

THERE ARE
BUGS
EVERYWHERE

BRITTA TECKENTRUP

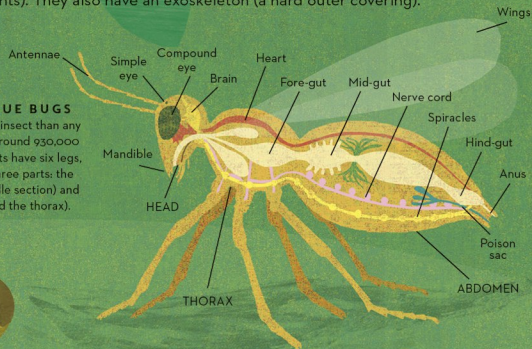
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IT'S A BUG! (SO WHAT IS THAT?)

The creatures that we call 'bugs' belong to a group known as arthropods. All arthropods have six or more legs, and their bodies are divided into parts (or segments). They also have an exoskeleton (a hard outer covering).

INSECTS AND TRUE BUGS

There are more species of insect than any other animal group, with around 930,000 discovered so far. All insects have six legs, and bodies made up of three parts: the head, the thorax (the middle section) and the abdomen (just behind the thorax).



HOW BUGS SEE

Most bugs have large eyes, known as **compound eyes**, made up of lots of different light sensors. These help bugs to detect movement, but they make it harder to spot smaller details. Many arthropods can also have **ocelli** or simple eyes, which detect changes in light.



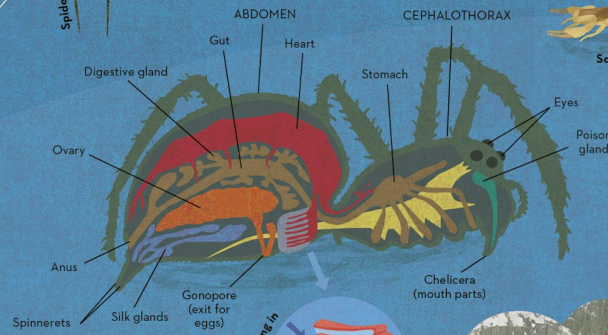
TRUE BUGS

True bugs are a group of insects that includes shield bugs, assassin bugs and bed bugs. All true bugs have a beak which they use to pierce and suck on their food.



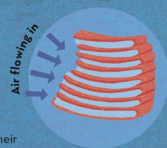
ARACHNIDS

This large group of arthropods has over 72,900 known species, including spiders, scorpions and ticks. All arachnids have eight legs, and a few have deadly bites and stings. Their bodies are made up of two sections, the cephalothorax (joined head and thorax) and the abdomen.



HOW BUGS BREATHE

Bugs take in oxygen through openings on their sides, called **spiracles**. Inside the bug's body are hollow tubes which make up the **tracheal system**. This system carries oxygen around the bug's body and carbon dioxide back out through the spiracles.



MYRIAPODS

Bugs with more than eight legs, such as centipedes and millipedes, are known as **myriapods**. Some myriapods have more than 700 legs!

RECORD-BREAKERS

Did you guess which bugs on the last page were record-breakers?

The **horned dung beetle** is the world's strongest bug. It can pull up to 1,141 times its own weight - that's the same as a person lifting six double-decker buses!



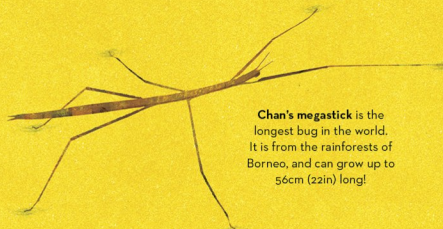
The **horsefly** is the fastest flying bug, reaching speeds of up to 145km/h (90m/h).



The **cicada** is the loudest insect in the world. A swarm can make sounds of up to 106 decibels - about as loud as a rock concert!



Chan's megastick is the longest bug in the world. It is from the rainforests of Borneo, and can grow up to 56cm (22in) long!



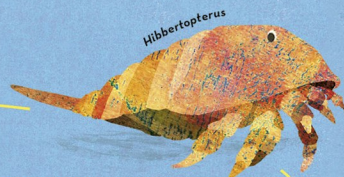
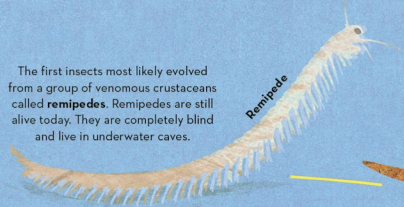
BUGS HAVE BEEN AROUND FOR AGES

Bugs have been around for a really long time. There have been arthropods in the oceans for over 500 million years. Then, around 480 million years ago, insects' ancestors were among the first animals on land. There was even a time, known as the Carboniferous period (359-299 million years ago), when giant bugs roamed the Earth.



Isotelus
500 million years ago
Trilobites are among the earliest known arthropods. Most were tiny, but some, such as **Isotelus**, grew up to 70cm (28in) long.

The first insects most likely evolved from a group of venomous crustaceans called **remipedes**. Remipedes are still alive today. They are completely blind and live in underwater caves.



Hibbertopterus
Scorpions first crawled out of the water around 430 million years ago. Early scorpions, such as **Hibbertopterus**, spent most of their lives at sea, but also had feet to scuttle around on land.



Meganeura was a griffinfly. It lived around 300 million years ago and grew to the size of a seagull.



Mesothelid spider
Mesothelid spiders are living fossils in today's world. Their ancestors first appeared around 400 million years ago.



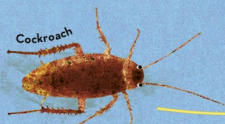
Mayfly
Around 400 million years ago, insects were the first creatures to fly. Plants were growing taller, and flying helped plant-eating insects reach their food source. The first flying insects may have been the ancestors of today's **mayflies**.



Melittosphex
The Cretaceous period (around 150 million years ago) brought flowering plants and bugs that fed on them. This included butterflies, ants and the first known species of bee, **Melittosphex**.



Silverfish
Silverfish are very ancient insects. Those that lived 200 million years ago were very similar to the ones alive today.



Cockroach
Cockroaches, as we know them today, first appeared around 180 million years ago.



Giant flea
During the Jurassic period, giant flea-like creatures lived closely alongside dinosaurs. They were ten times the size of fleas today.



Flea Today
150 million years ago, insects became smaller. This may be because birds took to the skies, and smaller insects could make a quicker escape.



Arthropleura
Oxygen levels 300 million years ago were very high, allowing bugs to grow to enormous sizes. At 2.3m (7.5ft) long, **Arthropleura** was one of the biggest bugs that ever existed.

WHERE DO BUGS LIVE?



There are very few places bugs don't live! You can find them in rainforests, deserts, woodlands, wetlands, caves, grasslands, in the freezing Antarctic and in your own back garden. Bugs, in fact, live in more habitats than any other animal group on Earth.

WATER BUGS

Many bugs live in ponds, lakes, streams and rivers, and you can even find insects in the tiniest pools of water – or above them! **Dragonflies** zoom over water, catching insects in the air.



Water spider

Water spiders spend most of their lives underwater but still need air to breathe. They come to the surface to collect large air bubbles which they live in during the day. They leave their bubbles to hunt at night.



Great diving beetle

Great diving beetles live underwater where they hunt for bugs, tadpoles and even fish. To breathe, they trap air bubbles under their wings.



Great pond snail

The **great pond snail** glides over underwater surfaces on its slimy, muscular foot. Its tongue is studded with tiny teeth, which it uses to feed on algae and plant and animal matter.



DESERT BUGS
Most animals struggle to survive in deserts because of the lack of water. Many species of bugs, however, have developed amazing adaptations to live in these hostile environments.

The **darkling beetle** survives in the harshest of deserts. It runs to the top of the sand dunes on cool mornings, where it stands on its head to collect water from fog which rolls down to its mouth!

POLAR BUGS

As there are no land mammals in Antarctica, bugs are the largest animals on land – making **springtails** and **mites** Antarctica's most fearsome land predators!



The **rhagidia mite** is about 1mm (0.04in) wide, and feeds on microscopic creatures. Its body produces a substance called glycerol, which stops it from freezing.

UNDERGROUND BUGS

Bugs that live in soil feed on plants and animals (alive or dead) and dung. Many live underground their whole lives, some just hibernate there, while others only live there when they're young.



Mole crickets spend most of their lives underground. Like moles, they have huge, spade-like front legs for digging, either to find food, or to make a chamber for their eggs.

ALPINE BUGS

In the mountains, temperatures can be extremely cold. Many bugs that live there are dark-colored to help them absorb the sun's heat.

The dark grey grasshopper ***Sigaus villosus*** lives in mountains in New Zealand. It uses its long back legs like ski poles, to move across the snow.



RAINFOREST

Tropical rainforests, such as the Amazon in South America, contain mind-blowing numbers of arthropods. A single square mile can be home to more than 50,000 different species! Each species performs a vital role in the survival of the forest. Without these bugs, rainforests as we know them would not exist.

EMERGENT LAYER

Huge, umbrella-shaped trees, more than 40m (130ft) high, form the **emergent layer**. Butterflies flit from flower to flower, spreading pollen.

Leaf beetles

CANOPY LAYER

The **canopy layer** sits 30–45m (100–150ft) above the ground. The many flowers here attract insects such as bees, beetles and wasps.

UNDERSTORY

Below the canopy lies the **understory**. Thick and dense, with plant life, this layer is home to countless insects, including bees and stick insects.

The **Titan longhorn beetle** is one of the world's largest beetles, at 75cm (31in) long. Its powerful jaws could snap a pencil in two.

Titan longhorn beetle

FOREST FLOOR

Very little light reaches the forest floor. Spiders and beetles crawl along the ground, which is covered in fallen leaves, rotting twigs and shallow roots.

Termites live in huge colonies on the forest floor. They munch up wood and mix it with their poo, creating fungus gardens for them to eat.

Click beetle larvae (or glow-worms) make their own light by a process called bioluminescence. This attracts termites for the glow-worms to eat.

Bullet ants can be aggressive if their colony is under threat. They have one of the most painful stings of any insect.

Bullet ant

Most stick insects are masters of disguise. However, the **Peruvian fire stick** is brightly coloured.

Peruvian fire stick

Blue morpho butterflies drink juices from rotting fruit, dead animals and fungi, and spread spores (which fungi use to reproduce) around the forest.

Blue morpho butterfly

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Leafcutter ants harvest

leaves from the canopy and carry them down to their nests.

Hewitson's sabre wing butterflies move so fast the human eye can't follow them.

Hewitson's sabre wing butterfly

Orchid bees travel through the understory, collecting scent from orchids.

Orchid bees

CAN YOU FIND?

Bugs are an important food source for many rainforest animals. How many predators can you find hiding on this page?

The 28cm (11in) wide **goliath bird-eating spider** can easily hunt small birds and frogs. It uses its huge fangs to inject prey with venom.

Goliath bird-eating spider

Glowworm

Termites

Termite mound