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# DINOSAURS!

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# DINOSAURS!

• DISCOVER THE GIANTS OF THE PREHISTORIC WORLD •



## IDENTIKIT

Two plant-eating dinosaurs and a gigantic prehistoric bird

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<b>STENOPELIX</b>	<b>2308</b>
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## IDENTIKIT



# KOTASAURUS

Hundreds of millions of years ago, giant *Kotasaurus* roamed the land.



*Kotasaurus* may have been the first, most primitive plant-eating sauropod dinosaur. The sauropods were the largest animals that ever walked on Earth. They included towering *Brachiosaurus*, which was taller than a four-storey building.

## EARLY ANCESTOR

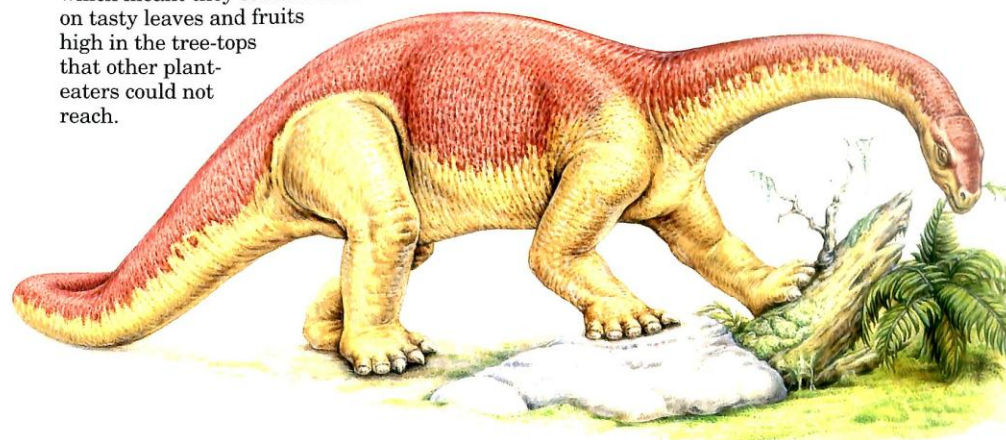
The very first giant dinosaurs were the prosauropods, a name that means 'before the sauropods'. They were the ancestors of the sauropods and appeared on Earth 50 million years before them. The prosauropods were a very important group of plant-eating dinosaurs. They were the first herbivores to evolve long necks, which meant they could browse on tasty leaves and fruits high in the tree-tops that other plant-eaters could not reach.

## GREAT SURVIVORS

The sauropods appeared about 208 million years ago in the Early Jurassic. The group is divided up into about eight families, and they ranged in size from very large to enormous. The sauropods were more successful than the prosauropods, which died out in Early Jurassic times. Sauropods spread across the world and survived to the end of the Age of the Dinosaurs.

## ANCIENT MYSTERY

*Kotasaurus* puzzled the experts. Some of its bones were like those of a prosauropod. Others looked more like those of a sauropod. The dinosaur was found in Early Jurassic rock, and at that time the last prosauropods were still alive. Scientists decided, however, that *Kotasaurus* was one of the first sauropods. But they still do not know which family it belongs to.



2305




**BONE EVIDENCE**

Certain bones around *Kotasaurus*' hips were shaped like those of a prosauropod. But the experts decided that there was more evidence that it was a primitive sauropod. Scientists are not sure how big *Kotasaurus* was, but they know it was much larger than any prosauropod. This big plant-eater also had long pelvic bones like those of the sauropods.

**SMALL RELATION**

*Kotasaurus* probably looked rather like another early sauropod called *Cetiosaurus*, although *Kotasaurus* was not such a giant. *Cetiosaurus* grew up to 18m long, about the length of two double-decker buses, and weighed about the same as five elephants.

**IT'S A FACT**
**MADE IN INDIA**

*Kotasaurus* is not the only sauropod to have been discovered in India. Experts have found a staggering 300 fossils of *Barapasaurus*, which also lived in the Early Jurassic Period. Both these long-necked plant-eaters were found in the Kota area of central India, after which *Kotasaurus* is named.

**SAUROPOD EVOLUTION**

Like *Cetiosaurus* and other early sauropods, *Kotasaurus* had a solid backbone. As time went on, sauropods became longer and larger, and their skeletons evolved to cope with this.

**BACK TO BACK**

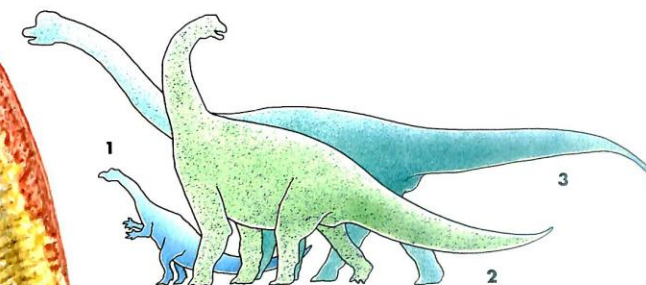
*Brachiosaurus* was even bigger than *Cetiosaurus*, but it had hollowed-out vertebrae. That meant the backbone was lighter, so the dinosaur's vast body was less heavy and it could move around more easily.



*Kotasaurus* lived in Jurassic forests. With its long neck it could reach up for the juiciest fruit and leaves growing on the tree-tops.

**HIGH AND LOW**

*Kotasaurus* had spoon-shaped teeth for cropping leaves. It browsed in the lush Jurassic forests where tall conifers, palms and ginkgos grew. *Kotasaurus* could have reached up to strip needles and cones from pine trees. It could also have lowered its head to graze on the ferns and horsetails that flourished on the forest floor.

**PROSAUROPODS AND SAUROPODS**


1 *Plateosaurus* is a prosauropod from the Late Triassic. It was about 7m long.

2 *Cetiosaurus* is one of the earliest sauropods. Experts think *Kotasaurus* looked like *Cetiosaurus*.

3 *Brachiosaurus* is a very large sauropod from the Late Jurassic. It was 23m long.

**MONSTER FACTS**

- **NAME:** *Kotasaurus* (koh-tuh-saw-rus) means 'Kota lizard'
- **GROUP:** dinosaur
- **SIZE:** unknown
- **FOOD:** plants
- **LIVED:** about 208 million years ago in the Early Jurassic Period in India



# STENOPELIX

Small, plant-eating *Stenopelix* remains a mystery dinosaur.

**E**xperts are still arguing about which family *Stenopelix* belongs to. The true identity of the dinosaur has puzzled scientists ever since its incomplete fossil skeleton was found in Germany in 1877.

### FIRST THOUGHTS

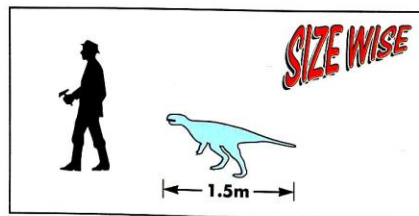
It was first thought to be a relative of *Hypsilophodon*. They were both small plant-eaters from the Early Cretaceous.

### A CHANGE OF MIND

Experts then decided *Stenopelix* was much more like *Psittacosaurus*, the 'parrot lizard'. *Psittacosaurus* was about the same size and it, too, lived in the Cretaceous Period.

## MONSTER FACTS

- **NAME:** *Stenopelix* (sten-uh-pel-icks) means 'narrow pelvis'
- **GROUP:** dinosaur
- **SIZE:** 1.5m long
- **FOOD:** plants
- **LIVED:** about 144 million years ago in the Early Cretaceous Period in Germany

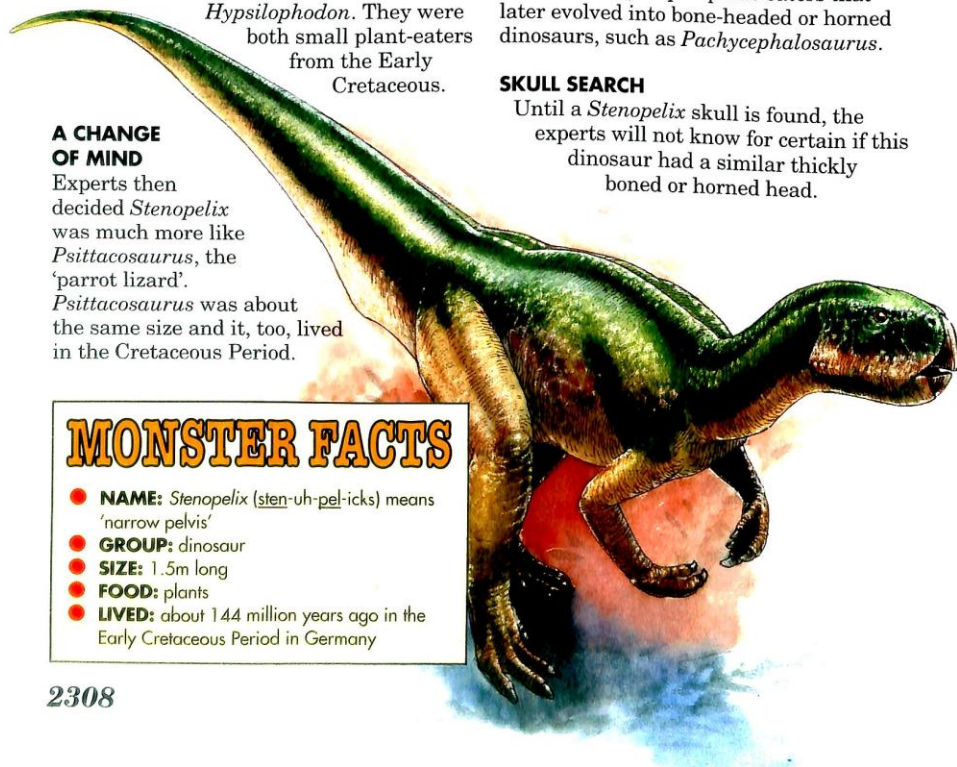


### STOP PRESS

Scientists now believe *Stenopelix* was a member of a group of plant-eaters that later evolved into bone-headed or horned dinosaurs, such as *Pachycephalosaurus*.

### SKULL SEARCH

Until a *Stenopelix* skull is found, the experts will not know for certain if this dinosaur had a similar thickly boned or horned head.



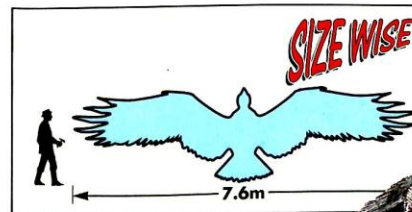
# ARGENTAVIS

Giant, vulture-like *Argentavis* is the largest known flying bird.

**H**uge birds soared through the skies in the last Ice Age. The largest was *Argentavis*, which had a wingspan as wide as the huge flying reptile *Pteranodon*.

### GLIDING HIGH

An albatross has the longest wingspan of any bird today. But prehistoric *Argentavis* could spread its wings twice as wide. It was probably too big to fly by flapping. Instead, *Argentavis* probably glided along supported by warm air currents.



## MONSTER FACTS

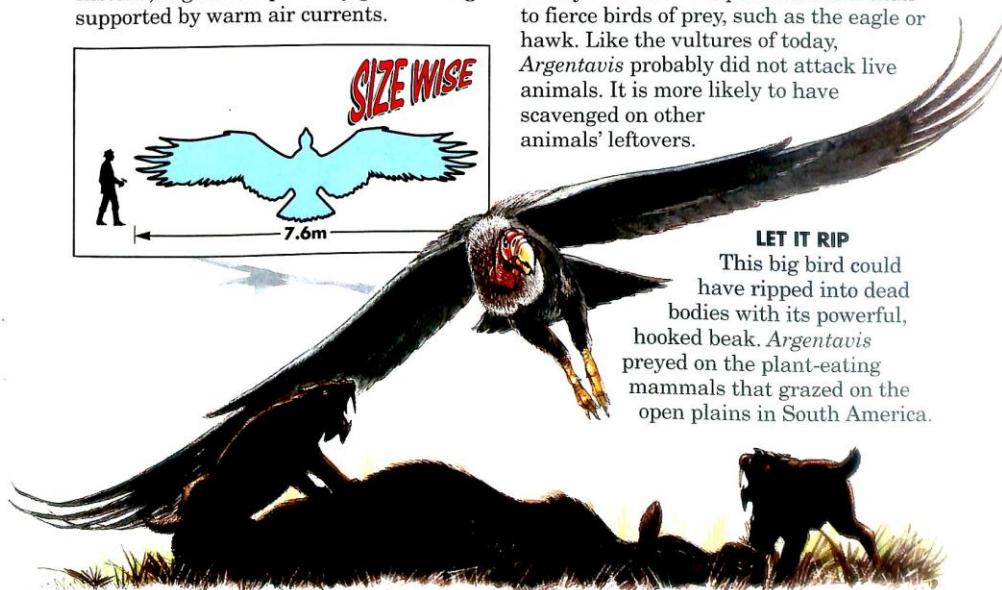
- **NAME:** *Argentavis* (ar-jen-tah-viss) means 'bird from Argentina'
- **GROUP:** bird
- **SIZE:** 7.6m wingspan
- **FOOD:** meat
- **LIVED:** about 5 million years ago in the Early Pliocene Period in Argentina

### EARLY BIRD

*Argentavis* was an early vulture – it was a meat-eating bird of prey. But it was more closely related to the peaceful stork than to fierce birds of prey, such as the eagle or hawk. Like the vultures of today, *Argentavis* probably did not attack live animals. It is more likely to have scavenged on other animals' leftovers.

### LET IT RIP

This big bird could have ripped into dead bodies with its powerful, hooked beak. *Argentavis* preyed on the plant-eating mammals that grazed on the open plains in South America.





# Atlas of finds South America

From some of the earliest dinosaurs to some of the smallest dinosaurs, South America is rich in fossils.

## VALLEY OF THE MOON DESERT

*Eoraptor* (below), a very primitive dinosaur, was found in Argentina in 1993.

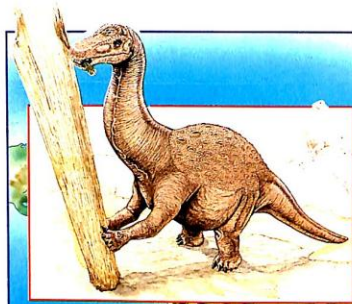
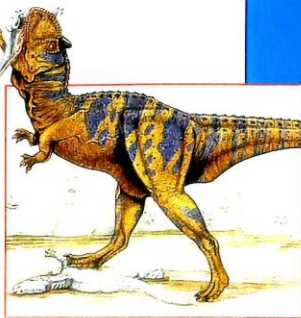
## CERRO RAJADA

Several skeletons of *Riojasaurus*, a bulky long-necked dinosaur (right), were found in the foothills of the Andes Mountains in Argentina.



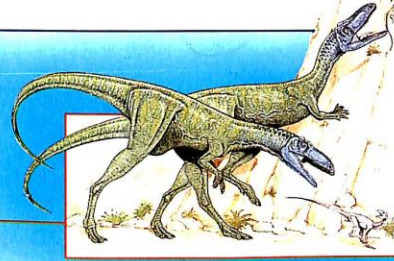
## CHUBUT

Found in Argentina, and named by one of South America's great dinosaur experts José Bonaparte, *Carnotaurus* (right), or 'carnivorous bull', was a very fierce meat-eater.



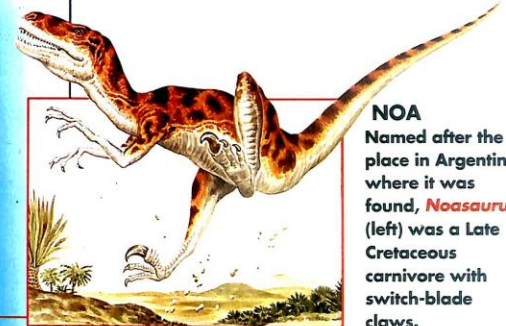
## EL BRETÉ

*Saltasaurus* (above), discovered in Argentina in 1980, was the first armoured sauropod to be found.

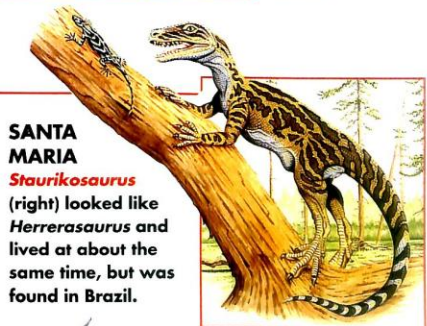


## ISCHIGUALASTO

*Herreriasaurus* (above) is 230 million years old. This makes it one of the oldest dinosaurs.

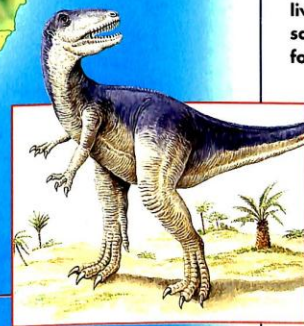


**NOA**  
Named after the place in Argentina where it was found, *Noasaurus* (left) was a Late Cretaceous carnivore with switch-blade claws.



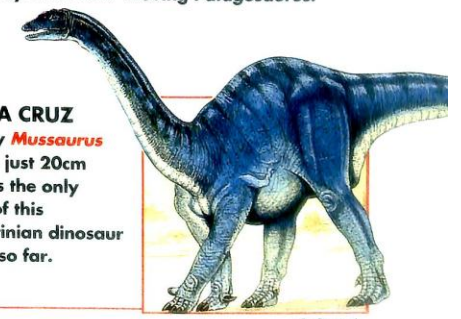
## SANTA MARIA

*Staurikosaurus* (right) looked like *Herreriasaurus* and lived at about the same time, but was found in Brazil.



## CERRO CONDOR

Patagonia is an area of Argentina in the far south of South America. It gave its name to *Patagosaurus*, nine skeletons of which were found between 1977 and 1983. *Piatnitzkysaurus* (left), lived in the same place at the same time and may have preyed on slow-moving *Patagosaurus*.



## SANTA CRUZ

A baby *Mussaurus* (right), just 20cm long, is the only fossil of this Argentinian dinosaur found so far.

Many prehistoric animal and dinosaur fossil finds have been made in South America, but there are probably more amazing fossils waiting to be discovered in rocks all over this continent.



**EXPERT FROM ARGENTINA**

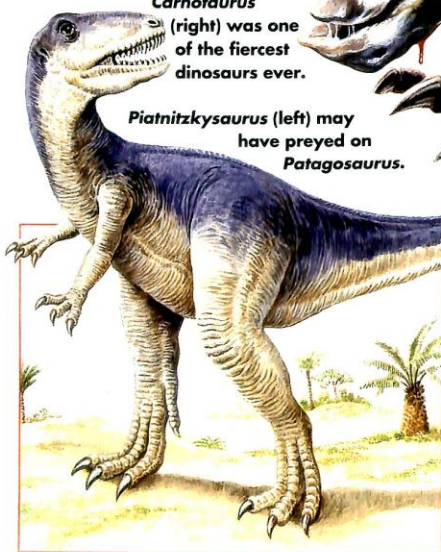
An Argentinian palaeontologist called José Bonaparte is responsible for much of what we know about South America's extraordinary dinosaurs. Bonaparte discovered and named *Patagosaurus*, *Riojasaurus*, *Carnotaurus* and *Piatnitzkysaurus*. He also co-named *Mussaurus*, *Saltasaurus* and *Noasaurus*.

**REACH FOR THE LEAVES**

*Riojasaurus* was an early South American dinosaur from the Late Triassic. It was one of the first animals able to reach up to eat tall plants, including leaves on trees. This gave it an advantage over other animals of the time, such as the rhynchosaurs, because it could reach food that they could not. *Riojasaurus* was up to 10m long, and was bigger than its European cousin *Plateosaurus*.

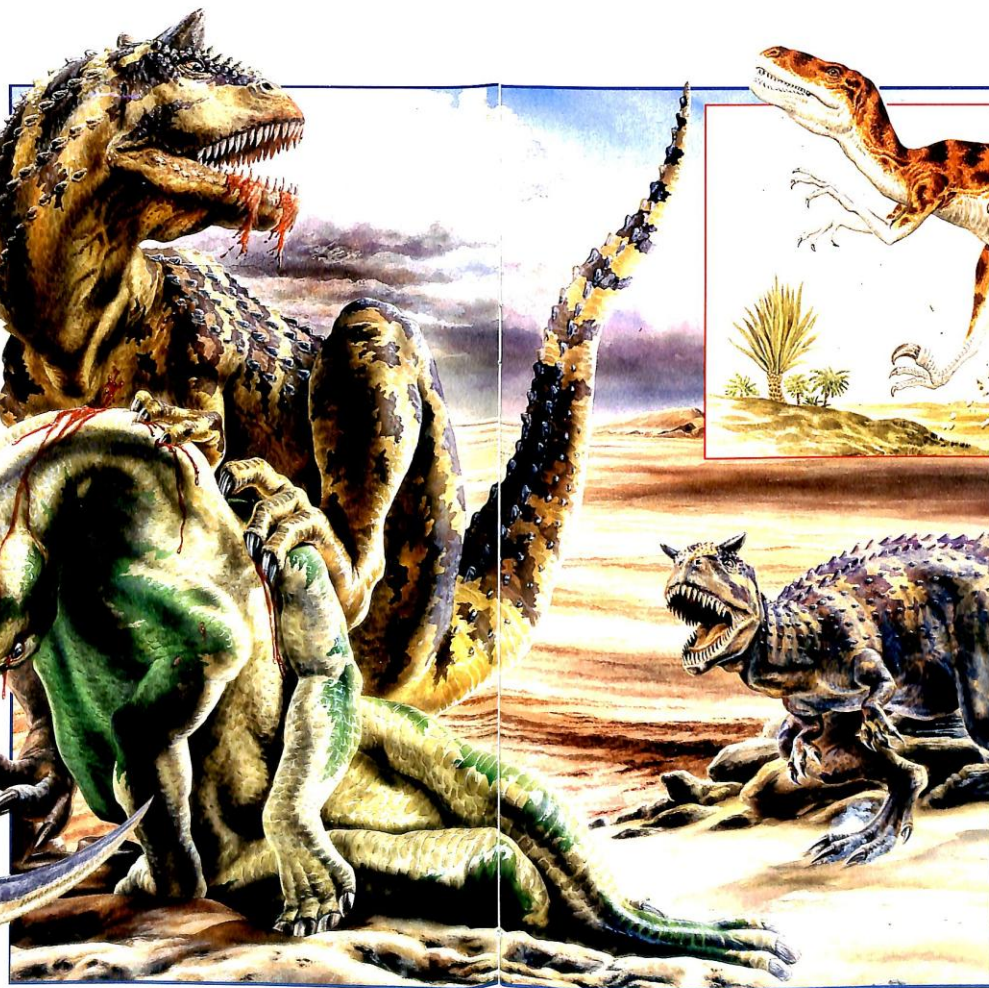
*Carnotaurus* (right) was one of the fiercest dinosaurs ever.

*Piatnitzkysaurus* (left) may have preyed on *Patagosaurus*.



**SUCCESS STORY**

*Herrerasaurus* and *Eoraptor* were two more very early dinosaurs. They lived in South America during the Late Triassic, and they were both meat-eaters and early theropods. Theropods were so successful that they remained kings of all predators for another 150 million years.



*Noasaurus* (left) had such sharp teeth that they may have been able to pierce *Saltasaurus'* armoured skin.

**SMALL AND NASTY**

*Noasaurus* was a small, active theropod from the Late Cretaceous. Large plant-eaters such as *Saltasaurus*, which lived in South America at the same time as *Noasaurus*, needed to keep a protective eye on young or sickly members of the herd to protect them from these predators.

**DINOSAUR CHAINMAIL**

*Saltasaurus* fascinated palaeontologists when they found it. The skin on its back was embedded with hundreds of pea-sized lumps that formed a kind of chainmail. Between these small lumps there were larger bony lumps the size of a man's fist. At 12m long, *Saltasaurus* was small for a sauropod and so more vulnerable to attack by meat-eaters. Experts think that it evolved armour to protect itself.

**HORNED HEAD**

*Carnotaurus* was a large carnivore like *Tyrannosaurus rex*. It was not as big, but probably killed its prey in much the same way. *Carnotaurus* charged at its victim and tore large chunks of flesh from the body, leaving the animal to bleed to death. Just above each eye *Carnotaurus* had a small horn. That is why it was given a name meaning 'meat-eating bull'. It lived in Mid Cretaceous Argentina.

**THE PALM OF YOUR HAND**

The skeleton of a baby prosauropod from the Late Triassic was found in 1978. It was only 20cm long. At that time, it was the smallest dinosaur that had been found. Experts can only guess what adult *Mussaurus* looked like. They think they were about 3m long and lived on plants.



# GIANTS OF THE PAST

## KOTASAURUS

The earth shakes as a herd of *Kotasaurus* crashes through an Early Jurassic forest in search of some juicy plants. They come across a lush forest, but a lone *Barapasaurus* has got them beat. It has reared up on its hind legs to reach the most succulent leaves from the tops of the trees. Although there is plenty for them all here, by winning the tree-tops, out of the reach of most other creatures, *Barapasaurus* feels contented and will move off to another part of the forest to feed in peace.

2314

2315



# 3-D Gallery 106

## STYGIMOLOCH



A frenzied battle is being fought among a group of male *Stygimoloch*. Sickening thuds fill the air as, again and again, they launch themselves at one another, butting with their bony heads. Only one will be left standing – the new leader of the herd.

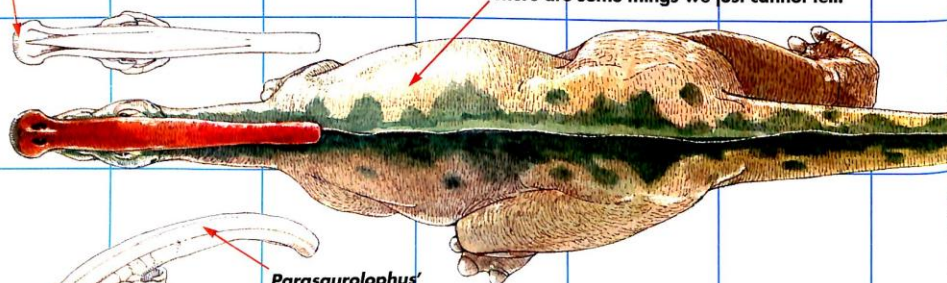




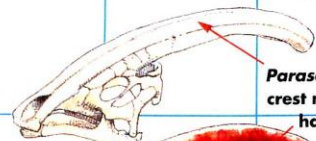
# Dino-graph: duckbill

The tips of *Parasaurolophus*' upper and lower jaws were broad and rough, showing that they were armed with a duck-like bill.

The skin colours may have been camouflage greens and browns, with bright hues on crests and frills for signalling. This, however, is a guess. There are some things we just cannot tell.



*Parasaurolophus*' crest may have supported a frill of skin, which might have been brightly coloured to act as a signal.



The tooth rows were set in from the side of the skull, leaving space for fleshy cheeks.

The skin probably formed deep vertical folds along the base of the neck and the shoulder.

Like all plant-eaters, duckbills would have had a pot-belly to make room for the large intestines they needed to digest food.



The duckbilled dinosaurs were the most common plant-eaters at the end of the Cretaceous Period. A great many skeletons of duckbills have been found – some belonging to entire herds that died suddenly. The first dinosaur skeleton to be discovered in North America was

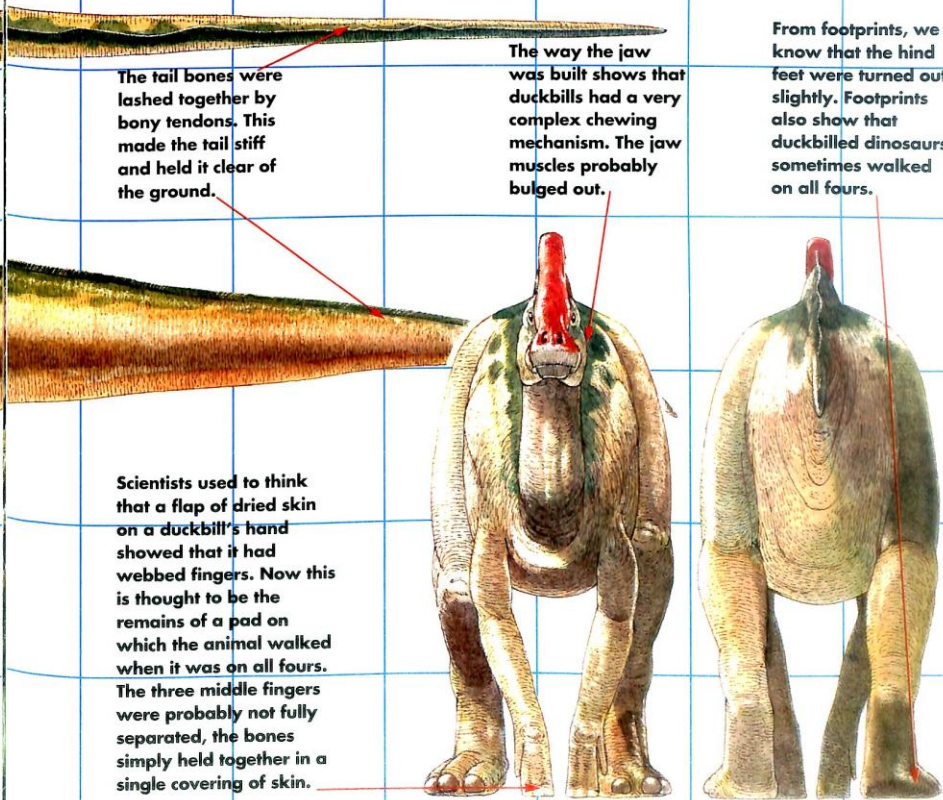
a duckbill. As a result, scientists know a great deal about what a duckbill looked like, and there are plenty of clues that artists are able to use to paint a realistic picture of these dinosaurs. The duckbill we have illustrated here is the extraordinary crested *Parasaurolophus*.

The tail bones were lashed together by bony tendons. This made the tail stiff and held it clear of the ground.

The way the jaw was built shows that duckbills had a very complex chewing mechanism. The jaw muscles probably bulged out.

From footprints, we know that the hind feet were turned out slightly. Footprints also show that duckbilled dinosaurs sometimes walked on all fours.

Scientists used to think that a flap of dried skin on a duckbill's hand showed that it had webbed fingers. Now this is thought to be the remains of a pad on which the animal walked when it was on all fours. The three middle fingers were probably not fully separated, the bones simply held together in a single covering of skin.





# The story of Douglass' dinosaurs

Earl Douglass (1862-1931) was one of the great dinosaur hunters. He dedicated his life to the search for fossils.

In 1902 Earl Douglass joined the staff of the Carnegie Museum in Pittsburgh, USA. By 1909, he had discovered one of the world's great dinosaur graveyards.

### SUCCESSFUL SEARCH

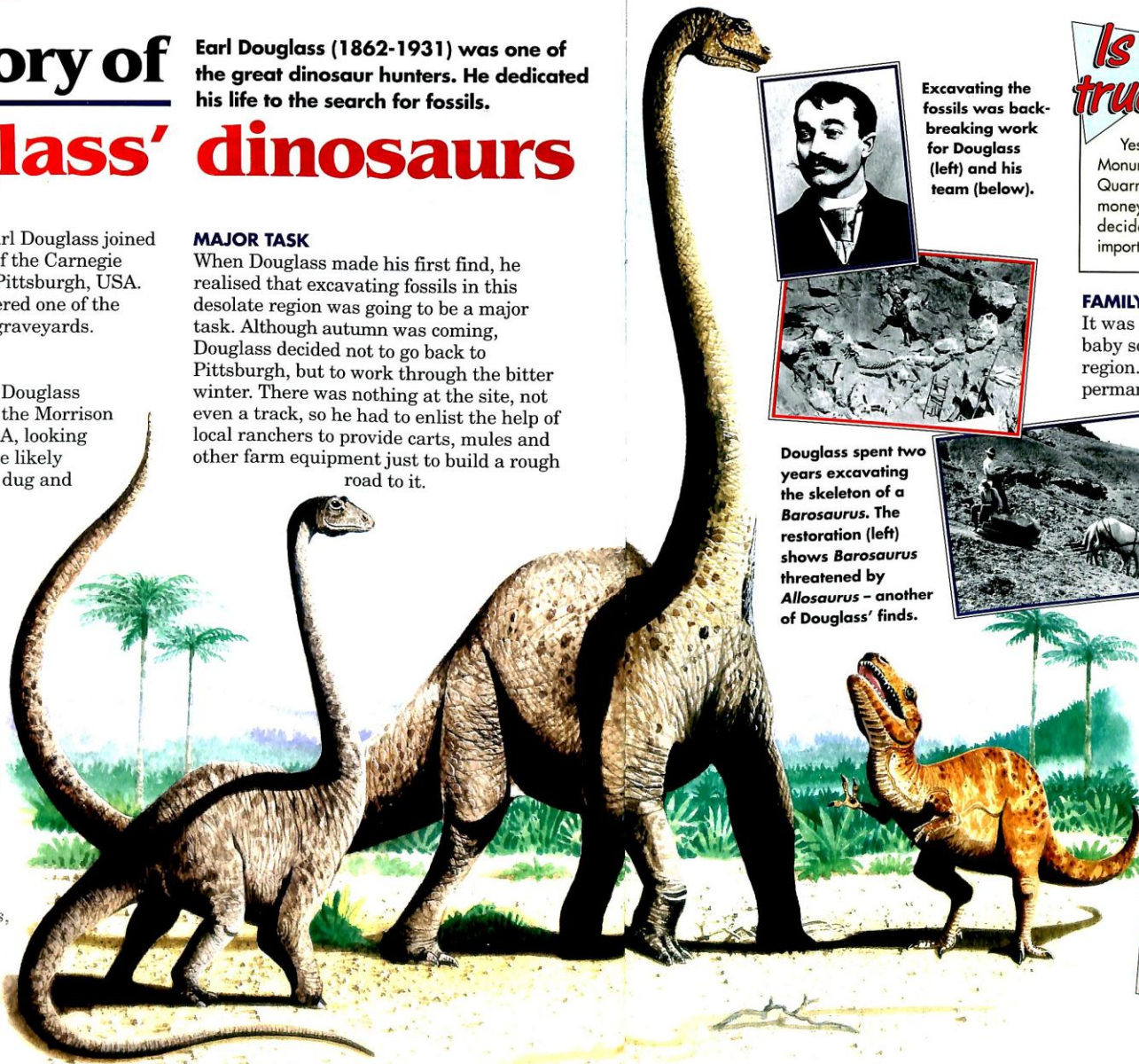
In the summer of 1909, Douglass walked the rocks called the Morrison Formation, in Utah, USA, looking for fossils. Spotting some likely looking rocks, Douglass dug and scraped, exposing the vertebrae of a huge dinosaur. Although he didn't know it at the time, he had uncovered the remains of an *Apatosaurus*.

### LIFE'S WORK

From that moment, excavating the whole area became his life's work. Between 1909 and 1924, Douglass and his team excavated an amazing array of dinosaur skeletons, including *Allosaurus*, *Barosaurus*, *Stegosaurus*, *Diplodocus*, *Camptosaurus* and *Camarosaurus*, as well as *Apatosaurus*.

### MAJOR TASK

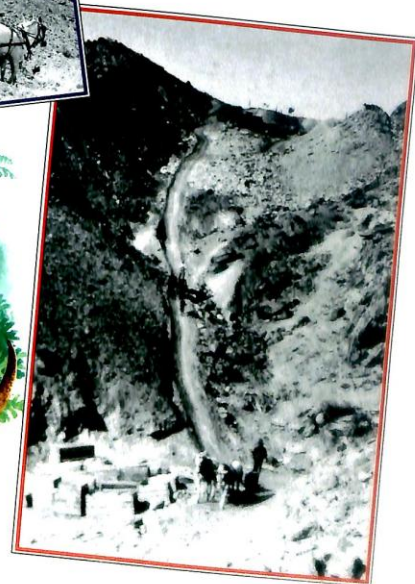
When Douglass made his first find, he realised that excavating fossils in this desolate region was going to be a major task. Although autumn was coming, Douglass decided not to go back to Pittsburgh, but to work through the bitter winter. There was nothing at the site, not even a track, so he had to enlist the help of local ranchers to provide carts, mules and other farm equipment just to build a rough road to it.



Excavating the fossils was back-breaking work for Douglass (left) and his team (below).



Douglass spent two years excavating the skeleton of a *Barosaurus*. The restoration (left) shows *Barosaurus* threatened by *Allosaurus* - another of Douglass' finds.



Is it true

that Douglass' dinosaur graveyard became a national monument?

Yes. Today it is known as Dinosaur National Monument. It was originally called the Carnegie Quarry because Andrew Carnegie donated the money for the excavations. But in 1915 it was decided that the quarry was of such national importance that it should be renamed.

### FAMILY SUPPORT

It was lonely work, but Douglass' wife and baby son joined him in this inhospitable region. Douglass decided to settle there permanently. He built a cabin near the site, and made a garden, where he kept animals and grew food. The nearest shop was several kilometres away!



**HARD WORK**

To get at the fossil bones, Earl Douglass and his assistants dug a gigantic trench. It was a back-breaking task. In those days there was no earth-moving machinery and the fossils were exposed with dynamite, picks and shovels. The team's hard work eventually produced a trench about 300m long by about 30m deep. They then had to dig the fossils from the walls of the trench.

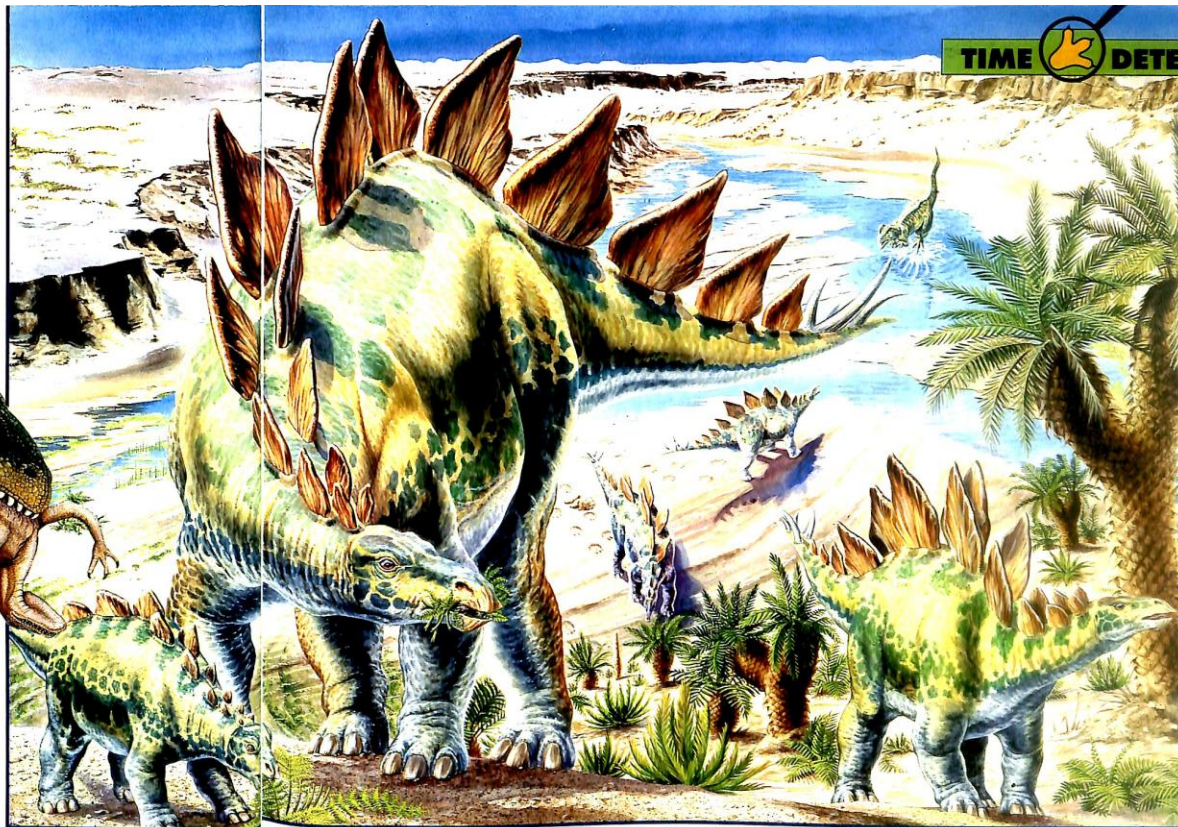
**DINOSAURS GALORE**

The area turned out to be one of the world's richest fossil beds. Why were there so many dinosaurs here?



2322

In Jurassic times, Dinosaur National Monument may have looked like this landscape (right) where *Stegosaurus* roamed. Predators such as *Allosaurus* (below) would have preyed on the plant-eaters.



**DINOSAUR MEETING PLACE**

In Jurassic times, this area was a valley with a broad river flowing through it. Dinosaurs must have come to drink at the river and to eat the vegetation that flourished near the water.

**DEAD AND BURIED**

Experts think that some of the dinosaurs Douglass found died naturally. Their bodies were then washed down river and were buried in silt and mud when they came to rest in shallow water. Other dinosaurs may have got stuck in mud or drowned trying to ford the river.

**BAROSAURUS DISCOVERED**

The almost complete skeleton of the mighty sauropod *Barosaurus* was discovered by Earl Douglass in 1912, but it took two years to dig it out of the ground.

**CAREFUL PACKING**

First the rock had to be dynamited to expose the fossils. Then each dinosaur bone was painstakingly excavated from the rock, which had once been the mud of the river bed. Every bone was wrapped in a sacking and plaster jacket to protect it, then loaded on to a wooden sledge. Mules pulled the sledges out of the valley.

**REST THOSE BONES**

The *Barosaurus* bones were sent back to the Carnegie Museum in Pittsburgh, but after several years they were acquired by Barnum Brown for the American Museum of Natural History in New York. The fossils remained there for almost 80 years.

**STAR ATTRACTION**

Then, in the early 1990s, the bones were brought out of storage and a cast was made of them. Eventually *Barosaurus* was reconstructed. It is now one of the star displays of the American Museum of Natural History in New York.

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# MONGOLIAN HOARDS

ZOFIA KIELAN-JAWORSKA WAS BORN IN POLAND A FEW YEARS BEFORE WORLD WAR II BEGAN. AFTER THE WAR, WARSAW WAS IN RUINS...



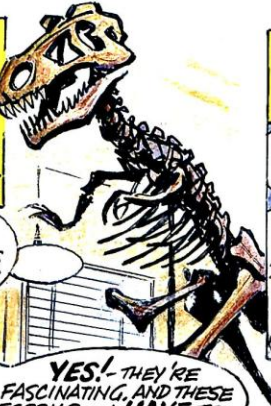
WHAT HAS HAPPENED TO THE INSTITUTE OF PALAEOLOGY?

ZOFIA ENROLLED IN PROF. ROMAN KOZLOWSKI'S CLASSES IN PALAEOLOGY, HELD IN HIS WARSAW APARTMENT.

**WELCOME!**  
I APOLOGISE FOR THE LACK OF BOOKS - THESE ARE ALL THAT'S LEFT OF THE INSTITUTE'S LIBRARY. NOW I WISH TO DISCUSS THE EXPEDITIONS TO MONGOLIA.

INSPIRED BY THE DISCOVERIES IN MONGOLIA, ZOFIA WENT TO MOSCOW IN 1955 TO MEET THE RUSSIAN SCIENTIST ANATOLE ROZHDESTVENSKY.

YOU HAVE SEEN THE PHOTOGRAPHS OF MY EXPEDITION?



**YES!** - THEY'RE FASCINATING, AND THESE FOSSILS... I HAVE TO GET TO MONGOLIA!

IN 1961, ZOFIA WAS ASKED TO ORGANISE A JOINT POLISH AND MONGOLIAN PALAEOLOGICAL EXPEDITION. IN 1964 SHE FINALLY ARRIVED IN MONGOLIA.



THERE'S SOMETHING EXCITING DOWN THERE!

IT LOOKS LIKE PART OF A SKELETON!

THE 'SOMETHING' TURNED OUT TO BE AN ALMOST COMPLETE TARBOSAURUS.

IT'S THE FIRST DINOSAUR EVER TO BE FOUND BY A POLISH EXPEDITION!



THE FOSSIL BONES OF THE 8M-LONG BEAST WERE SENT TO WARSAW IN 16 CRATES...



IT'S IN THE EXACT POSITION IT DIED IN ALMOST 80 MILLION YEARS AGO!

THEY LATER DISCOVERED SKULLS AND EGGS OF PROTOCERATOPS - AND THE FIRST COMPLETE ARMOURNED PINACOSAURUS.



NEXT YEAR ZOFIA RETURNED TO MONGOLIA, TO ALTAN ULA. VERY SOON, ANOTHER EXCITING DISCOVERY WAS MADE...



WHATEVER IT IS, IT'S ALMOST INTACT!

I'VE NEVER SEEN BONES AS BIG AS THIS!

IT WAS INDEED A SAUROPOD - THE FIRST EVER FOUND IN THE ALTAN ULA FOSSIL BEDS. THEY NAMED IT OSPISTHOCELIKAUDIA.

IT LOOKS LIKE AN ENORMOUS SAUROPOD!

EVEN BETTER THINGS WERE IN STORE. AT ANOTHER SITE, ZOFIA MADE AN AMAZING DISCOVERY...

IT COULD BE ONE OF AN ENTIRELY NEW GROUP OF CARNIVOROUS DINOSAURS.



WHAT DO YOU THINK IT IS, ZOFIA?

THE MYSTERIOUS ANIMAL WAS LATER NAMED DEINOCERIUS ('TERRIBLE HAND').

THE POLES CELEBRATED A TRADITIONAL HOLIDAY AT THE END OF JULY.

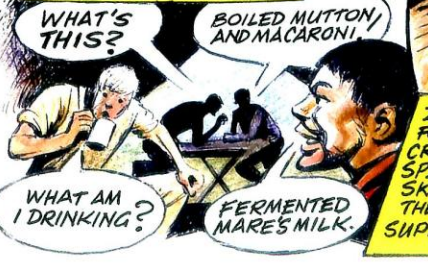


HOY!

WHAT ARE THEY DOING?

I DON'T KNOW - BUT IT LOOKS LIKE FUN!

A FEW DAYS LATER, THE MONGOLIANS RETURNED THE HOSPITALITY IN A TYPICAL MONGOLIAN YURT.



WHAT'S THIS?

BOILED MUTTON AND MACARONI.

WHAT AM I DRINKING?

FERMENTED MAKE'S MILK.



ZOFIA'S EXPEDITION DISCOVERED SO MANY FOSSILS THAT IT TOOK HUNDREDS OF CRATES TO CARRY THEM. ONE OF THE MOST SPECTACULAR WAS THE HIGH-DOMED SKULL OF PACHYCEPHALOSAURUS - THE DINOSAUR THAT FOUGHT FOR SUPREMACY BY HEAD-BUTTING ITS ENEMIES.



# Improve and test your knowledge with... FACT FILE

*Ichthyosaurus* holds all the answers. See how you score in the quiz.

**1** What was the Dinosaur Monument in the USA originally called?  
a) the Douglass Ranch  
b) the Carnegie Quarry  
c) the Dinosaur Graveyard

**2** 'Meat-eating bull' is the meaning of which dinosaur's name?  
a) *Carnotaurus*  
b) *Noosaurus*  
c) *Mussaurus*

**3** *Parasaurolophus'* crest may have carried:  
a) a pair of horns  
b) a sharp claw  
c) a frill of skin

**4** Which was the first dinosaur to be found by a Polish expedition?  
a) *Polacanthus*  
b) *Warsaurus*  
c) *Tarbosaurus*

**7** *Saltasaurus'* skin was armoured with:  
a) bony lumps  
b) scales  
c) thick hair

**8** Dinosaur brains probably looked like:  
a) human brains  
b) bird brains  
c) crocodile brains

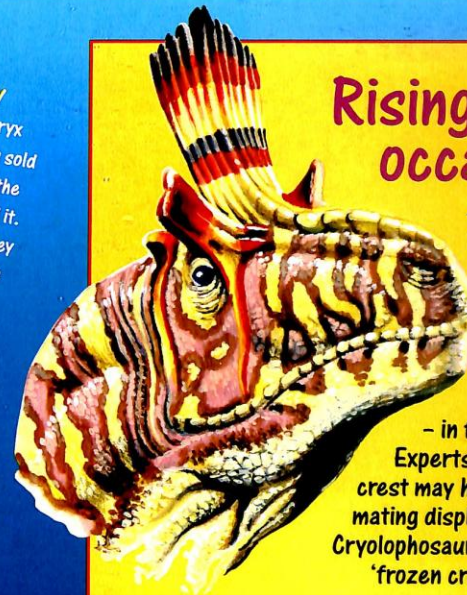
**Fowl food**  
The mosasaur *Platycarpus* ate birds. Bones of the Cretaceous seabird *Hesperornis* have been found in its stomach area. Bird feathers have also been found in the droppings of big fish from Miocene times.

**Worth the wait**  
*Seismosaurus*, the longest known dinosaur, was first discovered in 1979. It was so big that it took 13 years to excavate.

**9** Which of these dinosaurs is the biggest?  
a) *Cetiosaurus*  
b) *Brachiosaurus*  
c) *Plateosaurus*

**10** What did *Stygimoloch* use to attack other males?  
a) its bony head  
b) its spiky tail  
c) its razor-like claws

**Quick getaway**  
The sixth *Archaeopteryx* skeleton to be found was sold to the local museum by the quarry worker who found it. He ran away with the money before the quarry owners realised it.



## Rising to the occasion

This crested meat-eating dinosaur was found where no other carnivorous dinosaurs had been found before - in freezing Antarctica. Experts think its intricate crest may have been used as a mating display. It was named *Cryolophosaurus*, which means 'frozen crested lizard'.

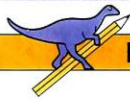
**Latecomers**  
Duckbilled dinosaurs only arrived in Europe for the last six million years of the Cretaceous Period. Until then, the titanosaurs were the most important European plant-eaters.

**Polluted seas**  
Many of the Late Cretaceous sea creatures of North America have been found fossilized in rock beds rich in the mineral bentonite. Bentonite comes out of volcanoes, and geologists think that the waters became poisoned by volcanic ash and killed the animals.

Answers to the questions on inside back cover

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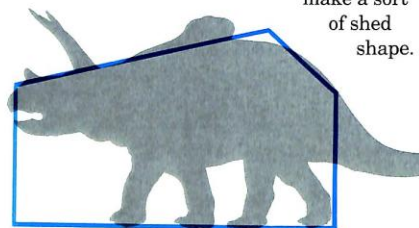




## HOW TO DRAW

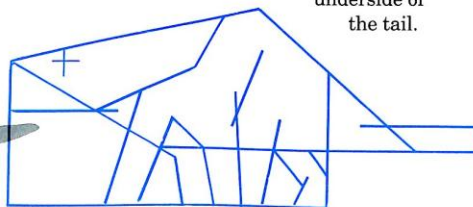
# TOROSAURUS

**1** Find a large piece of paper and a sharp pencil. Then lightly draw a basic shape for *Torosaurus*' bulky body in the middle of the paper. From the side, its body and legs



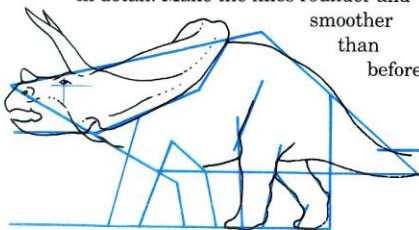
make a sort of shed shape.

**2** Next, divide the shed shape into smaller, simple shapes that represent the frill, head and legs. Draw a straight line showing where the legs join the body. Carry the line on outside the shed shape for the

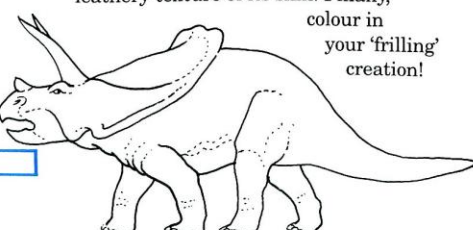


underside of the tail.

**3** Once you are happy with the position of all the guidelines, draw *Torosaurus* in detail. Make the lines rounder and smoother than before.



**4** Have a go at shading in parts of *Torosaurus* in pencil to show the leathery texture of its skin. Finally, colour in your 'frilling' creation!



### Fact box

Horned *Torosaurus* had the biggest head of any known land animal.

- **NAME:** *Torosaurus* (tor-oh-saw-rus) means 'bull reptile'
- **GROUP:** dinosaur
- **SIZE:** 7.5m long
- **FOOD:** plants
- **LIVED:** about 70 million years ago in Late Cretaceous North America

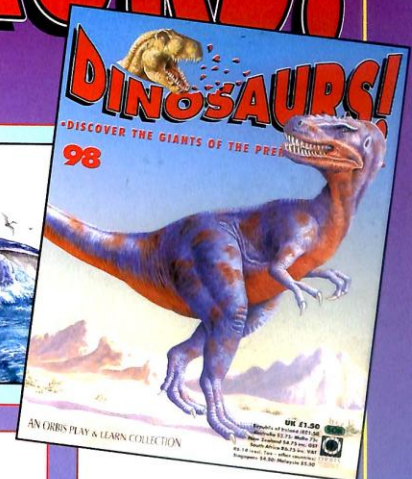


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COMING IN PART 98 OF

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Three amazing creatures in IDENTIKIT and SPOTTER'S GUIDE HISTORY IN PICTURES 3-D GALLERY

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ANSWERS TO FACT FILE QUESTIONS: 1.b 2.a 3.c 4.c 5.b 6.c 7.a 8.c 9.b 10.a





Dr David Norman of Cambridge University answers your dinosaur questions

# ASK THE EXPERT

## Would dinosaurs have licked up the salt in prehistoric salt lakes?

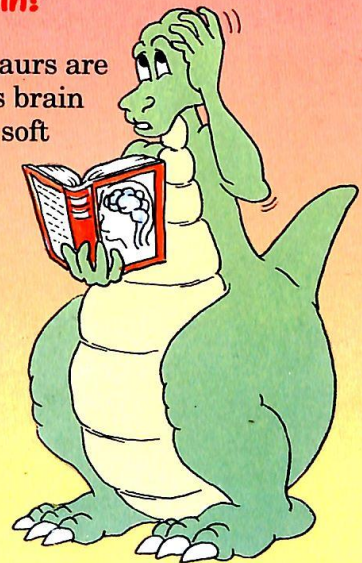


Mammals, including humans, sweat through their soft, moist skins when they get hot. When they sweat, they lose both water and salt from their bodies. (If you've ever tasted your own sweat, you'll

know how salty it is.) Both the water and the salt have to be replaced, which is why mammals need to eat salt. However, modern birds and reptiles do not sweat, and dinosaurs were probably the same. This is because their skin was non-permeable and often scaly – liquids could not seep through it. It is therefore unlikely that dinosaurs licked up salt in prehistoric salt lakes. They simply did not need to, even in very hot climates.

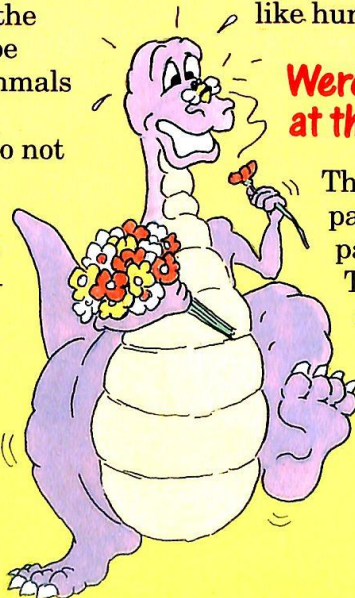
## Would a dinosaur brain have looked like a human brain?

The brains of dinosaurs are largely unknown as brain tissue is extremely soft and unlikely to fossilize. However, studies of bony brain cases have shown that the brains of most dinosaurs are very similar in shape to those of crocodiles. So no, dinosaur brains did not look like human ones.



## Were there bees living at the time of the dinosaurs?

The fossil record of bees is very patchy. All I can say is, maybe, particularly in the Late Cretaceous. This is when flowering plants appeared. Their presence is closely linked to the presence of bees.



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