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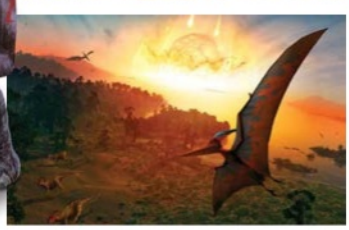

What happened to the dinosaurs?

Why was T-rex a deadly hunter?

Features more than 80 photos and illustrations

This issue of
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belongs to

Welcome to

WORLD OF DINOSAURS

A complete guide to the **fantastic creatures** that roamed the **prehistoric Earth**

From the makers of **How It Works**, the bestselling knowledge magazine


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WORLD OF DINOSAURS
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What happened to the dinosaurs?
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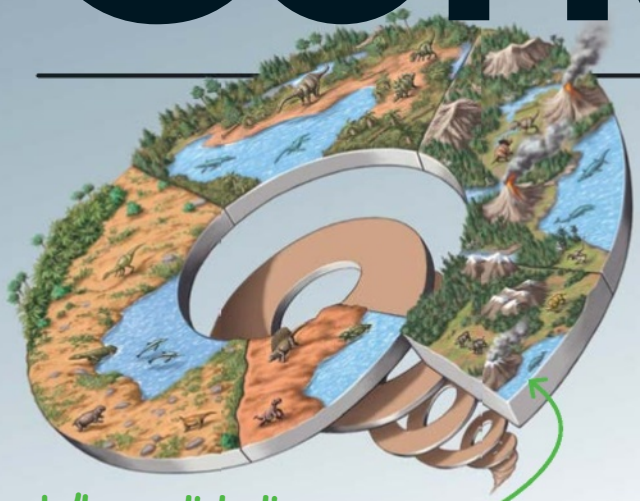

When did dinosaurs rule the Earth?
Find out on page 38

What's the biggest dinosaur ever found? Page 62

Supports Key Stage 2 learning

Key Stage 2 learning is for kids aged 7 to 11 in Years 3 to 6 of primary school. All of the articles in **How It Works Illustrated** have been recommended by an educational consultant as suitable for Key Stage 2 students and beyond.

Brain games

Take the quiz and test your prehistoric knowledge

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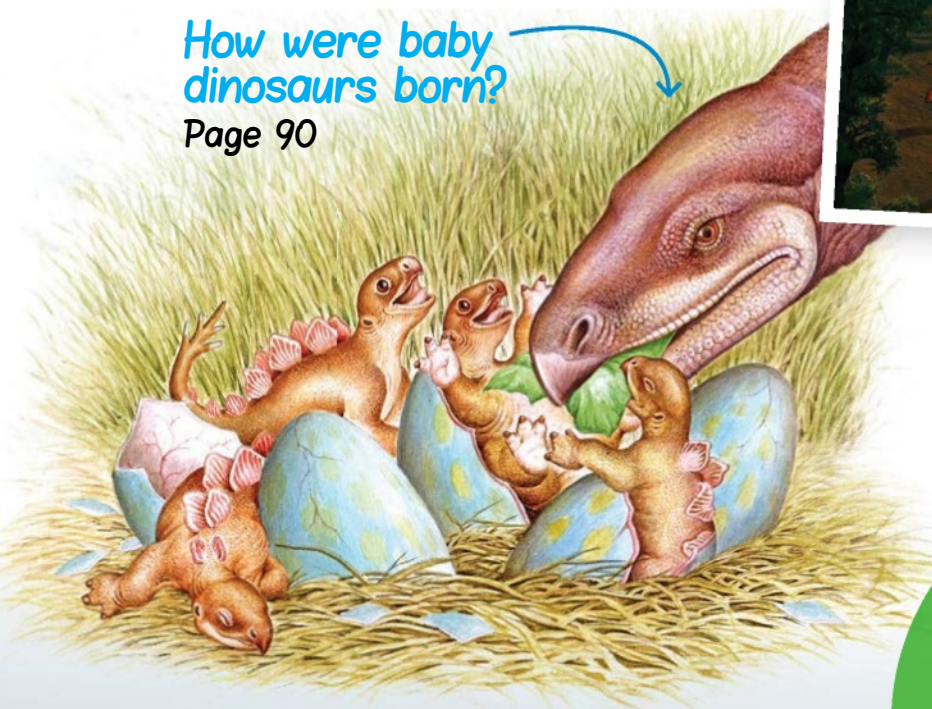
Look out for these...

- Blue circles mean quiz time!
  Send your answers to **contactus@howitworksdaily.co.uk** for a chance to win the next issue
- Words and phrases explained
- Amazing facts about the topics we cover
- Where you can find the places in our features

Discover the most amazing dinosaurs

Turn the page to get started

What happened to the dinosaurs?
Discover how they went extinct page 96



How were baby dinosaurs born?
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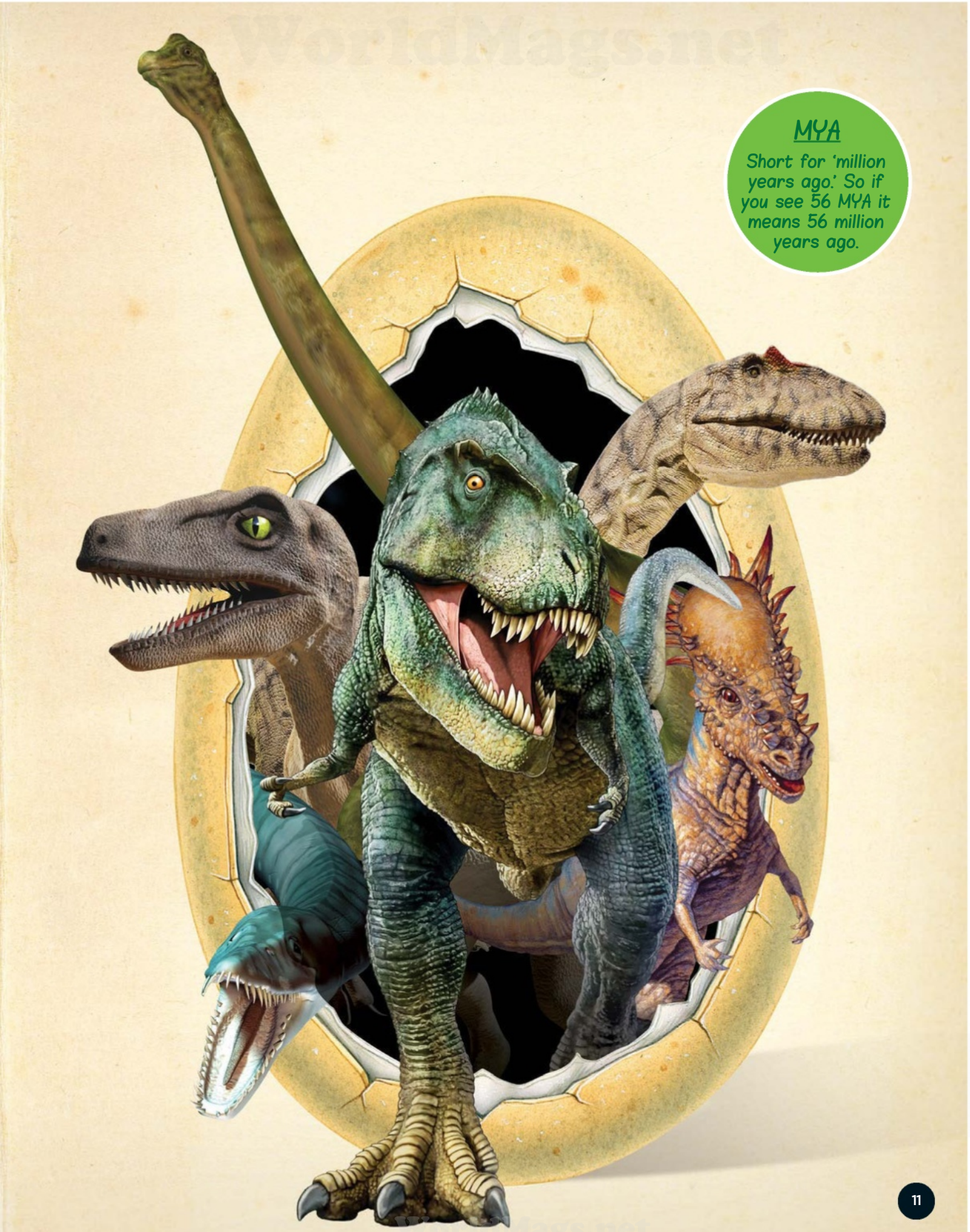
Did you love it?

Place a tick where you see this symbol if you really enjoyed what you learned

Discover the **MOST** amazing **DINOSAURS**

Over 500 types of dinosaur existed before they died out 65 million years ago. Here's 26 of the biggest, fiercest and weirdest known to humans today.



MYA

Short for 'million years ago.' So if you see 56 MYA it means 56 million years ago.

Tyrannosaurus rex

('Tyrant lizard king')

Carnivore

Cretaceous period, 67-66 MYA

Found in: ***Western North America***

Lived in: ***Forests with swamps and rivers***

T-rex was able to live for up to 30 years.

T-rex's huge head was balanced by its tail.

T-rex may have had feathers on at least part of its giant body, just like a bird!

Although T-rex's arms were small, each with two claws, they were strong, able to grip prey or lift itself off the floor.

Dinofact!
The largest T-rex heads found are 1.5m across, and their teeth were 30cm long!

Dino Skill

Killer rating:

Speed:

Defence:

T-rex may have had the most vicious bite of any animal to have lived, many times stronger than lions and sharks and capable of crunching bone and ripping apart its prey.

Stegosaurus

('Roof lizard')

Herbivore

Late Jurassic period, 150 MYA

Found in: ***Europe and Eastern North America***

Lived in: ***Forests and vegetated plains***

Dino Skill

Killer rating:

Speed:

Defence:

Stegosaurus had sharp 60-90cm-long tail spikes that it could swing at an attacker to defend itself.

Stegosaurus weighed about 5,000kg – that's about half as much as a double-decker bus!

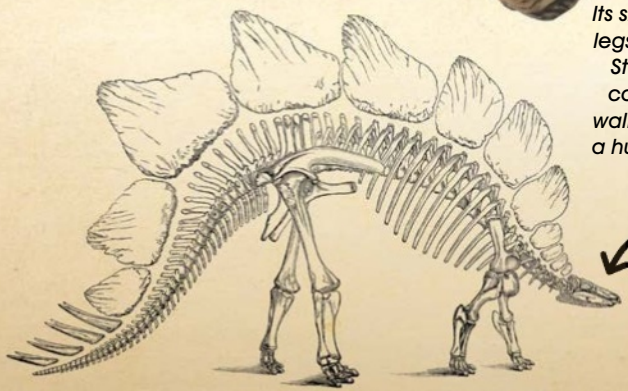
Stegosaurus had 17 plates on its back.

Dinofact!
Stegosaurus's distinctive plates on its back may have been a type of air conditioning, as air cooled the blood running through them

The spike at the end of a Stegosaurus's tail was called a thagomiser.

Its short, stumpy legs meant that Stegosaurus could barely walk faster than a human being.

This is a bony plate from the back of a Stegosaurus.



Stegosaurus was not a very smart dinosaur – it had a brain no larger than a dog's.

Triceratops

('Three-horn face')

Herbivore

Late Cretaceous, 67-65 MYA

Found in: ***Western North America***

Lived in: ***Forests and prairies***

Dino Skill

Killer rating:

Speed:

Defence:

Triceratops' three horns and frill were used for courtships and combat, using them to take on and beat the dreaded Tyrannosaurus rex!

Powerful horns helped protect from predators.

Triceratops were big-heads – the largest triceratops skulls found by dinosaur-fossil hunters are over 2m in length.

The large frill was probably used to attract a mate, like a peacock's feathers, but it could also have doubled up as a way of keeping their blood cool.

Triceratops weighed the same as two West African elephants – that's almost 12 tons!

Dinofact!

Dino-dentists would have been busy – during their lifetime Triceratops would go through between 400 and 800 teeth as they munched on ferns and palms!

Velociraptor

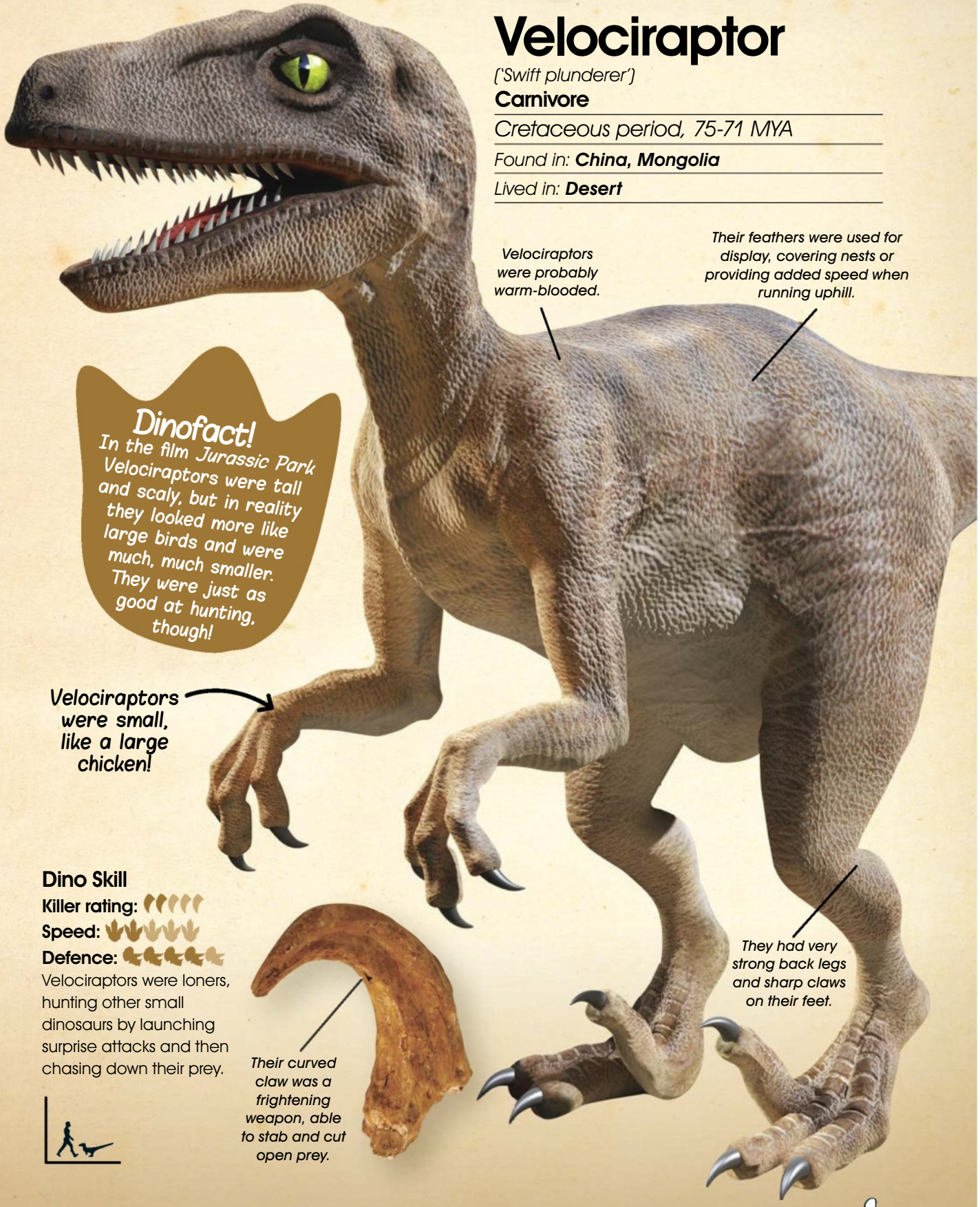
('Swift plunderer')

Carnivore

Cretaceous period, 75-71 MYA

Found in: ***China, Mongolia***

Lived in: ***Desert***



Velociraptors were probably warm-blooded.

Their feathers were used for display, covering nests or providing added speed when running uphill.

Dinofact!
In the film *Jurassic Park* Velociraptors were tall and scaly, but in reality they looked more like large birds and were much, much smaller. They were just as good at hunting, though!

Velociraptors were small, like a large chicken!

Dino Skill

Killer rating:

Speed:

Defence:

Velociraptors were loners, hunting other small dinosaurs by launching surprise attacks and then chasing down their prey.

They had very strong back legs and sharp claws on their feet.

Their curved claw was a frightening weapon, able to stab and cut open prey.

Brachiosaurus

('Arm lizard')

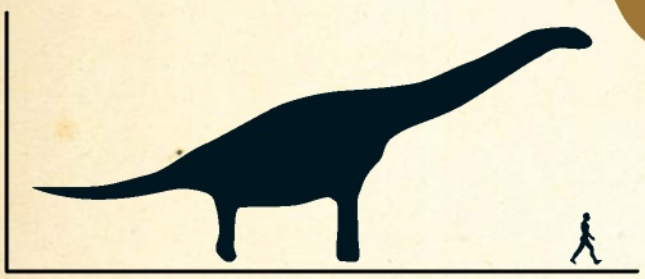
Herbivore

Jurassic period, 150 MYA

Found in: ***North America***

Lived in: ***Forests***

Dinofact!
Brachiosaurus constantly ate, and it's thought that it gobbled up between 200 and 400kg of plants every day – that's like eating 400 to 800 lettuces!



Dino Skill

Killer rating:

Speed:

Defence:

Brachiosaurus just spent its day lumbering around, so wasn't particularly skilful, but it was so large that no predator could harm it!

Brachiosaurus had a tiny head.

Adult Brachiosaurus weighed over 100 tons!

Brachiosaurus may have often held its long neck parallel to the ground to sift through the undergrowth for food, as well as to reach up to leaves on trees.

This is a bone from the long neck of the Brachiosaurus called a vertebra.

Unlike many other dinosaurs, their front legs were longer than their back legs, which provided additional elevation for their neck and head.

Pteranodon

('Toothless wing')

Carnivore

Late Cretaceous, 88-80 MYA

Found in: ***North America***

Lived in: ***Coastal/lake areas***

Dino Skill

Killer rating:

Speed:

Defence:

Pteranodons were able to walk on four legs when on the ground, using their claws attached to their wings

Dinofact!

Not strictly dinosaurs, Pteranodons were giant flying reptiles that lived at the same times as the dinosaurs. They didn't have any teeth, so would scoop up and swallow fish from rivers when it was time to eat

Pteranodons had no feathers.

The raised crests at the back of their heads may have been used as displays to help attract mates, as well as help change direction in flight.

Pteranodons are thought to have been able to swim on the surface of water, dipping their beaks beneath the waves to grab fish.

Males had a 3m wingspan

These creatures had small hands with four claws on them.

The male Pteranodon sternbergi had a larger upright crest on top of the head compared to females' smaller crest.

Allosaurus

('Different lizard')

Carnivore

Late Jurassic, 155-150 MYA

Found in: ***North America***

Lived in: ***Semi-arid plains and forests***

Dino Skill

Killer rating:

Speed:

Defence:

Allosaurus was able to sniff out its prey, like Stegosaurus and Diplodocus, with a keen sense of smell.

Forward-facing eyes helped focus on prey.

Its large and terrifying skull was balanced by its heavy tail, so that it didn't fall forward all the time!

Its mighty jaws could clamp down hard on its prey, but not as hard as an alligator, for example.

Dinofact!
Allosaurus' backward-facing, 10cm-long teeth meant that it could continuously push its prey further down its mouth!

Razor-sharp claws.

Their legs weren't as long as a Tyrannosaur's and they couldn't run as fast

This is what the skull of an Allosaurus looks like.

Spinosaurus

('Spine lizard')

Carnivore

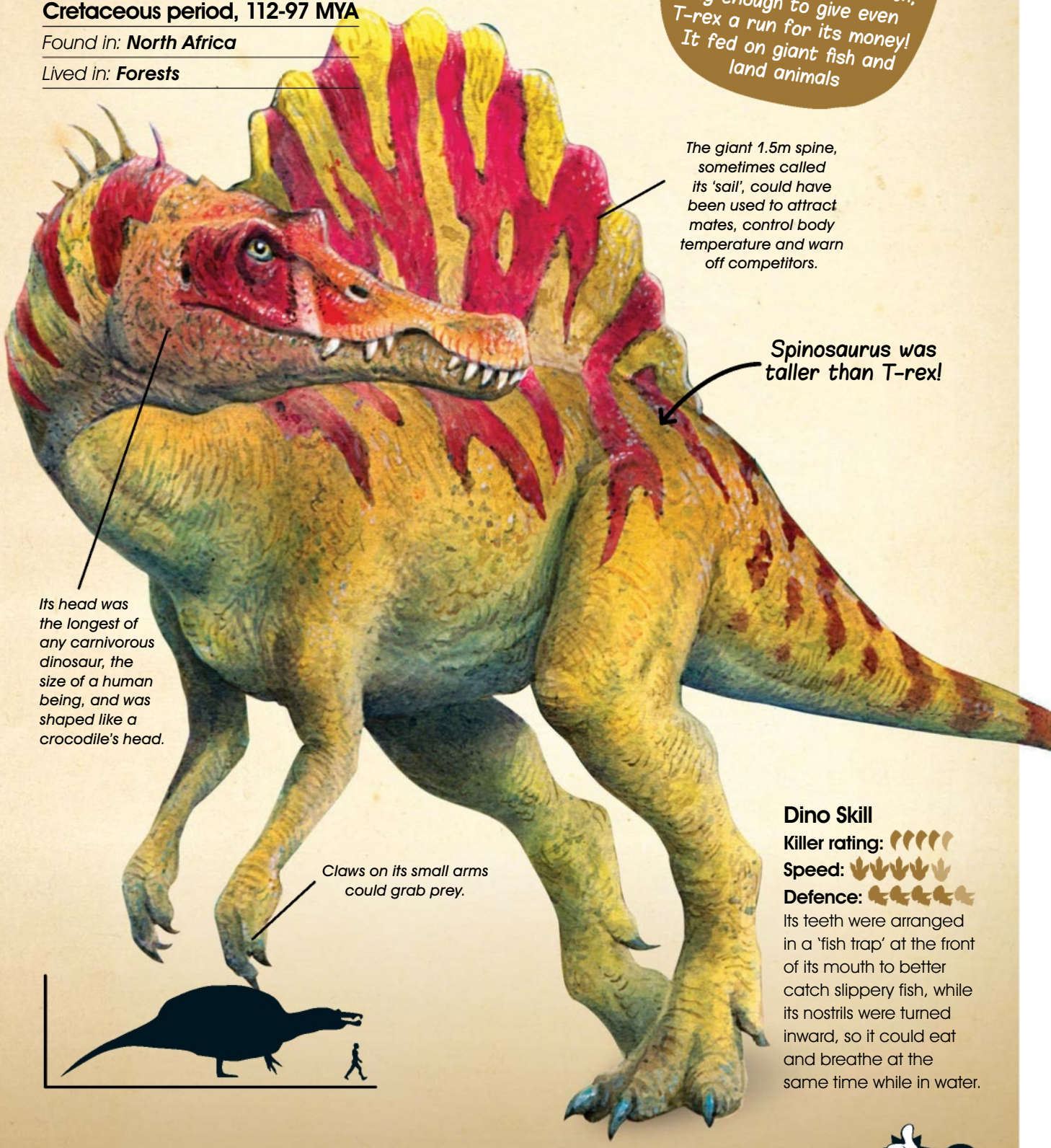
Cretaceous period, 112-97 MYA

Found in: ***North Africa***

Lived in: ***Forests***

Dinofact!

Spinosaurus is the largest meat-eating animal that has ever existed on Earth, big enough to give even T-rex a run for its money! It fed on giant fish and land animals



The giant 1.5m spine, sometimes called its 'sail', could have been used to attract mates, control body temperature and warn off competitors.

Spinosaurus was taller than T-rex!

Its head was the longest of any carnivorous dinosaur, the size of a human being, and was shaped like a crocodile's head.

Claws on its small arms could grab prey.

Dino Skill

Killer rating:

Speed:

Defence:

Its teeth were arranged in a 'fish trap' at the front of its mouth to better catch slippery fish, while its nostrils were turned inward, so it could eat and breathe at the same time while in water.

Argentinosaurus

('Argentine lizard')

Herbivore

Cretaceous, 95 MYA

Found in: ***Argentina***

Lived in: ***Forests***

Adult Argentinosaurs would lay dozens of eggs each year.

We can tell from fossil finds that its skin was armoured.

Its small brain would have meant that Argentinosaurus was one of the dumber dinosaurs!

Argentinosaurus was incredibly slow and walked at 8km/h – you would be able to beat it in a walking race

Don't step in its poo! Argentinosaurus would have produced 15 litres' worth of dino droppings each time – that's like five big buckets of poo in one go!

Dinofact!

Argentinosaurus was the largest animal ever to walk the Earth. Baby Argentinosaurs had to grow by a whopping 25,000 times their original size to become fully grown over the course of 15 years!

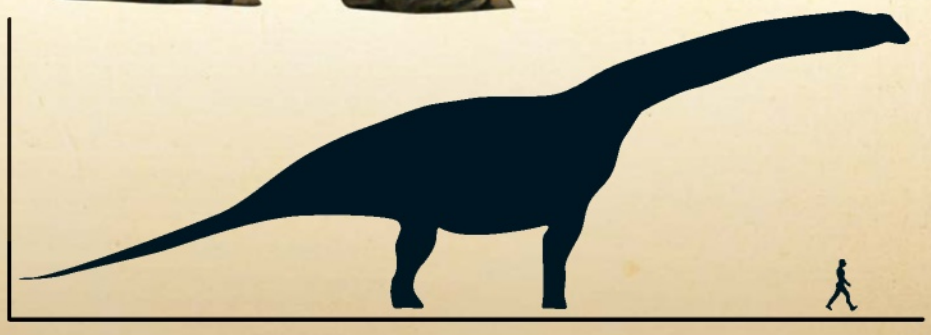
Dino Skill

Killer rating:

Speed:

Defence:

Argentinosaurus had the ability to stand up on its back legs, then come crashing down on any attackers!



Carnotaurus

('Meat-eating bull')

Carnivore

Late Cretaceous, 70 MYA

Found in: ***Argentina***

Lived in: ***Lake environments***

Carnotaurus had small eyes, so its vision was not very good. Combined with not being able to turn easily, it probably just smashed through obstacles without seeing them!

It used its sense of smell to hunt.

Carnotaurus' scales were small and pebble-like.

Dinofact!

Carnotaurus could run very fast at about 40 km/h, faster than T-rex, but it could not turn very well, so it tended to charge in straight lines

Dino Skill

Killer rating:

Speed:

Defence:

With the horns on its forehead and muscular neck, Carnotaurus could head-butt its prey into submission!

The skull of a Carnotaurus

Carnotaurus had powerful thigh muscles that were so big they weighed twice as much as a human being. The Carnotaurus as a whole weighed the same as a small car!

Plesiosaurus

('Close to lizard')

Carnivore

Early Jurassic, 195 MYA

Found in: ***England***

Lived in: ***The sea***

When breathing out it would push the air out through its nostrils.

The Plesiosaurus would breathe in through its mouth.

Smooth skin helped the Plesiosaurus swim.

Plesiosaurus had flippers to push itself through the water at about 16km/h, which is slower than today's dolphins or whales.

Dinofact!

Plesiosaurs weren't really dinosaurs. As well as eating fish, they also ate stones, which helped digest the fish by grinding them down inside their stomachs

Plesiosaurus's eyes were on the side of its head, so that it could look up at its prey, and attack from below.

Needle-like teeth were able to trap fish.

Dino Skill

Killer rating:

Speed:

Defence:

The long neck of the Plesiosaurus has 40 bones compared to human necks that only have seven. This long neck allowed the Plesiosaurus to reach food in tight spaces.

Diplodocus

('Double beam')

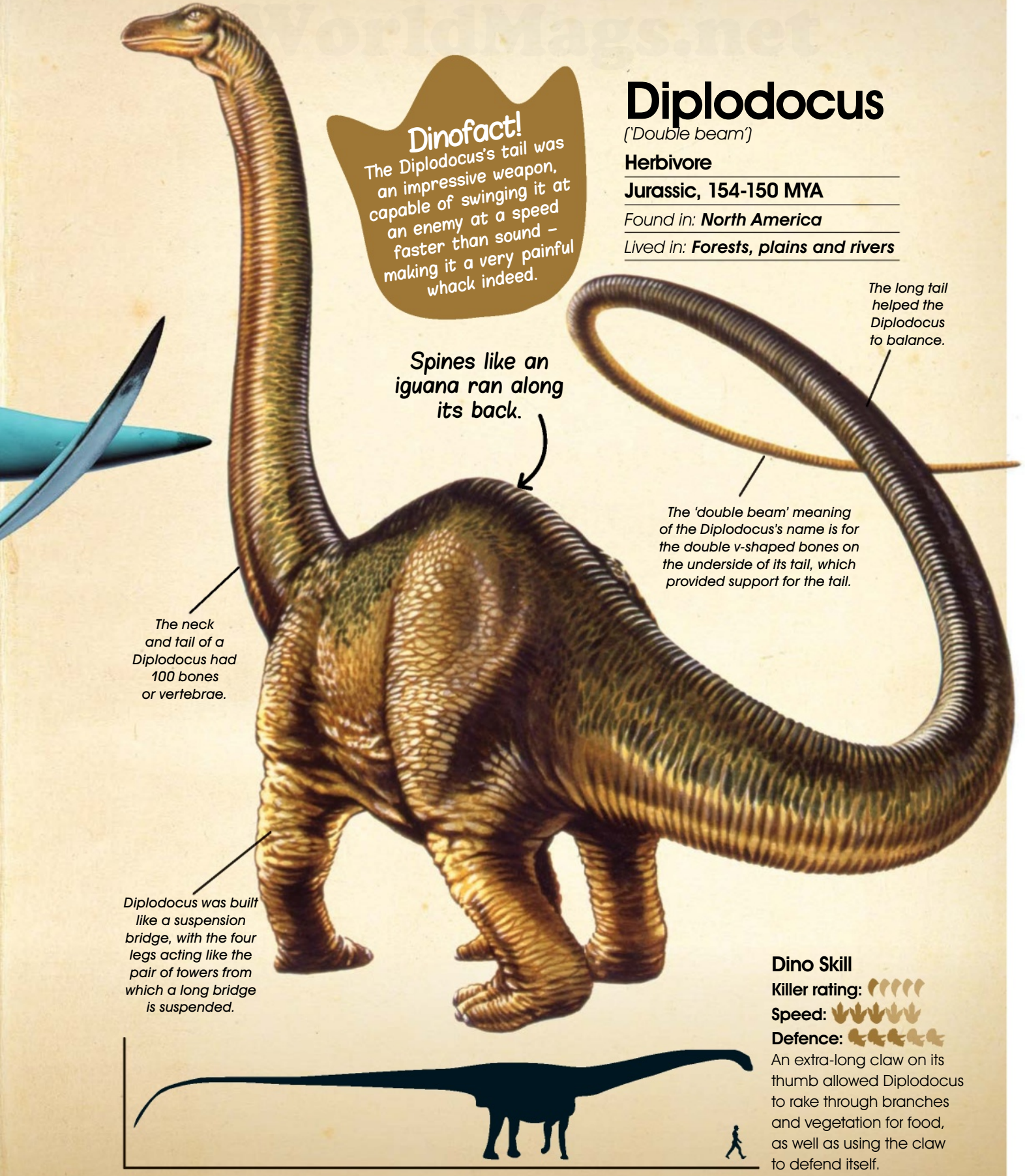
Herbivore

Jurassic, 154-150 MYA

Found in: ***North America***

Lived in: ***Forests, plains and rivers***

Dinofact!
The Diplodocus's tail was an impressive weapon, capable of swinging it at an enemy at a speed faster than sound – making it a very painful whack indeed.



Spines like an iguana ran along its back.

The long tail helped the Diplodocus to balance.

The 'double beam' meaning of the Diplodocus's name is for the double v-shaped bones on the underside of its tail, which provided support for the tail.

The neck and tail of a Diplodocus had 100 bones or vertebrae.

Diplodocus was built like a suspension bridge, with the four legs acting like the pair of towers from which a long bridge is suspended.

Dino Skill

Killer rating:

Speed:

Defence:

An extra-long claw on its thumb allowed Diplodocus to rake through branches and vegetation for food, as well as using the claw to defend itself.

Sinosauropteryx

'Chinese lizard wing'

Carnivore

Cretaceous period, 135-120 MYA

Found in: ***China***

Lived in: ***Lakes***

Feathers on its tail were bands of orange and white.

Sinosauropteryx is the earliest known bird-like dinosaur.

It's twins! Sinosauropteryx was able to lay two eggs at a time, which it would sit on to incubate until they hatched.

The feathers might also have been used for camouflage.

Feathers covered the body of Sinosauropteryx, providing insulation to keep this reptile warm, meaning it may have been warm-blooded.

Dino Skill

Killer rating:

Speed:

Defence:

Sinosauropteryx had a strong stomach – poisonous small mammals were to be found on its menu!

Fossil evidence like this showed scientists that Sinosauropteryx had feathers.

Dinofact!

Sinosauropteryx was the first dinosaur to have its colour described by scientists. Its feathers were dark reddish-brown, with bands of orange and white on its tail!

Ankylosaurus

('Fused lizard')

Herbivore

Cretaceous, 70-65 MYA

Found in: ***South America***

Lived in: ***Coastal plains***

Dino Skill

Killer rating:

Speed:

Defence:

Its club-like tail was a vicious weapon that the Ankylosaurus could use to defend itself with.

Two rows of spikes ran along its body, plus there were two large horns from the back of its head that it could defend itself with.

The Ankylosaurus had a small brain.

Dinofact!

Ankylosaurus was a walking tank! It had strong armour plates of bone fused into the skin on its back that was impenetrable even to T-rex!

Powerful club-tail could break an attacker's bones

This is an old sketch of an Ankylosaurs skeleton, before the tail club was discovered.

The underside of its belly was the only place the Ankylosaurus was not armoured – flipping it over was the only way to kill it.

Ankylosaurus probably had five toes on each foot.

Its entire head was covered in bony plates.

Archaeopteryx

('First bird')

Carnivore

Jurassic period, 150 MYA

Found in: ***Germany***

Lived in: ***Subtropical islands***

Sharp teeth made Archaeopteryx an efficient predator.

It is unclear whether Archaeopteryx was able to flap its wings and fly, or more likely whether it could just glide.

Tips of feathers coloured black.

Archaeopteryx had three claws on each wing, plus killing claws on its feet, with which would hunt for insects and small reptiles.

Dinofact!

As well as being a dinosaur, the Archaeopteryx is also the first known bird and was about the size of a pigeon, although it had more teeth!

Dino Skill

Killer rating:

Speed:

Defence:

Its wings were made for gliding only short distances – instead Archaeopteryx was well adapted to spending most of its time living in trees.

Compsognathus

('Elegant jaw')

Carnivore

Late Jurassic, 155-145 MYA

Found in: ***Germany and France***

Lived in: ***Lagoons***

Large eyes with binocular vision aided hunting.

To help it run fast, its long tail helped to give the Compsognathus balance.

Compsognathus was small, about the size of a turkey, and is one of the smallest known dinosaurs, along with other dinosaurs like Microraptors and Parvicursors.

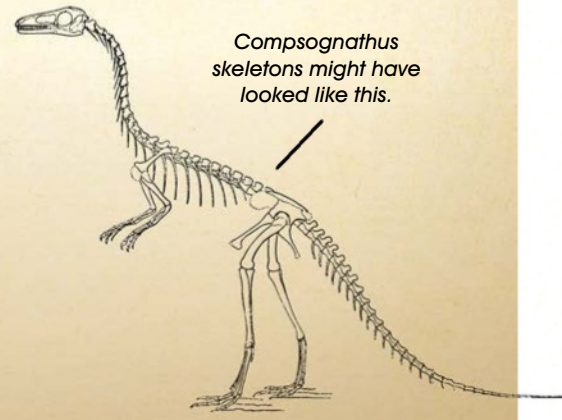
Dinofact!
Compsognathus had no time for chewing its food – for example, Bavarisaurus has been found in Compsognathus fossils having been eaten in one gulp!

Compsognathus had short arms with two clawed fingers on each hand.

It had a small pointed head with sharp teeth.

Sharp claws made Compsognathus a deadly dinosaur.

Compsognathus skeletons might have looked like this.



Dino Skill

Killer rating:

Speed:

Defence:

Compsognathus may have been small, but they were incredibly fast, able to run at 60km/h – that's half as fast as cheetahs – to escape predators and to catch small prey.

Herrerasaurus

('Herrera's lizard')

Carnivore

Late Triassic, 231 MYA

Found in: ***Argentina***

Lived in: ***River floodplains with active volcanoes***

Dino Skill

Killer rating:

Speed:

Defence:

One of the first dinosaurs, Herrerasaurus had an semi-opposable thumb among its claws, allowing it to grab more firmly onto its prey

Inwardly curving teeth allowed it to hang onto its prey.

Its lower jaw was jointed, allowing it to slide back and forth to grasp and bite prey

Longer arms than T-rex or Allosaurus.

Dinofact!

Compared to the T-rex and Spinosaurus, Herrerasaurus is tiny. But it lived in a time when all dinosaurs were fairly small, meaning it was one of the top predators

It could slide its lower jaw forward and backward in a sawing bite.

Herrerasaurus had big feet, which, along with its strong legs and powerful thigh muscles, meant it could gallop quite fast, up to 40km/h!

Pachycephalosaurus

('Thick-headed lizard')

Herbivore

Late Cretaceous, 65-75 MYA

Found in: ***North America, Isle of Wight, Mongolia, Madagascar***

Lived in: ***Coastal regions***

Dino Skill

Killer rating:

Speed:

Defence:

Pachycephalosaurus would use its domed head to ram the sides of other animals that attacked it.

Bony dome protected its small brain.

It had large eyes compared to many other dinosaurs.

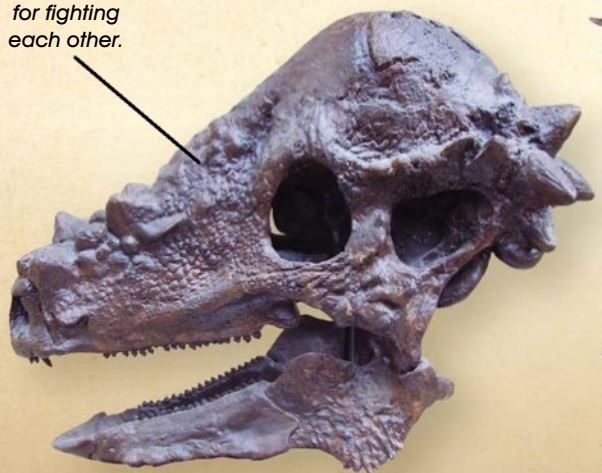
Dinofact!

Bow down to the royalty! Pachycephalosaurus wore a crown of spikes on its head, which was armoured by a large, bony dome

Pachycephalosaurus found additional safety in numbers – they lived in herds, feeding on plants with their small, sharp teeth.

Hands with five-fingered claws.

Some scientists think they used their thick skulls for fighting each other.



Despite the powerful legs, Pachycephalosaurus was not much of a sprinter, although its first line of defence from attackers would have been to run.

Deinonychus

('Terrible claw')

Carnivore

Early Cretaceous, 110 MYA

Found in: ***North America***

Lived in: ***Swamps***

Deinonychus had quite large brains compared to other dinosaurs, making them some of the smartest.

A flexible neck helped it attack from all angles.

Large claw used for slashing prey.

Deinonychus were quite small so they may have hunted in packs to catch prey larger than themselves.

Some scientists think the legs closely resembled eagles and hawks.

Dino Skill

Killer rating:

Speed:

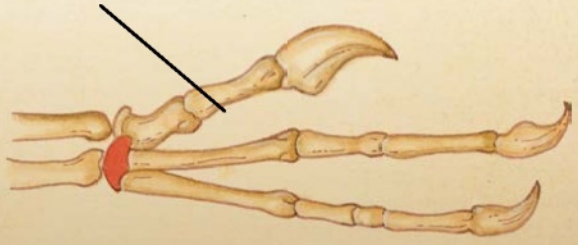
Defence:

Deinonychus is named after its large, hooked claw on the second toe of each foot, which it would use to slash at its prey.

Dinofact!

Believe it or not, birds today are thought to have evolved from dinosaurs, and it was fossils of Deinonychus that first made scientists wonder about the connection!

They had long fingers with claws at end, the wrist bone is shown in red.



Liopleurodon

('Smooth-sided teeth')

Carnivore

Mid-Jurassic, 160-155 MYA

Found in: ***Europe***

Lived in: ***The sea***

Dinofact!
Ambush! For the sea's deadliest dino-killer, the Liopleurodon would ambush its prey with a surprise attack

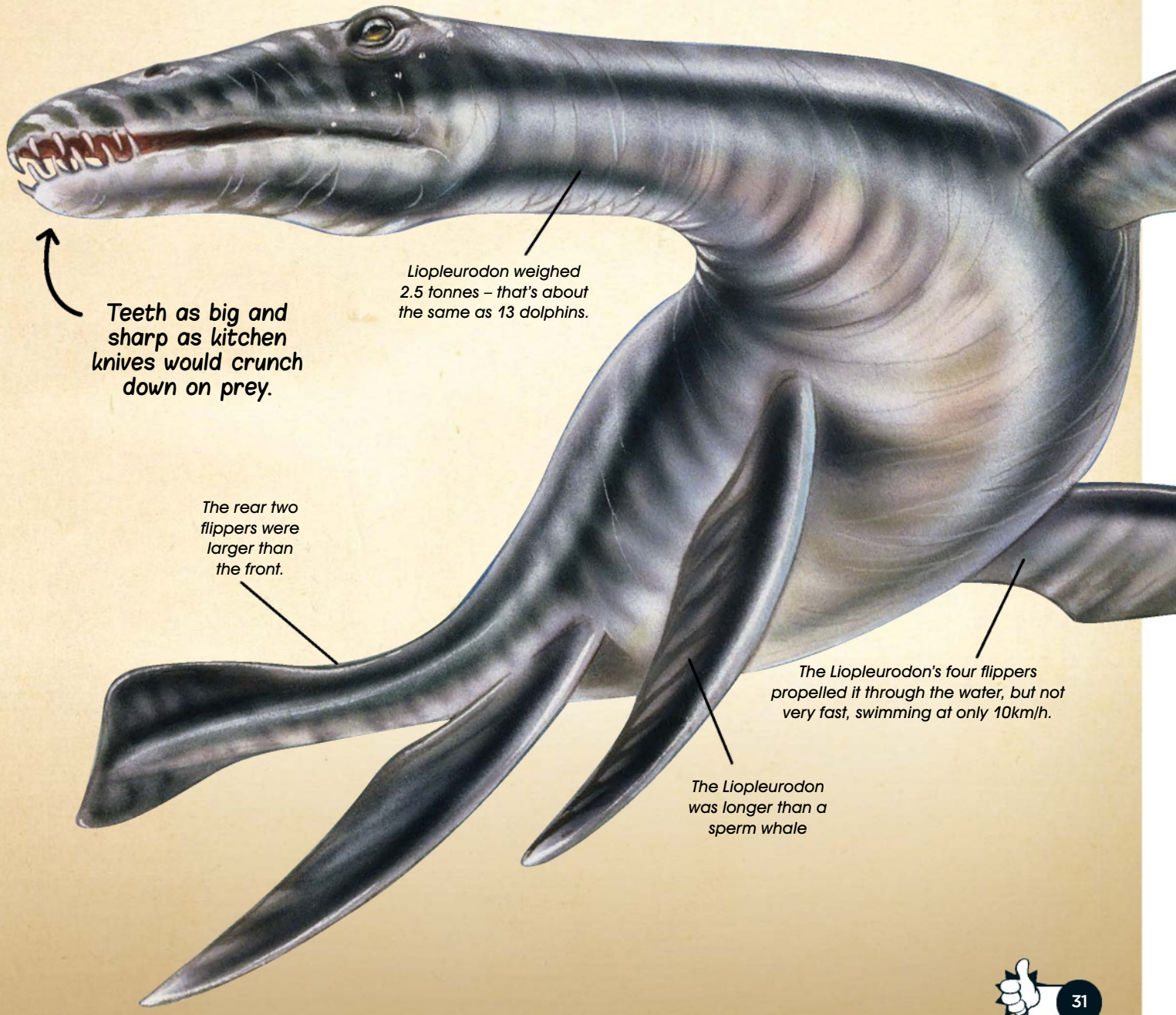
Dino Skill

Killer rating:

Speed:

Defence:

In the dark seas of the Jurassic era, the Liopleurodon used its keen sense of smell to sniff out prey that had the misfortune to swim past it.



Teeth as big and sharp as kitchen knives would crunch down on prey.

Liopleurodon weighed 2.5 tonnes – that's about the same as 13 dolphins.

The rear two flippers were larger than the front.

The Liopleurodon's four flippers propelled it through the water, but not very fast, swimming at only 10km/h.

The Liopleurodon was longer than a sperm whale

Euoplocephalus

('Well-armed head')

Herbivore

Late Cretaceous, 70 MYA

Found in: ***North America***

Lived in: ***Forests and rivers***

Dinofact!
Dinosaurs had poor eyesight and Euoplocephalus had some of the worst, with just a pair of tiny eyes – it probably bumped into things a lot!

Spikes and horns provided additional defence.

At 2,000kg Euoplocephalus was twice the weight of a male Indian rhino

Euoplocephalus had armour plates that ran across their entire body, providing ample protection from the jaws of carnivores like T-rex.

Predators beware! It may have only eaten leaves, but its club-tail could give anyone who made it angry a pretty major whack!

Dino Skill

Killer rating:

Speed:

Defence:

Euoplocephalus would eat many types of plants and to help digest it all they had a large stomach inside a big rib cage and a barrel-shaped abdomen.

Gigantosaurus

('Giant southern lizard')

Carnivore

Cretaceous period, 100 MYA

Found in: ***South America***

Lived in: ***Argentina***

Giganotosaurus was not very smart – its brain was small, and banana-shaped as well!

Giganotosaurus would have given T-rex a run for its money, being larger, with serrated knife-like teeth for cutting into prey!

Dinofact!
Despite being huge and monstrous, Giganotosaurus would often fall over when running fast, breaking its arms and ribs!

It had short but powerful arms with razor-sharp claws on each hand.

Giganotosaurus weighed up to eight tons.

Giganotosaurus could run at the same speed as a car in a 30mph zone.

Dino Skill

Killer rating:

Speed:

Defence:

Its thin, pointed tail would have provided balance, allowing the Giganotosaurus to turn quickly, making it agile enough to catch prey.

Iguanodon

('Iguana-tooth')

Herbivore

Early Cretaceous, 130 MYA

Found in: ***Europe, North America, Africa, Asia***

Lived in: ***Forests, plains and rivers***

Dino Skill

Killer rating:

Speed:

Defence:

The Iguanodon's claws also had a thumb spike, which could have been used to help grab food, as well as give attackers a sharp thump!

Dinofact!

While most dinosaurs stayed in one region, the Iguanodons were sight-seers and liked to travel, spreading to all continents apart from Antarctica!

Iguanodon had a long, stiff tail.

Iguanodon had no front teeth for biting, but it did have back teeth for grinding plants like a modern iguana, and a beak to pick at the plants with.

Iguanodon's legs were longer than its arms and it could walk on all fours or run on its back legs at up to 20km/h.

Spikey thumbs helped Iguanodon grapple things.

Seismosaurus

('Quake lizard')

Herbivore

Late Jurassic, 156-145 MYA

Found in: ***North America***

Lived in: ***Forests, plains and rivers***

Dino Skill

Killer rating:

Speed:

Defence:

Its long neck ended in a small head armed with peg-like teeth that could strip entire woodlands of their leaves and other foliage in no time at all!

A long neck allowed Seismosaurus to reach food.

Seismosaurus travelled in grazing herds.

Its enormous weight meant Seismosaurus needed very strong and sturdy legs to hold it up.

Its long tail was a deadly weapon to be used against any would-be attackers.

Dinofact!

Seismosaurus is actually a giant version of the Diplodocus, weighing 30 tons, and the ground would literally have shaken when this enormous beast lumbered past!

Ouranosaurus

('Brave lizard')

Herbivore

Early Cretaceous, 115-110 MYA

Found in: ***North Africa***

Lived in: ***Forests***

The distinctive spine ran across the length of Ouranosaurus' back and besides keeping the dinosaur cool, could have stored energy for the winter.

Dino Skill

Killer rating:

Speed:

Defence:

Like Spinosaurus and Stegosaurus, the large sail on the spine of Ouranosaurus helped to regulate its temperature.

Ouranosaurus had average intelligence for a dinosaur.

Ouranosaurus had no teeth in its beak, but it had teeth inside its cheeks, with which it chewed up food such as leaves, fruit and seeds.

Ouranosaurus could run on two legs or walk on four.

Its skull was 67cm long and quite flat.

Dinofact!

Ouranosaurus had to be brave, because it did not have many defence mechanisms! What it could do was use its sail to make it appear bigger than it really was, to intimidate predators

Dilophosaurus

('Two-crested lizard')

Carnivore

Early Jurassic, 193 MYA

Found in: ***Arizona, USA and China***

Lived in: ***Close to rivers and in dry places***

This dinosaur had a strange bump behind its first row of teeth, making it look like a crocodile.

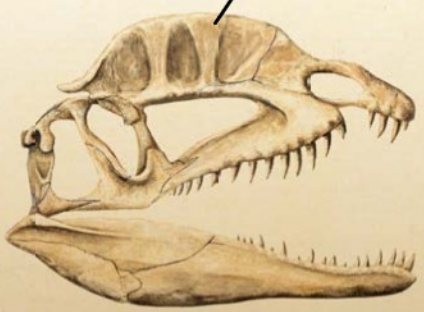
Dilophosaurus wasn't big enough to kill and eat large animals, so it ate smaller creatures and fish instead.

Despite what you might have seen in the movie Jurassic Park, Dilophosaurus was unlikely to have spat out poison.

Dinofact!

Dilophosaurus had two frilly crests on the top of its head – just like a chicken. It appeared in the movie Jurassic Park, but may not have had a neck frill in real life

The most interesting part of its skull is this crest, used for attracting a mate.



Dilophosaurus was very likely to have hunted in packs like wolves.

Dino Skill

Killer rating:

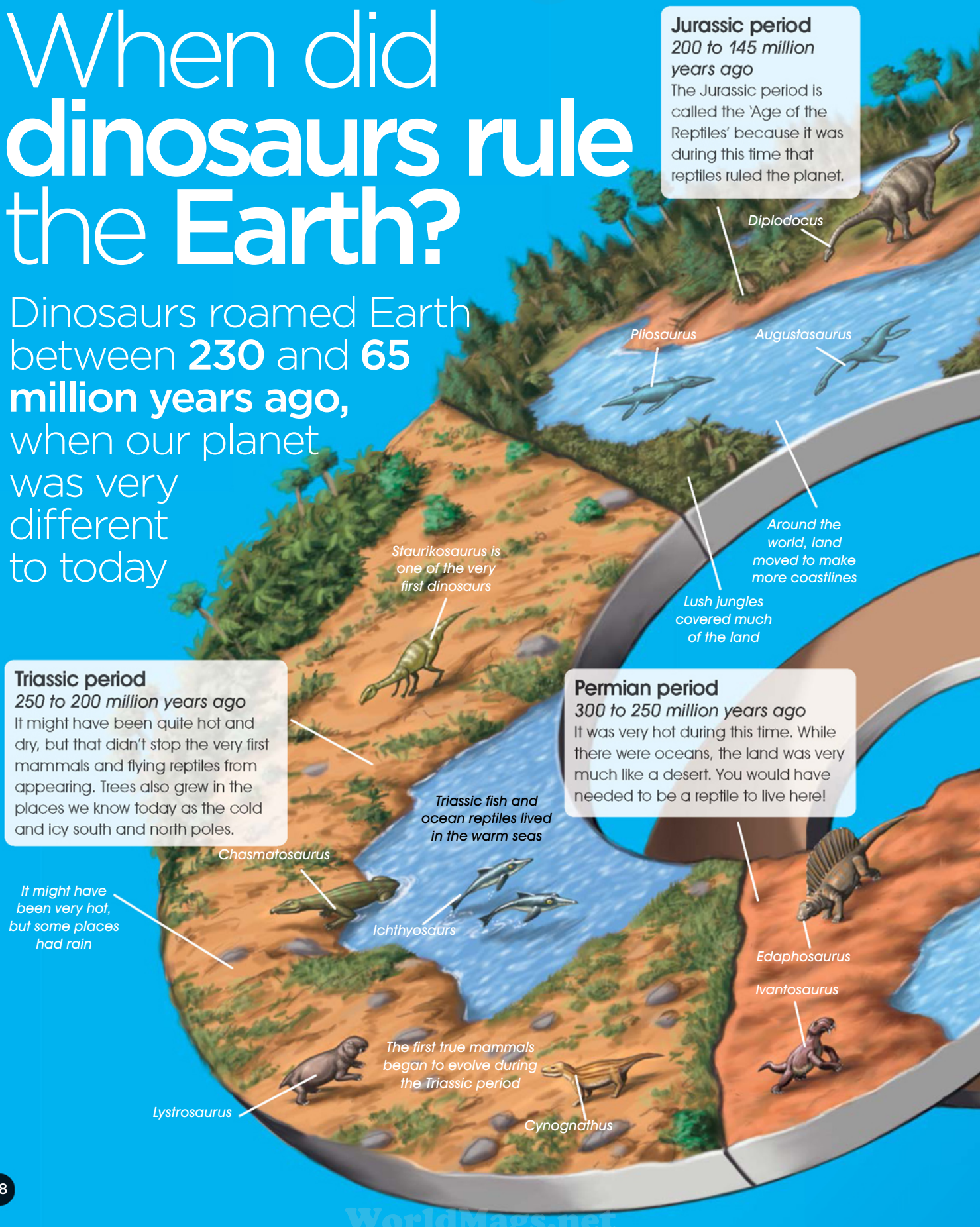
Speed:

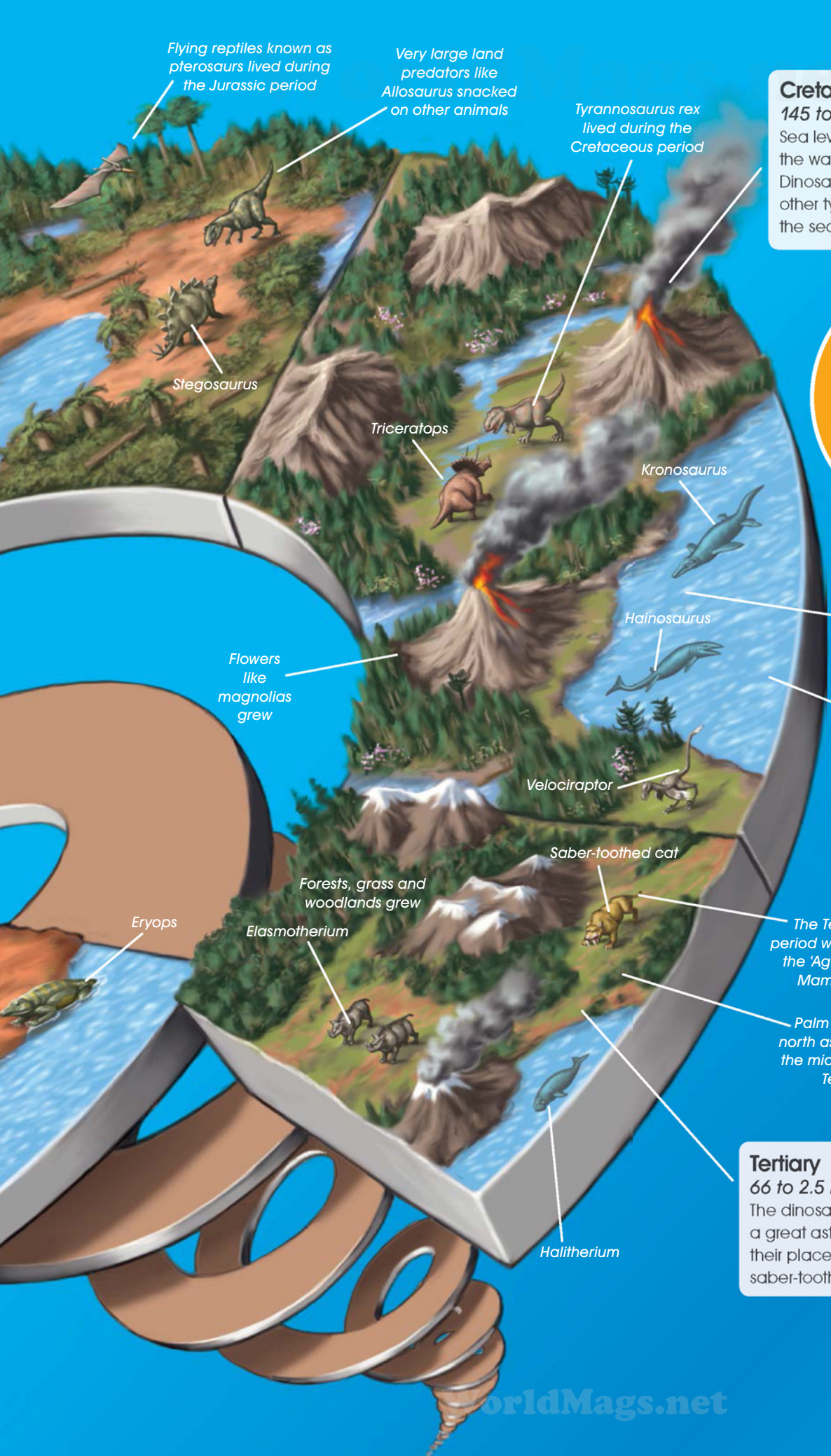
Defence:

Its long neck ended in a small head armed with peg-like teeth that could strip entire woodlands of their leaves and other foliage in no time at all!

When did **dinosaurs rule** the **Earth?**

Dinosaurs roamed Earth between **230** and **65 million years ago,** when our planet was very different to today





Cretaceous period

145 to 66 million years ago

Sea levels were high during the warm Cretaceous period. Dinosaurs ruled the land, while other types of creatures swam the seas.

60°C

That's how hot it got in some places on Earth during the Triassic period. Lots of dinosaurs couldn't survive

Tertiary

66 to 2.5 million years ago

The dinosaurs had been killed by a great asteroid by this time. In their place, other animals like the saber-toothed cat lived.

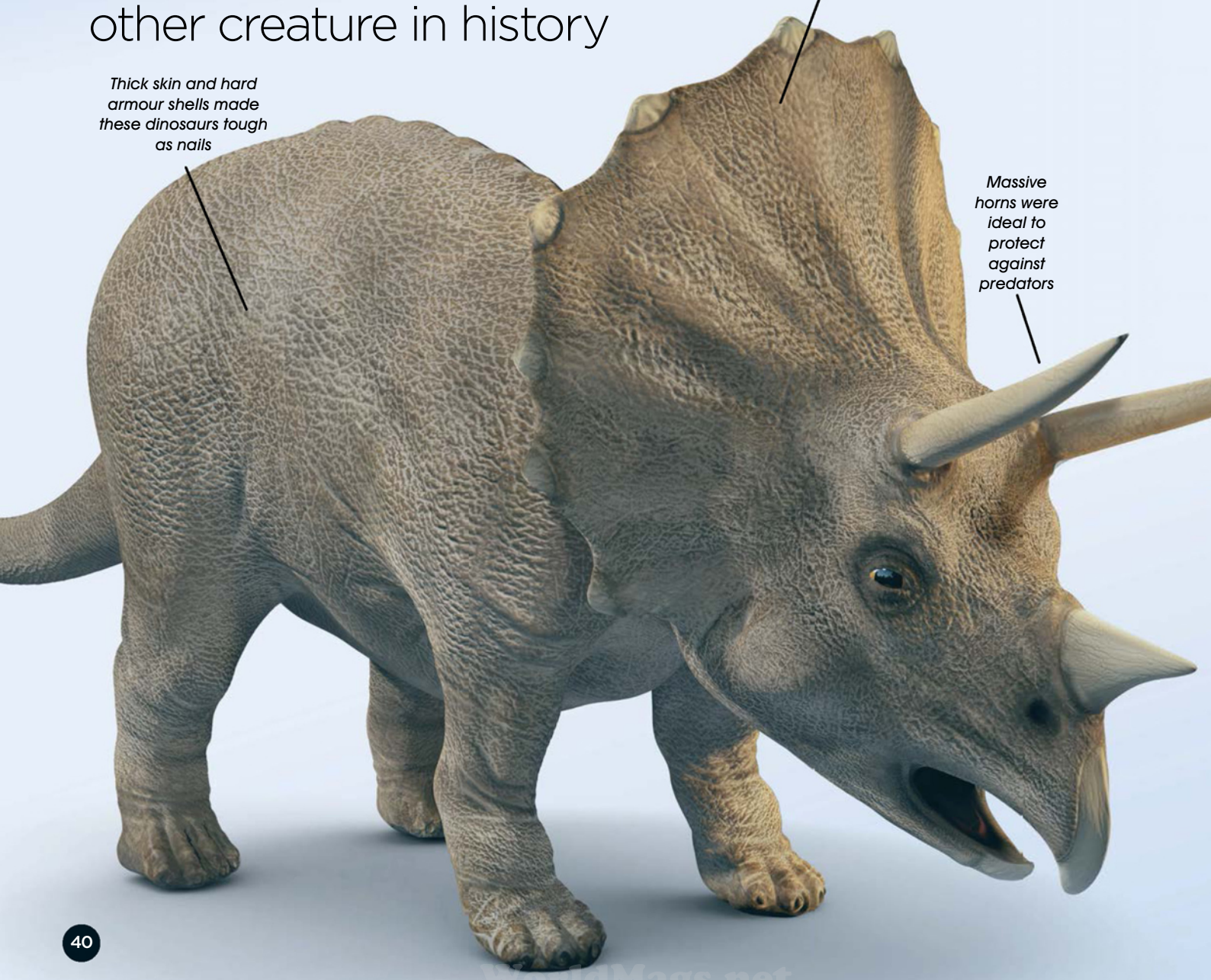
What was a dinosaur?

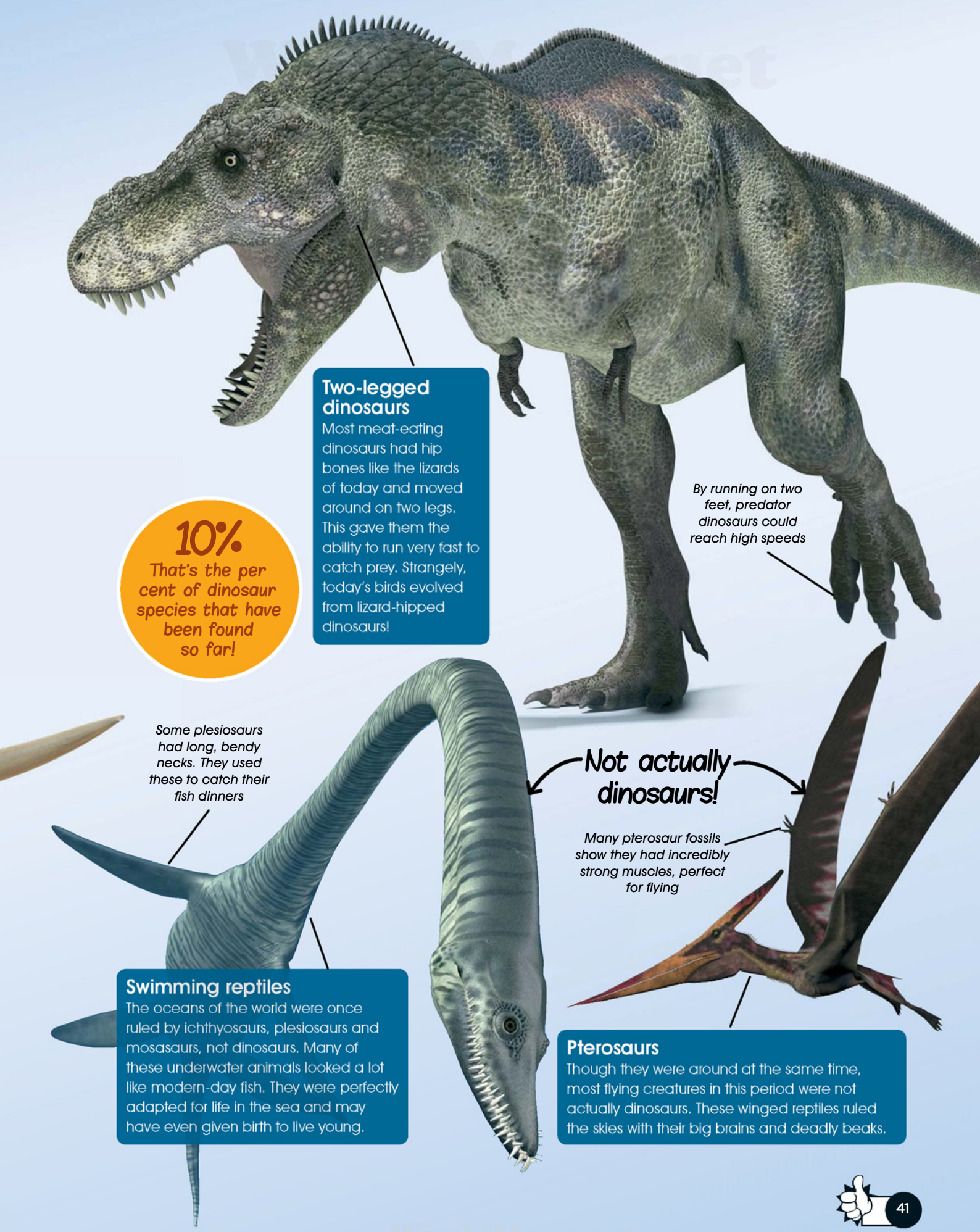
Dinosaurs were a **reptile** that **first appeared** over **230 million years ago.** They lived on Earth longer than any other creature in history

Four-legged dinosaurs
Most plant-eating dinosaurs had hip bones similar to the birds of today. They walked on four legs and evolved to protect themselves against predators. Some had huge horns for defence.

Thick skin and hard armour shells made these dinosaurs tough as nails

Massive horns were ideal to protect against predators





Two-legged dinosaurs

Most meat-eating dinosaurs had hip bones like the lizards of today and moved around on two legs. This gave them the ability to run very fast to catch prey. Strangely, today's birds evolved from lizard-hipped dinosaurs!

By running on two feet, predator dinosaurs could reach high speeds

10%

That's the per cent of dinosaur species that have been found so far!

Some plesiosaurs had long, bendy necks. They used these to catch their fish dinners

Not actually dinosaurs!

Many pterosaur fossils show they had incredibly strong muscles, perfect for flying

Swimming reptiles

The oceans of the world were once ruled by ichthyosaurs, plesiosaurs and mosasaurs, not dinosaurs. Many of these underwater animals looked a lot like modern-day fish. They were perfectly adapted for life in the sea and may have even given birth to live young.

Pterosaurs

Though they were around at the same time, most flying creatures in this period were not actually dinosaurs. These winged reptiles ruled the skies with their big brains and deadly beaks.

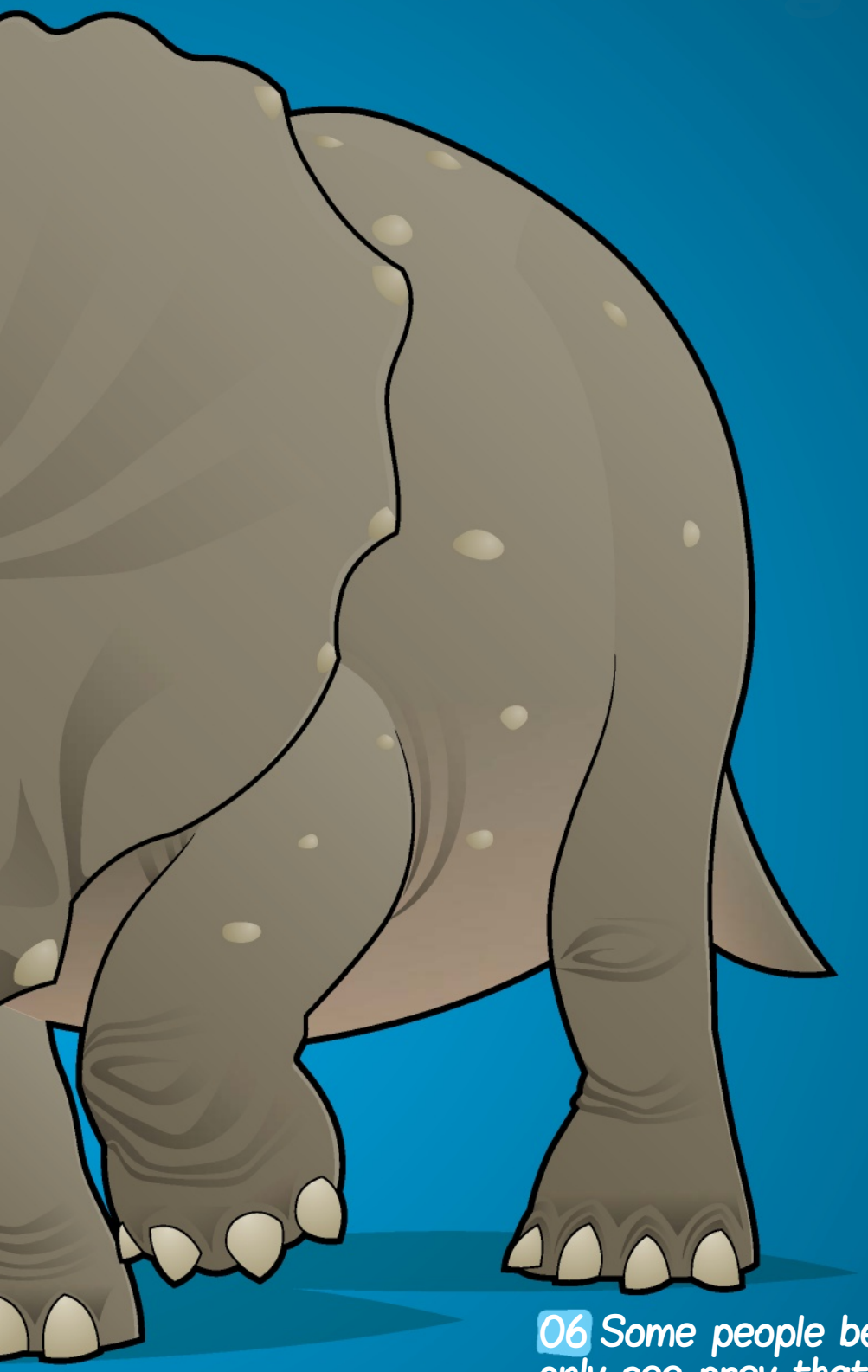
12 dinosaur myths busted

There are a lot of **popular ideas** about dinosaurs from **movies** and **books** that **aren't true**. Find out the **real story** behind 12 **dinosaur myths**...

Myth

A myth is something that lots of people think is true, but is actually false

01 Humans and dinosaurs never lived together. Dinosaurs died out millions of years before humans lived



02 The dinosaurs are all extinct

Although dinosaurs were wiped out as a species, scientists believe that the birds we see today are descended from the ancient prehistoric beasts. So birds are technically dinosaurs too!

03 All dinosaurs moved slowly

When we think of dinosaurs, we often think of the huge, lumbering kinds like Diplodocus and Brachiosaurus. But don't forget that two-legged, carnivorous dinosaurs had to run fast enough to catch their prey and avoid becoming dinner for bigger beasts. This meant that some were quite fast and would have easily been able to beat (or eat!) Olympic runner Usain Bolt!

04 Dinosaurs all had scaley skin

In movies and TV shows, dinosaurs are often show as having tough, leathery skin or even scales like reptiles today. This might not have been true, as scientists have recently found fossils that show dinosaurs might well have had feathers like birds.

05 Some dinosaurs could swim or fly

There were prehistoric animals that lived with the dinosaurs that could swim or fly, but all true dinosaurs lived on the land. Animals that soared in the sky like Pterodactyls and swimmers like plesiosaurs were a different kind of reptile.

06 Some people believe that T-rex could only see prey that was on the move, but in fact they could see still animals too. They had great eyesight.

07 Velociraptors were as tall as a man

Jurassic Park is a really great film, but it's not very accurate in places. For instance, they show Velociraptors as being as tall as people, when in fact they were only about as high as your knee! The Velociraptors in the movie are more like another type of dinosaur called Deinonychus.

Jurassic Park

This was a movie from 1993 about dinosaurs coming back to life!

08 Stegosaurus had two brains

Scientist used to think that a Stegosaurus's walnut-sized brain was far too small to control its huge body. When they found a large gap in its back, some thought this was a place for a second brain that controlled its back-half – but they were wrong.

09 Some dinosaurs could spit venom

Another dinosaur from the *Jurassic Park* movie that isn't very accurate is Dilophosaurus, which is shown spitting venom at its prey. In real-life, scientists have found no evidence of poisonous dinosaurs.

10 All dinosaurs lived in jungles

Although the Earth was warmer, dinosaurs lived all over the planet: near the sea, in deserts or even in cold Arctic places.

11 T-Rex had small and weak arms

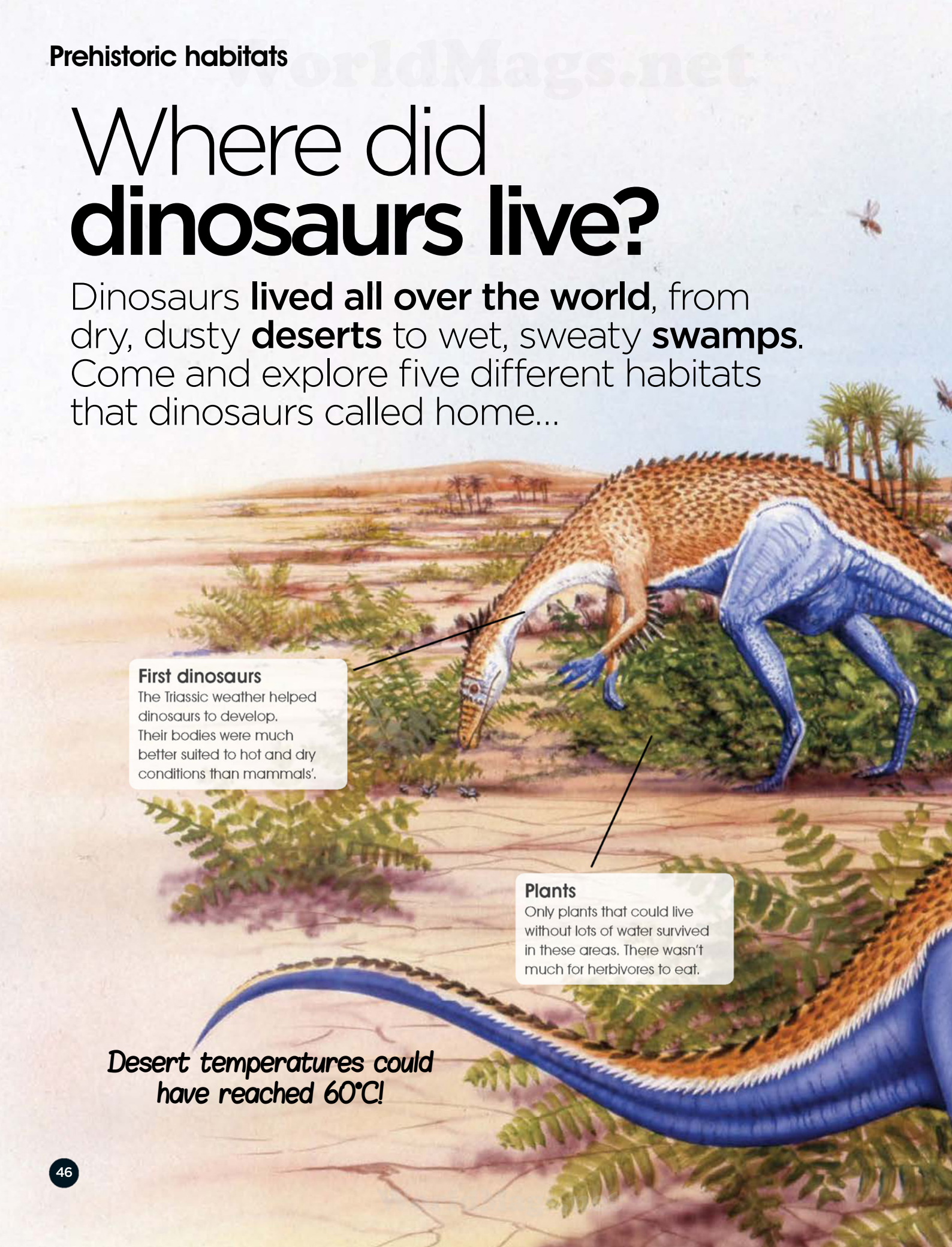
They might look thin and weedy compared to the strong leg muscles, but scientists believe that a T-Rex's arms could have bench-pressed around 180kg on each arm. That's around the weight of two human adult men!

12 There was a dinosaur called a Brontosaurus

If you've read this book and wondered why there is no Brontosaurus in it, that's because the Brontosaurus never existed. It was actually a dinosaur that was identified incorrectly when someone made the mistake of putting the head of a Camarasaurus on the body of an Apatosaurus.

Where did **dinosaurs live?**

Dinosaurs **lived all over the world**, from dry, dusty **deserts** to wet, sweaty **swamps**. Come and explore five different habitats that dinosaurs called home...



First dinosaurs
The Triassic weather helped dinosaurs to develop. Their bodies were much better suited to hot and dry conditions than mammals'.

Plants
Only plants that could live without lots of water survived in these areas. There wasn't much for herbivores to eat.

Desert temperatures could have reached 60°C!

Triassic desert

250 to 200 million years ago

Dinosaurs first appeared during the Triassic period. Earth was hot, dry and covered in deserts.

Extinction
Before the Triassic period began, almost all life had died out. Earth was recovering from the biggest extinction event ever.

Passing through
Dinosaurs only travelled deep into the desert for food. Some areas were too hot to live in all the time.

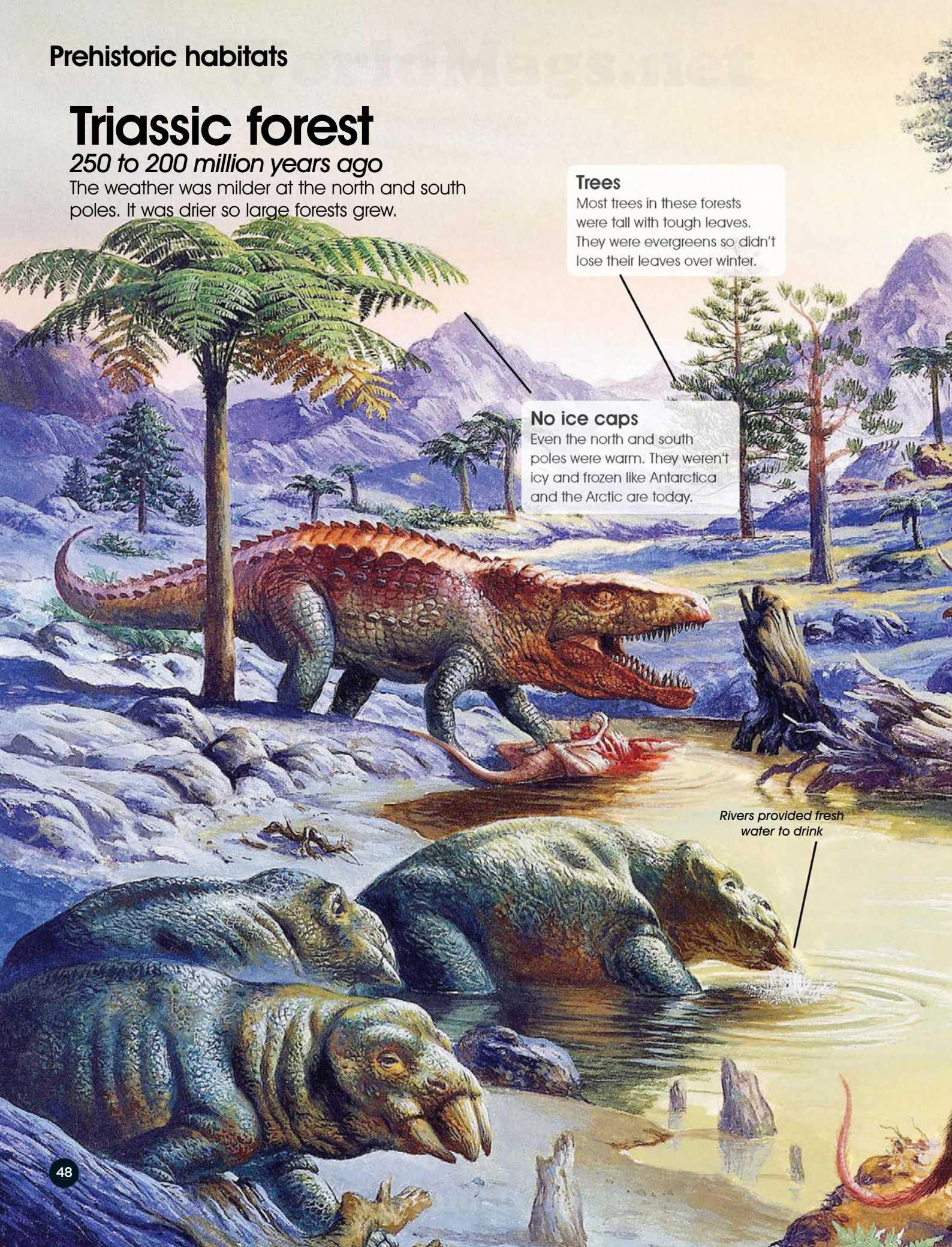
Dinosaurs like Coelophysis hunted in these areas

Extinction
An event that wipes out lots of animals and plants

Triassic forest

250 to 200 million years ago

The weather was milder at the north and south poles. It was drier so large forests grew.



Trees
Most trees in these forests were tall with tough leaves. They were evergreens so didn't lose their leaves over winter.

No ice caps
Even the north and south poles were warm. They weren't icy and frozen like Antarctica and the Arctic are today.

Rivers provided fresh water to drink


Food
Some Triassic herbivores stood on two legs and had long necks. This let them reach higher leaves on tall trees.
300 million
Most of the trees in Triassic forests were conifers. They evolved this many years ago
No grass
There was no grass during the Triassic period. The ground was covered in small plants like ferns and mosses instead.
The first mammals started to evolve

Jurassic swamp

200 to 145 million years ago

Sea levels were higher during the Jurassic period. Some land got flooded, which created muddy swamps.

Swamp air was thick and humid

Bigger dinosaurs
Herbivores got bigger because there were more plants for them to eat. Carnivores also grew as their prey got larger.

Plants
Trees spread across Jurassic Earth. They started growing in places that were too dry for them back in the Triassic.

Small animals lived in the trees


Weather
Regular rainy seasons kept the soil damp. This watered ferns and other small ground plants that herbivores could snack on.
Did dinosaurs get bigger or smaller during the Jurassic period?
Email us with your answer
See page 9
Continents moving
As Pangaea split up, the new continents had different habitats like swamps. Animals evolved quickly to survive in these areas.

Jurassic ocean

200 to 145 million years ago

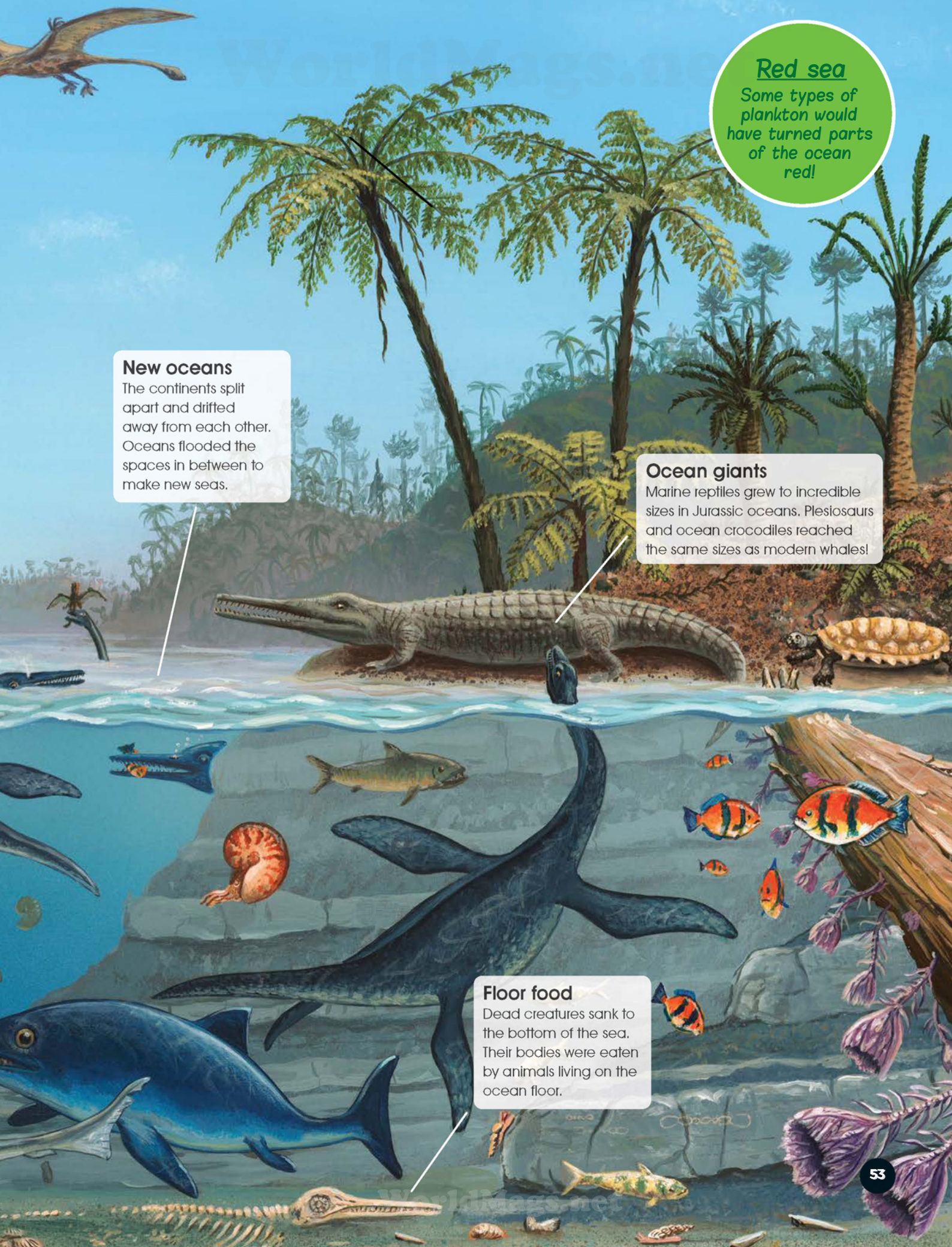
Reptiles didn't just live on land. Massive prehistoric monsters ruled the Jurassic oceans as well.

Jurassic oceans were much warmer than today's

Plesiosaurs and ichthyosaurs were top predators

Plenty of food

Smaller creatures like fish and molluscs were everywhere. They made easy meals for bigger beasts like reptiles, sharks and whales.



Red sea

Some types of plankton would have turned parts of the ocean red!

New oceans

The continents split apart and drifted away from each other. Oceans flooded the spaces in between to make new seas.

Ocean giants

Marine reptiles grew to incredible sizes in Jurassic oceans. Plesiosaurs and ocean crocodiles reached the same sizes as modern whales!

Floor food

Dead creatures sank to the bottom of the sea. Their bodies were eaten by animals living on the ocean floor.

Cretaceous plains

145 to 66 million years ago

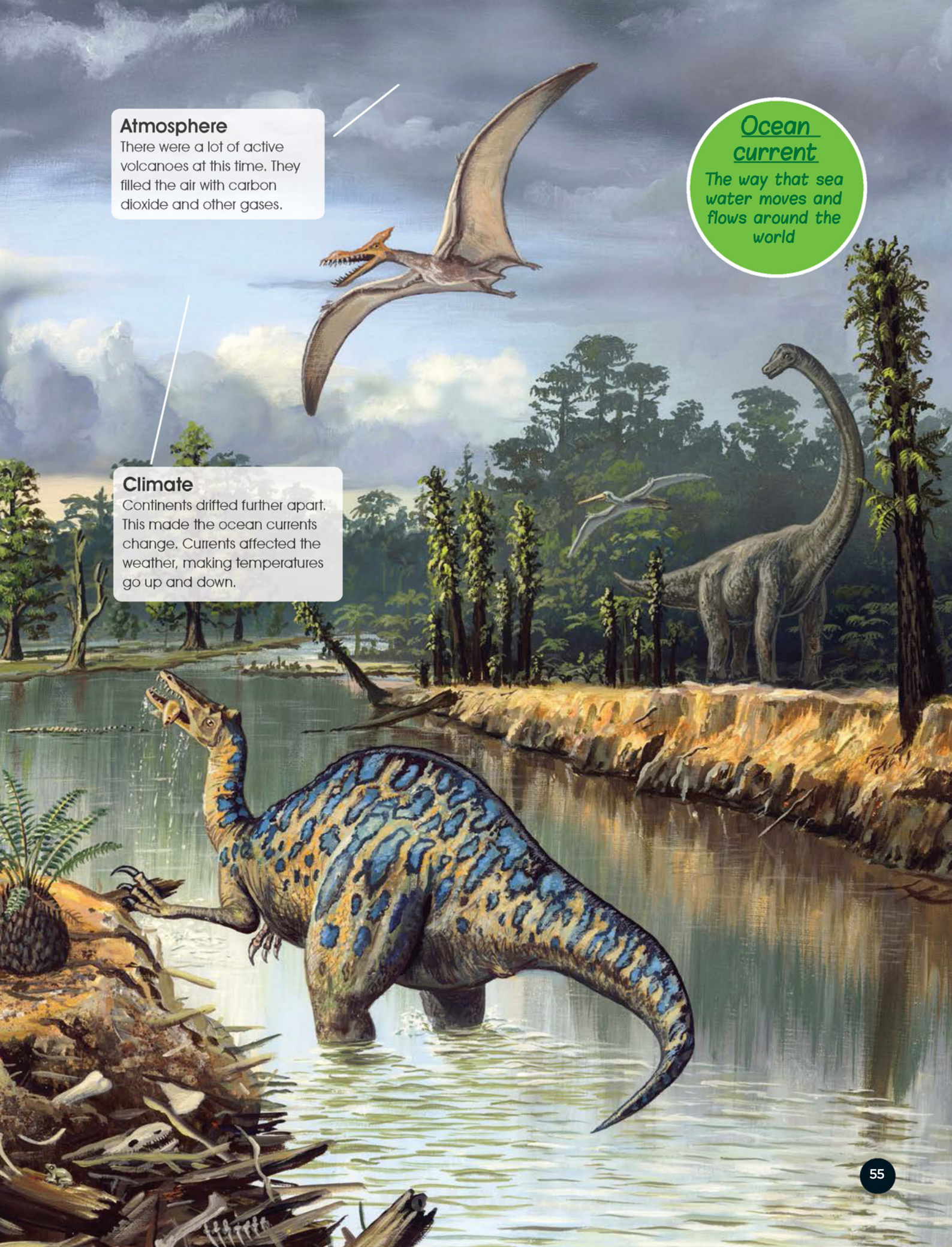
Life was not easy on the Cretaceous plains. Dinosaurs faced many changes to their habitat.

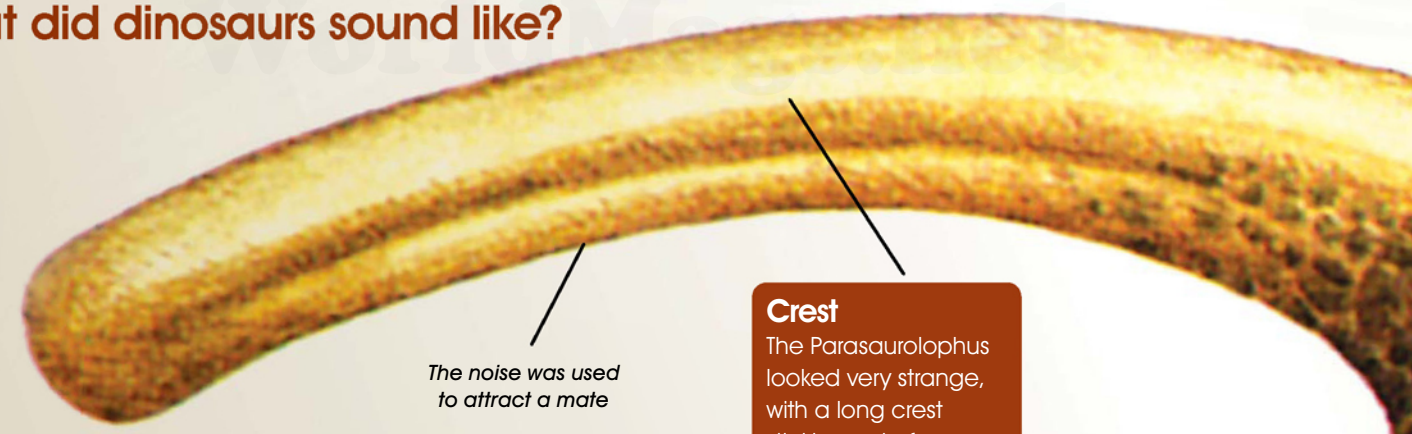
Fires destroyed forests and created flat plains

Wildfires
During the Cretaceous period, lightning struck trees and started fires. Because there were plenty of plants, flames could spread quickly.

Some dinosaurs survived better in groups

Flowers
Lots of different flowering plants evolved. Their pollen was spread by insects like bees. Flowers eventually outnumbered trees and shrubs.


Atmosphere
There were a lot of active volcanoes at this time. They filled the air with carbon dioxide and other gases.
Ocean current
The way that sea water moves and flows around the world
Climate
Continents drifted further apart. This made the ocean currents change. Currents affected the weather, making temperatures go up and down.



The noise was used to attract a mate

Crest
The Parasaurolophus looked very strange, with a long crest sticking out of its head.

What did **dinosaurs sound like?**

We hear dinos **roaring** on TV all the time, but they probably made all sorts of **noises** to **communicate** with each other

Sounds don't fossilise like bones and teeth, so it's difficult to know for sure whether dinosaurs actually roared. They probably grunted, snarled and maybe even squawked, too. But scientists have made a pretty good guess at what one particular dino sounded like…

With the help of a rare fossil of a Parasaurolophus and some clever computer modelling, they were able to create the noise. It turns out that it sounded a lot like a trombone! That's because there were tubes inside its head that it blew air through.

When it blew air through its crest, it would have made a sound like a tuba

It had great eyesight and hearing

1.8m

That's about how long the Parasaurolophus' crest was. It was larger than its entire skull!

Nostrils

The dinosaur's nostrils went all the way up through the crest and back down again. Air flowed through these tubes.

Toothless

This dinosaur loved to munch pine needles and leaves. Instead of teeth, it had a hard beak to chomp its food.

What **colour** were the **dinosaurs?**

We don't know for sure, but research suggests that dinosaurs were **all sorts** of **colours**. Some were dull and drab, while some were **incredibly colourful**

Palaeontologists don't know what colour dinosaurs were, because dinosaur skin no longer exists. However, they have tried to guess the colour of dinosaurs based on animals that do exist. Some think they were dark in colour, like large modern-day animals such as elephants and rhinoceroses. Reptiles like lizards and crocodiles are also dull shades of grey and brown.

However, other palaeontologists believe they were more colourful, just like birds. The Sinosauropteryx had feathers like a bird, although it could not fly. Fossils have been found, which tell us that the Sinosauropteryx had reddish-orange feathers and a striped tail. This means that some dinosaurs were definitely bright and colourful.

Dinky dino

The colourful Sinosauropteryx wasn't very big compared to other dinosaurs. It was around the same size as a turkey.

Feathers

Scientists have found fossils that show it may have had feathers along its back and sides, and even had a mane or tuft on the back of its head.

Palaeontologist
A scientist who studies the history of life on Earth

What was the **first dinosaur** ever **found?**

Dinosaurs lived millions of years ago, but it's only **200** years since **humans first found** out that they even **existed**. But which was the first one to be found?

Nobody knows for sure what the first dinosaur ever found really is. But the first animal to be named as a dinosaur is the Megalosaurus, a great name for new type of animal! It took 30 years for scientists to figure out that its bones were actually dinosaur bones.

William Buckland was a scientist who studied rocks. He lived in the early-19th century. One day another scientist sent him some bones that he thought were from a very large lizard. Buckland found out these bones were actually from a giant prehistoric animal unlike anything ever seen before: a dinosaur. He called it Megalosaurus.

Long as a plane

Megalosaurus was nine metres long from tail to head, which is longer than a light aircraft!

On two feet

Buckland thought Megalosaurus walked on all fours, but more research proved that Megalosaurus stood tall on its two back legs, unlike any lizard.

A big head

A complete skeleton of a Megalosaurus has never been found – not even a complete skull. But the size of its jaw is a hint that its head was very large!

Meat-eater

The sharp, jagged teeth show that the Megalosaurus was a carnivore – an animal that eats meat – with claws made for hunting.

1676

Year the first Megalosaurus bone was found – it was identified 148 years later!

What was the **biggest dinosaur ever found?**

The largest dinosaur we know about is **Argentinosaurus**. It was the biggest animal to ever walk the Earth

The Argentinosaurus was not only the biggest dinosaur ever found, but also the biggest land animal ever to exist. It weighed the same as ten big elephants and each thigh was the size of a car. The dinosaur was about 35 metres long, which is the same as two train carriages.

As its name suggests, the Argentinosaurus lived in the South American country of Argentina. It was a slow-moving herbivore and used its long neck to find food in trees and bushes. Its food had a long journey down to the dinosaur's stomach though!

Heavy as a herd
It would take ten elephants to balance a seesaw if an Argentinosaurus sat on one side.

Man-sized bones
The first discovered vertebra (a bone found in the neck) belonging to an Argentinosaurus was the same size as a tall human.

Human tower
Four adults and one child would need to stand on each others' heads to reach the head of the Argentinosaurus.

Very slow
Its size meant the Argentinosaurus could only run about 8kmph, compared to a Tyrannosaurus rex that could run about 40kmph.

Was the Argentinosaurus a carnivore or a herbivore?

Email us with your answer

See page 9

What was the **largest carnivore?**

Scientists believe the largest **carnivorous dinosaur** was the **Spinosaurus.** It was the biggest meat-eating beast ever, even **bigger** and **heavier** than a **Tyrannosaurus**

The Spinosaurus was the largest carnivore ever to have existed on our planet. Its name means 'spine lizard', and this dinosaur was up to 18 metres long and could weigh 20 tons! It lived on the land and in the water during the Cretaceous period and mostly ate fish.

The long and narrow Spinosaurus skull looked a lot like a crocodile's, but it was almost two metres long. If they lived today, Spinosaurus could swallow a human being in one gulp!

The Spinosaurus lived in North Africa, in particular Egypt and Morocco

It was as heavy as 20 small cars

It could move on two legs or four legs

Scientists think that the Spinosaurus walked mostly on two legs, although it may have sometimes crouched on all four.

Why were **herbivores** so **big?**

There's no doubt that herbivorous dinosaurs **ate a lot**. But is their **enormous size** really down to their diet? Perhaps there's a more evolutionary explanation, like **self-defence...**

Most dinosaurs were herbivores

Blunt teeth

A herbivorous dinosaur didn't have sharp teeth because it didn't need to tear or chew meat. Its teeth were blunt and sometimes flat for grinding down tough plants.

Four legs

Most herbivores walked on four legs, so they were quite slow and couldn't run fast. This weakness could be why they evolved to be so big.

You might wonder how herbivores got so big when all they ate was plants! The prehistoric world was full of trees, plants, moss and other vegetation. Surrounded by tasty treats, herbivorous dinosaurs could eat and eat and eat. With an endless supply of food, it's no wonder they became so big!

However, many palaeontologists believe some species of herbivorous dinosaurs evolved to be gigantic. They grew very large to protect themselves against predators. So, although a meat-eating Velociraptor might sound scarier, it certainly wouldn't mess with a giant plant-eating Brachiosaurus. Herbivorous dinosaurs like these would be at least ten times bigger.

There are many theories about why herbivorous dinosaurs were so huge. Some believe it was because of their large lungs, others due to egg laying. Some even think it has something to do with them being cold-blooded. We can't be sure, but it's likely to be a combination of things.

40m

That's how long some herbivorous dinosaurs were. That's as long as four double-decker buses!

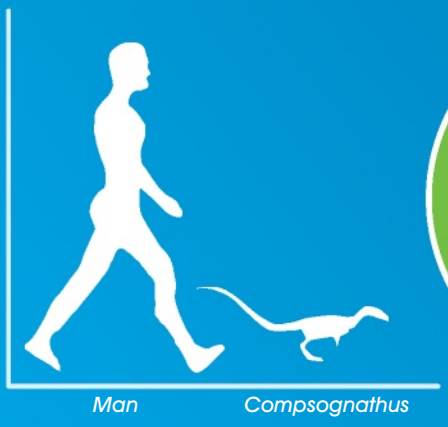
Which dinosaur was the **smallest**?

Compsognathus was no bigger than a **football**. It was one of the **smallest dinosaurs** ever

Compsognathus was one of the smallest meat-eaters during the age of dinosaurs. It was less than a metre tall, which meant these tiny reptiles were no bigger than a chicken. Compsognathus was no birdbrain though – it was a very clever dinosaur.

Compsognathus might not have been as big as the other dinosaurs, but it was great at keeping itself out of trouble in another way. Using two very long legs and an even longer tail to keep its balance, Compsognathus was able to escape being another animal's meal by running at over 60 kilometres per hour. That's even faster than a galloping horse!

The dinosaur's small, pointy head was attached to a long, bendy neck. Its eyes were large, which allowed Compsognathus to see its food from great distances. The dinosaur would have ran fast to catch its prey, and used its powerful jaws and rows of very sharp teeth to eat its dinner.



Compsognathus

Compsognathus means 'elegant jaw' because of the dinosaur's small and dainty appearance

During the late Jurassic period, Compsognathus could be found on the land that makes up Europe today

Big eyes
Compsognathus had large eyes that allowed it to see its dinner – mainly small mammals and lizards – from very far away.

Long neck
Compsognathus's neck was very long and also quite bendy.

Tail for balance
To help it to keep its balance for very fast turns (mainly to escape being eaten!), Compsognathus had a very long tail.

Short arms
Compsognathus had short arms. On each hand it had two fingers with sharp claws.

Two-legged
Just like us, Compsognathus walked around on two legs. These were thin and had three toes on each foot.

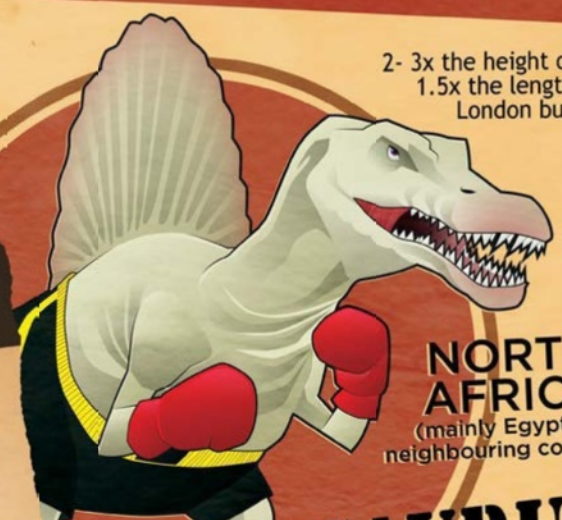
Which was the **meanest dinosaur**?

Which **prehistoric predator** wins the title of **cruelest carnivore** ever?

Carnivore
A animal that ate mostly meat. All the dinosaurs here were carnivorous

DOORS OPEN FROM
CRETACEOUS – 97MYA

2- 3x the height of a man, 1.5x the length of a London bus!



NORTH AFRICA
(mainly Egypt and neighbouring countries)

SPINOSAURUS
HEAVYWEIGHT

The Spiny Giant has a great, big, colourful sail along its back. Even though it mainly eats fish, it's still a big and burly fighter, whose spine strikes fear into even the biggest hunters.

ALLOSAURUS ★
"Different Lizard"

Lived:
Late Jurassic
150 MYA

Found in:
North America, Portugal

A little bit taller than a human (2.3-2.5m) but much longer (about 8-8.5m)

Lightweight

THE JURASSIC GANGSTER!
Allosaurus would gang up on its prey and hunt in large groups. It wasn't very smart, but made up for it with fierceness!

★★★ ★★★

90

That's how many tons a Titanosaur could weigh – but still the Giganotosaurus would hunt it!

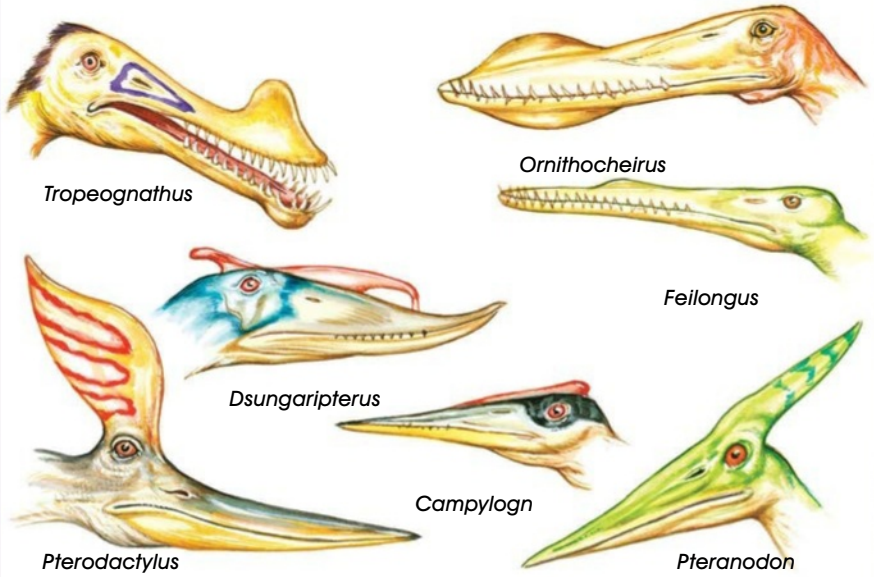
Did **dinosaurs fly?**

Actually, **true dinosaurs couldn't fly**. But a type of creature called a **pterosaur** was able to **soar** through the skies!

There are lots of different types of creatures on the planet today, like mammals, fish, birds, insects and reptiles. The same could be said around the time of the dinosaurs. A bird-like animal called a pterosaur was able to go to a place where no others could – the sky.

Pterosaurs were the largest flying animals to ever live, with enormous wings. They didn't have feathers and instead were covered with fine hair. This probably means they were warm-blooded. They lived near the coast and ate fish, which they would pluck out of the sea with their long beaks.

Meet the pterosaur family…



Warm-blooded

Warm-blooded animals keep their bodies at the same temperature, while cold-blooded ones adapt to the environment

Wing-hands

Pterosaurs had arms and hands on their wings. On the ground they could walk on all fours. In the sky they could glide gracefully. In the sea they could even swim!

Teeth

Pterosaurs lived from 215 to 66 million years ago. The earliest pterosaurs had sharp teeth, but later pterosaurs had no teeth and just gulped fish down whole.

Giant wings

The largest pterosaurs had enormous wings at 15 metres across, which is the same length as a basketball court!

What did dinosaurs eat?

Some dinosaurs ate **meat**, from **insects** and **reptiles**, to **fish** and even **other dinosaurs**. Most were **herbivorous**. These dinos fed on **trees**, **plants**, **twigs** and more

Carnivore or herbivore?

A carnivore is a meat-eater, while a herbivore is a plant-eater

Dinosaur Menu

Carnivore's menu

Lizards
Eaten by: Velociraptor
The Velociraptor used its exaggerated claw to rip reptiles and amphibians. It also had sharp teeth for tearing.

Triceratops
Eaten by: Tyrannosaurus rex
The Tyrannosaurus rex ate small dinosaurs, like Triceratops, and even large dinosaurs, including other Tyrannosaurus rex.

Insects
Eaten by: Alvarezsaurus
This carnivorous dinosaur ate insects, and was a bit like a modern-day anteater.

Herbivore's menu

Conifers
Eaten by: Barosaurus
Conifer trees were everywhere during the Mesozoic era. Long-necked dinosaurs could reach the tops of them.

Magnolia, oak and laurel
Eaten by: Triceratops
The Triceratops used its beak to enjoy the new flowering plants that appeared towards the end of the Jurassic period.

Cycadophytes
Eaten by: Stegosaurus
Throughout the Triassic and Jurassic periods, these plants thrived. They had woody stems and tough leaves.

Seafood menu

Fish
Eaten by: Spinosaurus
Spinosaurus was the largest of the carnivorous dinosaurs. It used its long snout to catch fish.

Scheenstia
Eaten by: Baryonyx
This ray-finned fish was enjoyed by the Baryonyx in the Cretaceous period.

Diplomystus
Eaten by: Koreaceratops
Diplomystus were found in fresh water in what is now Japan and Korea. They were a tasty treat for piscivorous (fish-eating) dinosaurs.

How much did an Apatosaurus eat?

Meet one of the **largest** land animals that **ever lived**! They were **over four times heavier** than an **elephant**. Here's how much they could eat in **one day...**

The Apatosaurus was one of the biggest and heaviest dinosaurs. They were herbivores that were over four times bigger than an elephant, but their heads were surprisingly small. Their mouths were full of teeth like pegs, which it used to scrape the leaves off the trees. This dinosaur may have looked quite big and scary, but they were strict vegetarians!

There was no grass at the time, so the Apatosaurus munched on pine needles and ferns. They could reach the trees easily thanks to their really long necks. If they didn't also have long tails for balance, the Apatosaurus would have been very clumsy. Although vegetables like these didn't exist in dinosaur times, here's how much an Apatosaurus would have to eat in a day if it lived now!

An Apatosaurus could eat 55 sacks of potatoes in one day!

That's the same as...

33 metres

The maximum length of an Apatosaurus. That's about the size of a small yacht

7,800 carrots

1,800 aubergines

5,500 broccoli florets

What was the **fastest dinosaur?**

Usain Bolt

Top speed: ***45 km/h***
Time: ***9.58 seconds***
Period: ***Modern day***

The fastest human alive, Usain Bolt holds the world record for the 100-metre sprint with this staggeringly quick time.

Gallimimus

Top speed: ***55 km/h***
Time: ***6.55 seconds***
Period: ***Cretaceous***

Compsognathus

Top speed: ***60 km/h***
Time: ***6 seconds***
Period: ***Late Jurassic***

This dino was only about the size of a large turkey – a metre at most. But it could sprint very fast from bigger (and slower) predators.

Dromiceiomimus

Top speed: ***65 km/h***
Time: ***5.54 seconds***
Period: ***Late Cretaceous***

Cheetah

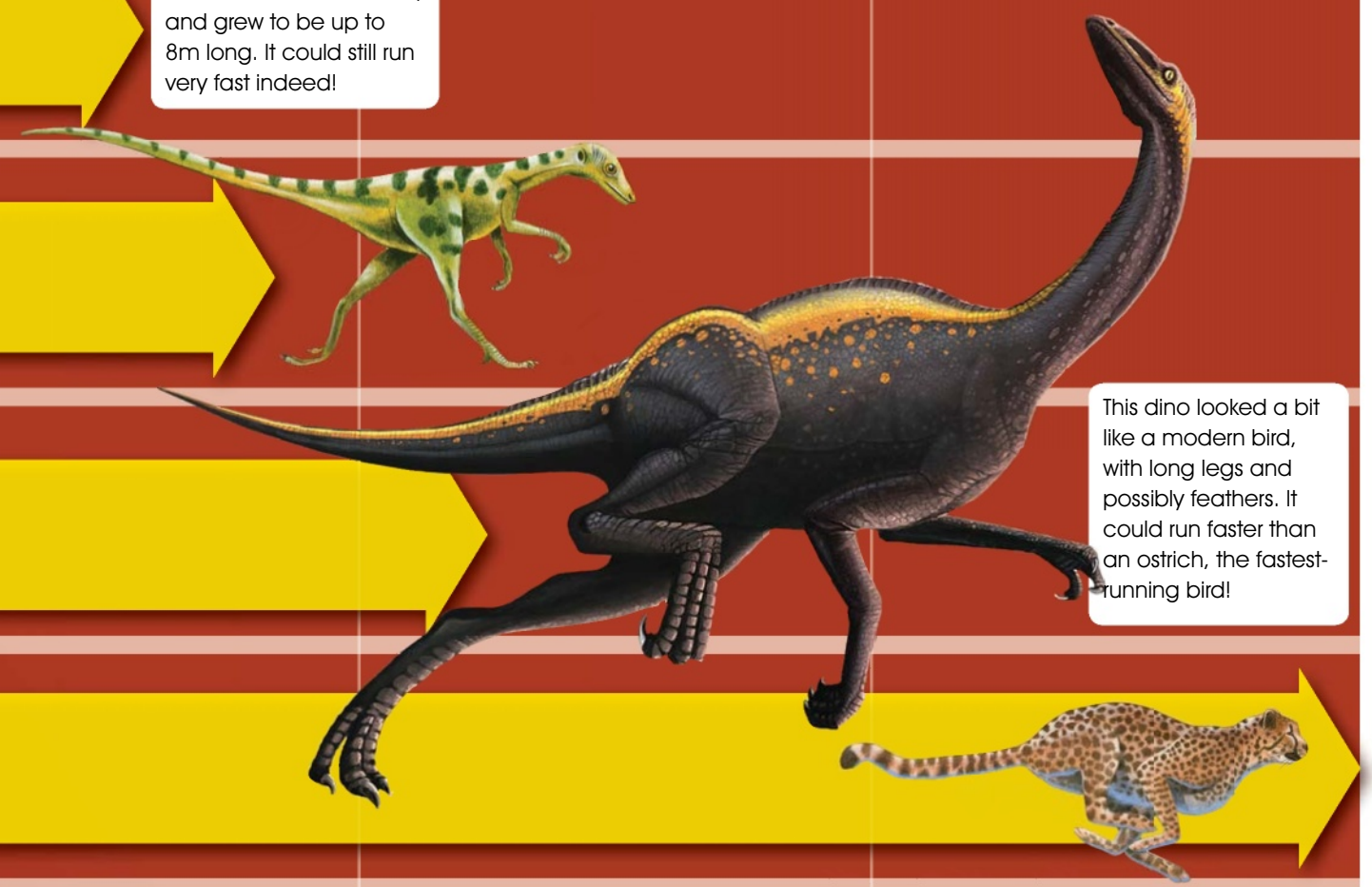
Top speed: ***114 km/h***
Time: ***3.15 seconds***
Period: ***Modern day***

Accelerating to speeds of up to 114 km/h, the cheetah is currently the quickest creature on four legs and would easily have beaten the fastest dinosaur in history!

Dinosaurs were not all giants, but some of them were **frighteningly fast!** Which would have won a **100-metre race** against some **modern-day** rivals?

FINISH

This was a lot bigger than a Dromiceiomimus, and grew to be up to 8m long. It could still run very fast indeed!



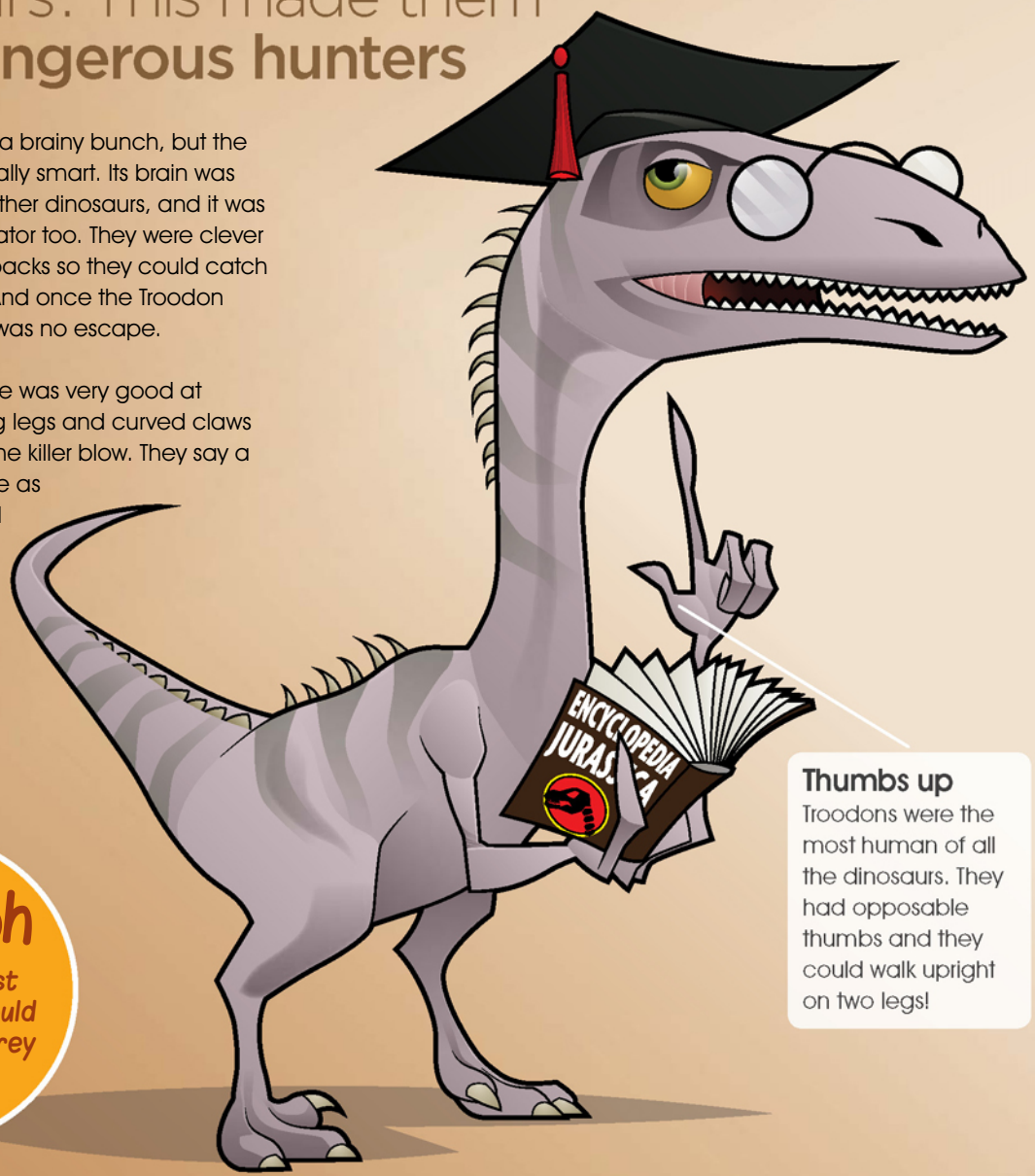
This dino looked a bit like a modern bird, with long legs and possibly feathers. It could run faster than an ostrich, the fastest-running bird!

What was the **cleverest dinosaur?**

The **Troodon** was about the **same size** as a **human**, but their **brain** was **much bigger** than the other dinosaurs'. This made them very **dangerous hunters**

Dinosaurs were not a brainy bunch, but the Troodon was unusually smart. Its brain was much larger than other dinosaurs, and it was a pretty scary predator too. They were clever enough to hunt in packs so they could catch much larger prey. And once the Troodon spotted you, there was no escape.

The bird-like creature was very good at running, with its long legs and curved claws that would deliver the killer blow. They say a Troodon's teeth were as sharp as knives and their big eyes had the power to see at night.



30kmph

That's how fast the Troodon could run after its prey with its long legs!

Thumbs up

Troodons were the most human of all the dinosaurs. They had opposable thumbs and they could walk upright on two legs!

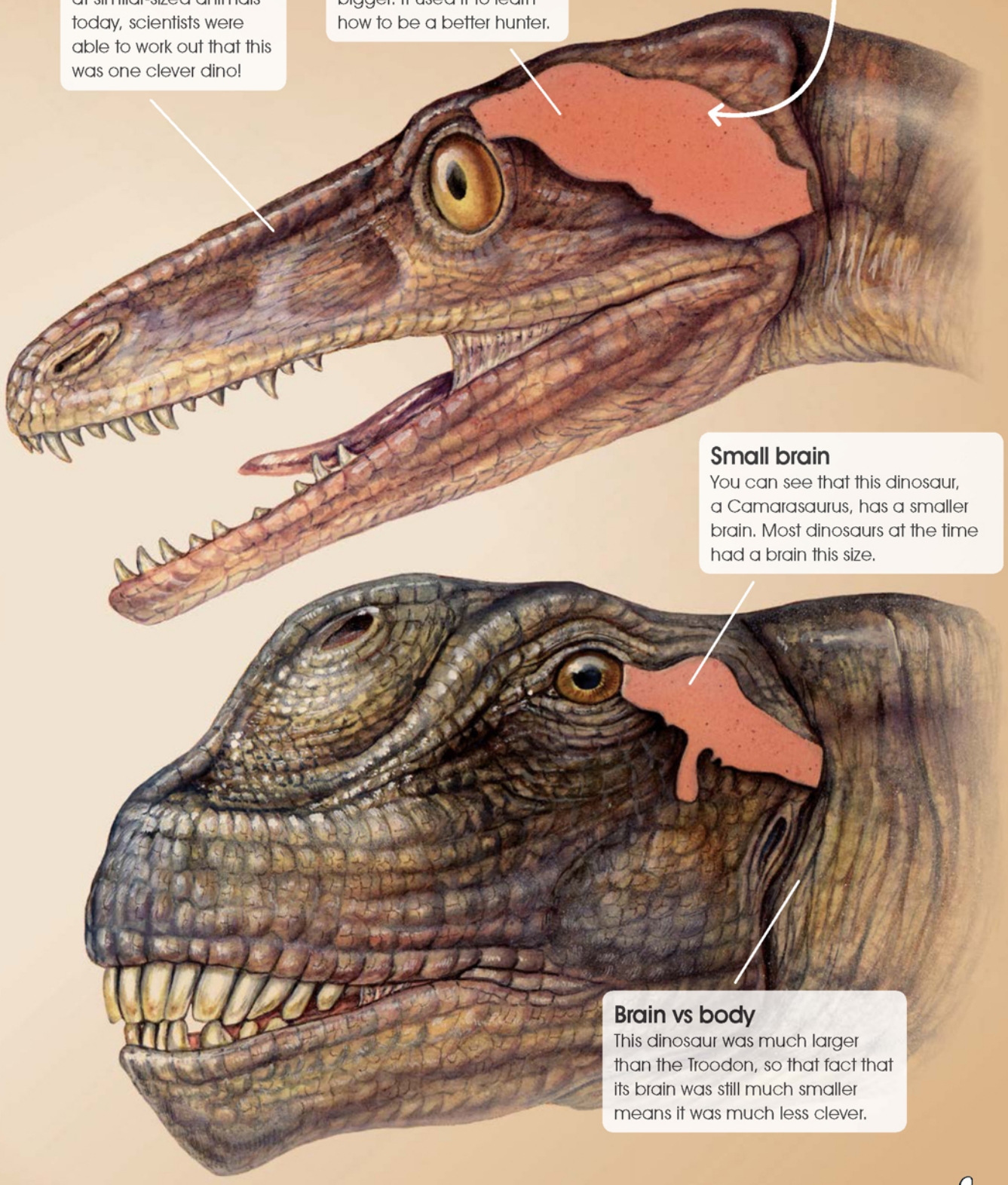
A smarter dinosaur

By comparing the size of its brain to the size of its body, then looking at similar-sized animals today, scientists were able to work out that this was one clever dino!

Big brain

Most dinosaur brains were as small as walnuts, but the Troodon's was much bigger. It used it to learn how to be a better hunter.

A bigger brain meant the Troodon could hunt in packs



Small brain

You can see that this dinosaur, a Camarasaurus, has a smaller brain. Most dinosaurs at the time had a brain this size.

Brain vs body

This dinosaur was much larger than the Troodon, so that fact that its brain was still much smaller means it was much less clever.

What made the T-rex so deadly?

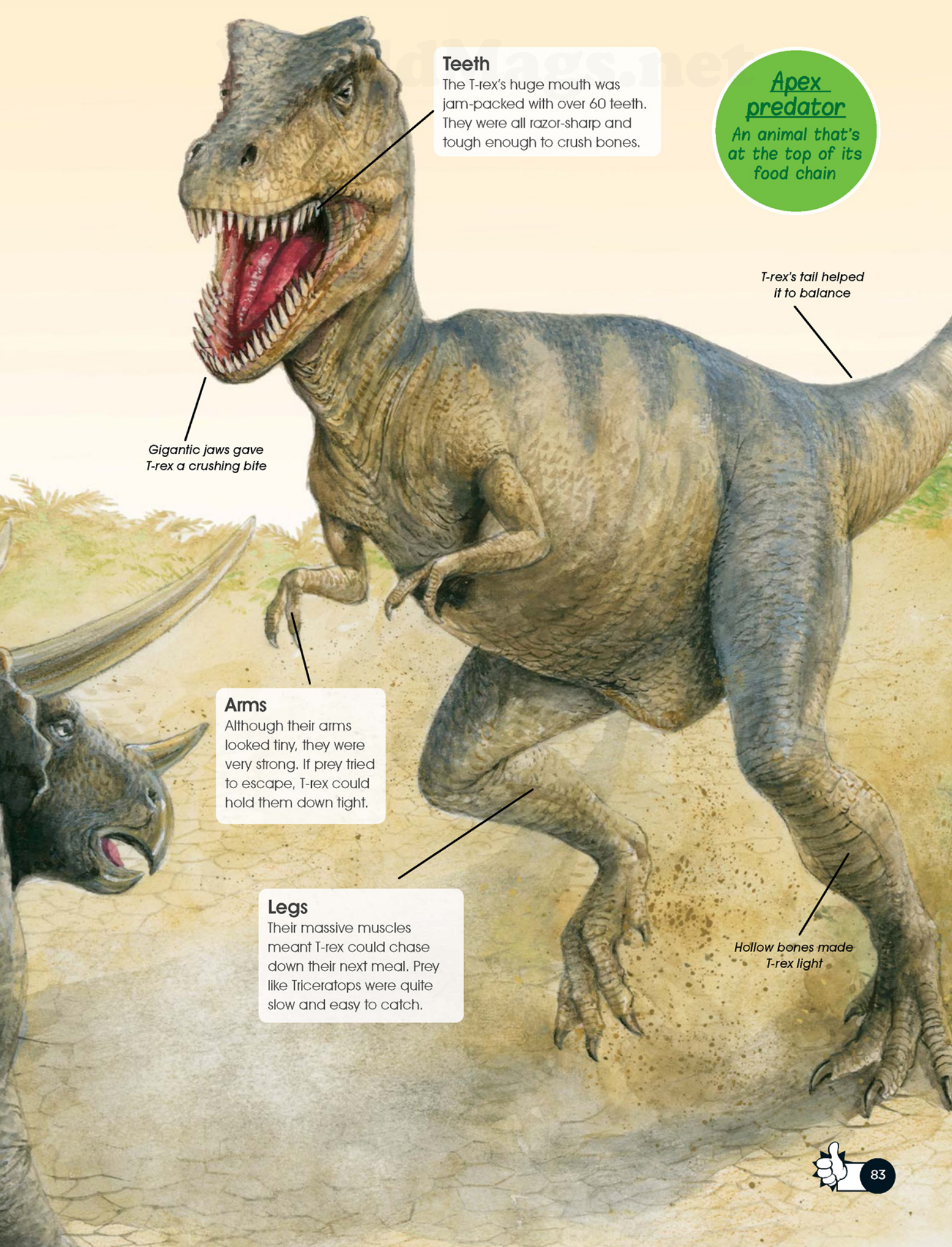
T-rex was one of the **biggest carnivores** on Earth. Their bodies had evolved features like **sharp teeth** and **powerful jaws** to make them **killing machines!**

Attack
T-rex would try to make Triceratops run away. This way it could attack from behind and avoid their defensive horns.

Few dinosaurs dared to challenge T-rex

T-rex's body was packed full of deadly adaptations. This is why they were apex predators – no other animals dared to try eating them. Their huge teeth grew to over 20 centimetres long. That's bigger than your hand! They were sharper than knives and perfect for tearing chunks off their prey.

T-rex also had the most powerful bite of any land animal ever. Scientists worked out that they could bite 15 times harder than a lion! They could run pretty fast too, thanks to powerful leg muscles. Their arms were small but were strong enough to rip your arms right off!


Teeth
The T-rex's huge mouth was jam-packed with over 60 teeth. They were all razor-sharp and tough enough to crush bones.
Apex predator
An animal that's at the top of its food chain
T-rex's tail helped it to balance
Gigantic jaws gave T-rex a crushing bite
Arms
Although their arms looked tiny, they were very strong. If prey tried to escape, T-rex could hold them down tight.
Legs
Their massive muscles meant T-rex could chase down their next meal. Prey like Triceratops were quite slow and easy to catch.
Hollow bones made T-rex light

How can a **T-rex** be **related** to a **chicken?**

Believe it or not, the T-rex's **closest living relative** is the chicken! All birds have **evolved** from the dinosaurs that **walked** on their **hind legs**

It might seem strange, but all birds are related to dinosaurs. Scientists think that lots of dinosaurs had feathers. We also know they laid eggs, just like birds do. Dinosaur fossils show that birds have a similar bone structure to theropods. These were dinosaurs that walked on two legs, like T-rex.

The most unbelievable link is between the terrifying T-rex and a farmyard animal – the chicken! Scientists made this connection after finding tiny amounts of protein in a T-rex fossil. The closest match to these proteins was found in chickens. Some theropods evolved into birds and managed to survive the extinction.

01 Saurischia
Lived: 230 million years ago
This group of lizard-hipped early dinosaurs are some of the oldest relatives to modern-day birds that we know of.

02 Coelophysidae
Lived: 220 million years ago
These dinosaurs had hollow bones just like birds do. This made their bodies lighter so they could run much faster than before.

03 Dromaeosauridae
Lived: 160 million years ago
This group included dinosaurs like the small but fierce Velociraptors. They had feathers and long tails. Their wing-like arms had sharp claws.

Proteins
These are tiny molecules that are found in all living things

04 Aurornis
Lived: 160 million years ago
Aurornis means 'dawn bird.' They are among the earliest bird-like dinosaurs. Although they had wings, they probably couldn't fly.

05 Anchiornis
Lived: 160 million years ago
These were about the same size as chickens. They had black and white wing feathers, like some chicken breeds.

06 Archaeopterygidae
Lived: 150 million years ago
Feathered dinosaurs eventually evolved into true birds. Archaeopterygidae are an in-between stage. They could glide between trees with their wings.

07 Birds
Lived: Present day
Birds are an diverse class that have themselves evolved over the ages into many different species all over the world.

How did T-rex hunt?

Most scientists think that T-rex **hunted** by **themselves.** But other experts disagree. Some of them think T-rex could have **attacked** their **prey** together in groups

Tyrannosaurus rex was one of the largest carnivores ever to have walked the Earth. We can tell from remains of their sharp teeth that they ate meat. But their fossils can't really tell us exactly how they caught their food! Scientists have different ideas about how T-rex hunted its prey.

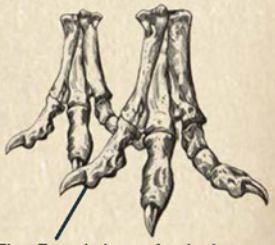
Some dinosaur fossils have T-rex bite marks. Scientists say this proves a T-rex killed them. But others think T-rex wasn't fast enough to chase other dinosaurs. They think T-rex was a scavenger – it only ate animals that were already dead. Some fossils suggest T-rex hunted together.

Diet

T-rex were at the top of the food chain. They mainly ate herbivores. These were vegetarian dinosaurs like the Triceratops.

40kmph

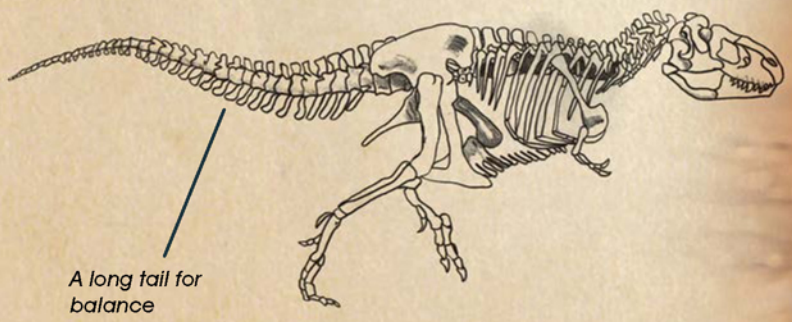
That's how fast scientists estimate T-rex could run – just a bit slower than Usain Bolt!



The T-rex's long foot claws helped them run very fast

Teeth

T-rex teeth were found stuck in other dinosaur's fossils. Scientists can't tell if they were bitten before or after they died though.



A long tail for balance

Senses

An excellent sense of smell helped the T-rex to sniff out its next meal. They also had very good eyesight.

Footprints

In 2014, scientists found fossilised footprints that show three T-rex travelled together. They might have hunted as a group to survive.

What's **inside** a **dinosaur egg**?

Just like **baby chicks**, dinosaurs grew and **hatched from eggs** to roam our planet a **very long time ago**

What came first – the dinosaur or the egg? We're not entirely sure, but what we do know is that these great reptiles laid eggs just like chickens do. Inside the shell of a hen's egg, chicks are able to grow before they're ready to hatch. That's just how the dinosaurs were born.

We know that baby dinosaurs were made this way because we have found lots of evidence. Fossilised dinosaur eggs have been found at over 200 places across the world. They tell a story about how the dinosaur made its nest, laid its eggs and how baby dinosaurs were born.

A thick liquid
A very thick liquid protected the young dinosaur inside. Without this, he or she would not have been able to survive.

Growing up fast
The baby dinosaur grew very fast, a lot faster than any bird or animal we know of. This happened both inside the egg and out.

Just like chickens and crocodiles
How a dinosaur is made inside an egg is very similar to the birth of many of today's birds and reptiles.

Breathing easy
The egg might be hard, but the baby was able to breathe air through little holes. These were so small that they would have been very hard to see.

Dinosaur egg versus chicken egg

Hypselosaurus egg
Oval-shaped, 30cm tall, 25cm across

30
Some dinosaurs were able to lay more than 30 eggs without stopping!

Chicken egg
Oval-shaped, 6cm tall, 4cm across

What were **baby dinosaurs** like?

Female dinosaurs laid **eggs in nests**, like birds. They had **very large families**, with up to **20 sons and daughters**. The babies **grew fast** after hatching

50cm

That's how long the biggest dinosaur eggs were. They were shaped like huge footballs

Dinosaurs began life as eggs. They were all sorts of shapes and sizes, from tennis balls to giant footballs. Females laid their eggs in nests that were dug out of the ground or built out of mud. Some nests were really big and had up to 20 eggs inside! Some mothers sat on them to keep the babies warm, but bigger dinosaurs had to use plants to cover the nest.

The duck-billed dinosaur Maiasaura was one of the best parents. They would feed their babies chewed-up plants until they were big and strong. Other kinds of dinosaur babies didn't need their parents to feed them, because they could run as soon as they had hatched.

Some dinos probably lived in large groups called herds. The older members would protect the young from predators that might want to eat them. Fossilised footprints have been found of babies and adults together, showing that babies stayed with their parents until they were old enough to fend for themselves.

Lots of eggs

Female dinosaurs would give birth to lots of eggs, so even if some were eaten by enemies, others might survive.

Speedy growers

Baby dinos didn't stay small for long. The ones that were born without horns or armour grew the quickest, so they could tower above their enemies.

Leafy blanket

Dino mothers would protect their nest with plants. This would keep the babies warm and hidden from any predators looking for an egg breakfast.

Babies probably pecked their way out of eggs like birds

Dino eggs came in all shapes and sizes

Dino dinners

The parents would chew up plants and feed them to the hungry babies. It sounds disgusting, but the young dinos loved eating their greens.

Staying safe

Some babies were too weak to walk when they first hatched. The parents would have to take care of them until they were strong enough to leave the nest.

How did dinosaurs **defend** themselves?

Dinosaurs **evolved spikes**, **horns** and even **thick armoured skin** to **protect themselves**. They needed to be able to **fight off predators**, or they'd get **eaten**!

Herbivorous dinosaurs developed built-in weapons to defend against carnivores. This gave them a better chance of surviving a fight. Some of them had sharp claws on their hands, like Iguanodons. Dinosaurs like Triceratops had horns as long as your arm. Both these defences could have been used to stab predators.

Other dinosaurs used their tails as weapons. The Ankylosaurus had a heavy, bony hammer at the end of its tail. They could use this to smash into an attacking dinosaur. They were strong enough to crush skulls! Some dinosaurs were covered in tough scales like a thick coat of armour.

Larger herbivores used their size as a defence. Dinosaurs like the Diplodocus were so massive that carnivores couldn't attack them very easily! For smaller dinosaurs, running away was usually the best defence. They developed lighter bones so they could run faster. They needed to escape quickly to avoid fighting altogether.

Frill horns

The large part of the top of their skulls is called a frill. This Styracosaurus had lots of sharp horns along the top of its frill.

Spikes

Spikes could be used as weapons because they were hard and sharp. They also made dinosaurs much harder to eat.

Whip

Dinosaurs like Diplodocus had long tails that they could use like whips. It's possible that they snapped faster than sound!

Tail club

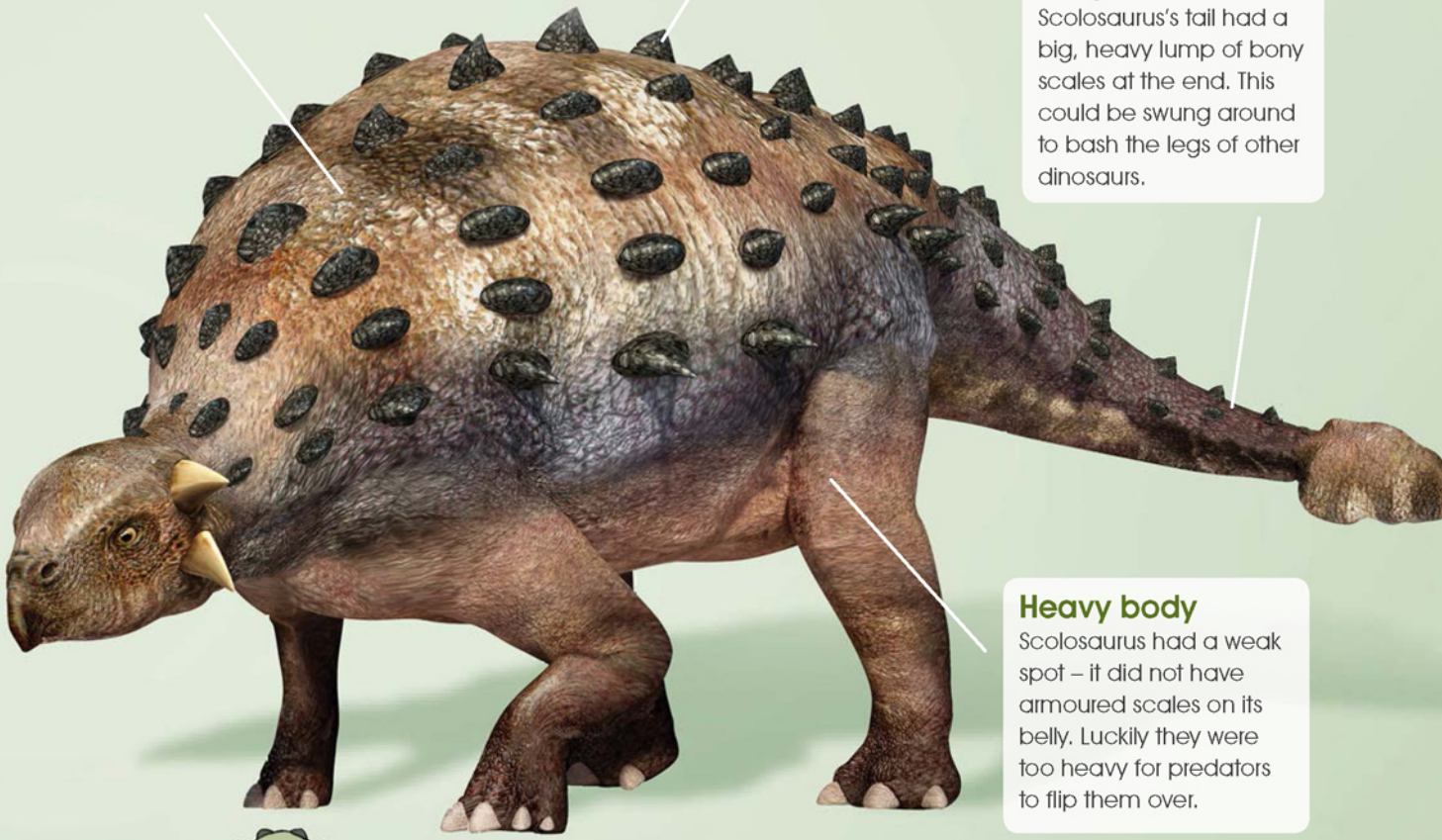
Tail clubs were swung around just like a hammer. They were smashed into predators' legs and could crush their bones.

Predator
Any animal that hunts and eats other animals for food

Thick scales
Scolosaurus's bodies were covered in extra-thick scales that were as hard as bone. Predators had a tough time trying to take a bite out of Scolosaurus!

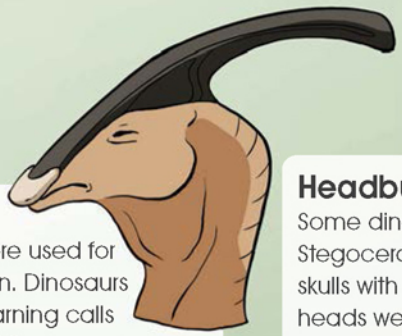
Boney spikes
All along their backs and the tail club were sharp spikes. They could do a lot of damage to any carnivores that got too close.

Bony club
Scolosaurus's tail had a big, heavy lump of bony scales at the end. This could be swung around to bash the legs of other dinosaurs.



Heavy body
Scolosaurus had a weak spot – it did not have armoured scales on its belly. Luckily they were too heavy for predators to flip them over.

Horns
Horned dinosaurs might have charged towards predators to try and scare them away. Their horns could have ripped through skin.



Crest
Head crests were used for communication. Dinosaurs could make warning calls to each other if they saw a predator nearby.

Headbutt
Some dinosaurs, like Stegoceras, could smash skulls with predators. Their heads were protected by extra layers of bone for shock-absorption.

The dinosaurs' neighbours

Tiny **mammals** lived **alongside** dinosaurs in the **Mesozoic era**. While many are now **extinct**, some of their **ancestors** are still **alive today**

Duck-billed platypus
Cretaceous, around 120 million years ago to present
The platypus is one of the most unique mammals in the world, because it lays eggs and even has poisonous stingers!

Palaeoryctidae
Mid-Cretaceous to early Paleogene, around 105 to 66 million years ago
These creatures looked a lot like modern-day shrews. They mainly lived in what would become North America and were very small.

Multituberculata
Late Jurassic to early Oligocene, 160 to 35 million years ago
This group of little mammals were around for roughly 120 million years. It's the longest-surviving mammal group on record!

Cynognathus
Triassic, around 230 million years ago
These creatures were also technically mammal-like lizards. They had many features in common with mammals, such as hair and possibly even warm blood.

Why did dinosaurs die out?

The **last dinosaurs walked** the Earth around **65 million years ago**. **Scientists** have lots of **different ideas** about **how** they died out

Asteroid

A rock found in outer space that orbits the Sun

Plant life

Plants soon died because they need sunlight and warmth to live. The plant-eating dinosaurs starved to death, so meat-eaters had nothing to eat either!

01 A huge asteroid hit the Earth

The most popular idea is that a giant rock from outer space crashed to Earth. It sent so much dust sailing into the sky that it blocked out the Sun for years. Without light, the plants died and the dinosaurs didn't have anything to eat. The huge bang killed everything around it and triggered forest fires and underwater earthquakes. The dinosaurs didn't stand a chance. They were blasted, roasted and frozen to death – in that order!

02 Mammals ate the dinosaurs' eggs

Another idea that some scientists believe is that dinosaurs and mammals evolved together, so there was a lot of competition for food. The meat-eating mammals would eat the dinosaurs' eggs before they had hatched. Eventually, the dinosaurs were wiped out and the mammals took over Earth. However, most scientists regard this idea as being disproved.

65 million

The number of years since the dinosaurs died out. They lived for about 165 million years

Competition

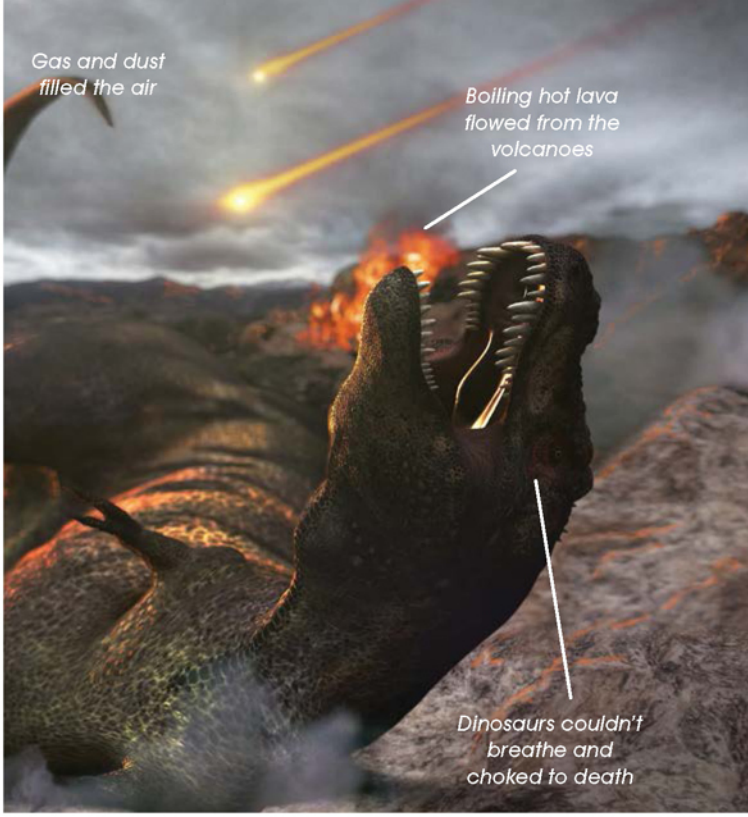
Mammals started evolving at a similar time to the dinosaurs. One theory is that they competed for space.

Starvation

It was thought that there wasn't enough food to go around and dinosaurs started to go hungry. The mammals ate the dinosaur eggs so the next generation didn't survive.

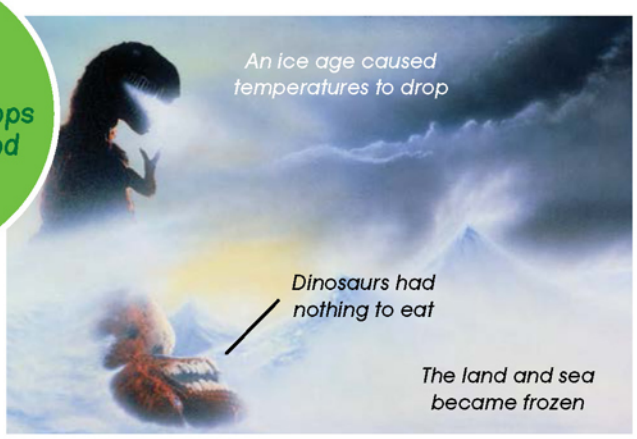
Ice age

When the temperature drops for a long period of time



03 Lots of volcanos erupted at the same time

Idea number three is that lots of volcanoes erupted and spewed layer upon layer of hot, melting rock. There was enough to cover an area the size of France, killing everything in its path. The volcanoes sent toxic dust and gas into the atmosphere. It blocked out the Sun, choked the dinosaurs and poisoned the sea creatures.



04 The world cooled down

Another idea is that the temperature on Earth got colder. The temperature of Earth depends on how far away it is from the Sun. If the planet tilted slightly, an ice age could have begun. The sea and the plants would have frozen. With nothing to eat and no warmth, the dinosaurs would have slowly died out.

How do we **know** about **dinosaurs**?

Palaeontologists are **scientists** who study **prehistoric fossils** including dinosaurs. This helps them find out what the dinosaurs **looked like** and **how they lived**

A dig
The area where palaeontologists start digging to look for fossils

People have been finding dinosaur fossils for thousands of years. Ancient civilisations thought they were the bones of mythical monsters like dragons! In the 18th Century, scientists started studying fossils more carefully. The skeletons were very different from any living creature. Scientists called this new group of animals 'dinosaurs'.

Studying fossils soon became a separate area of science called palaeontology. It combines lots of different topics like geology (the study of rocks) and biology (the study of living things). People who study palaeontology are called palaeontologists. Their job involves digging up fossils and figuring out which dinosaur they're from.

Thanks to palaeontologists, we know much more about dinosaurs. They can tell us how old fossils are, what dinosaurs looked like, and even how strong they were. Palaeontologists also work with museums to put fossil skeletons together and write information for the displays.

Carefully uncovering a fossil

Studying rocks
A fossil is roughly the same age as the rock it's found in. Palaeontologists perform experiments on rock samples to discover how old fossils are.

Hunting for bones

Palaeontologists go on 'digs' where they hunt for prehistoric fossils. They are trained to dig very carefully because fossils can easily be damaged or broken.

Hunting for plants

Some palaeontologists choose to study plant fossils. This is called palaeobotany. They can find out which trees and flowers existed millions of years ago.

30

Palaeontologists discover this many new dinosaur species each year. That's one every 12 days on average!

Using other sciences

Sometimes they get help from other scientists to learn more. For example, palaeontologists worked with engineers to find out how hard a T-rex could bite.

Looking at animals

Palaeontologists compare fossils to the skeletons of animals that are alive today. This helps them to understand how dinosaurs and other extinct creatures might have moved.

What is a **fossil?**

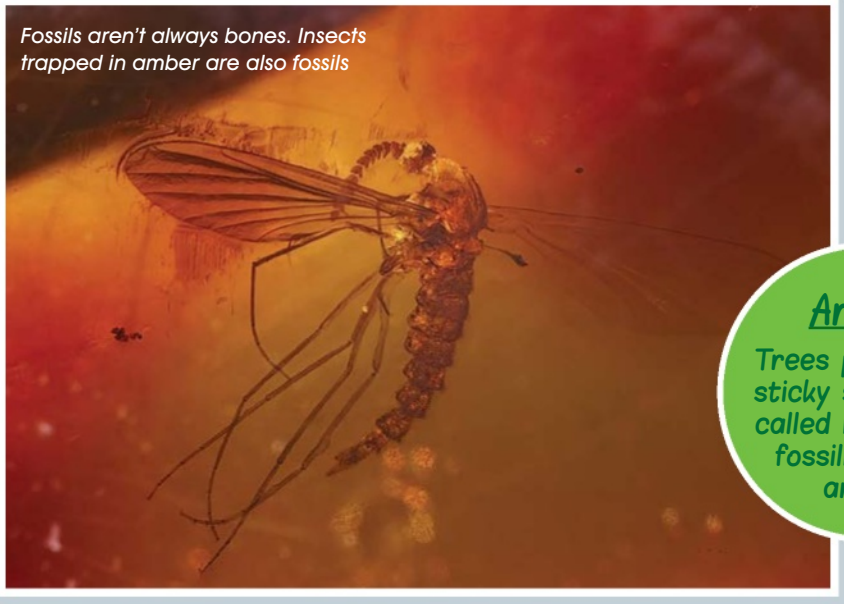
Fossils are the **leftovers** of **prehistoric** plants and animals. They are found **buried** in **rocks**. They are the only way we know dinosaurs ever lived

Fossils are the rocky remains of dead animals and plants. Sometimes dinosaurs got buried by rock when they died. Their bodies rotted away but their bones turned to stone. When we find them or dig them up, we call them fossils. There are two main types: body or trace fossils.

Body fossils are the leftovers of a plant or animal's body. This includes things like bones, shells, feathers, tree trunks, leaves and insects in amber.

The dinosaur skeletons that you see at the museum are this type. Body fossils give us a good idea of what the dinosaurs looked like.

Most people just think of skeletons when they think about fossils, but there are other types as well. Trace fossils are evidence of what the animal did. This includes things like footprints, dinosaur poo, nests and egg shells. These give us more information about how dinos lived.



Fossils aren't always bones. Insects trapped in amber are also fossils

Didier Descouens

Amber

Trees produce a sticky substance called resin. This fossilises into amber

3.5 billion years

That's the age of some of the oldest fossils. That's not far off the age of Earth itself!

Body fossil

This ammonite is an example of a body fossil. The stone is exactly the same shape as its shell was. The patterns are very detailed.

Fossil hunting

Some beaches are famous for having lots of fossils. They are usually stuck in the rocky cliffs but some get knocked loose by the waves.

How are **fossils made?**

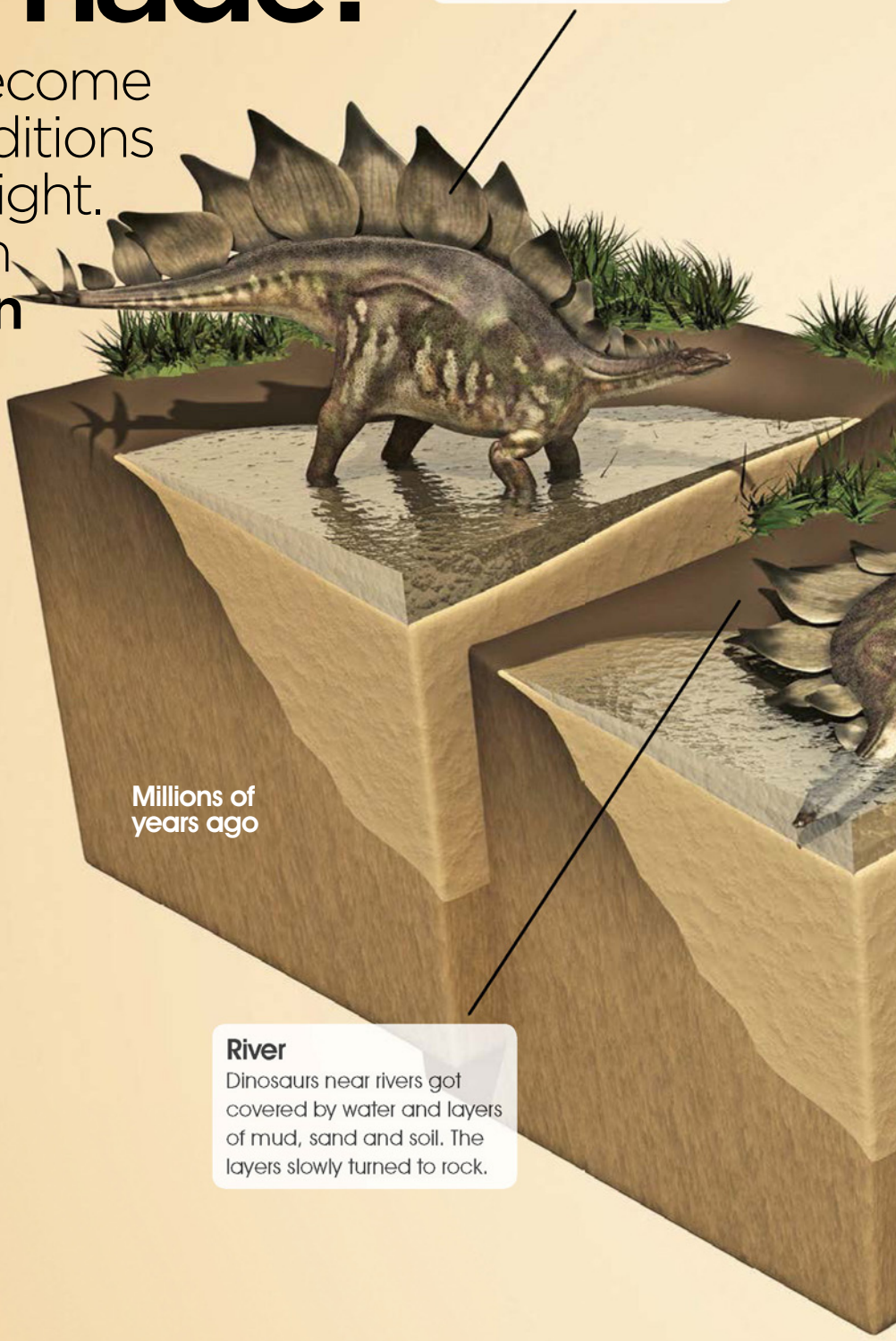
Not all bones become fossils – the conditions have to be just right. **Find out** how an animal's **skeleton** can get **turned** to **stone**

Fossils are the remains of animals that lived millions of years ago. They only form when an animal gets buried by mud, sand or soil after they die. Over many years the body gets covered by rock layers. The animal's skin and muscles rot away, leaving just the skeleton behind. Bones eventually rot too, creating skeleton-shaped holes in the rock.

Minerals seep through and fill these gaps, producing fossils. Over time they get pushed to the surface where we find them. Fossils are quite rare, as most animals just rot away. Without fossils, we wouldn't know that dinosaurs ever existed!

18 metres

The thigh fossil of the Dreadnoughtus dinosaur is as big as a grown man!



Not all fossils are as well preserved as this one

Buried

Minerals replaced the bones and fossils were formed. Earthquakes and mountain formation bring fossils to the surface from deep underground.

More rock layers cover the bones

Puzzle pieces

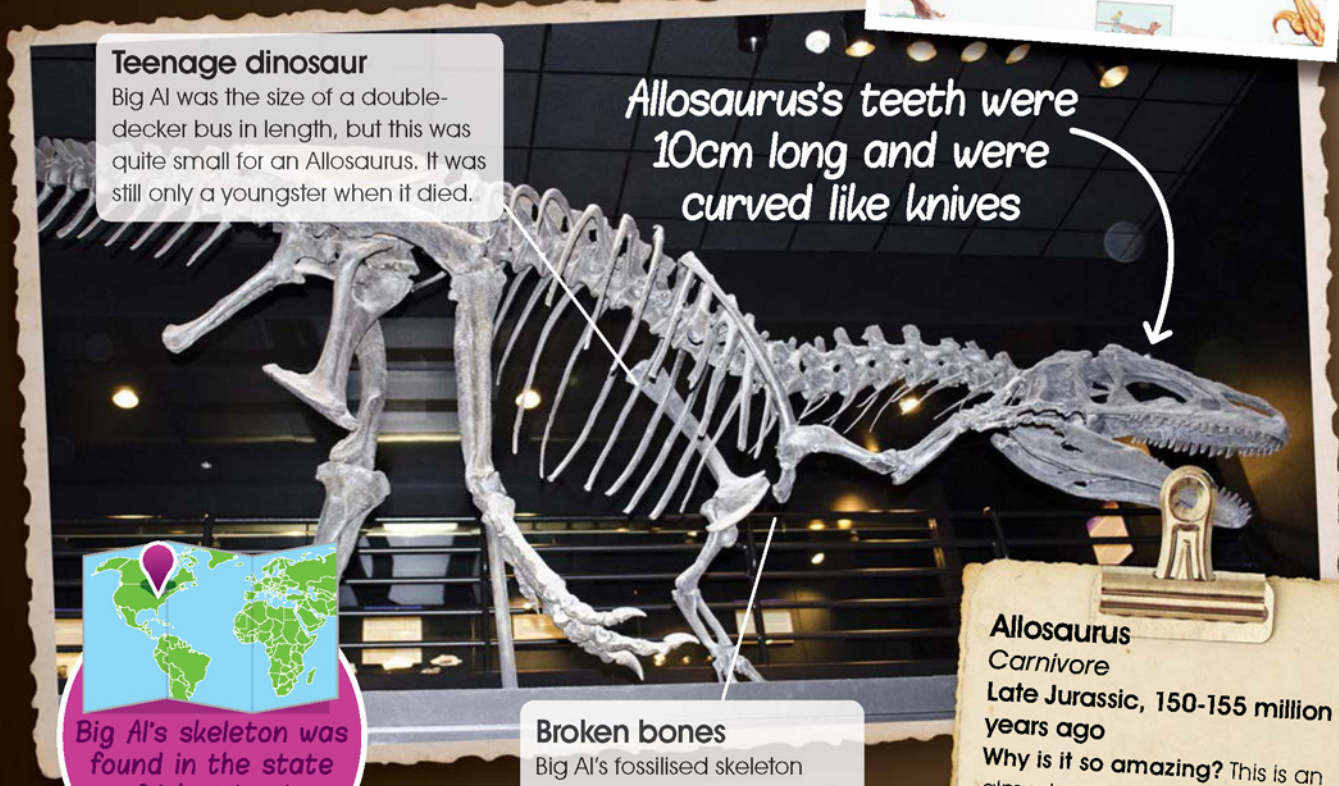
Fossils are like parts of a jigsaw. Scientists put them back together to figure out exactly what dinosaurs looked like.

Palaeontologists are scientists who study dinosaurs

Today

What are the most amazing dinosaur fossils?

The **past** comes to **life** when **fossil hunters** dig up **dinosaur bones**. Take a look at some of best fossils people have **ever found**



Teenage dinosaur
Big Al was the size of a double-decker bus in length, but this was quite small for an Allosaurus. It was still only a youngster when it died.

Allosaurus's teeth were 10cm long and were curved like knives

Big Al's skeleton was found in the state of Wyoming in the USA

Broken bones
Big Al's fossilised skeleton has 11 broken bones, which probably came from fighting with other dinosaurs.

Allosaurus
Carnivore
Late Jurassic, 150-155 million years ago
Why is it so amazing? This is an almost complete skeleton of an Allosaurus nicknamed Big Al. It had died in a fight, receiving an enormous amount of injuries.

Argentinosaurus

Herbivore

Cretaceous, 95 million years ago

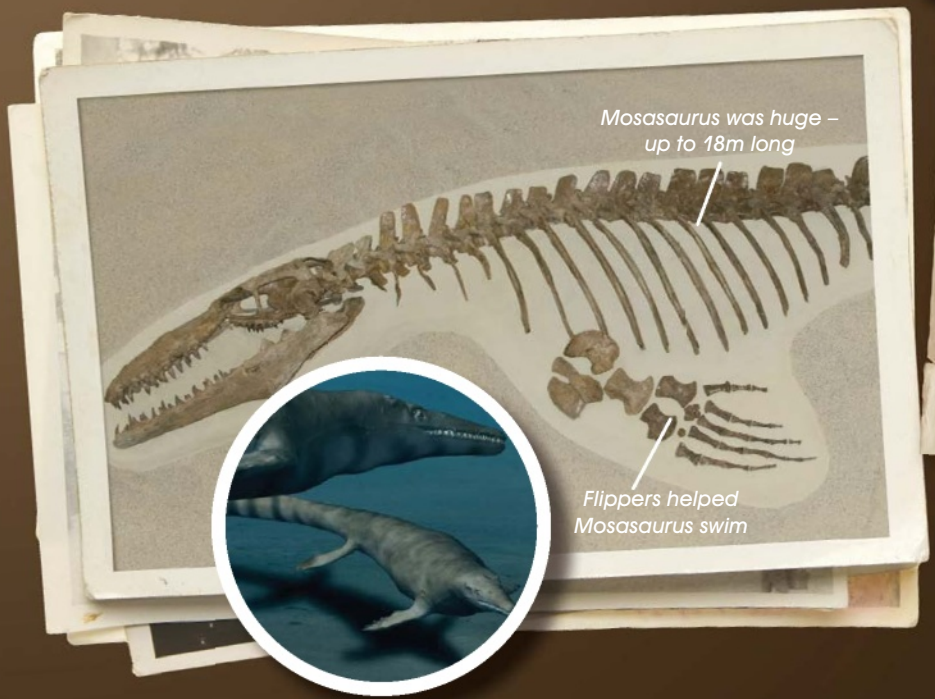
Fossil found in: *Argentina*

Why is it so amazing? This was discovered by a farmer in Argentina. He first found a leg bone that was so big he thought it was a piece of a fossilised tree!

Argentinosaurus stood four times taller than a human

Argentinosaurus's backbones are as big as a person!

Argentinosaurus was one of the biggest dinosaurs to have ever stomped across the planet!



Mosasaurus

Carnivore

Late Cretaceous, 66-77 million years ago

Fossil found in: *Netherlands*

Why is it so amazing? People had been finding prehistoric bones for centuries, but not realising what they were. A Mosasaurus fossil found in 1764 was the first to be recognised as being from something extinct, but no one knew what the creature was!

A Mosasaurus lived in the sea and looked a bit like a giant crocodile

The prey

The unlucky Protoceratops died in battle with the Velociraptor when a sand dune fell on them and crushed them.

The attacker

The Velociraptor was found attacking the other dinosaur, with one of its sharp claws stuck in its prey's throat!

Velociraptor

Carnivore

Late Cretaceous, 71-75 million years ago

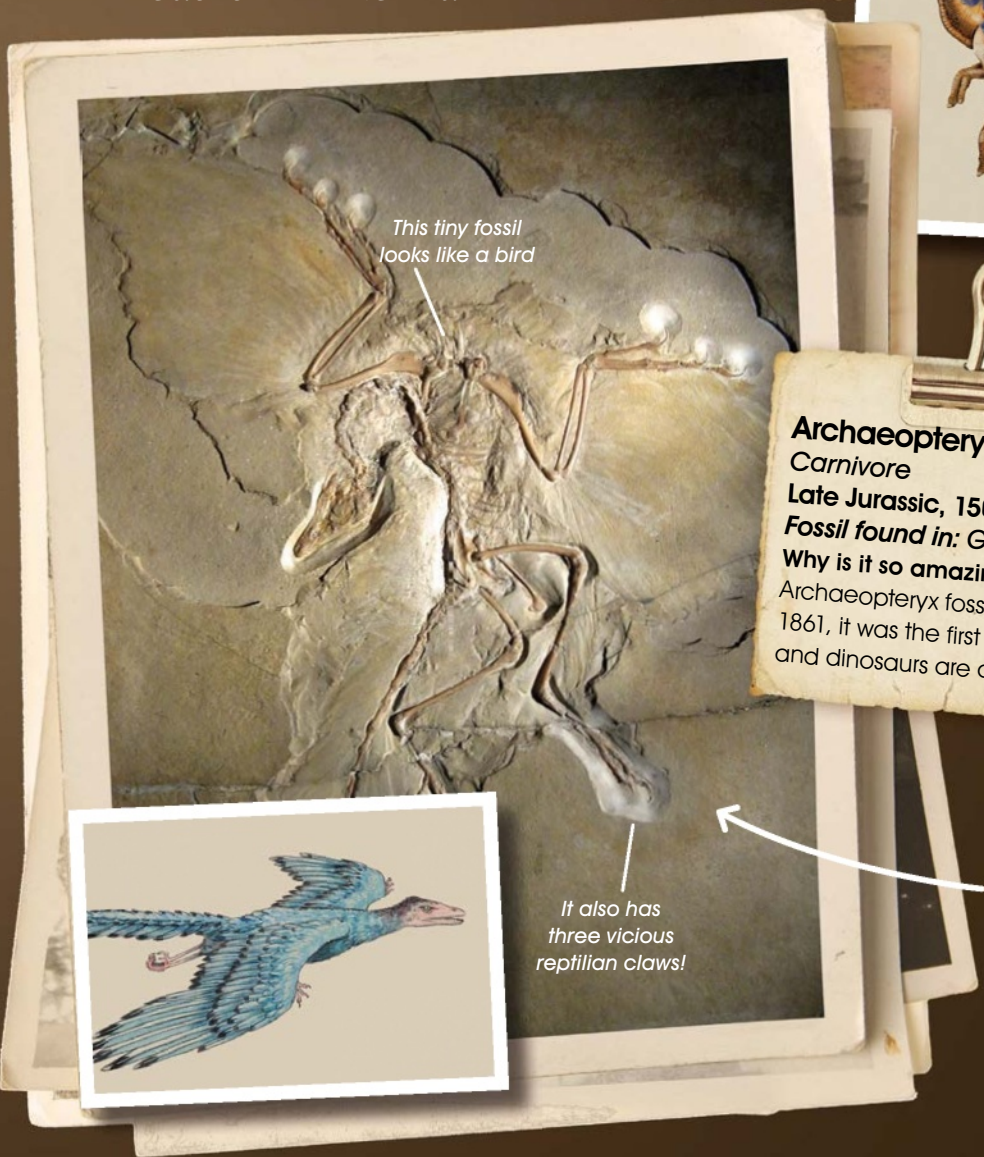
Why is it so amazing? This fossil is known as 'Fighting Dinosaurs'. It is actually two dinosaurs – a Velociraptor and a Protoceratops – locked together in combat!

A Velociraptor's main weapon is the curved claw on its feet

The fighting dinosaurs were dug up in the sandy Gobi Desert in Mongolia

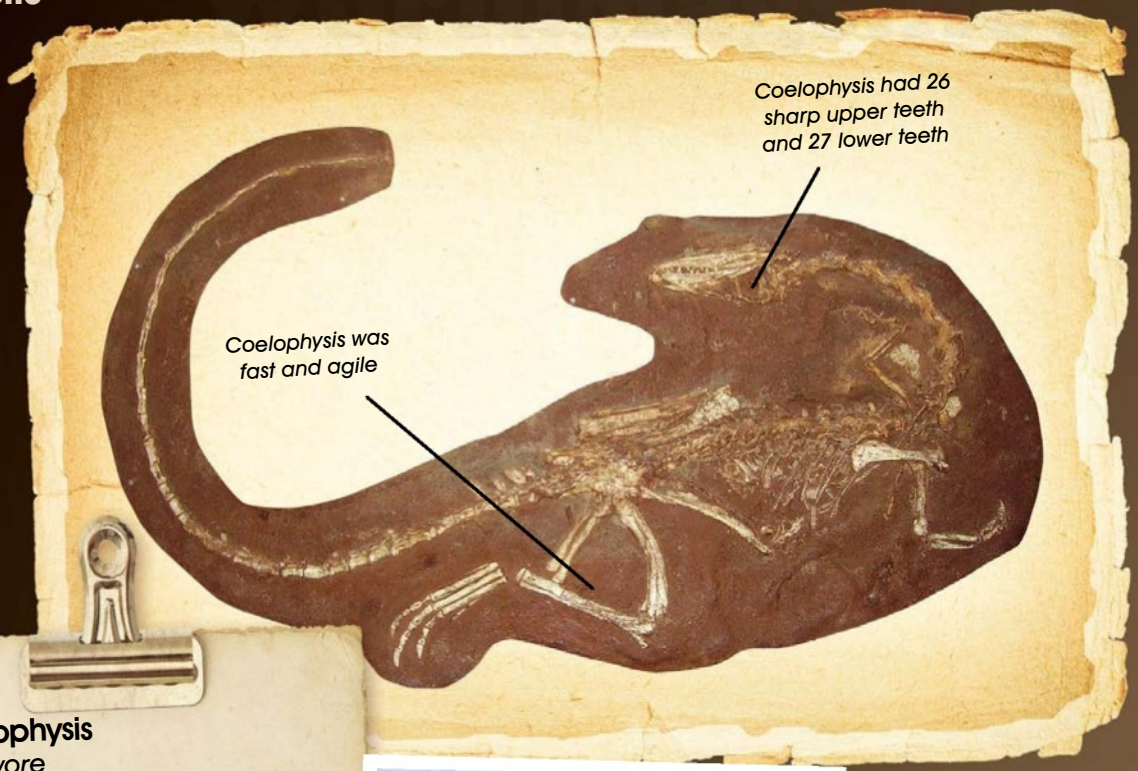
Hadrosaurus
Herbivore
Late Cretaceous, 75-80 million years ago
Fossil found in: *New Jersey, USA*
Why is it so amazing? Hadrosaurus was the first dinosaur skeleton to be discovered in the USA, in 1858.

Only one Hadrosaurus fossil skeleton has ever been found, meaning there is still a lot we don't know about this dinosaur



Archaeopteryx
Carnivore
Late Jurassic, 150 million years ago
Fossil found in: *Germany*
Why is it so amazing? When an Archaeopteryx fossil was discovered in 1861, it was the first evidence that birds and dinosaurs are actually related!

Believe it or not, today's birds are thought to have evolved from dinosaurs like Archaeopteryx!



Coelophysis
Carnivore
Late Triassic, 215 million years ago
Fossil found in: *New Mexico, USA*
Why is it so amazing? Thousands of bones belonging to a group of Coelophysis were found in 1947. This is evidence that these smaller dinosaurs may have liked to travel in herds.

This small, skinny-looking dinosaur liked to eat little lizards for dinner

These dinosaurs would head-butt one another to try and attract a girlfriend!

Brachylophosaurus
Carnivore
Late Cretaceous, 75 million years ago
Fossil found in: *USA*
Why is it so amazing? In 2000, fossil hunters found the most complete skeleton of a Brachylophosaurus ever. They called it 'Leonardo'.

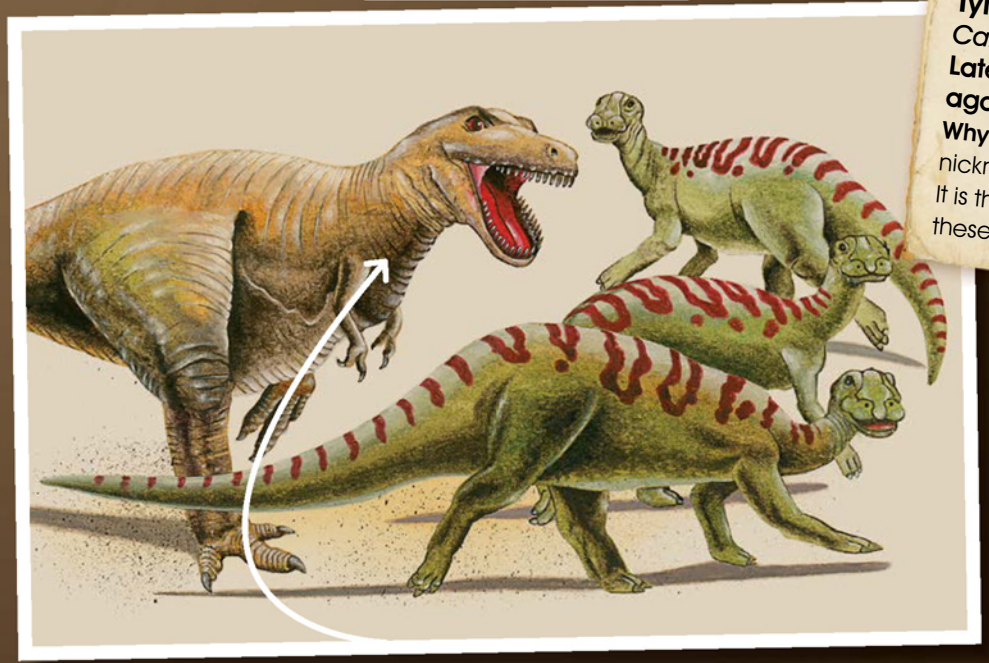
A beat-up T-Rex

This T-rex is a giant – 4 metres tall and 12 metres long! Sue had several injuries and broken bones, some from fights and others from infections.

Old lady

'Sue' is the oldest known T-rex ever found. Her age was measured by the condition of her bones.

Tyrannosaurus rex
Carnivore
Late Cretaceous, 67 million years ago
Why is it so amazing? This T-rex, nicknamed 'Sue', lived to 28 years old. It is the most complete skeleton of these fearsome creatures ever found!



Sue was found in the rocks of a cliff face in South Dakota in the USA

T-rex had the most powerful bite of any dinosaur that ever lived!

Compsognathus

Carnivore

Late Jurassic, 145-155 million years ago

Why is it so amazing? One fossil of this tiny dinosaur contained the even smaller fossil of a lizard. The Compsognathus had just had dinner before it died!

Long tail

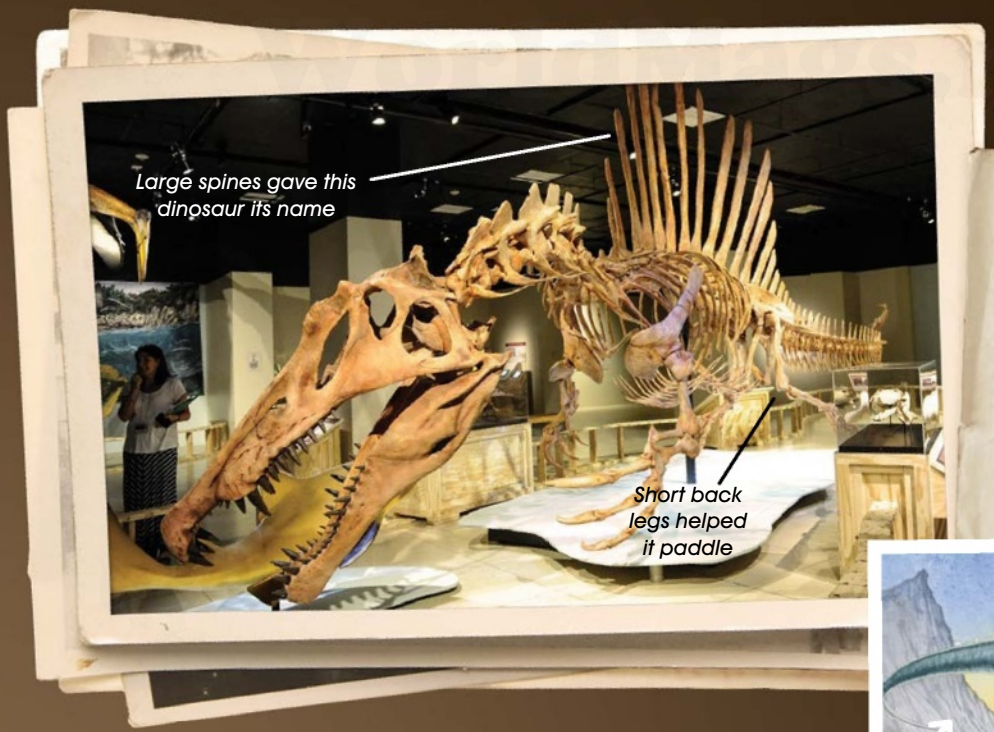
This fossil was found in Germany in 1859. It shows the long tail of the Comsognathus, which helped the little dinosaur keep its balance when running.

Only two complete Compsognathus fossils have been found – one in Germany and the other in France

Tiny but hungry

Compsognathus was one of the smallest dinosaurs ever – about the size of a chicken. It could still swallow small lizards whole, though.

Although it was small, Compsognathus was one of the fastest dinosaurs ever. It hit a top speed of over 60kmph!



Spinosaurus
Carnivore
Cretaceous, 100 million years ago
Fossil found in: *Morocco, Africa*
Why is it so amazing? Spinosaurus's fossil shows that it was able to swim and hunt sharks with vicious teeth and razor-sharp claws.

Spinosaurus was the only dinosaur known to be a deadly hunter on both land and in the sea

Austroraptor
Carnivore
Late Cretaceous, 70 million years ago
Fossil found in: *Argentina*
Why is it so amazing? This fossil find shows that new types of dinosaurs are still being discovered all the time! Austroraptor was first, and was found in 2008.

Austroraptor had short arms like T-rex, a long, low head, and would hunt larger dinosaurs

Know your **dino footprints**!

Dinosaur **footprints** contain **information** that their bone fossils **don't**. We can figure out **how they moved** and discover if they travelled in **groups** or **alone**

Iguanodons walked on four legs but could run on two. They put less weight on their front legs so those prints are smaller.

Ankylosaurus walked on four legs. Its back feet were bigger than the front feet. Their toes helped them run faster.

T-rex made huge footprints. Each one was about 80 centimetres long – covering an area big enough for you to sit in!

Ankylosaurus
Herbivore
Late Cretaceous
(66 million years ago)
Where did it live?
North America
Habitat: Woodland

Tyrannosaurus rex
Carnivore
Late Cretaceous
(67-66 million years ago)
Where did it live?
Northwestern USA
Habitat: Marshes and forests

Iguanodon
Herbivore
Early Cretaceous
(126-125 million years ago)
Where did it live? Europe and North America
Habitat: Marshes and woodland

They had five toes on their front feet, but only three on their back feet. Their toes were spaced out to spread their weight.

Triceratops footprints were about 50 centimetres wide – big enough for you to stand in. They walked with their feet pointing outwards.

Scientists guess dinosaurs' speeds from their footprints. Triceratops tracks show they were probably quite slow compared to other dinosaurs.

Stegosaurus had very small feet for its size. They weighed more than a car, so each foot was under lots of pressure.

Apatosaurus footprints have been found in lines next to each other. This is how we know groups of them travelled together.

Stegosaurus
Herbivore
Late Jurassic (155-150 million years ago)
Where did it live? North America and Europe
Habitat: Open woodland

Triceratops
Herbivore
Late Cretaceous (68-66 million years ago)
Where did it live? USA and Canada
Habitat: Woodland

Apatosaurus
Herbivore
Late Jurassic (154-150 million years ago)
Where did it live? USA
Habitat: Near forests

How do we **date dinosaur bones**?

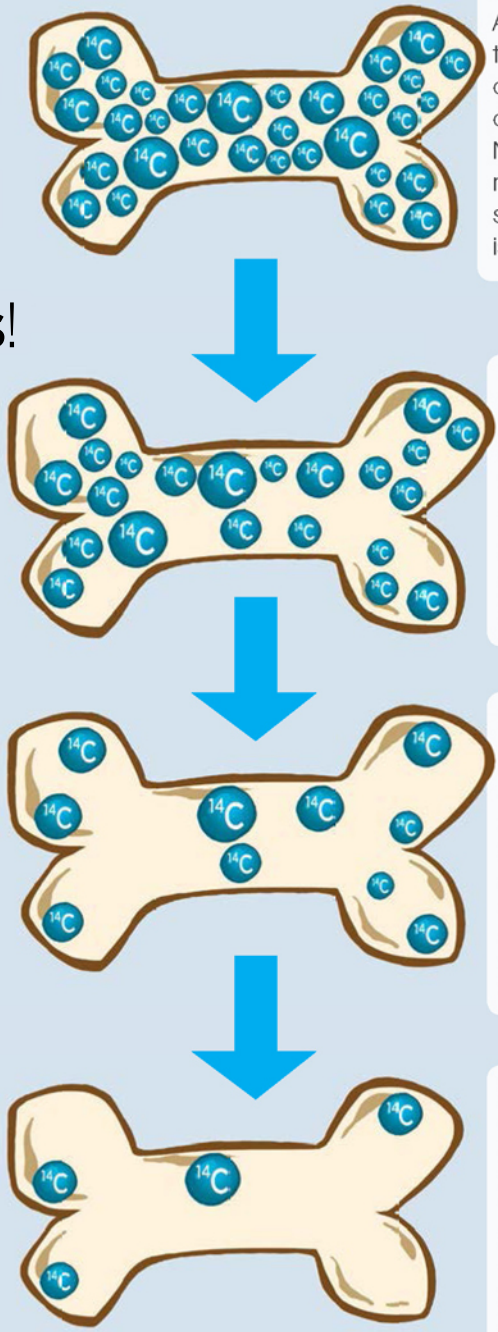
Dinosaur bones are **very, very old**. We are able to **work out** just how old by **counting radioactive atoms**!

Everything in your body is made from atoms like carbon, oxygen, iron and calcium. While the atoms that you're made of will always be the same, some atoms like to turn into different ones. When that happens, they glow with radiation. This means that they are radioactive.

Imagine that you have a dinosaur bone with loads of atoms in it. The time it would take for half of these atoms to turn into different ones is called a 'half-life'. The number of times you see the atoms halve in number tells you the age of your dinosaur bone. To work out the age of very old bones, we need atoms with very long half-lives, such as a radioactive metal called uranium.

240 million years

That's the age of the oldest dinosaur bones ever found. They belong to a dinosaur called Nyasasaurus parringtoni (meaning 'Lake Nyasa lizard')



Carbon 14

All of the living things on Earth contain something called carbon. Not all carbon is radioactive, but a small amount is. This is called carbon 14.

Decay

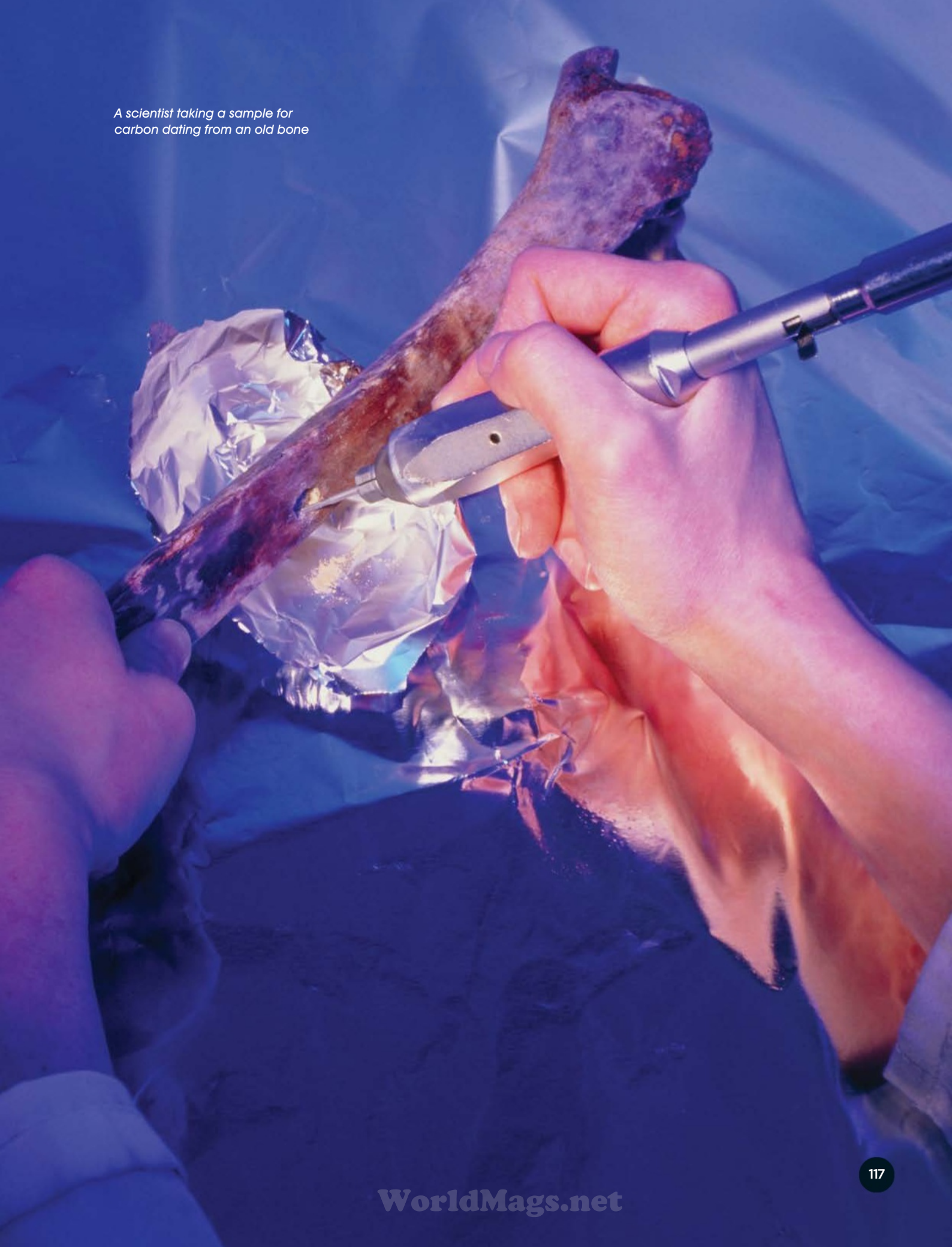
Over time, carbon 14 will decay. So the older the fossil gets the less carbon 14 it will contain.

Counting carbon

Scientists know how long it takes for carbon 14 to decay. So by counting the amount of carbon 14 molecules left in a fossil, they are able to work out how old it is.

Other elements

Radiocarbon dating only works for fossils less that 50,000 years old. But scientists can look at the decay of other elements in these objects and date them up to billions of years ago!



A scientist taking a sample for carbon dating from an old bone

How to **rebuild** a **dinosaur**

Because dinosaurs no longer exist, we have to **rebuild** their **skeletons** based on **fossils** we **find** and **dig up**. Sometimes a skeleton is made from **many different dinosaurs!**

When you go to a museum where there's a dinosaur skeleton, you're seeing the result of months, or sometimes years, of hard work by lots of people.

Dinosaur fossils are carefully treated and put together to re-create the dinosaur. Often, a single dinosaur skeleton is made up from many different dinosaurs, because fossils of complete dinosaurs in nature are very rare. Some are actually fakes. For example, Dippy the Diplodocus in London's Natural History Museum is a plaster replica of a skeleton in the Carnegie Museum in Pittsburgh, USA.


Dippy is located in the Natural History Museum in London
A year and a half
It took 18 months to create the casts for Dippy's bones. When it was finally finished in 1904, the parts for the skeleton were shipped to England in 36 big crates!
A long tail
The tail has an impressive 70 vertebrae (bones). The tail had to be this long to help the 27-metre herbivore keep balance.
Bars are put in between all the casts so they stick together
You can walk directly under the skeleton's long tail
War shelter
In the Second World War, Dippy was taken apart and stored in the museum's basement so it wouldn't be damaged by air raids.
There are 10 Dippy replicas around the world

Where can you see dinosaurs today?

There is lots you can learn about **dinosaurs today** all over the world. You could go to a **museum** or visit a place that's famous for **fossils**...

Dinosaur Provincial Park, Alberta, Canada
Incredibly, many dino fossils have been found in this national park in Canada. If you go there, you might just find yet another one!

You can 'dig for a day' at the Wyoming Dinosaur Center, USA

Field Museum, Chicago, USA

Hell Creek, Montana, USA
It has a nasty name, but Hell Creek is where archaeologists have found dinosaurs of all types – both land walkers, ocean swimmers and flying dinosaurs called pterosaurs. Bring plenty of water, though.

72
That's how many Triceratops have been found just in Hell Creek, Montana!

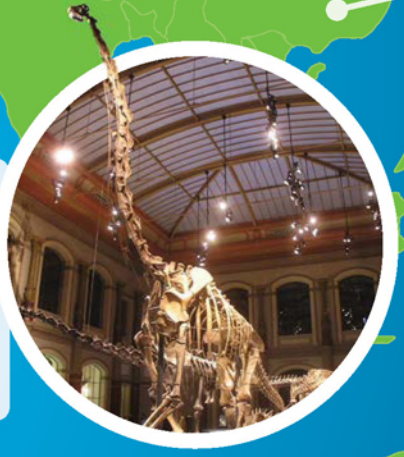
Natural History Museum, London, England

This world-famous museum has many different dinosaur skeletons of all types and sizes. There is even an animatronic T-rex that moves and roars!

Flaming Cliffs, Mongolia

It's really hard to get to the remote Flaming Cliffs in the Gobi Desert, but those who have made it have found hundreds of fossils. The first-ever dino eggs were found there.

Dashanpu Formation in China has many fossils



Museum für Naturkunde, Berlin, Germany

This cool-looking museum has the tallest dinosaur skeleton in the world – the 13.3-metre tall Brachiosaurus brancai. This is one of the biggest dinosaurs that ever lived.

Iziko Museum, South Africa

Dinosaur Cove, Australia

Australia's not all about snakes and kangaroos. 100 million years ago, many different species of dinosaur roamed around down under!

Brain Games

The big quiz about the prehistoric world

Answers on page 127

Pick the right one

01 How long did some herbivorous dinosaurs grow?
Page 67
a. 30m
b. 40m
c. 70m

02 A prehistoric flying reptile was called a...?
Page 72
a. Dinosaur
b. Hacksaur
c. Pterosaur

03 The fastest dinosaur was the...?
Page 79
a. Dromiceiomimus
b. Compsognathus
c. Gallimimus

04 What was the largest carnivore?
Page 64
a. Tyrannosaurus
b. Spinosaurus
c. Giganotosaurus

05 How long were a T-Rex's teeth?
Page 82
a. Over 20cm
b. Under 20cm
c. Over 40cm

06 An Apatosaurus could eat the equivalent of how many bags of potatoes every day? *Page 76*
a. 55
b. 105
c. 1,000

07 Which dinosaur thigh fossil is as big as a grown man? *Page 104*
a. Apatosaurus
b. Diplodocus
c. Dreadnoughtus

08 The Argentinosaurus was a heavy as...
Page 62
a. A blue whale
b. 10 rhinos
c. 10 elephants

09 Where in the world can you see Dippy the Diplodocus? *Page 118*
a. London
b. Argentina
c. Africa

10 The Triceceratops was around during which period? *Page 39*
a. Cretaceous
b. Permian
c. Tertiary

Spot the mistakes

This Jurassic scene contains three animals that don't belong in this time. Can you spot the ones that shouldn't be there?

Fill in the blanks

Follow the clues to complete the words

01 A person who studies fossils *Page 100*

P _ l _ eo _ to _ o _ i _ t

02 The largest dinosaur to have been discovered *Page 62*

_ r _ en _ i _ o _ a _ _ u _

03 One of the smallest dinosaurs ever *Page 68*

C _ m _ s _ g _ a _ h _ s

04 A vegetarian dinosaur *Page 74*

He _ b _ v _ r _

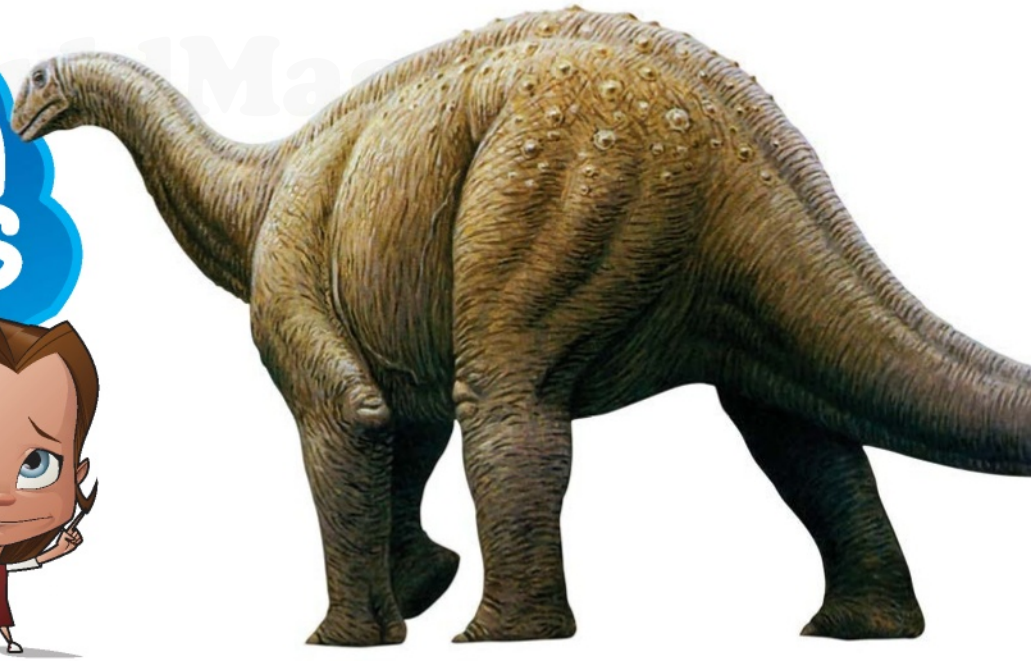
05 Scientists think this dinosaur was the cleverest *Page 80*

Tr _ _ d _ _

06 The name of the Diplodocus skeleton at the National History Museum *Page 118*

D _ p _ y

Brain Games



Do you know?

Test what you've learned! All the answers to the questions below can be found in this issue.

01 The age of the oldest fossils ever found *Page 103*

02 Where did the Allosaurus live? *Page 18*

03 What do scientists think hit the Earth and wiped out the dinosaurs? *Page 96*

04 How big are the largest T-Rex heads? *Page 12*

05 Which period did Velociraptors live in? *Page 15*

06 Which prehistoric creature's name meant 'toothless wing'? *Page 17*

07 How fast could a Carnotaurus run? *Page 21*

08 Who found the first ever dinosaur bones? *Page 60*

09 What name was given to the first dinosaur identified? *Page 60*

10 Which dinosaur sounded like a tuba? *Page 56*

Word hunt

Can you find ten words about dinosaurs hidden in the grid below?

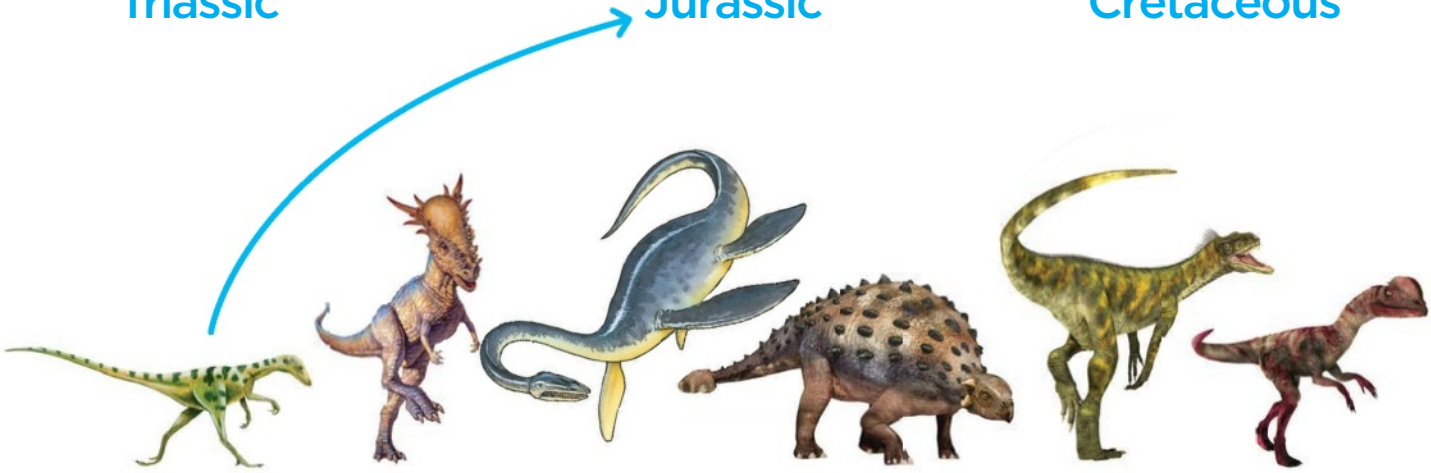
A	L	L	O	S	A	U	R	U	S	S	E	F	H
D	I	H	J	M	H	E	M	H	C	A	X	T	E
M	L	T	S	F	C	A	F	G	I	T	T	Y	R
C	A	R	N	O	T	A	U	R	U	S	I	O	B
O	S	D	I	N	O	M	O	T	R	U	N	L	I
P	T	E	R	O	S	A	U	R	C	I	C	P	V
D	E	J	U	R	A	M	S	S	A	C	T	U	O
F	R	E	A	T	F	M	L	A	S	T	I	O	R
I	O	S	A	T	C	A	R	N	I	V	O	R	E
J	I	E	S	I	N	L	U	S	R	F	N	H	U
T	D	I	P	L	O	D	O	C	U	S	G	T	F
D	U	T	S	C	O	Y	R	R	O	G	T	U	Y
T	Y	R	A	N	N	O	S	A	U	R	U	S	H

Allosaurus
Carnotaurus
Pterosaur
Herbivore
Carnivore
Mammal
Asteroid
Tyrannosaurus
Diplodocus
Extinction

Prehistoric puzzle

Use our guide to the most amazing dinosaurs ever (page 10) to help you draw a line from each dinosaur to the period that they lived in.

Triassic Jurassic Cretaceous



Compsognathus Pachycephalosaurus Plesiosaurus Ankylosaurus Herrerasaurus Dilophosaurus

Brain Games

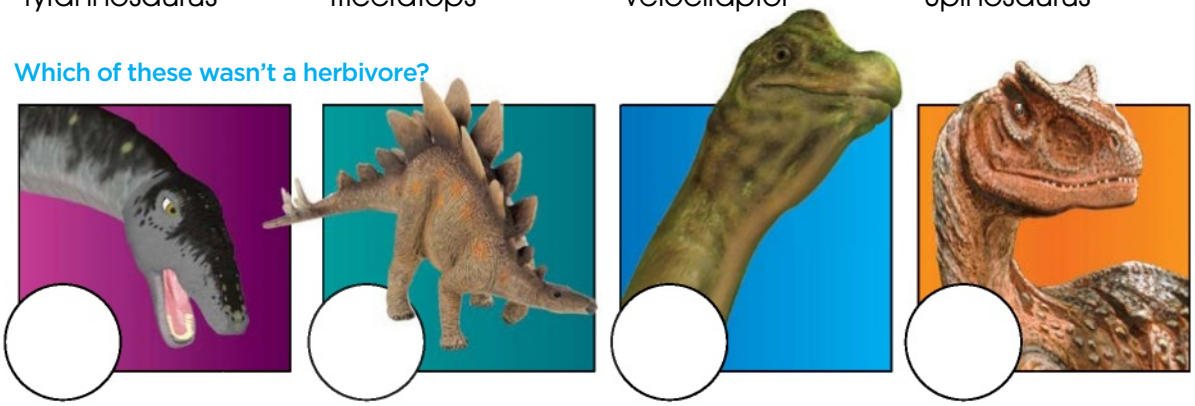
Odd one out

Can you guess which is the odd one out from each row below?

Which of these wasn't a carnivore?

Tyrannosaurus | Triceratops | Velociraptor | Spinosaurus

Which of these wasn't a herbivore?



Apatosaurus | Stegosaurus | Brachiosaurus | Allosaurus

Which of these wasn't a dinosaur?

Argentinosaurus | Carnosaurus | Pteranodon | Diplodocus

Answers

A	L	L	O	S	A	U	R	U	S	S	E	F	H
D	I	H	J	M	H	E	M	H	C	A	X	T	E
M	L	T	S	F	C	A	F	G	I	T	T	Y	R
C	A	R	N	O	T	A	U	R	U	S	I	O	B
O	S	D	I	N	O	M	O	T	R	U	N	L	I
P	T	E	R	O	S	A	U	R	C	I	C	P	V
D	E	J	U	R	A	M	S	S	A	C	T	U	O
F	R	E	A	T	F	M	L	A	S	T	I	O	R
I	O	S	A	T	C	A	R	N	I	V	O	R	E
J	I	E	S	I	N	L	U	S	R	F	N	H	U
T	D	I	P	L	O	D	O	C	U	S	G	T	F
D	U	T	S	C	O	Y	R	R	O	G	T	U	Y
T	Y	R	A	N	O	S	A	U	R	U	S	T	H

Odd one out

1. Triceratops
2. Allosaurus
3. Pteranodon

Pachycephalosaurus, Ankylosaurus

Do you know?

01 3.5 billion years
02 North America
03 An asteroid
04 1.5 metres across
05 Cretaceous
06 Pteranodon
07 40 kmph
08 William Buckland
09 Megalosaurus
10 Parasaurolophus

Prehistoric puzzle

Triassic: Herrerasaurus
Jurassic: Compsognathus, Dilophosaurus, Plesiosaurus
Cretaceous:

Pick the right one

1.B 2.C 3.A 4.B 5.A 6.A 7.C 8.C 9.A 10.A

Spot the mistakes

Panda, Orang-utan, Eagle

Fill in the blanks

01. Palaeontologist
02. Argentinosaurus
03. Compsognathus
04. Herbivore
05. Trooodon
06. Dippy

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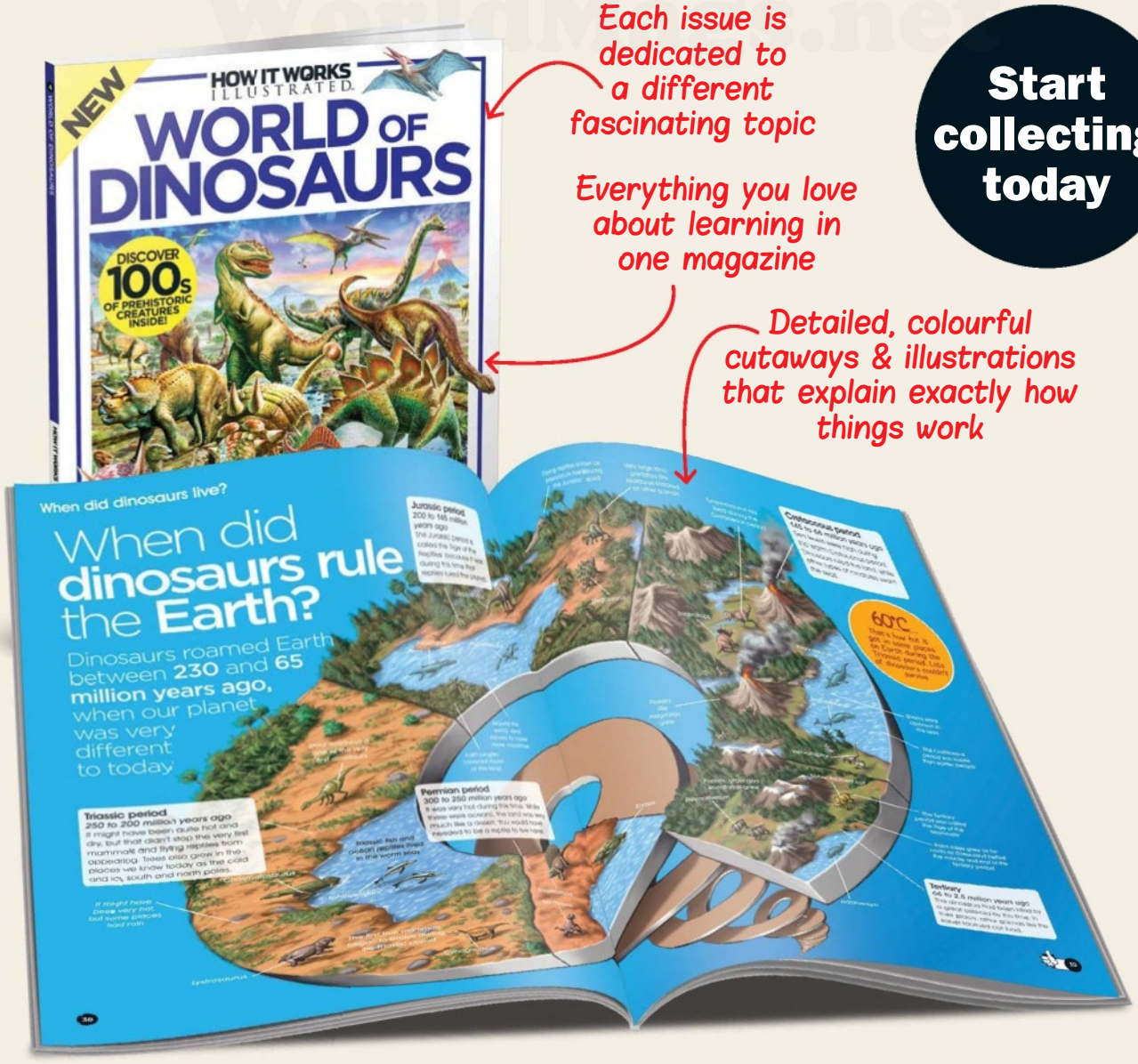

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Imagine Publishing Ltd
Richmond House, 33 Richmond Hill, Bournemouth,
Dorset, BH2 6EZ
☎ +44 (0) 1202 586200

Web
www.imagine-publishing.co.uk
www.howitworksdaily.com
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Magazine team

Editor in Chief Dave Harfield
Senior Art Editor Helen Harris
Designer Rebekka Hearl
Photographer James Sheppard
Publishing Director Aaron Asadi
Head of Design Ross Andrews
Education Consultant Godfrey Hall

Contributors
Sarah Bankes, Erlingur Einarsson, Alicea Francis, Philippa Grafton, Gemma Lavender, Jackie Snowden, Jodie Tyley, Tim Williamson

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Head of International Licensing
Cathy Blackman
☎ +44 (0) 1202 586401
licensing@imagine-publishing.co.uk

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☎ 01202 586200

Production
Production Director Jane Hawkins
☎ 01202 586200

Founders
Group Managing Director Damian Butt
Group Finance and Commercial Director Steven Boyd

Printing & Distribution
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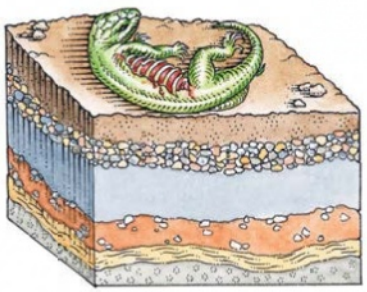

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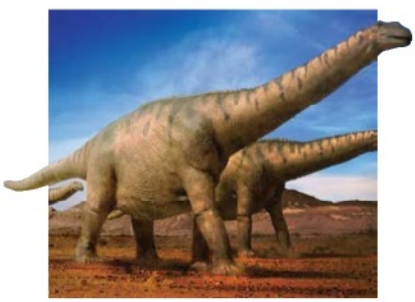

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