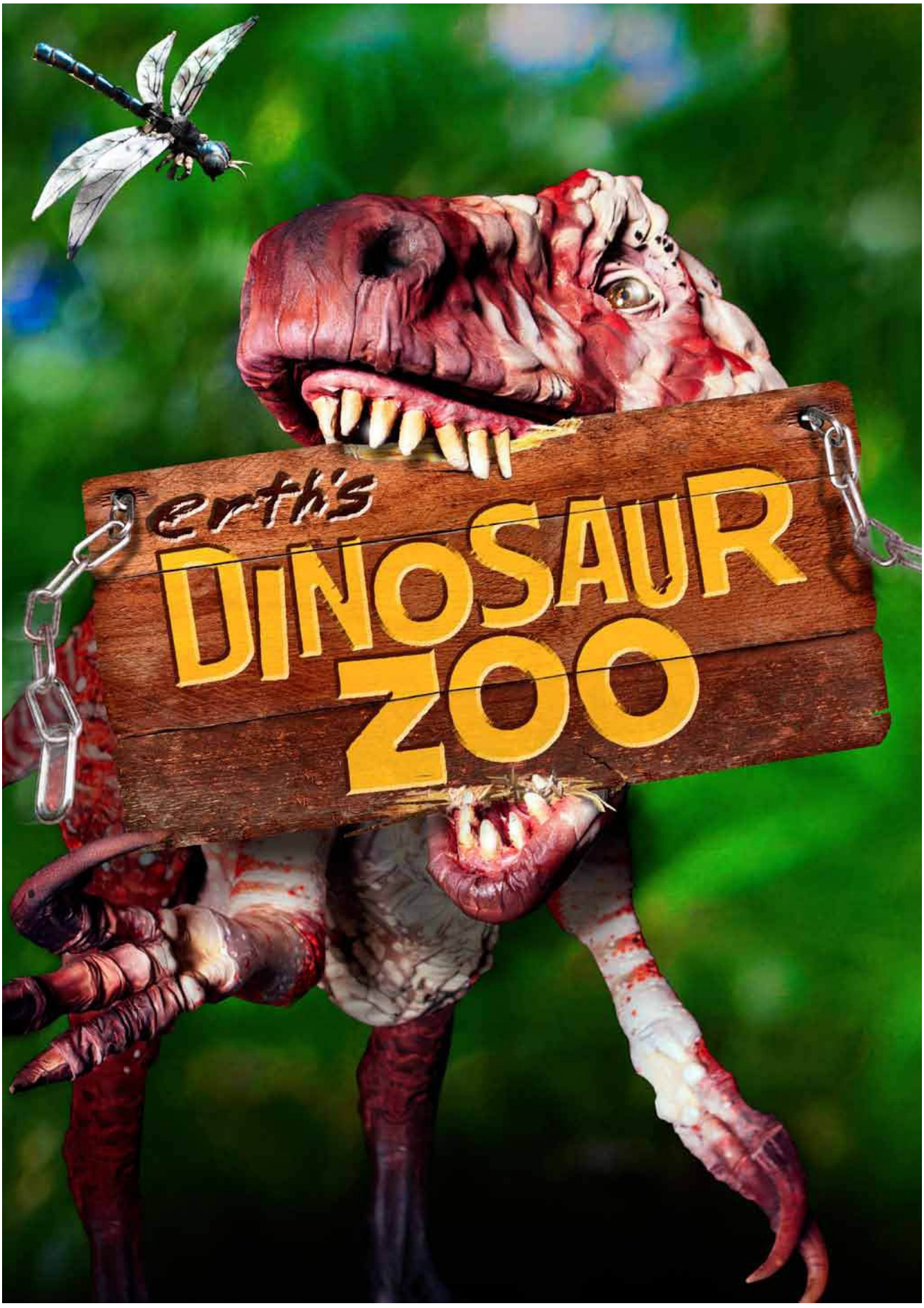
Pack 1:

Research & Resource Pack for Teachers (Key Stages 1 & 2)

The Mesozoic Era: A General History of Dinosaurs



www.dinosaurzoolive.com

Pack Contents

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About Erth

Erth Visual & Physical Inc have continually created original live theatre at the forefront of new performance practice.

Since its beginnings in 1990, the Company has strived to provide audiences with eye popping visual experiences. Giant puppetry, stilt-walkers, inflatable environments, aerial and flying creatures. **Erth** is all these things and more.

Erth have built an Australia wide, and increasingly international reputation based on exceptional work. In demand for events and festivals, the Company inspires audiences with their unique and dynamic vision.

Erth's Dinosaur Zoo is a unique and exciting show where children have the opportunity to get up close and personal with ancient life-sized dinosaur puppets and learn about dinosaurs and prehistoric Australia!

Introduction

Between 230 and 65 million years ago, some of the most amazing creatures ever to have lived ruled our planet. The most successful of these creatures were a group of land-living reptiles called dinosaurs!

Not all the dinosaurs lived at the same time, nor did they all live in the same part of the world, but they existed on the Earth for over 165million years.

No other single group of animals has dominated the Earth for such a long period, it is difficult to imagine how long the dinosaurs were dominant for until we compare this with human existence. The earliest known human genus evolved on the Earth about 2.4 million years ago and Modern Humans (Homo Sapiens) only originated about 200,000 years ago!
One reason for the dinosaurs success was their ability to evolve (develop and change) very quickly.

Dinosaurs lived during a period of the **Earth's history** called the **Mesozoic Era**.

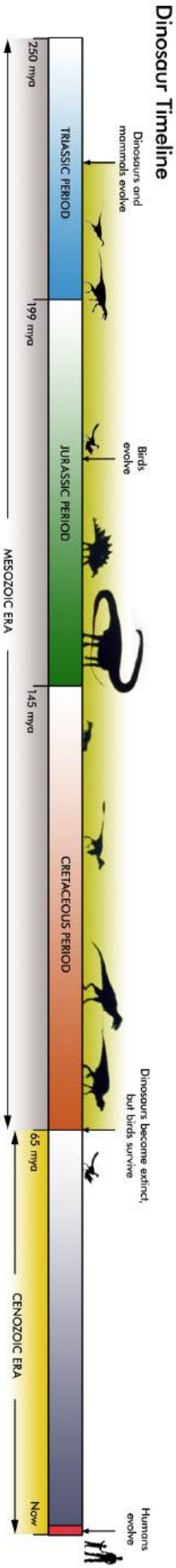
The Mesozoic Era spans 183 million years and is divided into 3 time periods- The Triassic Period, The Jurassic Period and the Cretaceous Period.

These time periods will be referred to throughout this pack to describe the time periods that different dinosaurs evolved and existed in.

Did you know: The history of the Earth is divided into many different time periods?

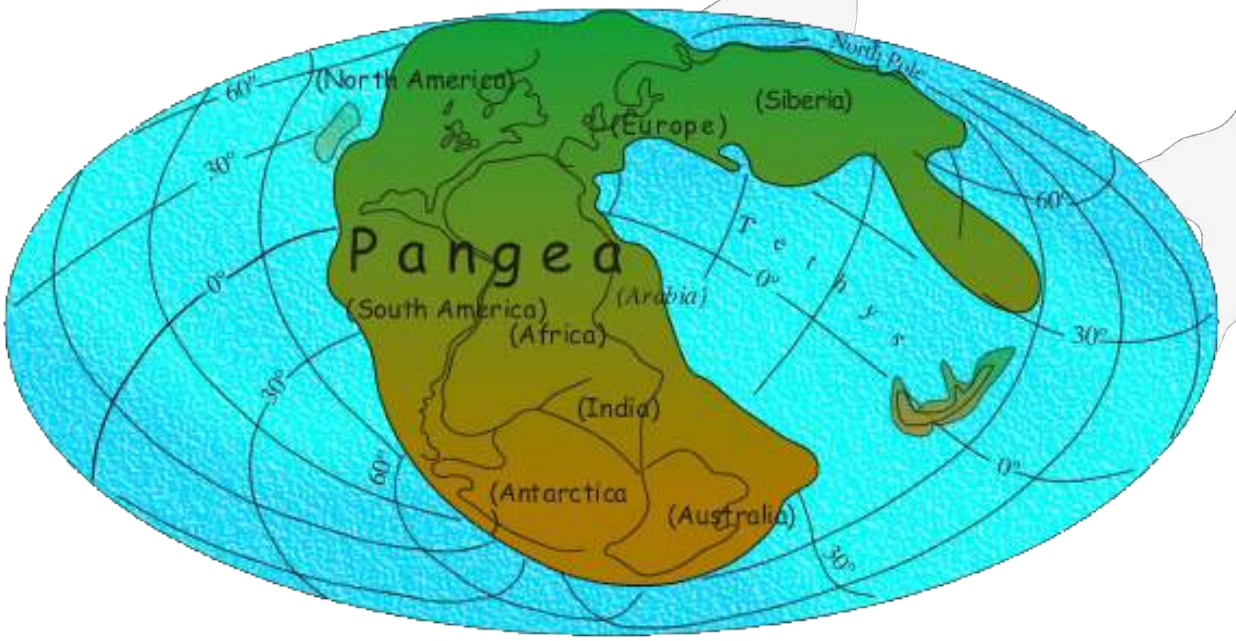
Click HERE to find out more about the history of the Earth.

Did you know: The name Mesozoic Era is derived from the Greek language and means 'Middle Life'?



The world the dinosaurs inhabited, looked vastly different to how it does today. During the Triassic period, all of the land masses were grouped together in one huge 'super-continent' named **Pangaea** (meaning 'All earth') and many countries we recognise today did not exist- or at least they were not in the locations that they are now!

The Triassic dinosaurs spread throughout Pangaea and over time, **the Pangaea landmass began to split**. By the Jurassic period, it had split into 2 enormous continents named Laurasia and Gondwana. These two land masses also began to break up and over millions of years, they split into smaller continents each with different climates and plants and groups of dinosaurs which evolved into new species to suit each new continent. By the time of the Cretaceous period, the continents looked much as they do today.



Did you know: Pangaea was the biggest landmass there has ever been? This allowed the dinosaurs to spread far and wide across the planet.

Did you know: The world is constantly changing? The land moves slowly over vast amounts of time and landscapes become dramatically different.

Click HERE to watch an animation of Pangaea breaking apart!

Click HERE to watch a 2 minute BBC video clip about the movement of the continents.

What is a Dinosaur ?

Dinosaur bones have probably been found for millennia, but it was not until 1842 that the term ‘dinosaur’ was first coined.

The first dinosaur to be described and named was presented as the ‘Megalosaurus or ‘Great Fossil Lizard of Stonesfield’. The bones and fossilised remains of this animal were found in the **Oxfordshire** village of Stonesfield.
In 1824 **William Buckland** (professor of Geology at Oxford) presented descriptions of the Megalosaurus discovery in a written paper, this was the first full account of a fossil dinosaur.

Did you know: Several of the first dinosaur discoveries were made in Oxfordshire?

Oxford University has a fantastic Museum of Natural History which records the history of many of the Oxfordshire dinosaur discoveries. The museum has a range of factsheets and activities on their website to stimulate most ages.

Click HERE to visit The Oxford University Museum of Natural History website

Click HERE to open a factsheet all about dinosaurs on display in the museum and the discovery of dinosaurs

Click HERE to find out more about William Buckland

In 1842 the word ‘**dinosaur**’ was invented by **Richard Owen**, following the discovery of several more creatures that shared common features with Megalosaurus.

Owen was a distinguished professor of anatomy and he based this new Dinosauria grouping on the shared features of the recently discovered large land-living reptiles **Megalosaurus, Iguanodon and Hylaeosaurus.**

He saw that they shared certain features (including hollow limb bones, and five fused vertebrae where the spine fastens to the pelvis) and recognised that they were more than just the overgrown lizards others had seen them to be.

**Did you know: The word Dinosaur, is a combination of two Greek words "Deinos” (terrible) and "sauros” (lizard)?
So, the name dinosaur means “Terrible Lizard”.**

Did you know: Megalosaurus, Iguanodon and Hylaeosaurus were all discovered in the UK and were the first 3 animals to be described as dinosaurs?

Click HERE to find out more about Richard Owen

Prior to the 1800s scientists struggled to interpret early findings of large bones that were occasionally dug from quarries.

The diagram to the right shows an early sketch of part of a Meglosaurus leg bone.

In 1677, before the discovery of dinosaurs, English Naturalist and Oxford Professor Robert Plot wondered if the bone could have been evidence of an elephant brought to Britain by the Romans, but finally concluded it was too large and so must be the remains of a Giant!

Dinosaurs are a large, yet very specific group of creatures.
The word “dinosaur” is often used incorrectly. Many people lump together all of the ancient reptiles (including the flying reptiles and marine reptiles) and call them dinosaurs.

Richard Owen’s skill as an anatomist enabled him to begin creating a classification system for dinosaurs. He identified **key common features** and criteria which classed an animal as a dinosaur. Below are the 4 main features:

1. It must have lived during the Mesozoic Era

2. It must be a reptile, although not all reptiles are dinosaurs. Lizards are reptiles, but they are not dinosaurs.

3. Its legs must be located below its body, as opposed to sticking out from the sides like the legs of a crocodile.

4. It must have lived on land, not in the water like swimming reptiles or in the air like the pterosaurs.
However, the fossil record indicates that birds evolved from theropod dinosaurs during the Jurassic period, and consequently birds are now considered a type of dinosaur in modern classification systems.

There are a number of other characteristics that many dinosaurs share:

-A large hole in the bottom of their basin-shaped hip-socket
-A secondary palate (uncharacteristic of reptiles) that permits dinosaurs to eat and breathe at the same time
-A fairly straight thigh bone with an in-turned head
-Two pairs of holes in the temporal region of the skull
-Backwards-pointing knees (or elbows) of the front legs
-Forwards-pointing knees of the rear legs (rather than pointing sideways)
-Front legs shorter and lighter than the rear legs (in almost every case)
-A special bone at the chin, capping the front of the bottom jaw in some dinosaurs

Dinosaurs evolved and adapted themselves rapidly during their 165 million year reign.

Early in their evolutionary history, dinosaurs split into **two major groups**, defined (and named) by their different hip structures.

Saurischians (Sore-iss-key-ans) means 'lizard-hipped' dinosaurs.

Ornithischians (Or-nith-iss-key-ans) means 'bird-hipped' dinosaurs.

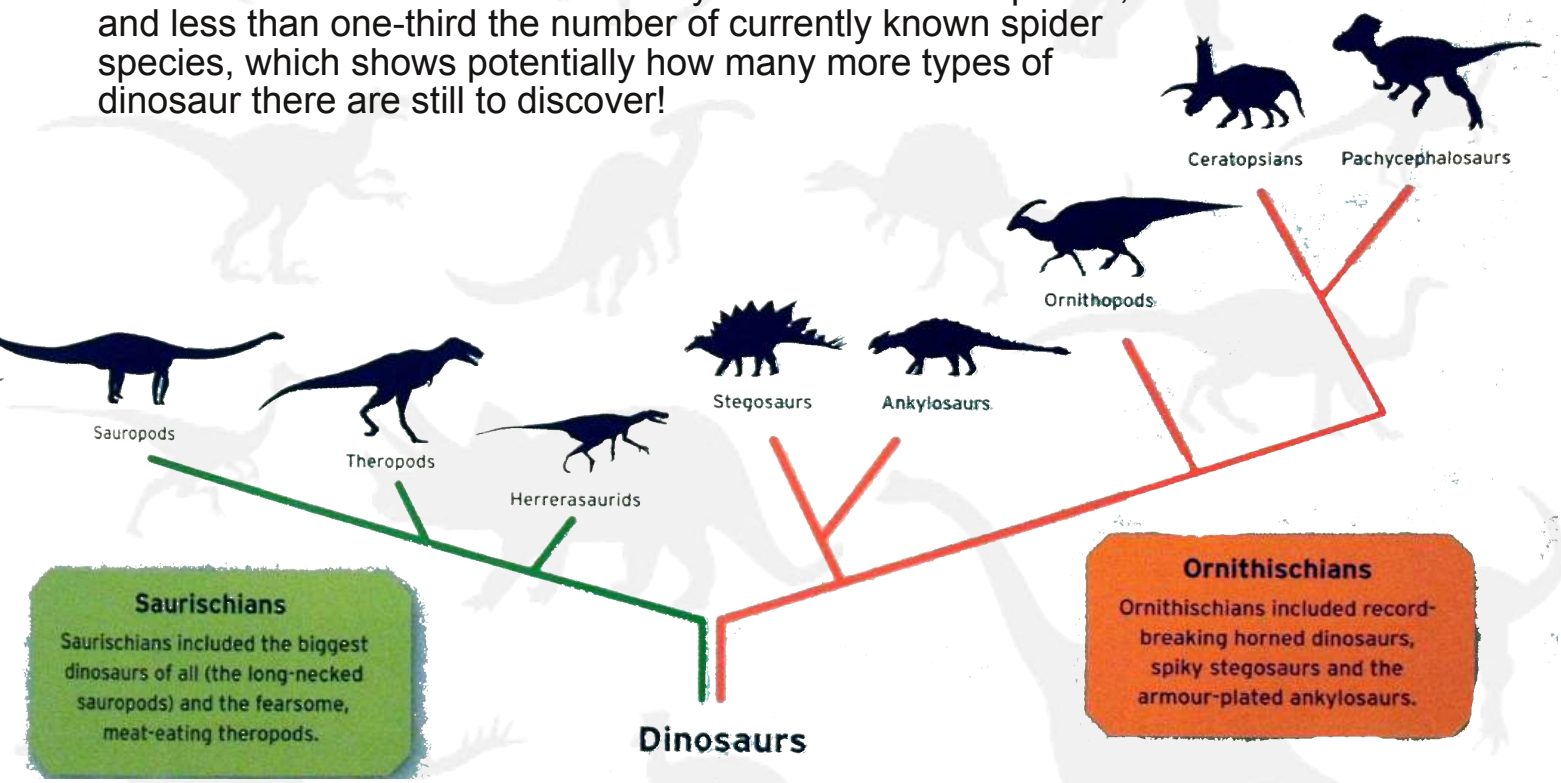
If that is not confusing enough, each group has several subgroups too!
And within each sub-group are several different species of dinosaur.

Have a look at the Family tree below. It clearly shows the two major groups along with their subgroups, but it does not show all the individual species- just a sample of each sub group!

It is impossible to tell exactly how many species of dinosaurs there were as the fossil remains of new species are still being found each year.

Approximately 700 species have been named so far.

Even if all 700 named species are valid, their number is still less than one-tenth the number of currently known living bird species, less than one-fifth the number of currently known mammal species, and less than one-third the number of currently known spider species, which shows potentially how many more types of dinosaur there are still to discover!



It can take a long time for scientists and **palaeontologists** to classify dinosaurs. Sometimes, new dinosaurs are discovered and named but then palaeontologists realise later that the dinosaur is actually a species of dinosaur already known to them!

The most famous case of mistaken identity is possibly that of the Brontosaurus. Brontosaurus used to be one of the most well known dinosaurs around but then palaeontologists realised that 'Brontosaurus' was actually the same creature as Apatosaurus and since Apatosaurus was discovered first, then this is the name that was used instead of Brontosaurus.

Palaeontologist (pay-lee-on-toll-oh-jist) is the name given to someone who studies the forms of life existing in prehistoric or geologic times, through analysis of the fossils of plants, animals, and other organisms.

Worldwide Well known dinosaurs

There are so many types of new dinosaurs that most of us have never heard of before, many have not quite made it yet to the hall of fame- but perhaps in a few years they will capture our imaginations like T-rex and many of the other dinosaurs that have become our **favourite dinosaurs** over the years.

Have you got a favourite dinosaur?

See if you can draw your favourite dinosaur or find out a new fact about it.

Have a look at our dinosaur hall of fame over the next few pages to see a collection of the world's best known dinosaurs and to learn all about them.

Fact File

Tyrannosaurus

How to say it:

Tie-ran-o-sore-us

Name means:

Tyrant Lizard King

Family group:

Tyrannosaur

Period:
Late cretaceous
66-70 MYA

Where found:

North America

1st Discovered:

1902

Height:

4 metres

Length:

14 metres

Weight:

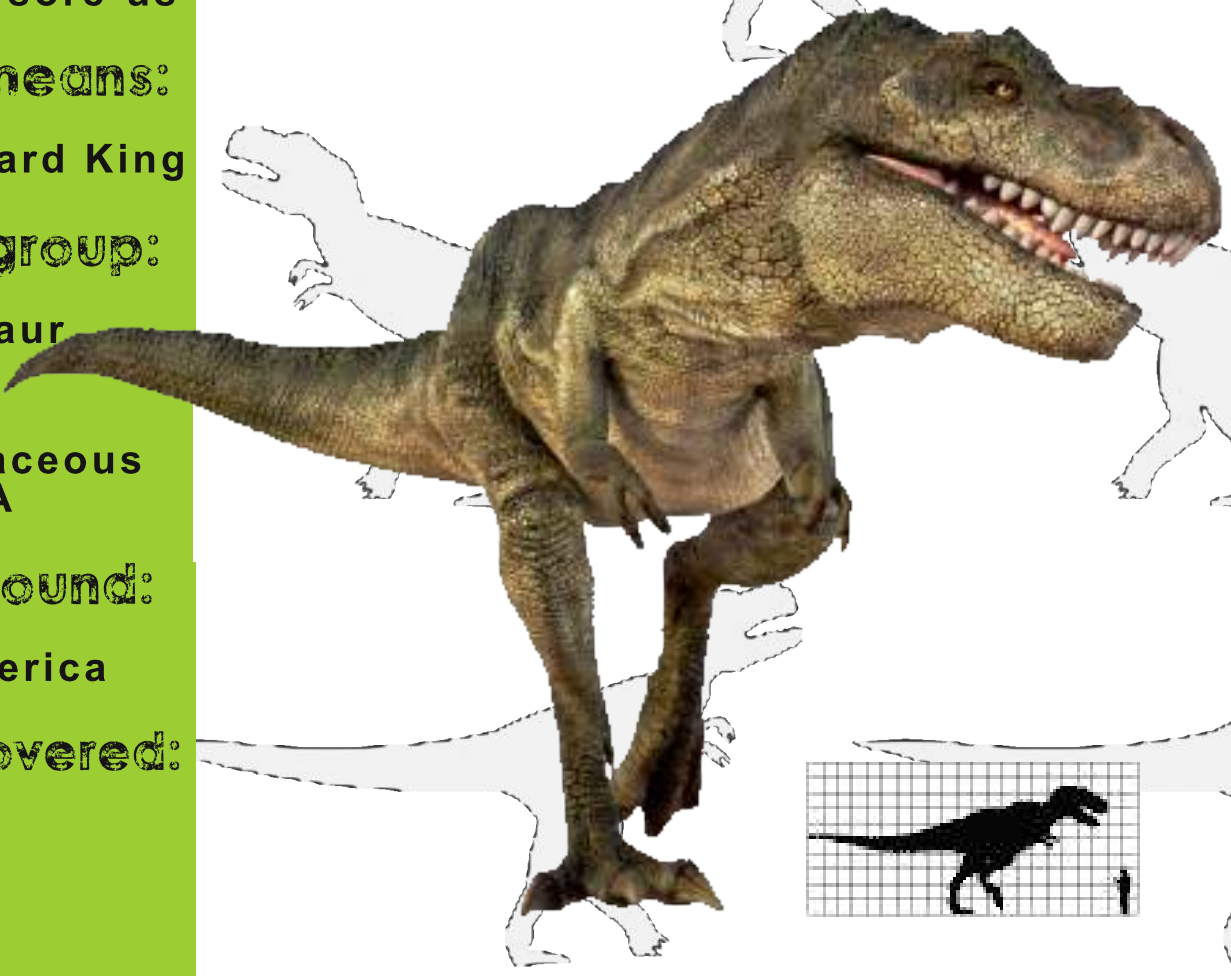
7700kg, 7.7 tons

Food:

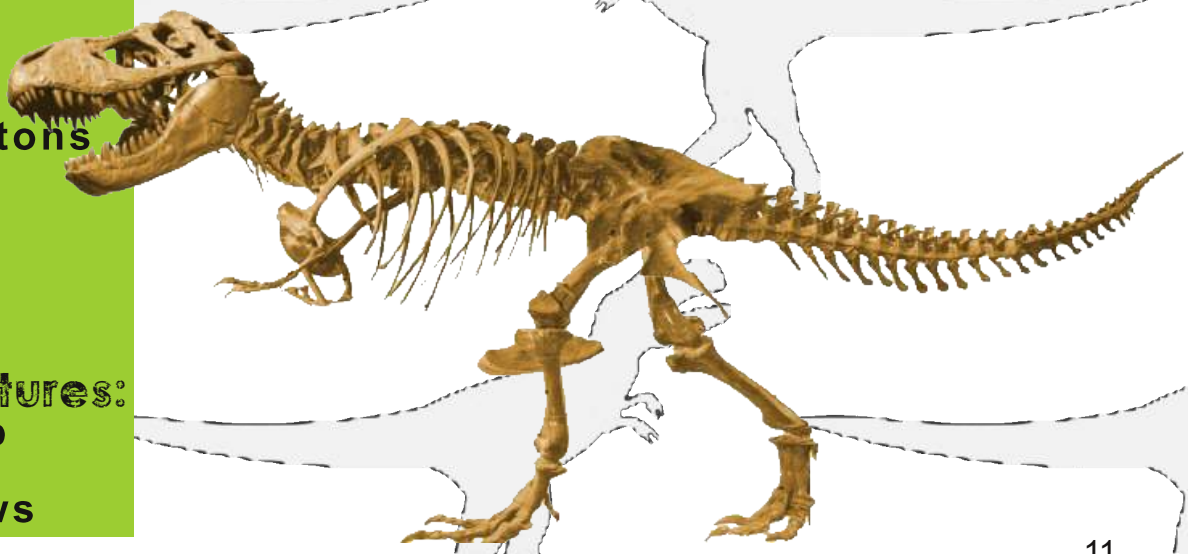
Meat

Special Features:
Large, sharp teeth and powerful jaws

T-rex is probably the most well-known dinosaur. It was first discovered by Barnum Vrown in 1902 and soon captured the public imagination.

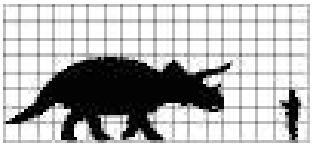


T-rex is a type of theropod dinosaur and was one of the first giant meat-eating dinosaurs to be put on display in a museum and was thought to be the largest but since its discovery- even larger carnivorous dinosaurs have been discovered!



Fact File

Triceratops



How to say it:

Tri-ser-ra-tops

Name means:

Three-horned face

Family group:

Ceratopidae

Period:

Late cretaceous 66-70 MYA

Where found:

USA

1st Discovered:

1889

Height:

3 metres

Length:

9 metres

Weight:

5400 kg, 6 tons

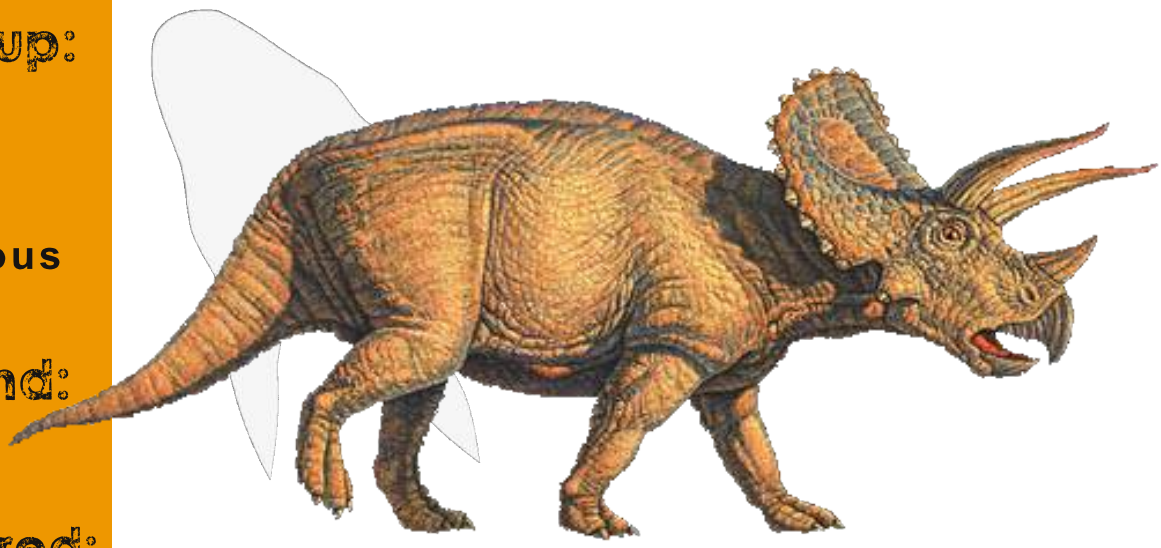
Food:

Plants

Special Features:

Horns and frill

Triceratops is a very large and distinctive dinosaur because of the 3 sharp horns on its head which give it its name.



Triceratops is classified as a cerapod and was one of the last dinosaurs to live on the earth.

Fact File

How to say it:

Ste-go-sore-rus

Name means:

Roof Lizard

Family group:

Stegosauridae

Period:

Late Jurassic
146-154 MYA

Where found:

USA

1st Discovered:

1877

Height:

2.8metres

Length:

9 metres

Weight:

2700 kg, 3 tons

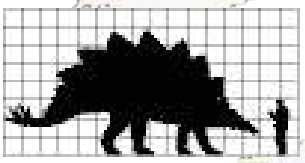
Food:

Plants

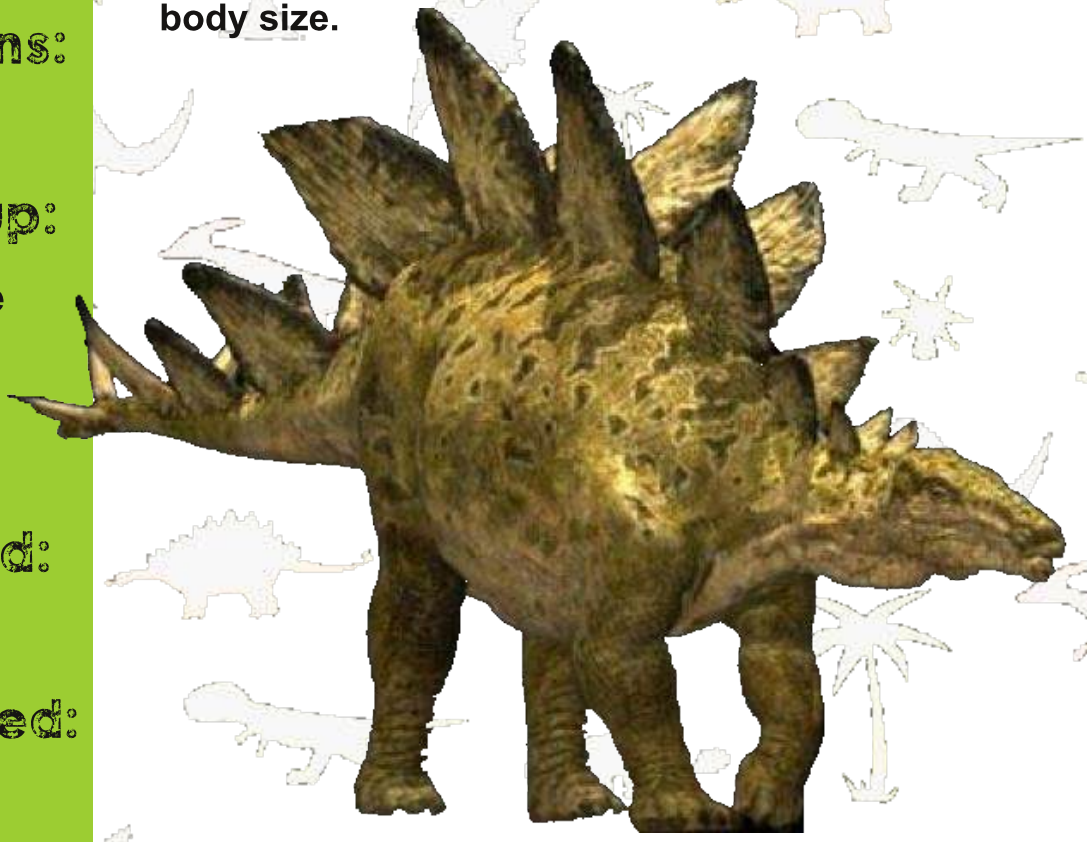
Special Features:

Double row of distinctive plates along its back

Stegasaurus



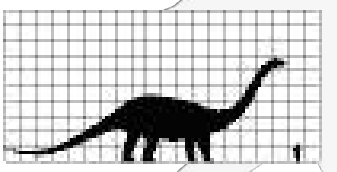
Stegasaurus is the largest member of the Stegosaur family but has one of the smallest brains of all known dinosaurs, comparative to its body size.



The most impressive feature of Stegasaurus are the large plates running along its back. Palaeontologists used to think these were for defence, but current thinking is that they were used to regulate temperature in some way.

Fact File

Diplodocus



How to say it:

Di-plo-doh-kus

Name means:

Double beam lizard

Family group:

Diplodocidae

Period:

Late Jurassic
145-161MYA

Where found:

USA

1st Discovered:

1877

Height:

5 metres

Length:

27 metres

Weight:

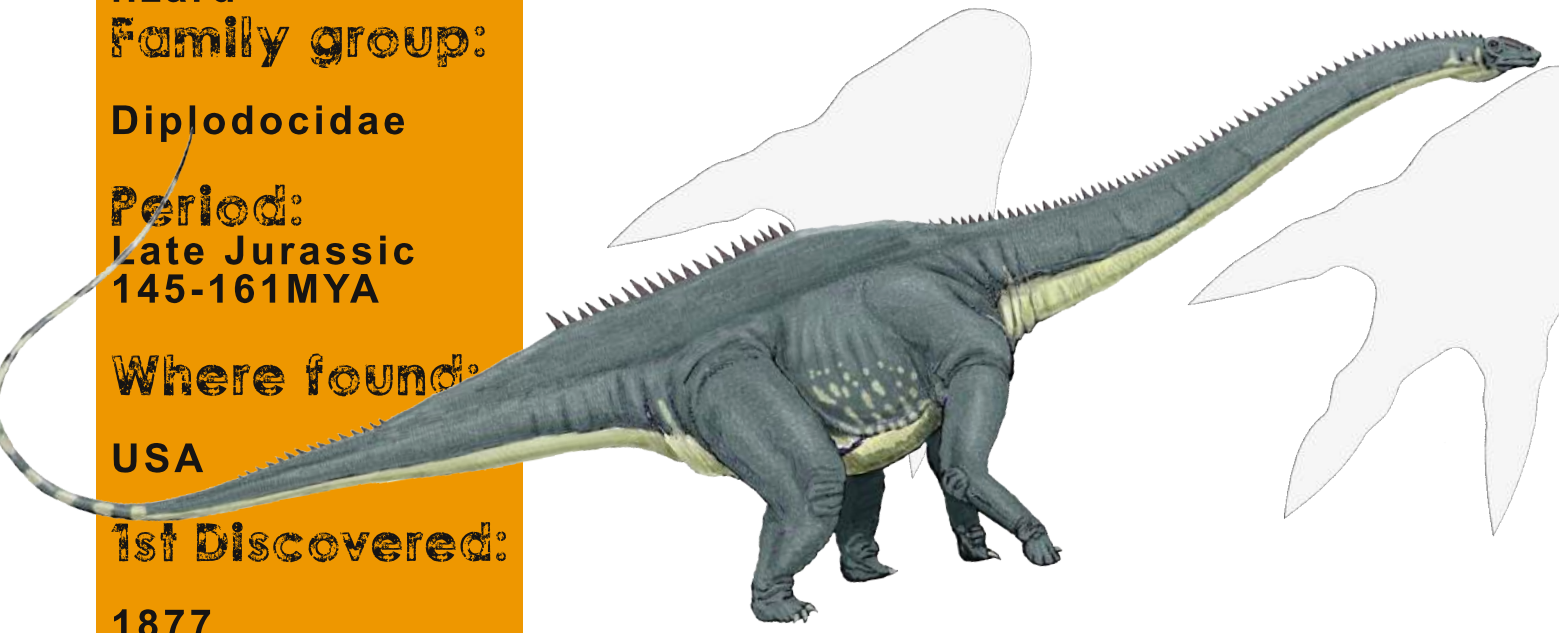
11,000 kg, 12 tons

Food:

Plants

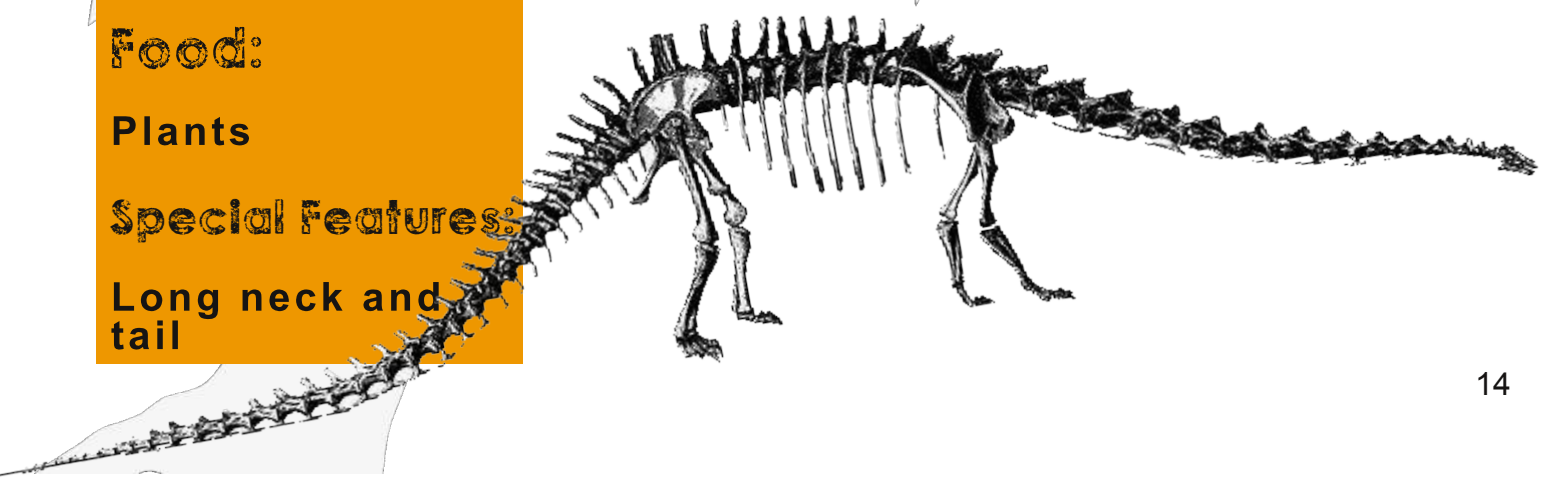
Special Features:

Long neck and tail



Diplodocus was one of the dominant plant eating dinosaurs during the late Jurassic era.

Diplodocus falls into the Sauropod category of dinosaur.



Fact File

Apatosaurus

How to say it:

A-pat-oh-sore-rus

Name means:

Deceptive Lizard

Family group:

Diplodocidae

Period:
Late Jurassic
145-161 MYA

Where found:

USA

1st Discovered:

1877

Height:

4 metres

Length:

21 metres

Weight:

30,000 kg,33 tons

Food:

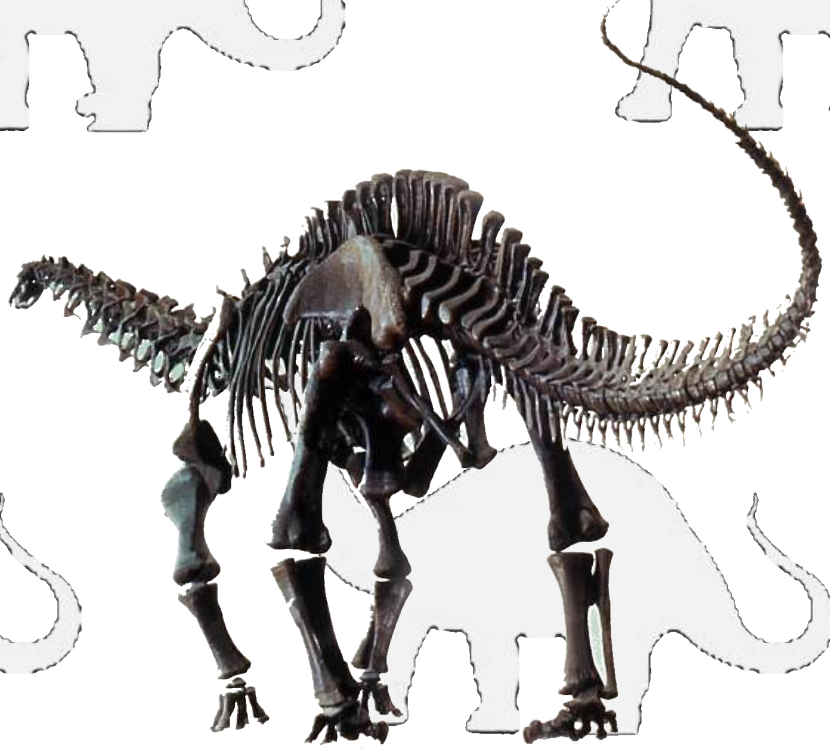
Plants

Special Features:
Enormous size and weight!

Apatosaurus is a large sauropod.

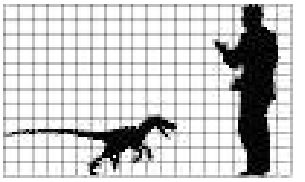
For many years, the most complete skeleton of an Apatosaurus was thought to be a different species and was named Brontosaurus.

In the 1970's, it was finally proven that Apatosaurus and Brontosaurus were the same creature.



Fact File

Velociraptor



How to say it:

Vel-oss-ee-rap-tor

Name means:

Fast robber

Family group:

Dromaesauridae

Period:
Late cretaceous
65-70 MYA

Where found:

Mongolia

1st Discovered:

1924

Height:

1 metre

Length:

2 metres

Weight:

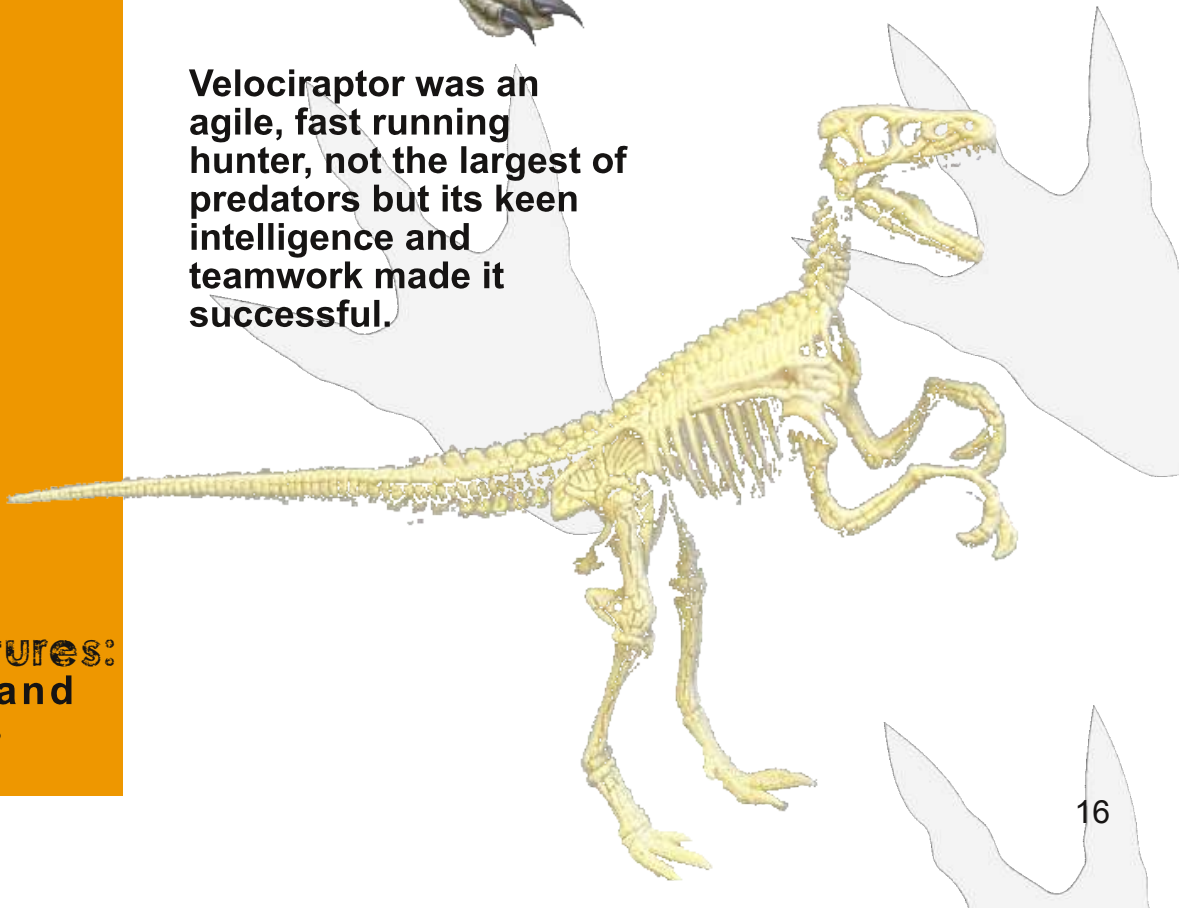
15kg

Food:

Meat

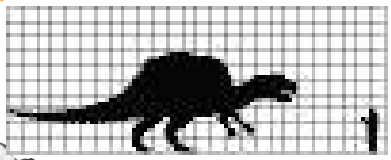
Special Features:
Intelligence and deadly claws

Velociraptor was an agile, fast running hunter, not the largest of predators but its keen intelligence and teamwork made it successful.



Fact File

Spinosaurus



How to say it:

Spine-oh-sore-rus

Name means:

Thorn lizard

Family group:

Spinosauridae

Period:
Late cretaceous
90-135 MYA

Where found:

North Africa

1st Discovered:

1915

Height:

5 metres

Length:

16 metres

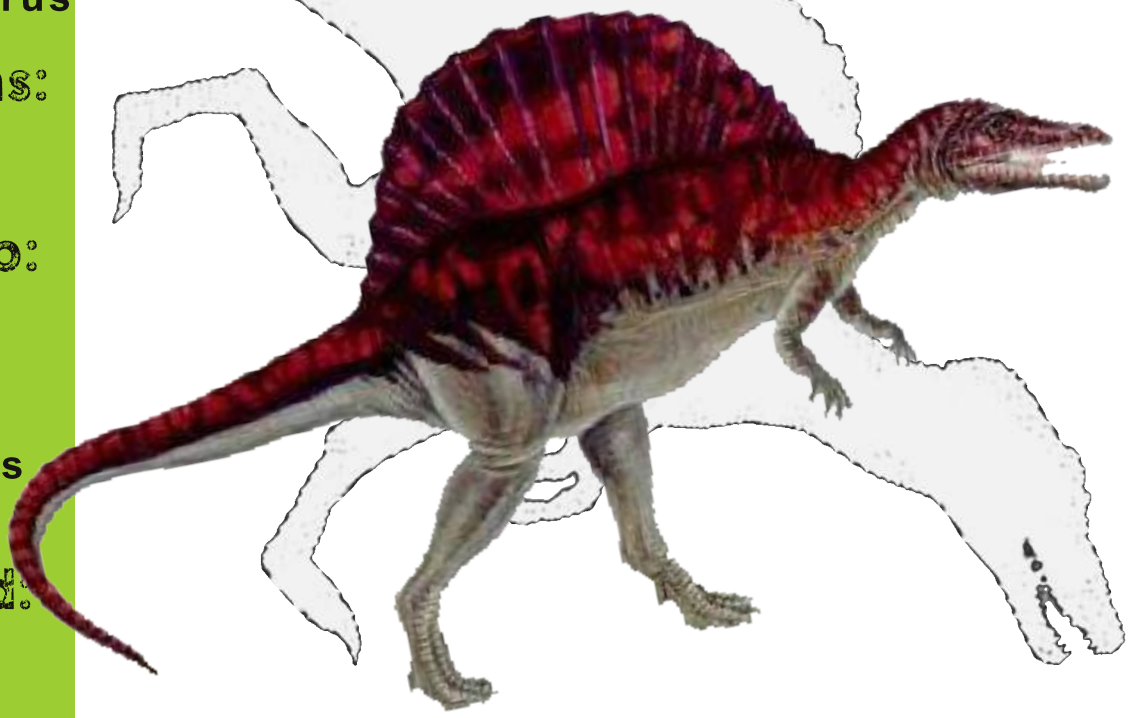
Weight:

3,660 kg, 4 tons

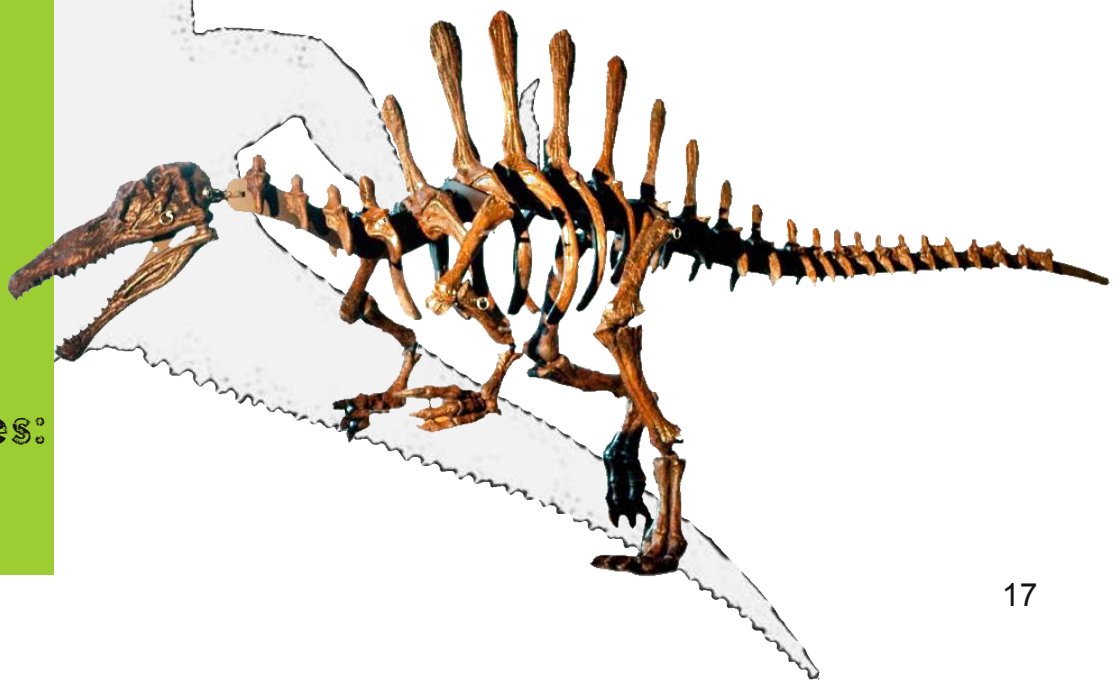
Food:

Meat

Special Features:
Large, sail like crest along its back



Spinosaurus is a very large carnivore. Significantly larger than T-rex and with a skull almost a metre longer than most t-rex skulls.



Fact File

How to say it:

Brak-ee-o-sore-us

Name means:

Arm Lizard

Family group:

Brachiosauridae

Period:

Late Jurassic
146-161 MYA

Where found:

North Africa/USA

1st Discovered:

1900

Height:

16 metres

Length:

30metres

Weight:

80,000 kg,88 tons

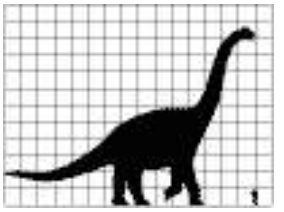
Food:

Plants

Special Features:

Extreme height and weight!

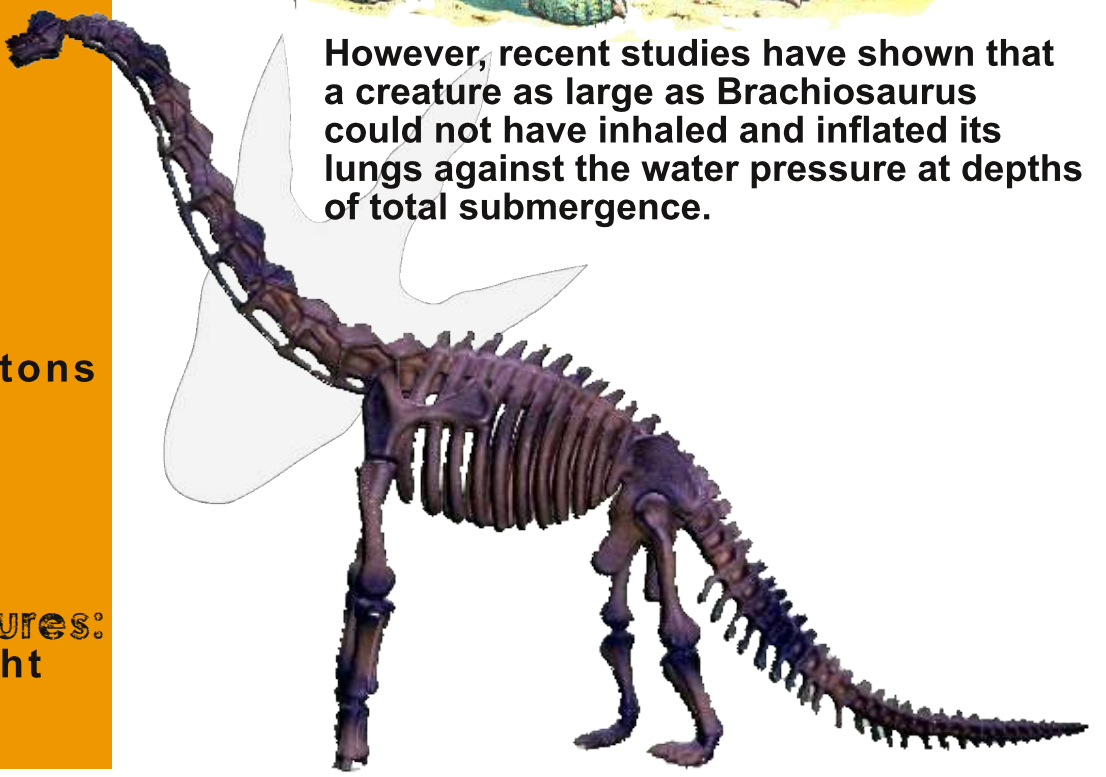
Brachiosaurus



Brachiosaurus is one of the largest known land animals.

Its large nostrils were located on top of its head, which caused speculation that Brachiosaurus might have spent time submerged in water.

However, recent studies have shown that a creature as large as Brachiosaurus could not have inhaled and inflated its lungs against the water pressure at depths of total submergence.



Scales, Spikes, Feathers or Fur ?

No one knows exactly what colours or patterns most of the dinosaurs were. Colouring and pattern are suited to the functions that an organism needs to survive.

Some dinosaurs were likely to be camouflaged in order to hide them from predators or to sneak up on their prey!

Some may have been coloured in a particular way to attract mates and some may even have been brightly coloured to ward off predators.

Different colours are also important for temperature regulation as the different colours absorb (or reflect) sunlight.

Fossilized skin impressions have only been found for a small fraction of the known dinosaurs. Not much is known about dinosaur skin and there is some debate among palaeontologists about this topic.

Most skin fossils show bumpy skin, only the huge plant-eaters seem to have had scaly skin. Some of the **bird-like dinosaurs** even had feathers.

Did you know there are dinosaurs flying in our skies today?

Despite almost 100 hundred years of disagreements, most scientists now acknowledge that birds of today are the ancestors of small meat-eating dinosaurs. The development of feathers, turned dinosaurs that could run or climb into birds that could fly.

The earliest true bird is **Archeopteryx**, which lived during the late Jurassic period. When Archaeopteryx remains were first unearthed, palaeontologists soon realised this was one of the most important dinosaur discoveries ever made because Archaeopteryx was the first feathered dinosaur to be found.

Fact File: Archeopteryx
How to say it: Ar-kee-op-ter-riks
Meaning of name: Ancient Wing
Family: Coelurideа
Period: Late Jurassic
Where found: Germany
First discovered: 1861
(but not classified as a dinosaur)
Height: 0.3 metres
Length:0.5metres
Weight: 500grams
Food: Meat
Special features: Feathers

Other dinosaurs developed feathers but were flightless, like many types of bird known today such as Ostriches, Emus and Kiwis- to name just a few.

Click HERE to find our more about the feathered dinosaurs!

UP IN THE AIR

At the time of the dinosaurs, there were a group of winged reptiles known as Pterosaurs. Pterosaurs are related to dinosaurs but are not classified as dinosaurs themselves. Pterosaurs had wings made of skin that stretched between long finger bones and the legs. They did not evolve to have feathers. Pterosaurs died out at the end of the creataceous period at the same time as the dinosaurs and did not evolve into modern day birds.

Click HERE to find out more about Pterosaurs

BELOW THE WAVES

Whilst dinosaurs ruled the land and pterosaurs (and eventually flying dinosaurs like Archeopteryx) ruled the air, the ocean was home to many species of marine reptiles such as Nothosaurs, Ichthyosaurs, Pliosaurs, Plesiosaurs, Mosasaurs and Elasmosaurs.
Most were fierce carnivores preying on other sea creatures and each other! Although they lived in the sea, many of these prehistoric creatures breathed air (like whales do).

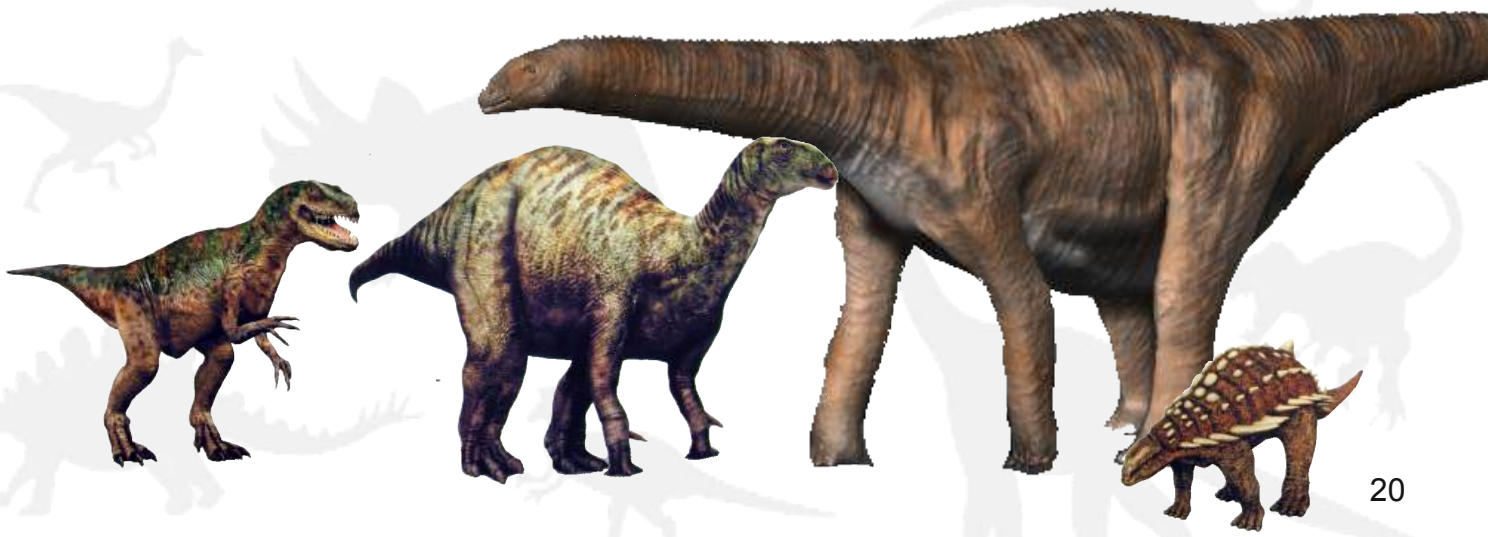
Click HERE to find out more about prehistoric sea life

Dinosaurs found in the UK

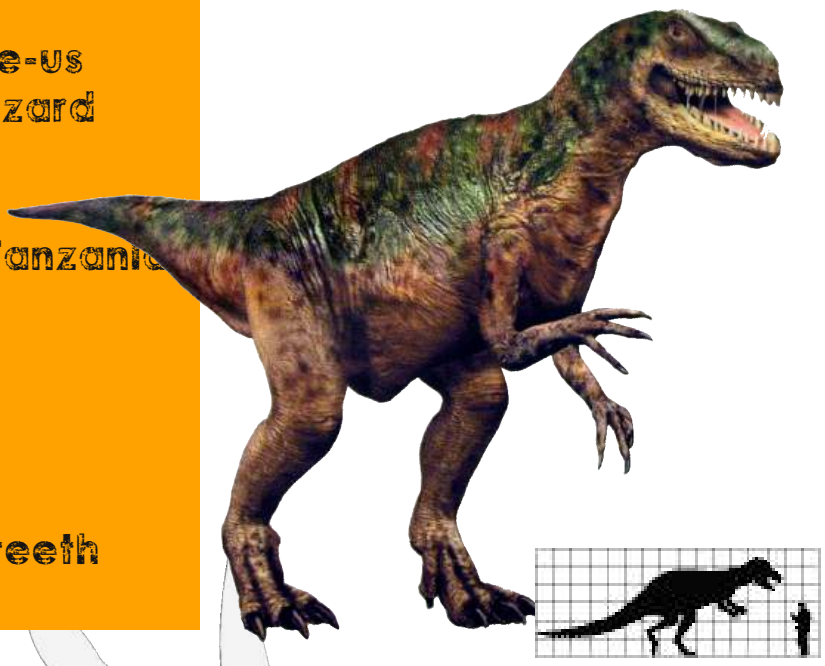
The United Kingdom has moved around a lot in its position in relation to the continents. It was in the middle of the northern super-continent during the Jurassic period before the continent later broke in half into North America and Eurasia.

Britain seems to have been at the crossroads in the middle, so any dinosaurs shared between North America and Eurasia must have gone through what is now the UK.

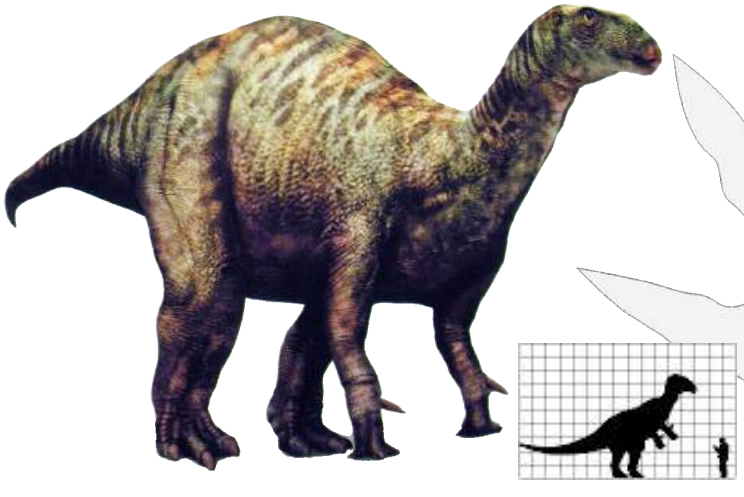
This is why some impressive prehistoric creatures were first discovered in Britain.



Fact File: MEGALOSAURUS
How to say it: Meg-a-lo-sore-us
Meaning of the name: Big Lizard
Family: Megalosauridae
Period: Mid Jurrassic
Where found: England and Tanzania
First discovered: 1818
Height: 3.7 metres
Length: 9 metres
Weight: 900kg
Food: Meat
Special Features: Serrated teeth



In 1842 Megalosaurus became the 1st creature to be described and classified as a dinosaur. Evidence of Megalosaurus was discovered much earlier. In 1677, the English naturalist Robert Plot discovered (and documented) a large fragment of bone. Unfortunately, although he correctly identified the bone as part of the thigh bone of a large animal and recognised it was too large to belong to any known species- he concluded it was the thigh bone of a giant, such as those mentioned in the bible.
So dinosaurs waited a further 150 years to be discovered.
Megalosaurus is a classic carnivore with powerful legs and a large head full of teeth that curve backwards into the mouth. The teeth are serrated, just like a T-rex's teeth are.



Iguanodon was the 2nd dinosaur ever to be named.

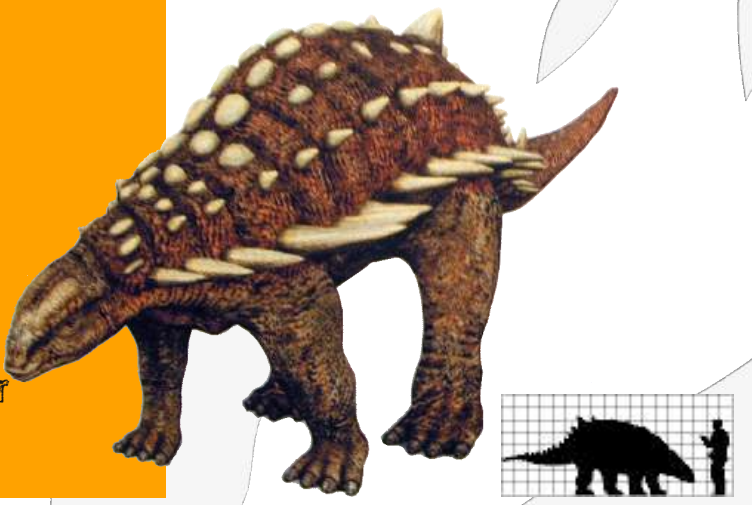
Fact File: IGUANODON
How to say it: Ig-wah-no-don
Meaning of name: Iguana tooth
Family: Iguanodontidae
Period: Early cretaceous
Where found: Belgium, England, Germany, Spain, USA
First discovered: 1809
Height: 5 metres
Length 10 metres
Weight: 4,000 kg (4.4tons)
Food: Plants
Special features: Thumb spike

An unusual feature of Iguanodon is its thumb spike- a strange horny digit on each hand where you might expect the thumb to be.

Iguanodon's lived in herds and ate plants.

Fact File: HYLAEOSAURUS
How to say it: Hy-lay-uh-sore-rus
Meaning of name: Woodland Lizard
Family: Nodosauridae
Period: Early cretaceous 125-140MYA
Where found: England
First discovered: 1832
Height: 1.8 metres
Length: 4.6 metres
Weight: 1,000 kg (1.1 tons)
Food: Plants
Special features: Body armour and spikes

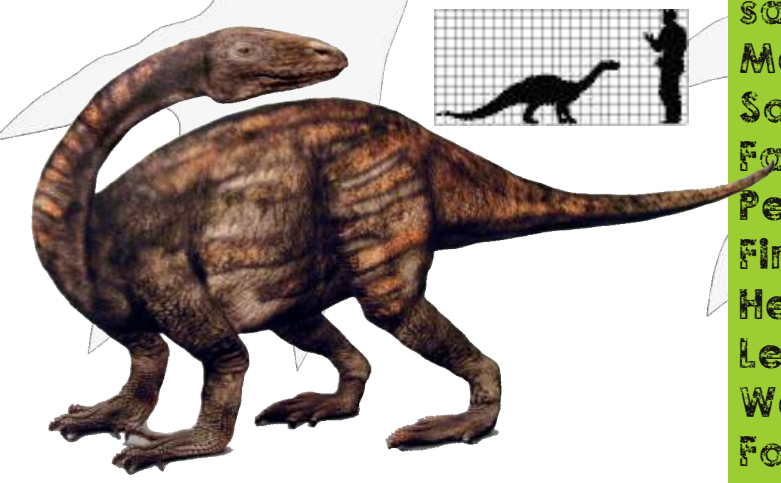
Hylaeosaurus is one of the first three dinosaurs to be named, it is a squat, armoured dinosaur found in England.



Hylaeosaurus had rows of horny, triangular-shaped spines running down its back.

It has also been suggested that Polacanthus is same species, but there are a number of differences in their bone structure.

Thecodontosaurus became the 4th type of dinosaur to be found in the UK.



Thecodontosaurus was a small to medium sized, very primitive type of prosauropod.

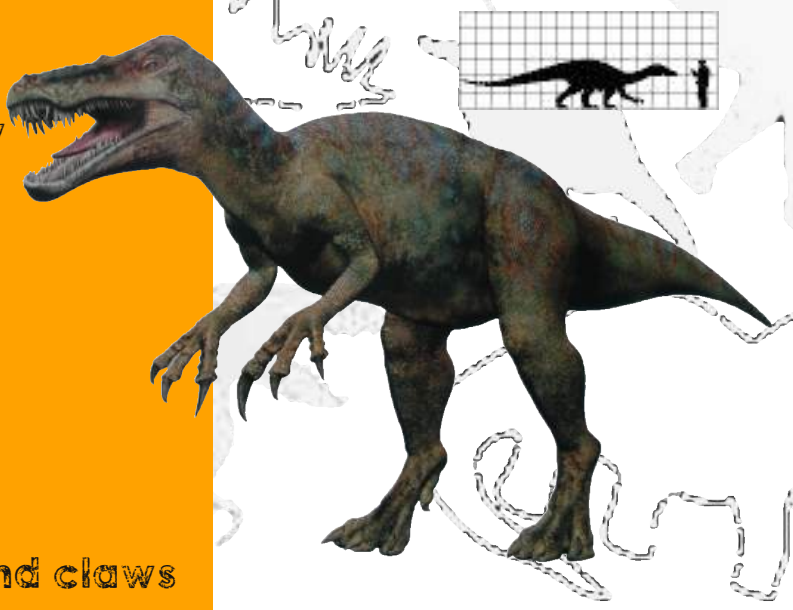
Fact File: THECODONTOSAURUS
How to say it: Thek-oh-don-toe-saw-rus
Meaning of the name: Socket-toothed Lizard
Family: Thecodontosauridae
Period: Late Triassic 228-200 MYA
First discovered: 1834
Height: 1.7 metres
Length: 2.5 metres
Weight: Uncertain
Food: Plants
Special Features: Long neck and slender limbs.

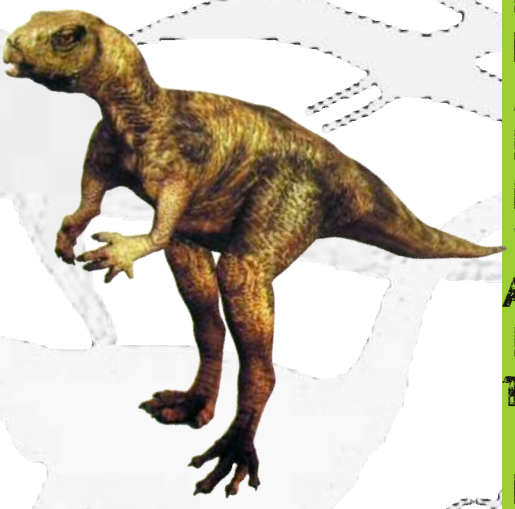
There are several other dinosaur species found in the UK in addition to the first 4 discoveries.

Here is a quick outline of some of the other dinosaur species found in the UK.

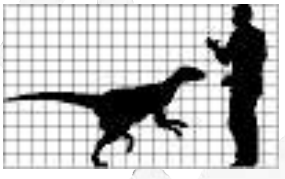
Look up the following dinosaurs online to see what else you can find out about them.

Fact File: BARYONYX
How to say it: Ba-ree-on-iks
Meaning of name: Heavy Claw
Family: Spinosauridae
Period: Early Cretaceous
Where found: England, Spain
First discovered: 1983
Height: 2.5 metres
Length: 9.5 metres
Weight: 1,800 kg (2 tons)
Food: Meat and fish
Special features: Long snout and claws

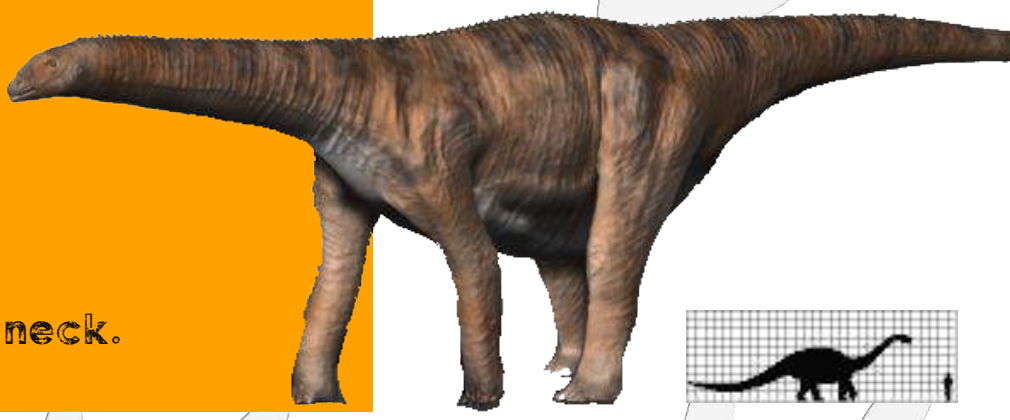




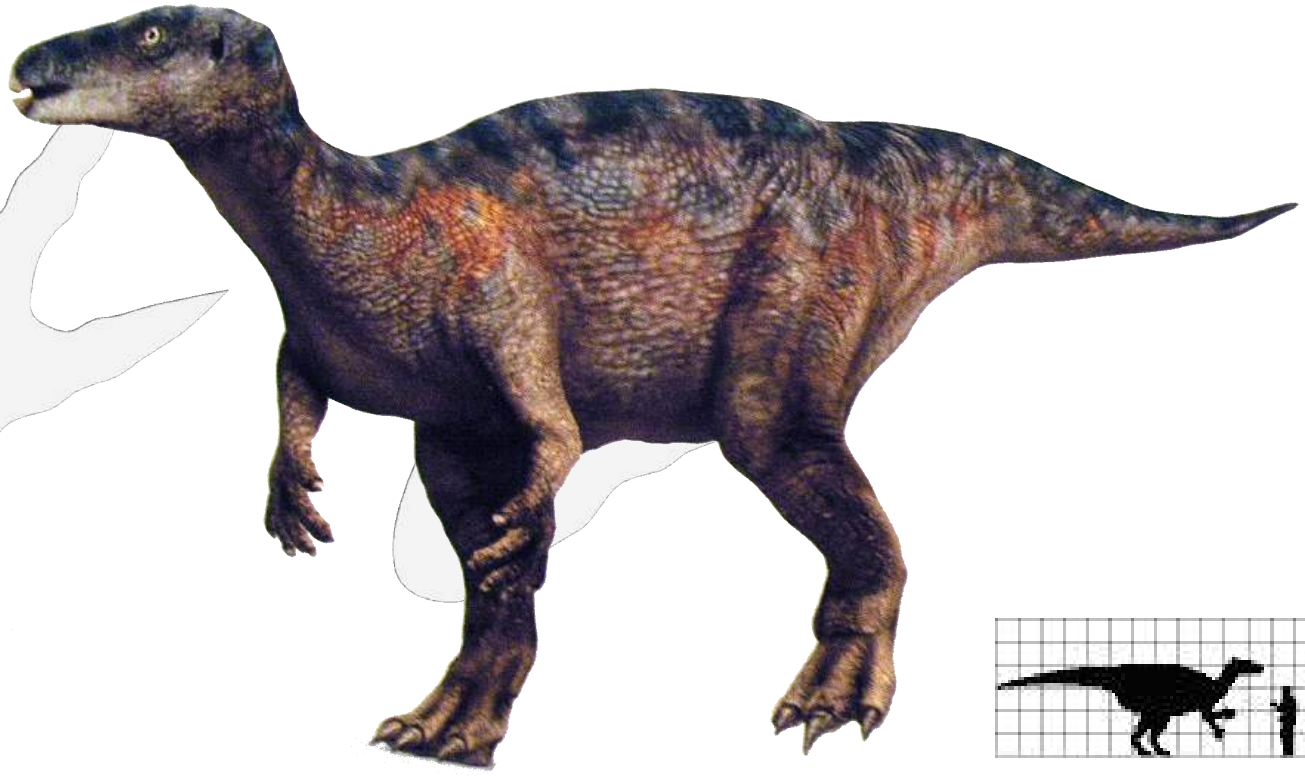
Fact File: HYPSILOPHODON
How to say it: HIP-sill-off-o-don
Meaning of name: High-ridge tooth
Family: Hypsilophodontidae
Period: Early Cretaceous
Where Found: Worldwide- Europe, North America, Asia
First discovered: 1849 (not named until 1889- due to mistaken identity as a baby iguanodon)
Height: 1 metre
Length: 2 metres
Weight: 25 kg
Food: Plants
Special features: Speed and agility

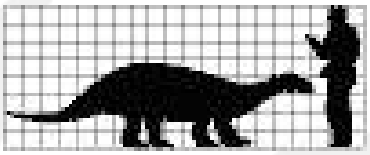


Fact File: CETIOSAURUS
How to say it: See-tee-oh-sore-rus
Meaning of name: Whale Lizard
Family: Cetiosauridae
Period: Mid to late Jurassic 169-181 MYA
Where found: England
First discovered: 1842
Height: 4.9 meters
Length: 15.2 meters
Weight: 20,000 kg
Food: Plants
Special features: long neck. 1st known sauropod.



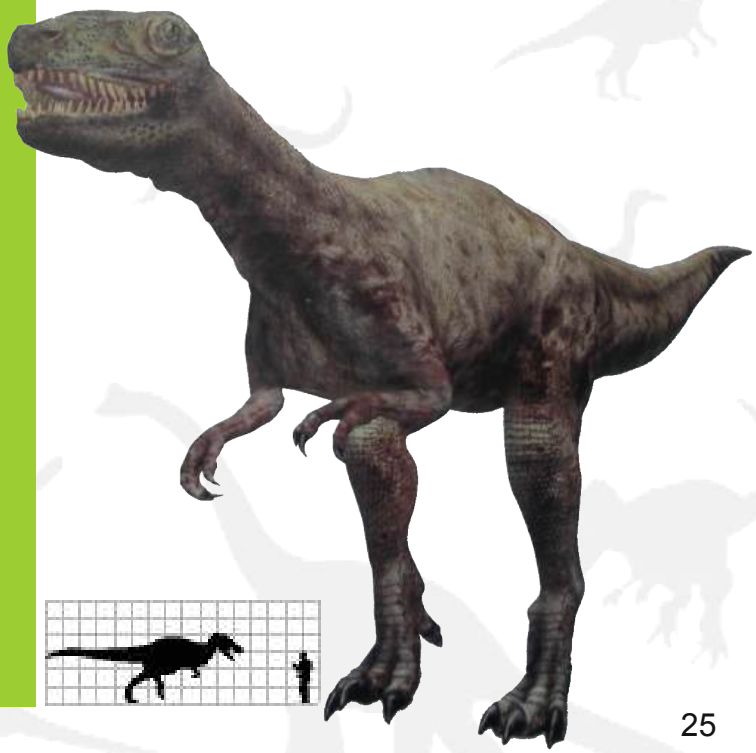
Fact File: CAMPTOSAURUS
How to say it: camp-toe-sore-rus
Meaning of name: Flexible Lizard
Family: Camptosauridae
Period: Late Jurassic-Early Cretaceous 126-154 MYA
Where found: England
First discovered: 1885
Height: 3 meters
Length: 7 meters
Weight: 1800 kg, 2 tons
Food: Plants
Special features: 4 fingers and spur-like thumb





Fact File: SCELIDOSAURUS
How to say it: Ske-lid-o-sore-rus
Meaning of name: Limb Lizard
Family: uncertain
Period: Early Jurassic
183-196 MYA
Where found: England
First discovered: 1859
Height: 1.5 meters
Length: 4 meters
Weight: 500kg, 0.5 ton
Food: Plants
Special features: Plate armoured dinosaur

Fact File: EUSTREPTOSPONDYLUS
How to say it: You-strep-toe-spon-dy-lus
Meaning of name: True reversed vertebrae
Family: Eustreptospondylidae
Period: Late Jurassic
155-160 MYA
Where found: England
First discovered: 1871
Height: 2.5 meters
Length: 6.5 meters
Weight: 1100kg, 1.1 tons
Food: Plants
Special features: Large head and long jaws



Fossils

Dinosaurs are a great part of our world history.

We know that dinosaurs (and other extinct animals and plants) existed because of the **fossils** they left behind.

Did you know: Fossils are the preserved remains or traces of animals, plants, and other organisms from the remote past?

Fossils offer physical evidence of life prior to human history. This prehistoric evidence includes the remains of living organisms, prints and moulds of their physical form, and marks/traces created in the sediment by their activities. Dinosaur fossils come in many types, from preserved bones to tracks and more.

Some fossils are better preserved than others and show impressions of skin and other soft tissues. Because of the fossil remains that dinosaurs have left, we know that they existed and are able to use fossil evidence to recreate their skeletons and even start to create pictures of what they actually might have looked like.

There is still so much to learn about dinosaurs and new fossil discoveries are being made all the time.

Click on the links below to watch some short BBC videos all about fossils.

Click HERE to watch a brief clip about how fossils formed in mud

Click HERE to watch a brief clip about fossilized bones

Click HERE to watch a brief clip about formation of fossils, limestone and slate

The following people played a key role in early dinosaur palaeontology:

Gideon Mantell (1790-1852) was an English doctor from Sussex. Gideon was a palaeontologist throughout his life and contributed greatly to the field through his discovery and analysis of many fossilised remains. One of the stories told about Mantell is that his wife found a tooth that looked like a very large Iguana tooth and it was many years before Mantell managed to complete the skeleton which turned out to be Iguanodon.

Mary Anning (1799-1847) was a fossil collector who gained a reputation as a palaeontologist. She lived in Lyme Regis and made many important prehistoric discoveries. She started fossil collecting to earn money and although women and the lower classes were not usually respected in scientific circles, Mary managed to make an impact.

Sir Richard Owen (1809-1892) was an English anatomy professor and palaeontologist. He's best known for inventing the term Dinosaur (meaning Terrible Lizard). Owen was a central character during the early days of dinosaur discovery.

(Benjamin) Waterhouse Hawkins (1807-1894) was an English sculptor and artist with an interest in natural history. He built the life-size Crystal Palace Dinosaurs under the scientific direction of Richard Owen. Unfortunately, later discoveries revealed that many of the assumed body positions of the dinosaurs were actually incorrect. For example, we now know Megalosaurus was **bipedal** but it was originally depicted on all fours.

Bipedal is the word used to describe any creature that walks on its 2 back limbs.

Can you imagine how difficult it is for palaeontologists to reconstruct a dinosaur and imagine what it looked like just by looking at a few bone fragments?

Palaeontologists need to be able to identify which bones belong to what type of creature and separate all the bones correctly if different species of dinosaur remains are all found together. They also need to be able to identify which part of the body each bone belongs to!

It must be very difficult and so it is understandable that sometimes they make mistakes identifying and classifying dinosaurs!

Would you like to have a go at assembling some prehistoric creatures?

Click HERE to play the BBC's fantastic fossil game on the BBC science website

Click HERE to play a similar game (made by The Online Dinosaur Museum)

Rare Finds

It must be exciting to find a dinosaur fossil.

Look at the photograph to the left of a fossil discovery made in the UK. Imagine how pleased you would be if you discovered this!

But what actually is it?

The BBC have made a fantastic, interactive video quest all about this discovery.

The quest takes about 20 minutes to play.

Click HERE to visit the BBC site and start your interactive discovery quest

Click HERE to find out immediately about the fossil.

Plants and animals are constantly dying but not all dead beasts become fossils. This is because the location and conditions at the site where the creature died have to be just right for it to be buried and a fossil to be formed.

Click HERE to play the BBC's quick game about fossil conditions

Click HERE to find out immediately about conditions needed for a fossil to form

Some fossil finds preserve exquisite details.

Look at this fossil of Archaeopteryx. It is so well preserved that you can even see the outline of the feathers.

This was an amazing discovery which helped palaeontologists establish that modern birds descended from dinosaurs.

DISCOVERY PROFILE

Name	*Mussaurus patagonicus*
Discovered	La Colorado Lake, Santa Cruz Province, Argentina, by Martin Vince, 1977
Described	By José Bonaparte and Martin Vince, 1979
Importance	First prosauropod hatchlings and eggs to be discovered
Classification	Saurischia, Sauropodomorpha, Plateosauria

Palaeontologists have discovered fossils of baby dinosaur hatchlings and fossils of dinosaur eggs.

Some of the eggs have even had unborn baby dinosaur remains inside them.

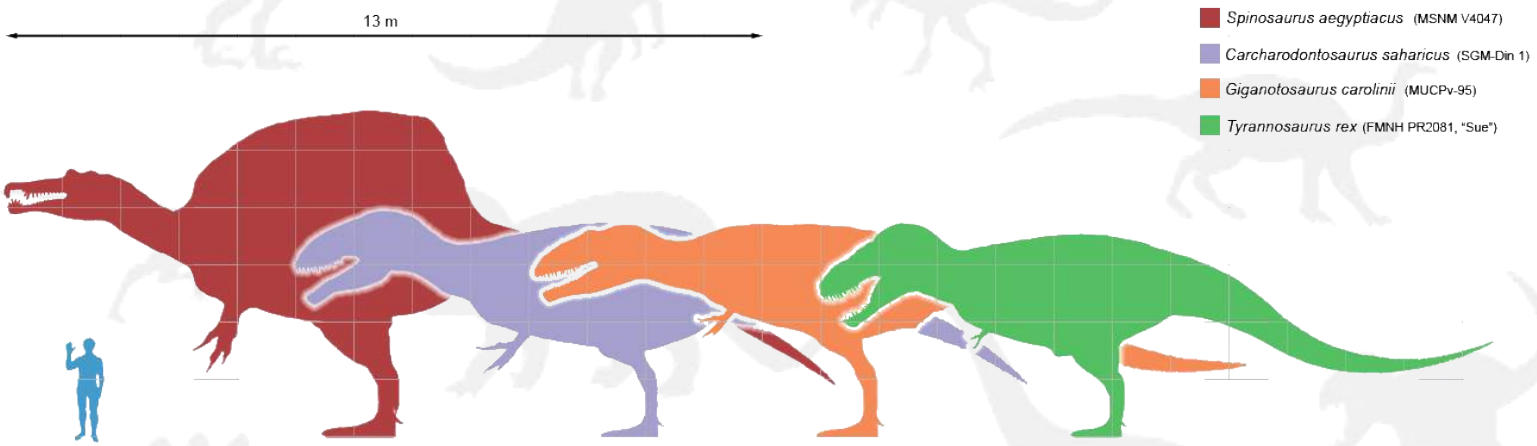
Click HERE to visit the National Geographic website to learn more about Dinosaur eggs and hatchlings

Big and Small

Some dinosaurs were ENORMOUS!!
Look at the sheer size of this carcharodontosaurus skull compared to an adult human skull.

Click HERE to get the facts about this giant carnivorous dinosaur

Diagram showing the largest known therapods.



Spinosaurus, Carcharodontosaurus, Giganotosaurus and Tyrannosaurus Rex

Some dinosaurs were tiny. Look at the skull of this full grown Shuvuuia dinosaur.

This tiny dinosaur has a simple, elongated lower jaw and numerous tiny teeth. Its skull was less than 8 cm long and the whole animal was only 60cm in length.

Click HERE to find out more about Shuvuuia

Weird and Wonderful

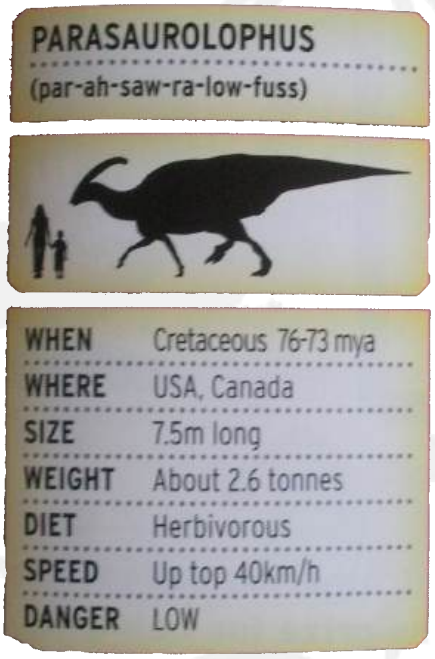
Some fossil remains of dinosaurs show them to have really strange features. It's hard to imagine what they must have really looked like.

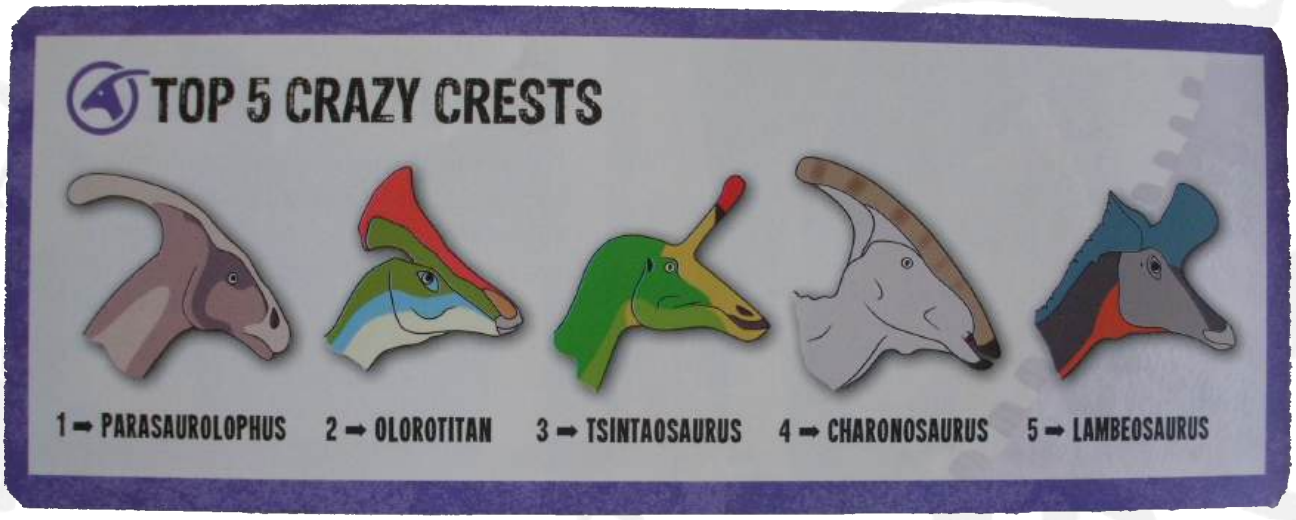
CRAZIEST CREST!

PARASAUROLOPHUS

Several duckbill dinosaurs had huge bony crests on their heads, but Parasaurolophus (par-ah-saw-ra-low-fuss) had the craziest.

At one metre long, it was the biggest crest of any dinosaur and was filled with strange looping passages which may have helped it to make loud, deep, honking noises. For this reason, Parasaurolophus is nicknamed the 'trombone duckbill'.





WEIRDEST LOOKING!

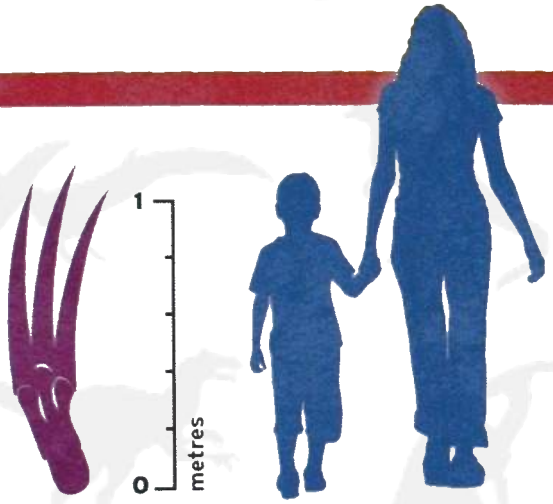
THERIZINOSAURUS (thair-ee-zine-uh-saw-rus)	
WHEN	Cretaceous 61-65 mya
WHERE	Mongolia
SIZE	10m long
WEIGHT	About 5 tonnes
DIET	Omnivorous
SPEED	32km/h
DANGER	MEDIUM

THERIZINOSAURUS

Therizinosaurus (thair-ee-zine-uh-saw-rus), found in Mongolia, was one of the weirdest-looking dinosaurs of them all.

With its feathers, long claws and big belly, it looked like a cross between a camel and a massive shaggy goose with teeth! It probably walked with an upright posture – unlike most other dinosaurs.

There are lots of interesting ideas about what Therizinosaurus might have looked like.
It certainly had large claws!



CRAZY CLAWS

Therizinosaurus had wide, short, four-toed feet with long, curved foot claws. Its hind legs were short and its body was very wide, so it would probably have been a poor runner. This might explain why it had incredibly long hand claws (1 metre long). Unable to run away from predators, it probably fought them off, or simply scared them away.

Big Mysteries

When new dinosaurs are discovered, it is often not the whole skeleton that is found.

Palaeontologists are skilled enough to identify and classify a new dinosaur discovery just from a few bones.

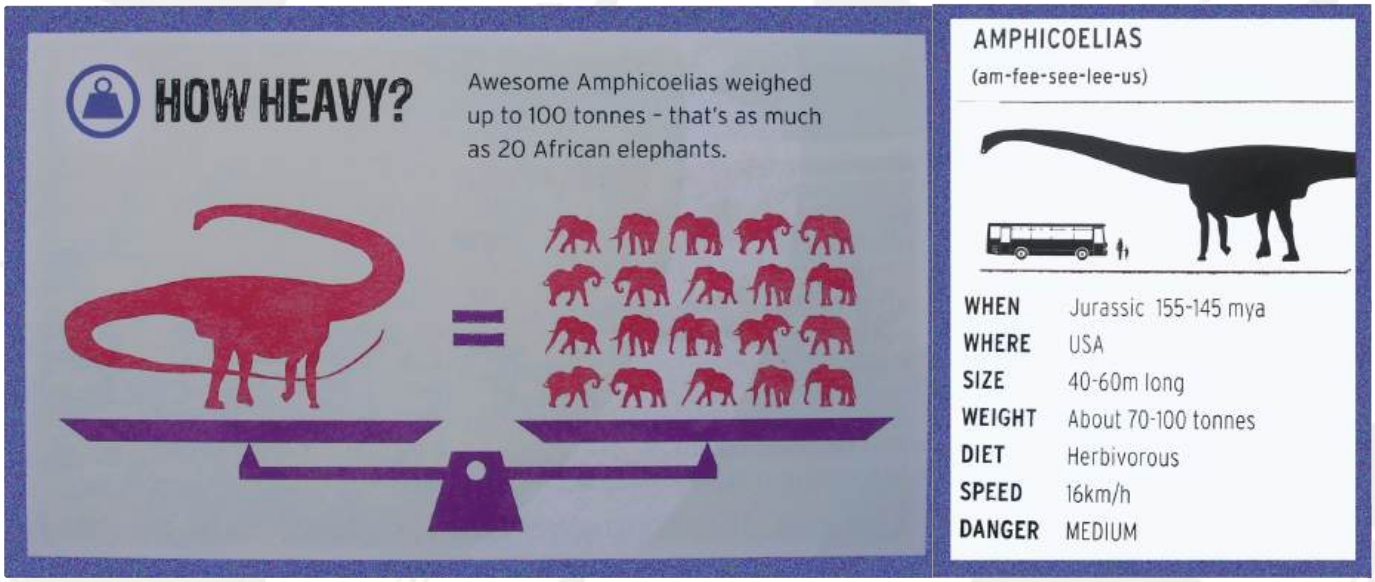
By comparing their findings with other similar dinosaurs (with more complete skeletons discovered) and looking at animals of today, they are often able to create a reconstruction and make accurate guesses about what the dinosaur might have been like based on the size and features of the parts they have found.

SUPER HEAVYWEIGHT CHAMPION

AMPHICOELIAS

Plant-eating dinosaurs known as sauropods had extremely long tails and necks and were often enormous, but one giant called Amphicoelias (am-fee-see-lee-us) out-sized all the others.

Only two of this plant-eater's bones have been found so far, but scientists have used them to work out that it was the biggest land animal that ever lived.



Deinocheirus (meaning 'terrible hand') is a genus of large theropod dinosaur, possibly an ornithomimosaurian.

Deinocheirus lived in what is now southern Mongolia, during the late Cretaceous Period.

The only known fossil remains are a single pair of massive forelimbs and the remains of some ribs and vertebrae.

They were found on 9th July 1965 during a Polish-Mongolian expedition to the Gobi desert.

Click HERE to know more about Deinocheirus

DISCOVERY PROFILE

Name	*Deinocheirus mirificus*
Discovered	Altan Ula III locality, Nemegt Basin, Gobi Desert, Mongolia, by Zofia Kielan-Jaworowska, 1965
Described	By Halszka Osmólska and Ewa Roniewicz, 1970
Importance	One of the most bizarre and enigmatic dinosaurs
Classification	Saurischia, Theropoda, Coelurosauria, Ornithomimosauria

Of course, Palaeontologists don't always get it right the first time!

Often, initial thoughts and ideas about what a creature might have looked like change dramatically in the light of new discoveries.

A great example of this is with Megalosaurus, the first dinosaur to be classified. When we look back through the history of this dinosaur discovery, it is clear that ideas about what it looked like have changed a lot!

From this:

To this:

Where are they now ?

65 million years ago, at the end of the Cretaceous period, one of the most devastating mass **extinctions** of all time took place on earth.

It wiped out between 60 and 80 percent of all living things and ended the dinosaurs lengthy reign on earth.

Many other groups of animals also became extinct at this time, including ammonites, mosasaurs, plesiosaurs, pterosaurs and many groups of mammals.

Virtually all life on earth was affected. On land, no animal weighing over 25kg survived.

The most common theory is that the mass extinction was caused by the impact of a giant asteroid or comet hitting the earth.

Other theories suggest sudden volcanic eruptions may have been the cause of the extinction or that dinosaurs simply failed to adapt to changing conditions.

Extinction means when a whole species or group of organisms is wiped out and ceases to exist. The moment of extinction is generally considered to be the death of the last individual of the species.

The discovery that birds are a type of dinosaur shows that dinosaurs in general are not in fact extinct as is commonly stated.

However, all non-bird dinosaurs as well as many groups of birds and other life did suddenly become extinct approximately 65 million years ago.

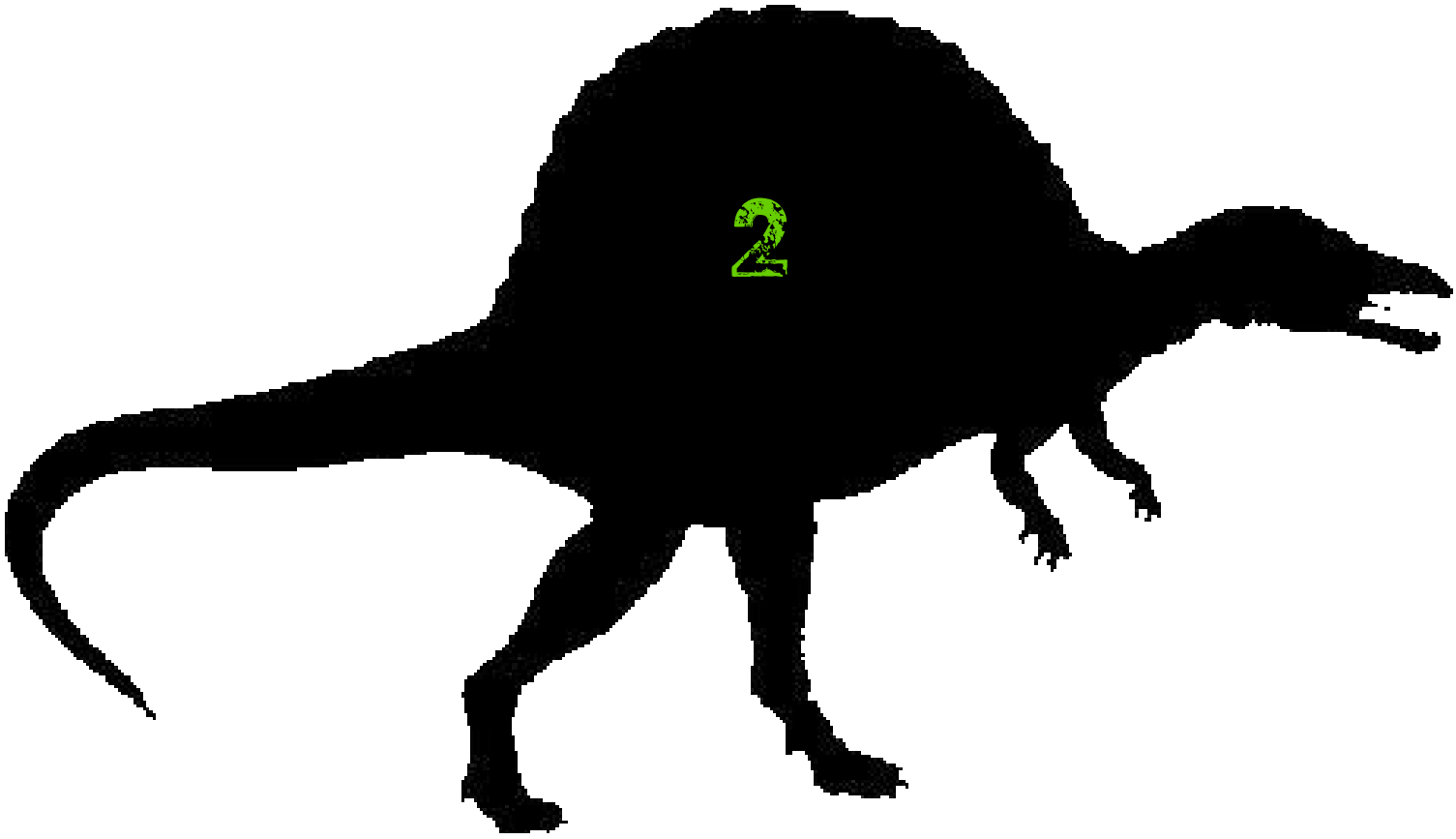
Click HERE to watch a short BBC video about the moment of the impact

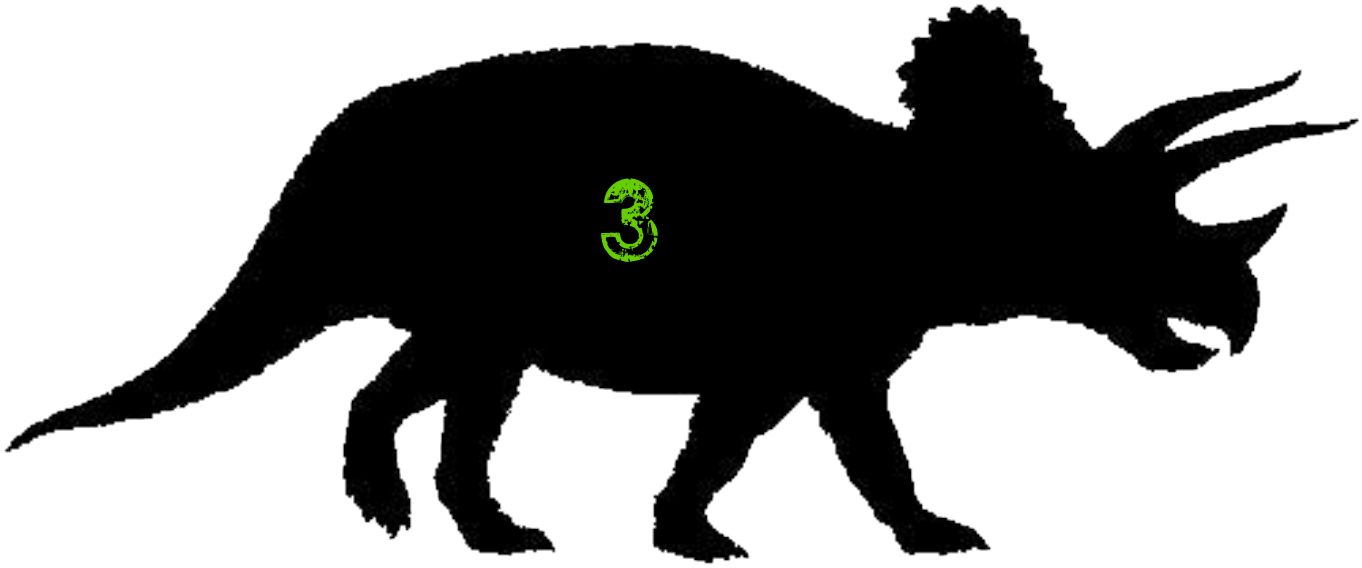
Click HERE to watch a short BBC video about life on earth after the impact

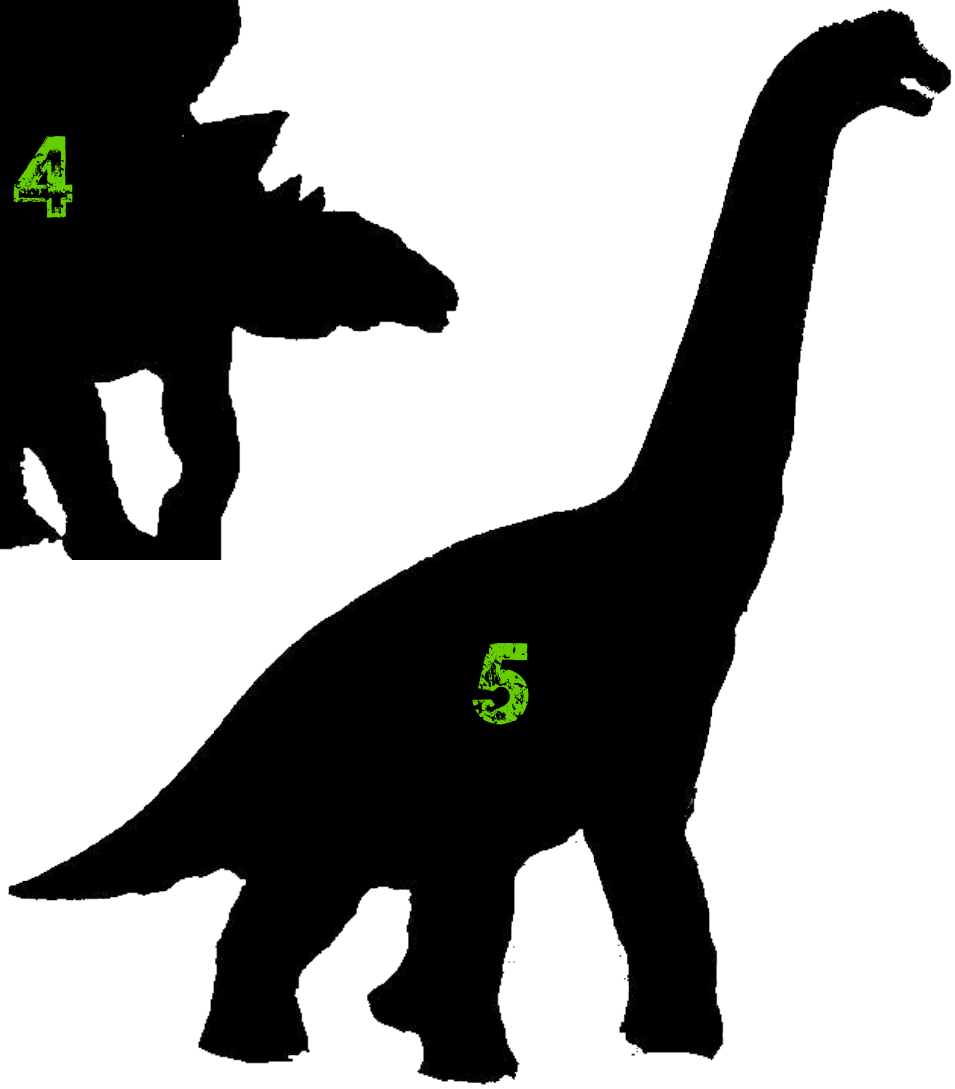
Activities

Silhouette Quiz

Can you identify all of the dinosaur species shown as silhouette shapes below?







Answers
Click Here!

Use the template on the next page to invent your own species of dinosaur!

My Dinosaur Fact File

Name:

How to say it:

Meaning of name:

Description:

Draw a picture of your dinosaur character to stick here

Period:

1st discovered:

Length:

Speed:

Food:

Where found:

Height:

Weight:

Danger Factor:

Special features:

Quiz

So how much do you think you have learned about dinosaurs?

Answer these quiz questions!

1. In which country was the first dinosaur discovered?

2. Who invented the name Dinosaur?

3. What does the name Dinosaur mean?

4. Which era of the earth's history did dinosaurs live in?

5. How long did dinosaurs live on the Earth?

6. What is the special name given to someone who studies dinosaurs and prehistoric life?

7. What should you feed a Tyrannosaurus Rex- plants or meat?

8. Which creatures of today are direct ancestors of the dinosaurs and are classified as dinosaurs?

9. What is the name given to preserved remains of animals, plants and other organisms from the past?

10. What word is used to describe a whole species being wiped out and ceasing to exist?

Answers
Click Here!

References

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http://en.wikipedia.org/wiki/Deinocheirus

http://en.wikipedia.org/wiki/Shuvuuia

Answers

Silhouette Quiz

1. Tyrannosaurus Rex or T-Rex
2. Spinosaurus
3. Triceratops
4. Stegasaurus
5. Brachiosaurus

Quiz

1. England
2. Richard Owen
3. Terrible Lizard
4. Mesozoic Era
5. 165 million years
6. Palaeontologist
7. Meat
8. Birds
9. Fossil
10. Extinction

Rare Finds:

The fossil discovery shown is a claw from the front foot of a dinosaur called Baryonyx.

Conditions needed for a fossil to form:

-A potential fossil needs to be buried quickly so that it is protected from scavengers and the weather.
-Then it needs to be in an area where rock will form around it, so that the plant or animal's body will be preserved.
-Muddy places are good as the dead animal sinks quickly in the mud and sediments build up around it which become rock over time.

This pack has been created by **Norwich Puppet Theatre** in partnership with **Norfolk and Norwich Festival** (2012) and **Erth Visual and Physical Inc**.
This pack was researched, compiled and designed by: Gemma Khawaja