.

17

▶ North American beavers are expert builders of dams (see page 61). They gnaw down trees with their sharp teeth, and pile up the logs across rivers or streams, filling in the gaps with sticks, weed and mud.

The beaver's webbed hind feet and flattened tail make it an excellent swimmer.



Beavers build their homes, or lodges, in lakes which they have made themselves by damming rivers.

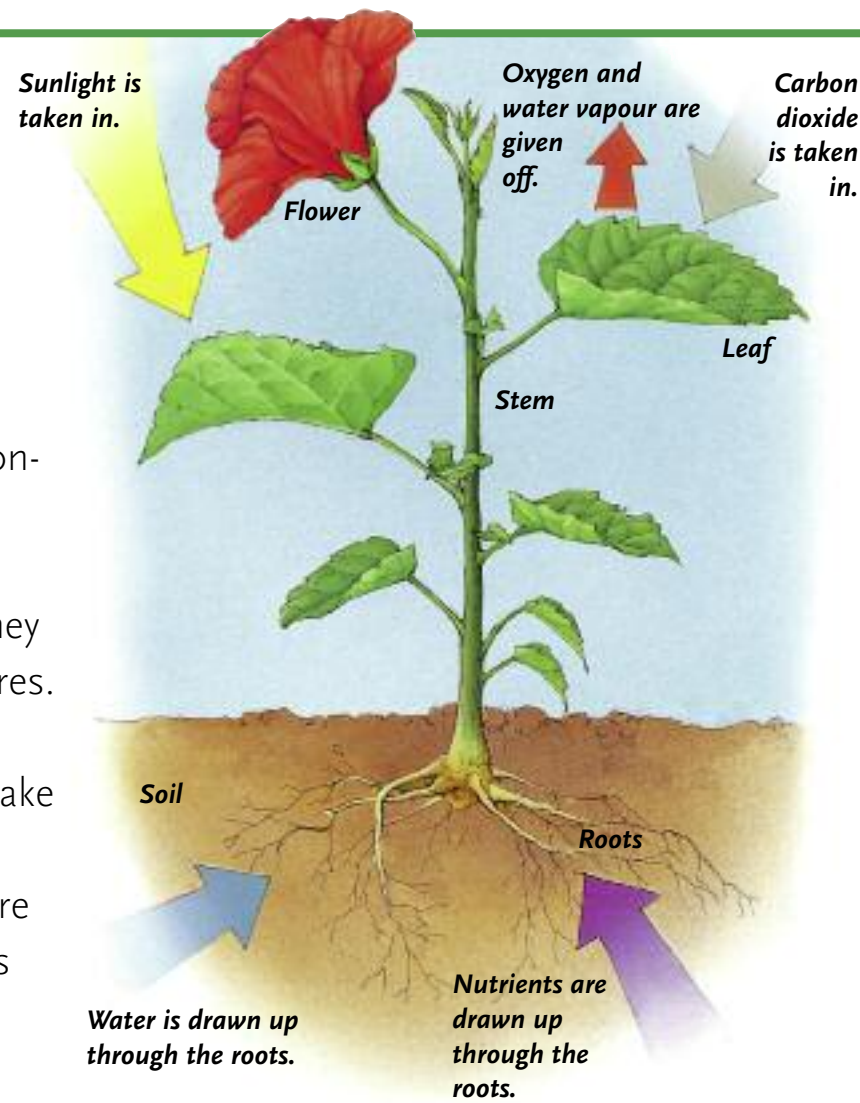
◀ The hippopotamus lives in the rivers and lakes of Africa. Hippos stay in the water during the heat of the day, coming out only at night to feed.



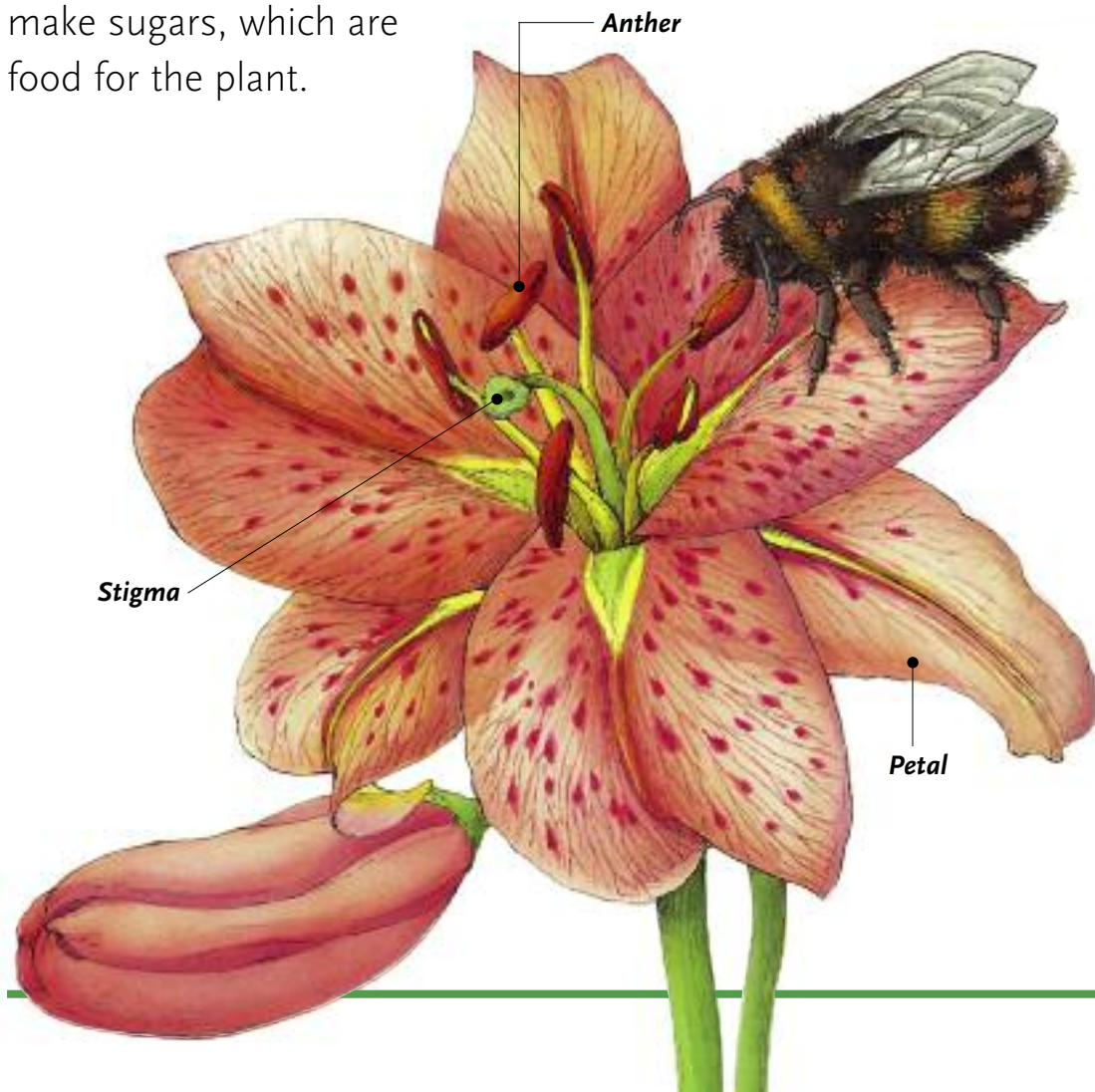
PLANTS

HERE ARE two main types of plant: flowering plants and non-flowering plants. Flowering plants have flowers which contain male and female parts. They use them to reproduce and make seeds. Non-flowering plants include ferns and algae, simple water life-forms ranging from microscopic plankton to giant seaweeds. They reproduce by making tiny bodies called spores.

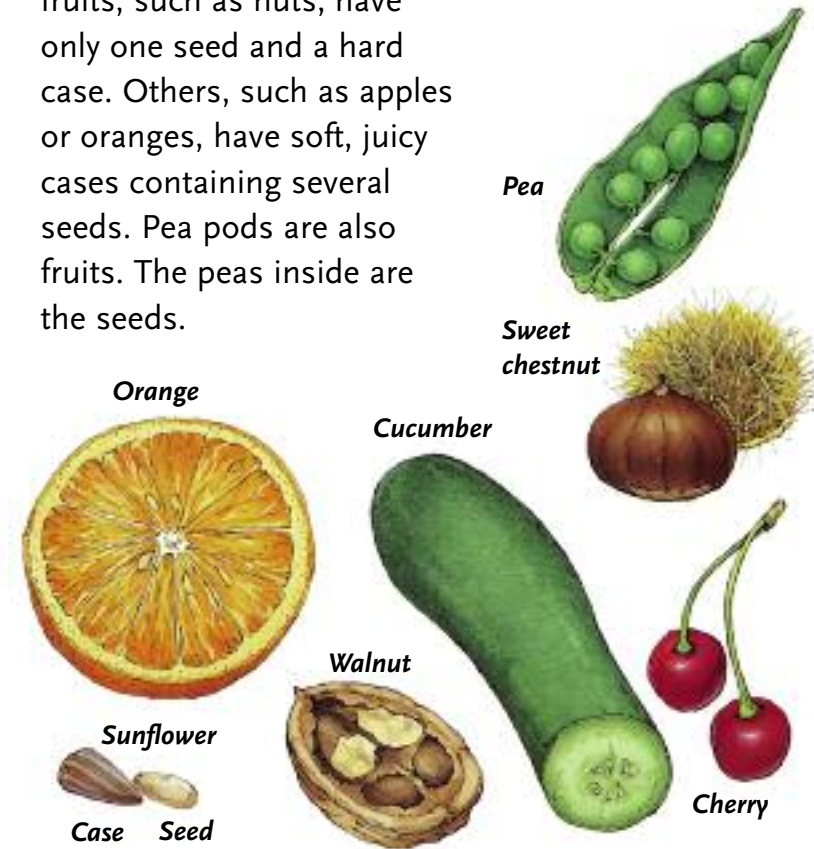
All plants make food in a process called photosynthesis. In most plants, the leaves take in sunlight and carbon dioxide from the air. Water and nutrients taken up by the roots are carried up the plant through tiny tubes in its stem. In a chemical reaction, the leaves combine carbon with water to make sugars, which are food for the plant.



Flowering plants can reproduce by a process called sexual reproduction. In some, the colour and scent of flowers attract insects. As the insects feed on nectar inside a flower, pollen from the anthers (the male parts) sticks to them. When they visit the next flower, the pollen brushes off on to the stigma (the female part). This is called pollination. The pollen joins with the female egg to make a seed. Other plants rely on the wind to spread their pollen. Some plants send out horizontal stems from which new plants grow.



A fruit is the protective case enclosing the seeds of a flowering plant. Some fruits, such as nuts, have only one seed and a hard case. Others, such as apples or oranges, have soft, juicy cases containing several seeds. Pea pods are also fruits. The peas inside are the seeds.



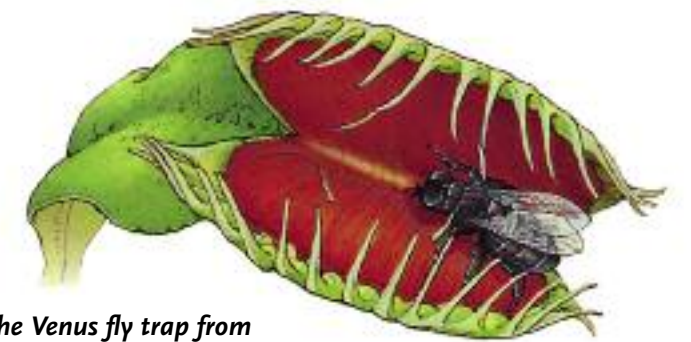
AMAZING PLANTS

The *Rafflesia* flower grows up to 1.5 m wide.



THE LARGEST flower in the world is *Rafflesia*. It is a parasite, so called because it takes its food from another plant (its host), the jungle vine, to which it is attached by long, thin threads. It lives in the rainforests of south-east Asia, and smells like rotting meat.

Some plants feed on animals! When a fly settles between its jaw-like leaves, the Venus fly trap snaps shut and the unfortunate fly is slowly digested.



The Venus fly trap from south-eastern USA.

Mushrooms and toadstools are not plants, but fungi. They cannot make their own food, so they take up dead plant and animal material from the soil or grow on living plants and animals. Fungi reproduce by sending spores into the air. Mushrooms and toadstools have caps raised up from the ground on stalks. The spores fall from beneath the cap and are carried away on a breeze.

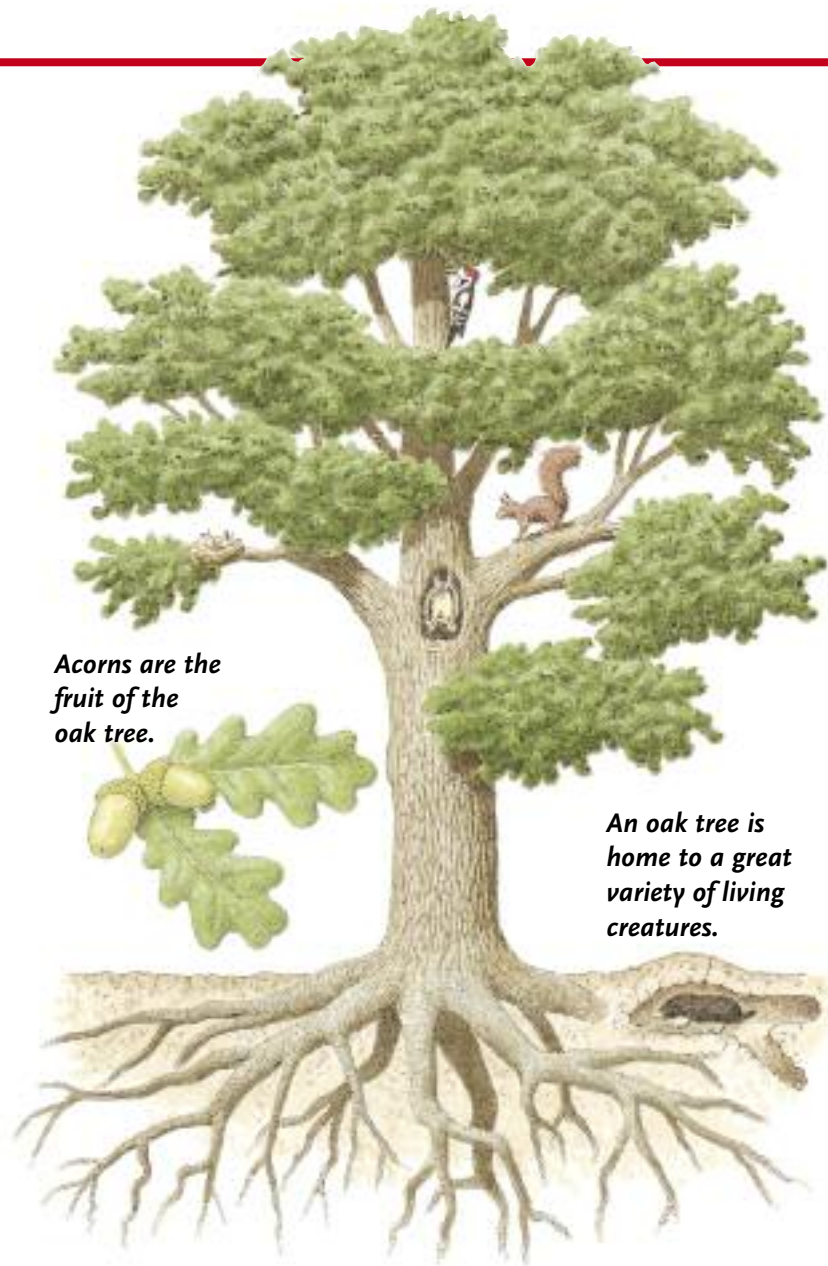


A fly agaric is a colourful toadstool that is poisonous to eat.

TREES

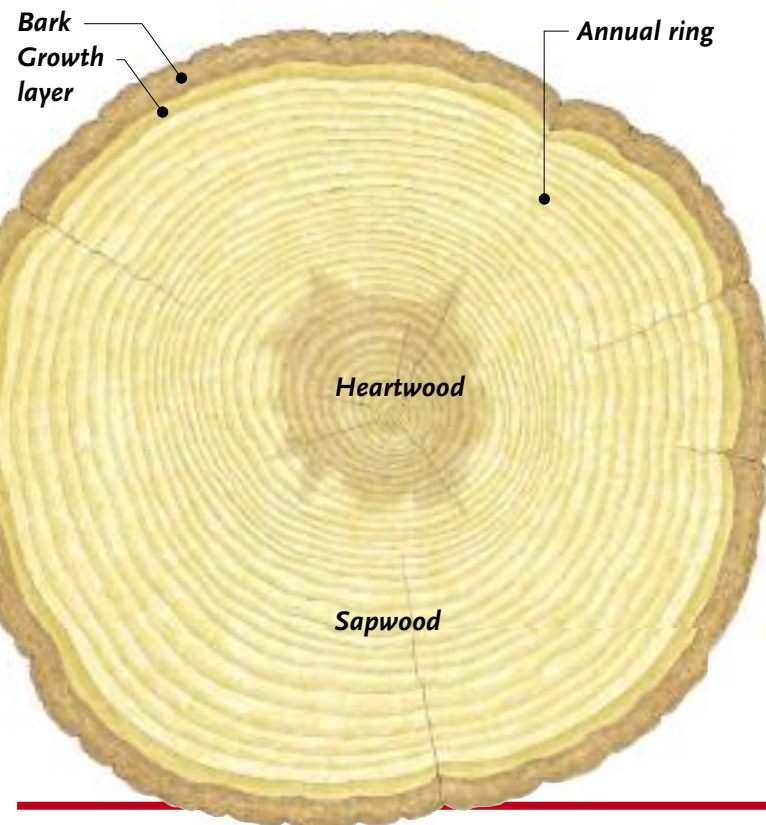
TREES are large plants that have woody stems or trunks covered with a protective layer of bark. There are two main types of tree: broad-leaved trees and conifers. All broad-leaved trees are flowering plants and produce fruits with seeds inside. Conifers produce cones which carry their seeds. Most broad-leaves are deciduous trees: their leaves fall in autumn. Nearly all conifers, and some broad-leaves, are evergreen. Their leaves also fall, but not all at the same time.

Trees are very important to us. Like all plants, they take in carbon dioxide from the air and give off oxygen for us to breathe. Their timber is used for fuel, paper, furniture and houses. Trees also give us medicines, oils, rubber and fruits. Many animals depend on trees for their homes and for food.



Acorns are the fruit of the oak tree.

An oak tree is home to a great variety of living creatures.



Bark Growth layer Annual ring

Heartwood

Sapwood

▲▲ A tree has roots below ground and a shoot (its stem) made up of a trunk, branches and twigs, which spread out the leaves so that they all receive sunlight. The central part of the trunk, the heartwood, forms the tree's strong "backbone". Water passes from the roots to the leaves through the outer layer, the sapwood. A new layer of sapwood grows each year. It appears as a single ring. We can tell how old a tree was by counting the rings in a tree stump.



◀ This giant sequoia in California is the heaviest tree in the world. More than 90 m high and possibly more than 3000 years old, it is 25 times heavier than the largest animal, the blue whale.

▼ Palm trees grow in hot countries and are neither coniferous nor broad-leaved trees. They have tall trunks with a few very large leaves at the top.



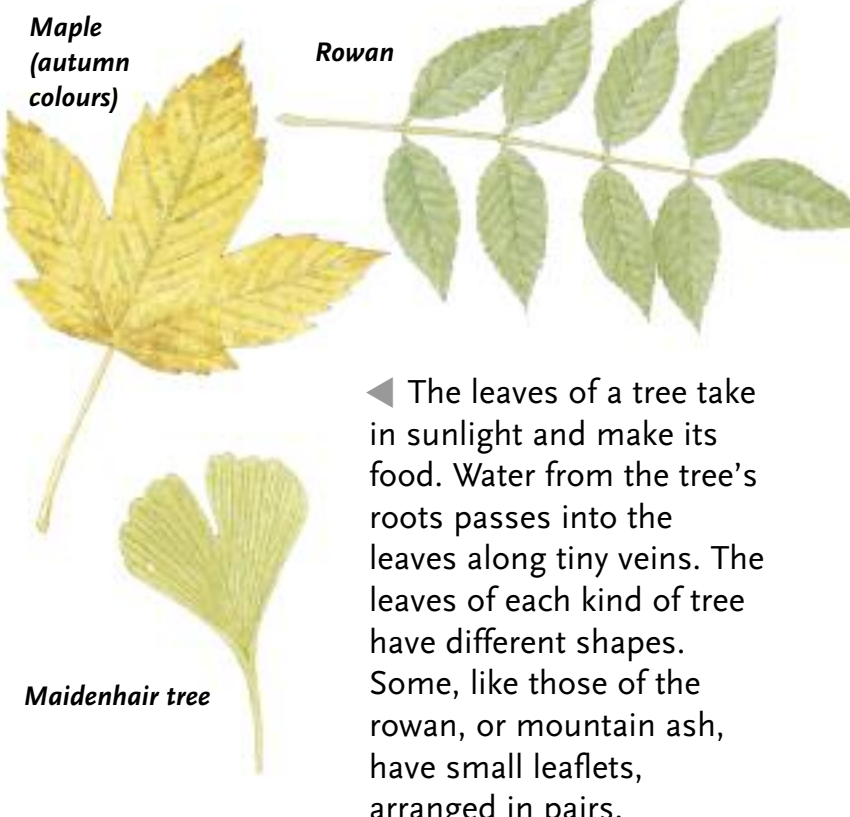
Palms bear fruits, like this coconut.

Coconut palm

◀ For a new tree to grow, its seeds must find their way into the soil. When the temperature and moisture levels of the soil are right, the seed splits open. Roots probe downwards into the soil while a shoot grows upwards. New leaves grow on the shoot.

◀ Baobabs, from Africa, are weird-looking trees. They have huge trunks shaped like bottles. These store water to help them survive the dry season.

Sweet chestnut



Maple (autumn colours)

Rowan

Maidenhair tree

◀ The leaves of a tree take in sunlight and make its food. Water from the tree's roots passes into the leaves along tiny veins. The leaves of each kind of tree have different shapes. Some, like those of the rowan, or mountain ash, have small leaflets, arranged in pairs.

CONIFERS



Cone

Douglas fir

Needles

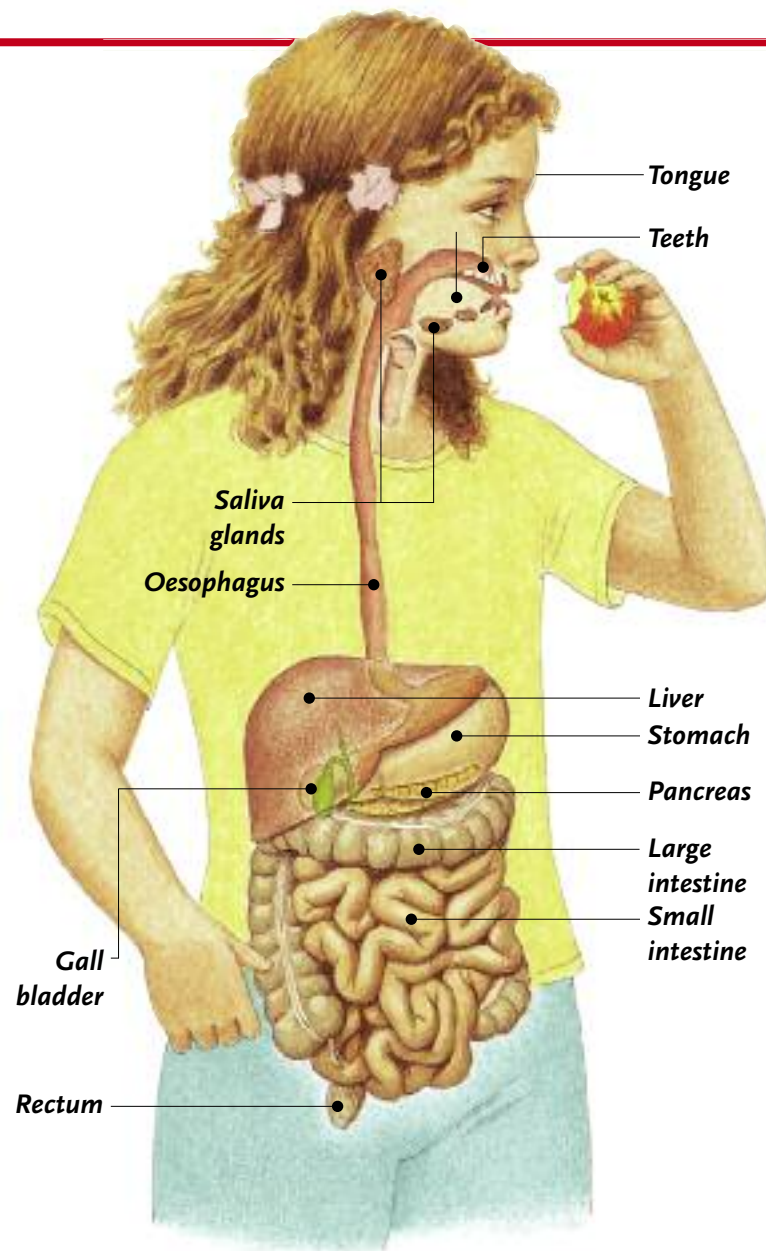
THE WORD conifer means "cone-bearing". A conifer's seeds are found on the faces of each of the scales that make up the cones. In damp weather, the scales are closed. When warm weather comes, they open and the seeds flutter away in the breeze.

Most conifers have long, narrow leaves called needles. The needles are tough and can survive wind, frost and long periods of drought. This means that conifers can grow in areas where the climate is cold or dry.

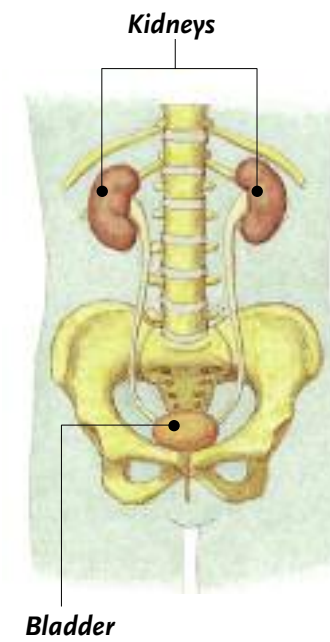
DIGESTION

THE HUMAN BODY needs food and drink to survive. The things we eat and drink must first be turned into substances the body can use. This process is called digestion.

Digestion begins in the mouth where food is mashed up by the teeth and tongue. Saliva softens the food, ready for swallowing. The food travels down the oesophagus into the stomach, where powerful acids change it into a mush. This then squeezes into the small intestine, where it mixes with juices from the pancreas and gall bladder. Any useful substances pass through the walls of the small intestine and are taken by the blood to the liver. The liver stores these useful substances. Waste products are pushed out of the body through the large intestine and the rectum.

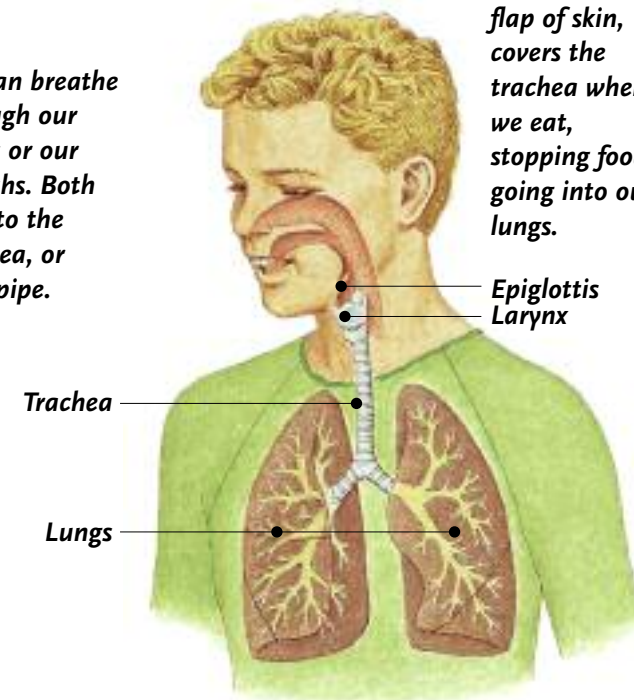


▶ The kidneys work with the liver to clean our blood by removing any harmful substances. They also make sure that we have the right amount of salt and water. Waste from all over the body travels in the blood to the kidneys. Any useful substances are sorted out and returned to the blood. Waste chemicals and any salt and water we do not need are sent down to the bladder to be passed out of the body as urine.

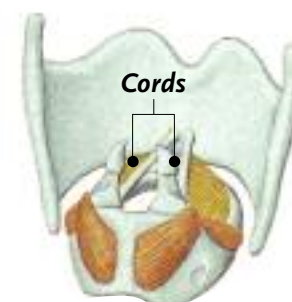


The epiglottis, a flap of skin, covers the trachea when we eat, stopping food going into our lungs.

We can breathe through our noses or our mouths. Both lead to the trachea, or windpipe.



Two tiny cords in the larynx vibrate as air is pushed between them. This creates sounds, which our mouths make into words.

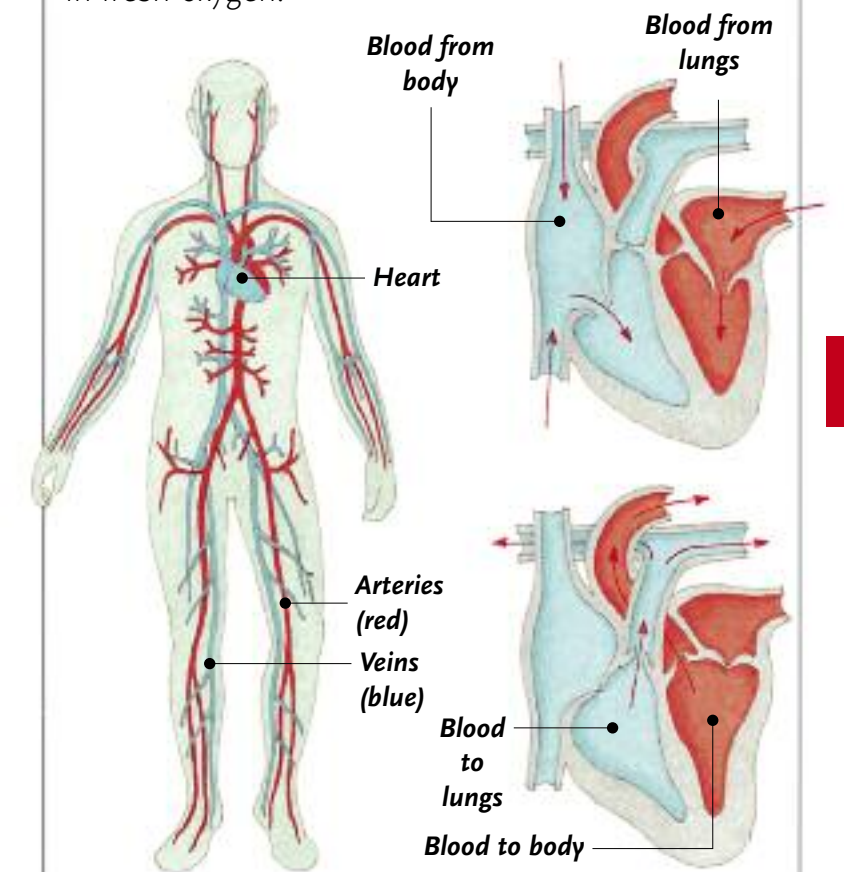


▲ By breathing in, we take oxygen from the air into our lungs. Blood vessels then carry the oxygen around our bodies. As the oxygen and the nutrients from our food are used up, we make carbon dioxide. The blood brings this back to the lungs, from where we breathe it out into the air.

HEART AND BLOOD

BLOOD carries food and oxygen all around the body and takes away waste products. The blood system is made up of a complicated network of blood vessels at the centre of which lies the heart.

The heart pumps oxygen-filled blood from the lungs around the body through blood vessels called arteries. Other vessels, called veins, bring used-up blood containing carbon dioxide back through the body. The heart sends this blood to the lungs to get rid of the carbon dioxide and take in fresh oxygen.



The heart is a powerful pump. As the muscles of the heart relax, blood enters its various "chambers": oxygen-filled blood from the lungs (red chambers in the diagram above, right), and carbon-dioxide-filled blood from the rest of the body (blue chambers). Flaps called valves stop any blood leaking back-wards. The heart then squeezes and pumps the blood out. The oxygen-filled blood goes to the rest of the body, the other blood to the lungs.



Proteins are found in foods such as meat, poultry and fish, greens, beans and milk.



Fats are found in meat and dairy products, as well as pies and avocados.



Carbohydrates are found in foods such as bread, potatoes, cereals, pasta and mushrooms.

◀ There are several kinds of useful substances in food, called nutrients, that our bodies must have to survive and stay healthy. They are: proteins, fats, carbohydrates, fibre, minerals and vitamins. Proteins are used to build and repair muscles and body parts. Fats and carbohydrates provide energy, while fibre helps us to pass waste out of the body. Vitamins and minerals are chemicals that are essential to keep us healthy and help us grow.



Fibre is found in wholemeal bread, fruit and vegetables.



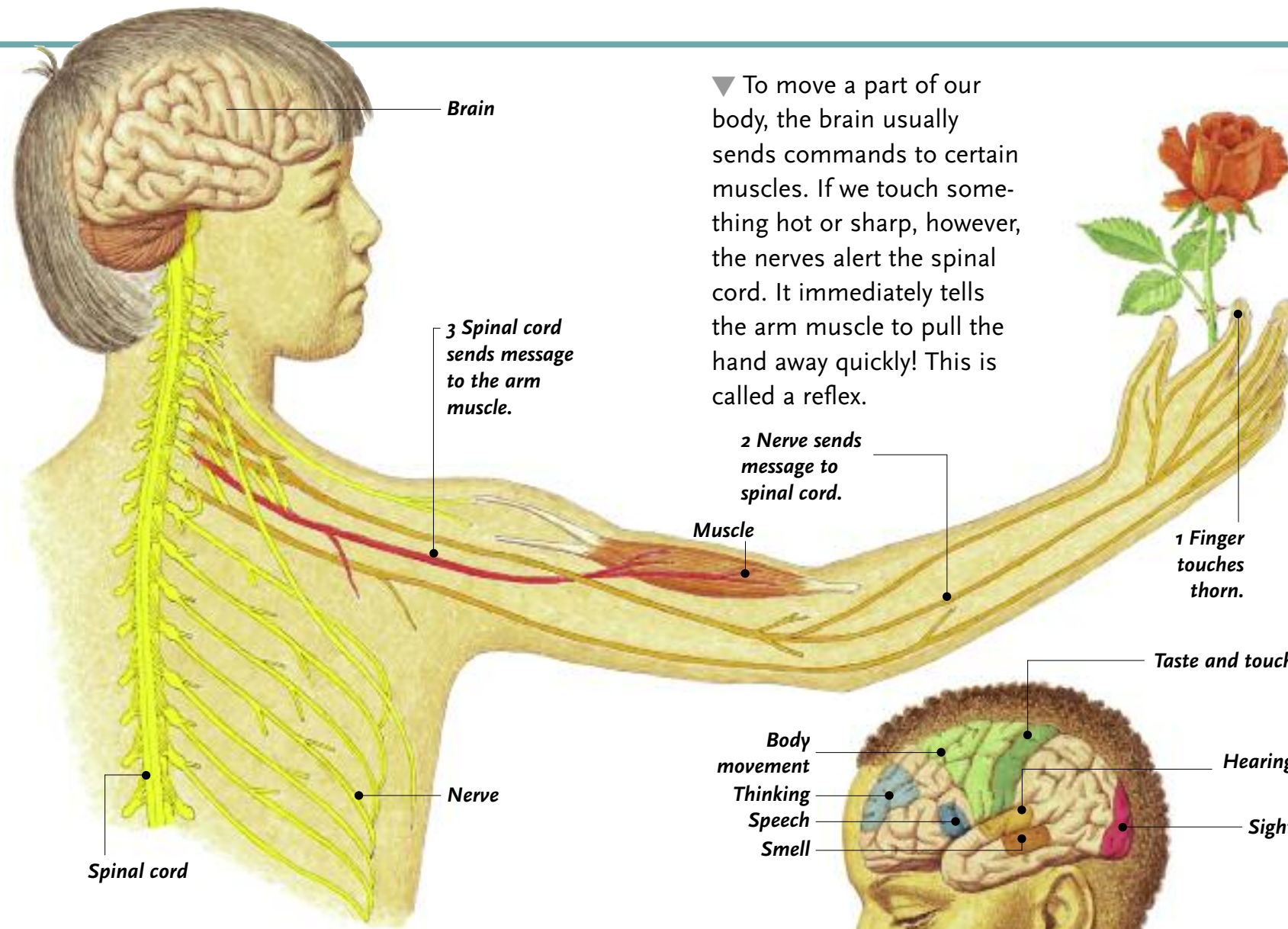
Iron, a mineral, is found in meat, green vegetables, eggs and nuts.



Vitamin A is found in cheese, carrots, fish, tomatoes and liver.

THE BRAIN

TOGETHER with the spinal cord, the brain controls everything we do, and every thought we have. The brain works all the time, even when we are asleep. The spinal cord is a thick bunch of nerves running from the brain down the spine. Branching off from it, is a complex network of nerves that runs to every part of the body. Nerves are like telephone wires, carrying commands from the brain to the rest of the body. They also bring information back to the brain about the outside world. This information is gathered by our five senses: sight, hearing, smell, taste and touch. The nerves also tell the brain what is happening inside the body. The brain can then make sure that our body temperature or breathing, for example, is at exactly the right level.

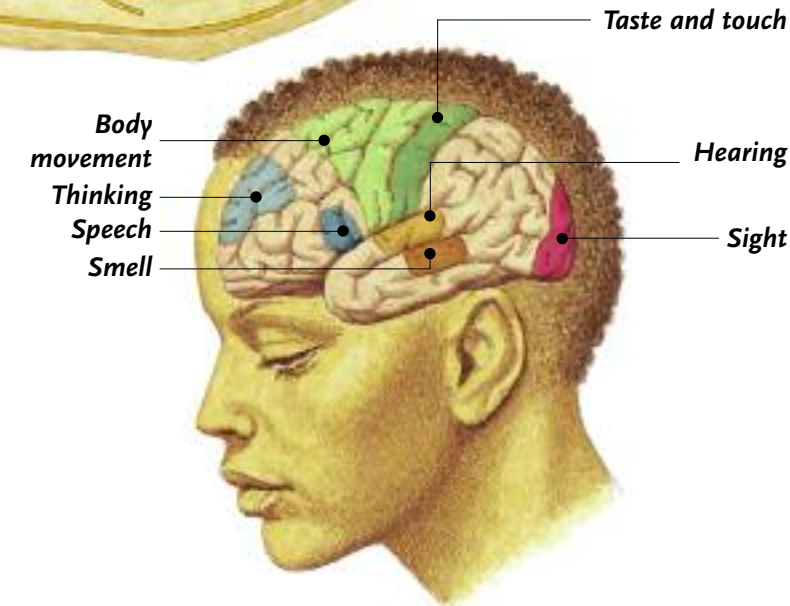


▼ To move a part of our body, the brain usually sends commands to certain muscles. If we touch something hot or sharp, however, the nerves alert the spinal cord. It immediately tells the arm muscle to pull the hand away quickly! This is called a reflex.

2 Nerve sends message to spinal cord.

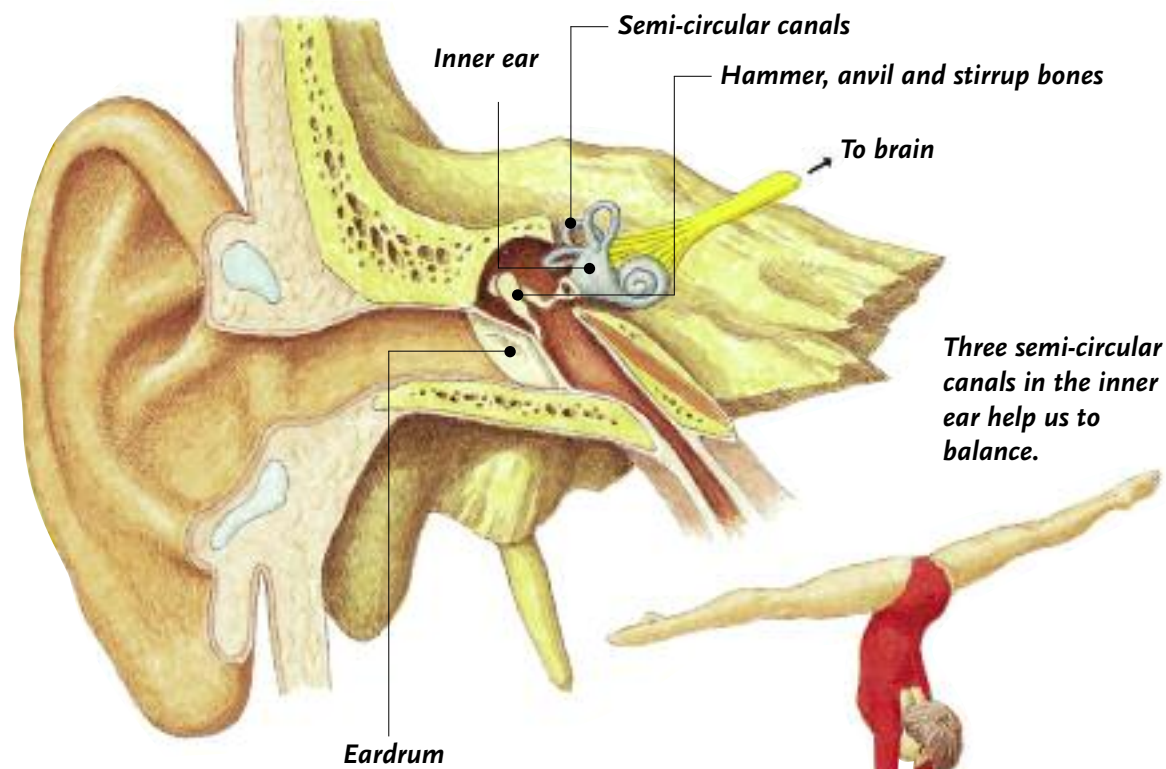
Muscle

1 Finger touches thorn.



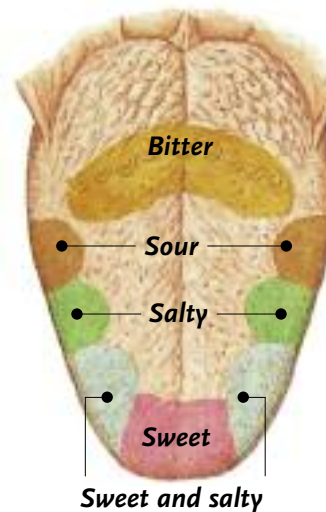
◀ All sounds are really vibrations in the air. As the vibrations travel into the ear, they are picked up by the eardrum. Tiny bones, called the hammer, anvil and stirrup, send the vibrations to the inner ear. There they are changed to signals and sent along a nerve to the brain.

▶ The surface of our tongue is covered with tiny taste buds which tell us whether something we are eating is sweet, salty, sour or bitter.



Three semi-circular canals in the inner ear help us to balance.

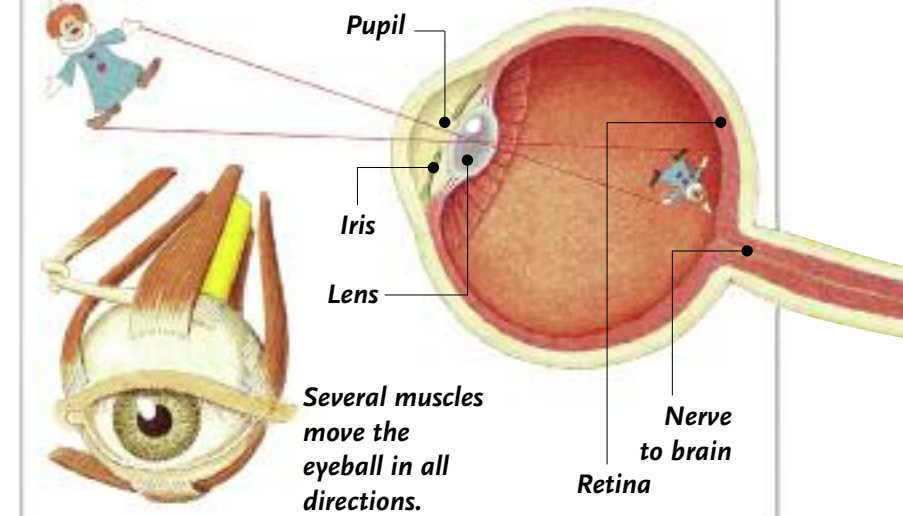
Different parts of the tongue recognize different tastes.



▲ The brain is divided into different areas. Each area controls a certain function of the body, such as speech, movement or thinking.

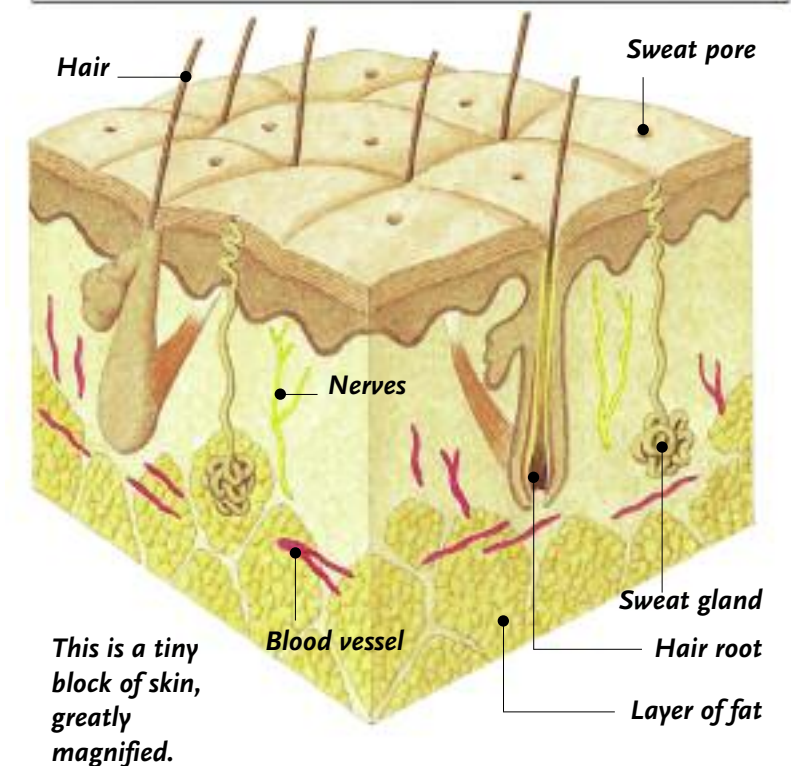
▶ The skin is the organ we use to sense touch. It is protective, waterproof, and keeps us at an even temperature. When we are hot, sweat is produced to lose heat into the air.

EYESIGHT



THE EYE is like a tiny camera, constantly taking pictures of the world around us. When we look at an object, light rays enter the eye through the pupil. The amount of light is controlled by the iris (the eye's coloured part). In dim light, the pupil must be opened wide to let in as much light as possible.

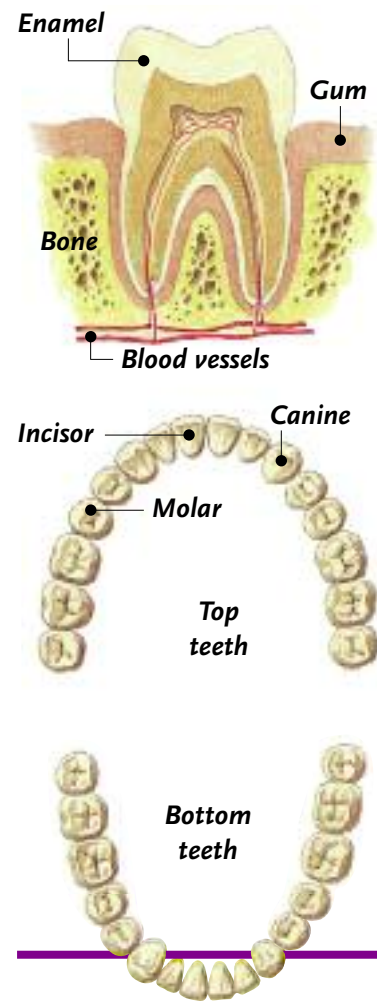
Behind the pupil is the lens. This focuses the light rays and forms a picture on the retina at the back of the eye. Because the light rays cross over in the eye, the image is upside down. The brain tells us how the world really looks.



This is a tiny block of skin, greatly magnified.

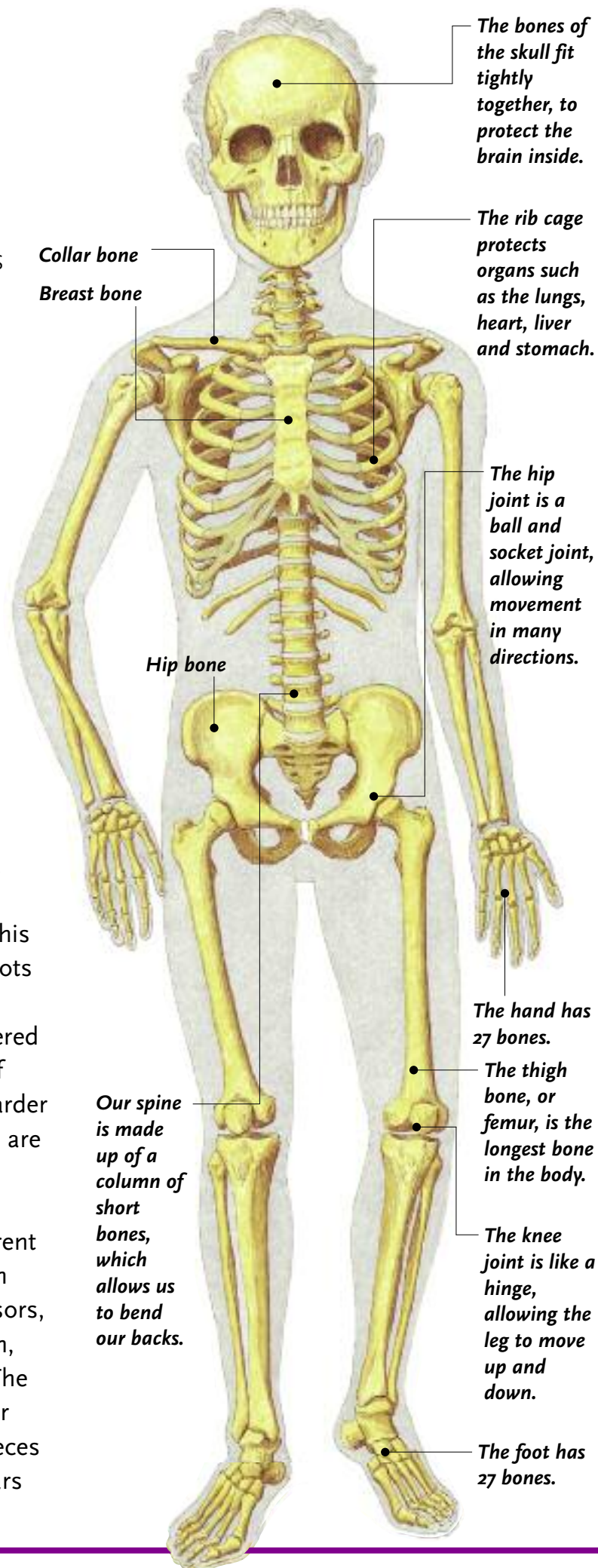
THE SKELETON

INSIDE OUR BODIES there is a strong framework of bones, called the skeleton. The skeleton gives the body its shape, allows it to move and protects the soft organs inside against injury. Without it, we would just be like piles of jelly! There are about 206 bones in the adult human body, but a child has more. When a baby is born, it has many tiny bones, some of which (for example, those in its skull) join together as it grows. Bones are very strong, but they are also lightweight and spongy inside. This helps us to be as agile as possible. Many bones are connected by joints that allow movement. These joints are held in place by straps called ligaments.



◀ Only a small part of a tooth shows above the surface of the gum. As this diagram shows, deep roots anchor the tooth to the jawbone. A tooth is covered with a protective layer of enamel which is even harder than bone. At the centre are blood vessels and nerve endings.

We have several different kinds of teeth. They each have different jobs. Incisors, at the front of the mouth, bite off pieces of food. The pointed canine teeth tear the food into smaller pieces while the wide, flat molars grind them up.



The bones of the skull fit tightly together, to protect the brain inside.

The rib cage protects organs such as the lungs, heart, liver and stomach.

The hip joint is a ball and socket joint, allowing movement in many directions.

The hand has 27 bones.

The thigh bone, or femur, is the longest bone in the body.

The knee joint is like a hinge, allowing the leg to move up and down.

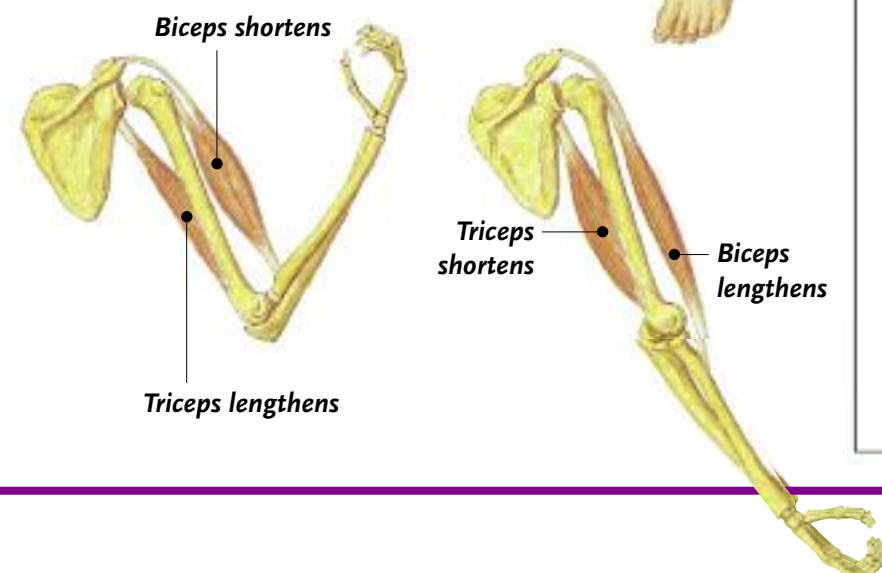
The foot has 27 bones.

Our spine is made up of a column of short bones, which allows us to bend our backs.

We use different muscles to perform different tasks. We can make muscles stronger by exercising, or practising movements.

▶ We use muscles to move our bones, and so our bodies, into different positions. This allows us to walk, stand, jump, pick things up and perform many other actions. Muscles also keep our hearts beating and our organs working.

Muscles can only work by pulling. To move the arm, for example, muscles must work in pairs. The brain gives the muscles a signal. This makes the biceps muscle shorten, pulling the bones upwards, while the triceps lengthens. To lower the arm, the reverse happens.



A BABY IS BORN

ABABY begins life when a sperm from a man and an egg from a woman join together inside the woman's body. Both the sperm and the egg are cells, tiny "building blocks" which contain all that is needed to create a new life. The two cells combine to form a new one about the size of a full stop. As the fertilized egg grows, it divides into two. Then it divides again and again, until it is a small ball of cells called an embryo. It moves to the woman's womb, where its cells carry on growing and dividing. After eight weeks, it is called a foetus. Food and oxygen are passed from the mother's blood to the foetus through the umbilical cord. (This is cut when the baby is born, leaving a scar or "belly button".)

The growth of an embryo (actual size)



It takes nine months before a baby is ready to be born. In the first few weeks, the heart, brain and spine form. By the 12th week, the foetus has nearly all its organs and its legs and arms have grown. After about 24 weeks, it is almost completely formed. It then steadily grows in size. When the baby is ready to be born, it usually turns round inside the womb so that its head is pointing downwards. Then, strong muscles in the womb push the baby along the birth canal and into the outside world.



GLOSSARY

Abdomen The rearmost main part of the body of a typical arthropod, usually containing the digestive, waste-disposal and reproductive parts.

Algae Plants without true stems, roots and leaves, found in water or moist ground. The largest and best-known are the seaweeds. Other kinds of algae are single-celled plants. They are part of a group of tiny floating plants and animals known as plankton.

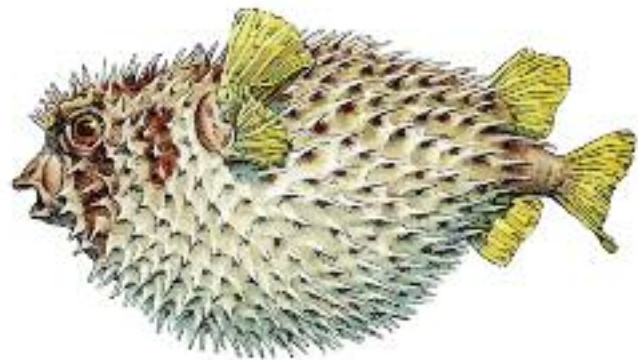
Antenna One or more pairs of long, mobile sense receptors on the heads of some animals, including insects and snails.

Artery A tube which carries blood away from the heart. Most carry oxygen-rich blood to the body's organs and tissues but the pulmonary arteries, which run from the heart to the lungs, carry blood with very little oxygen in it.

Blood vessels The tubes that carry blood around the body.

Camouflage The means by which an animal can escape the notice of predators (or prey, when it is itself a predator), using the colours or patterns of its body to blend into its surroundings.

Carbohydrates Foods like sugars and starches, which provide energy.



Carnivorous Animals (or plants) that feed on other animals are carnivorous.

Cartilage A fibrous material, sometimes called gristle. It provides a cushioning layer between joints in some animals. It makes up the entire skeleton of sharks and rays.

Circulatory system The system of blood vessels that transports blood around the organs of the body.

Cold-blooded A cold-blooded animal's body cannot maintain a constant internal temperature. Its body temperature varies according to its surroundings.

Colony A group of one kind of animals living together. Some animals, such as ants, form permanent colonies, co-operating to feed and breed as part of a single unit.



Echolocation The method by which some animals, such as bats, whales and dolphins, navigate. They emit high-pitched sounds, and use the echoes that bounce back to build up a picture of their surroundings.

Embryo The name given to a baby in the first weeks of its development in the uterus.

Fins The broad, flat surfaces projecting from the body of a water creature such as a fish or a whale, used for steering and balance.

Gills The breathing organs of water creatures such as fish. As water passes in through the mouth and out over the gills, oxygen is filtered out by tiny blood vessels.



Gland An organ that produces a useful substance inside an animal, for example, sweat, saliva and digestive juices.

Habitat The type of surroundings in which a plant or animal lives.

Metamorphosis The process whereby an animal, such as a butterfly or frog, changes its body structure and behaviour between the larval (young) stages and the adult stages of its life. In some animals this involves a period of pupation.

Migration The movement of a population of animals from one place to another at a certain time of the year to feed or breed.

Intestine The tube linking the stomach to the rectum. The first part, called the small intestine, takes in nutrients from the digested food. The second part, the colon or large intestine, leads waste to the rectum.

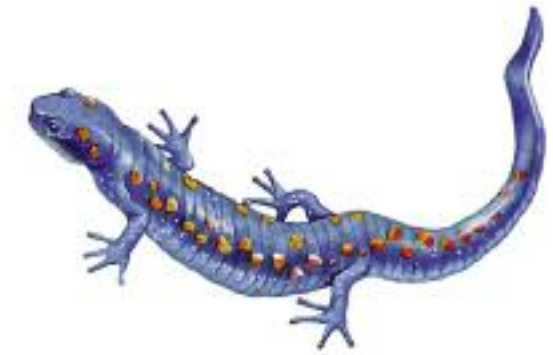
Nutrients Raw materials that an organism must obtain in order to make and repair its body. For humans, nutrient are: proteins, carbohydrates, fats, vitamins and minerals.

Oesophagus The tube through which food passes from the mouth to the stomach.

Pancreas An organ which produces digestive enzymes and releases them into the intestine. It also produces the hormones insulin and glucagon which control the levels of sugar in the blood.

Photosynthesis The process by which green plants use sunlight as an energy source to turn carbon dioxide and water into the sugars they need for food. A chemical called chlorophyll, found in cells in a plant's leaves, absorbs the sunlight and begins the process.

Pollination The transfer of microscopic grains called pollen from the male part of one flower to the female part of another (or the same) flower. This produces seeds that may grow into new flowering plants.



Retina The layer of light-sensitive cells in the back of the eye.

Spinal cord The thick bunch of nerves that run from the brain down the back of the body.

Spore A minute particle produced by plants, bacteria and fungi, from which a new organism can grow.

Trachea The tube, sometimes called the windpipe, which connects the lungs to the mouth and nose.

Venom A poisonous substance found in the bodies of some animals, including species of snakes, spiders, scorpions and fish. It can be used for hunting or for defence, and is usually injected with a sharp sting or bite.

Vitamin An essential chemical that the body needs, in small amounts, to function properly.



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