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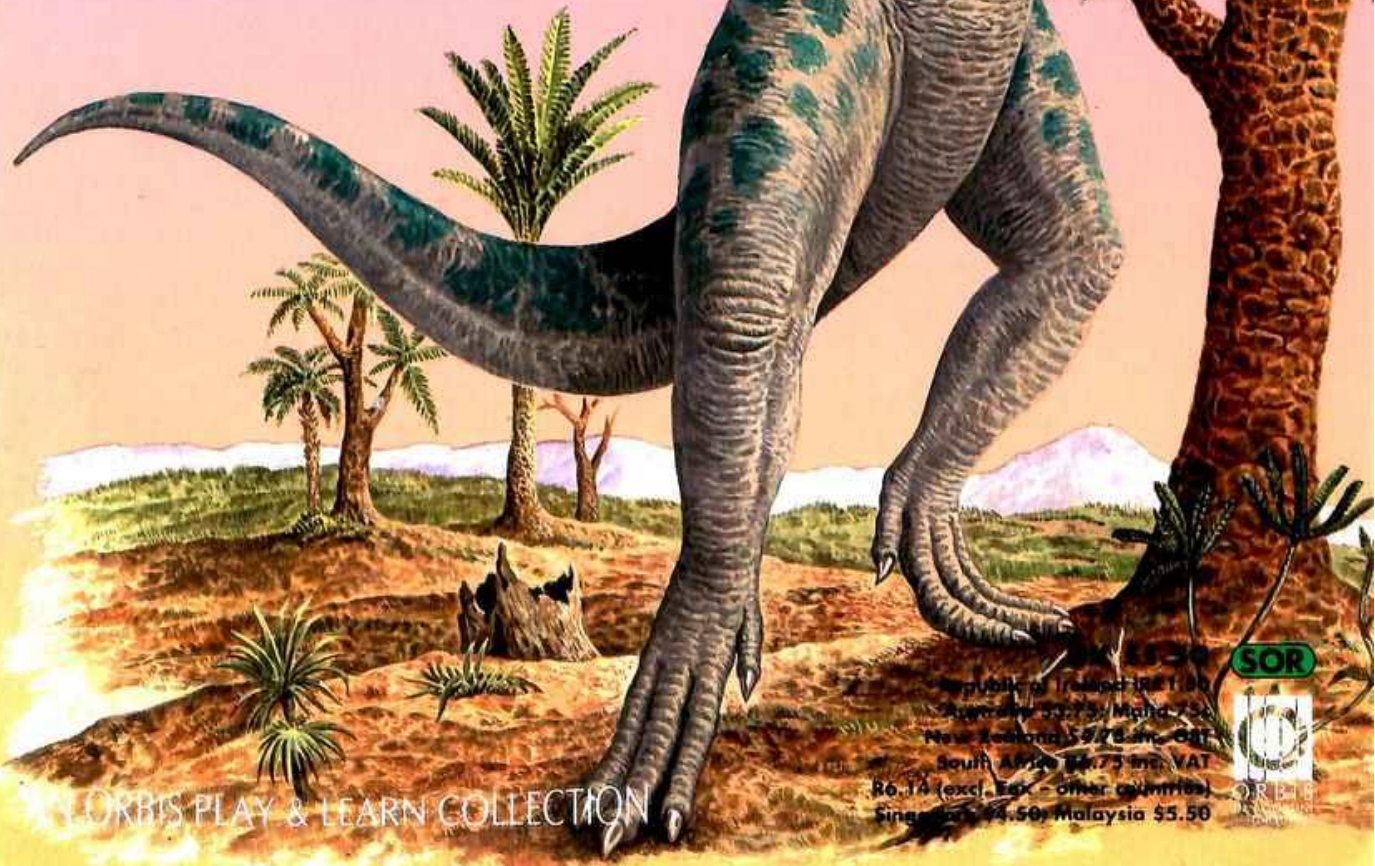


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# DINOSAURS!

• DISCOVER THE GIANTS OF THE PAST

89



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# DINOSAURS!

• DISCOVER THE GIANTS OF THE PREHISTORIC WORLD •



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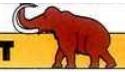
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## IDENTIKIT



# ARSINOOTHERIUM

The huge horns of *Arsinootherium* make it one of the strangest fossil mammals of all.



*Arsinootherium* was taller than today's rhinoceros but very similar in shape. Its massive, barrel-like body was supported by four sturdy legs and it was armed with a pair of lethal-looking horns.

### DOUBLE TROUBLE

At first glance, *Arsinootherium* might have looked very like a rhino, but there were some important differences.

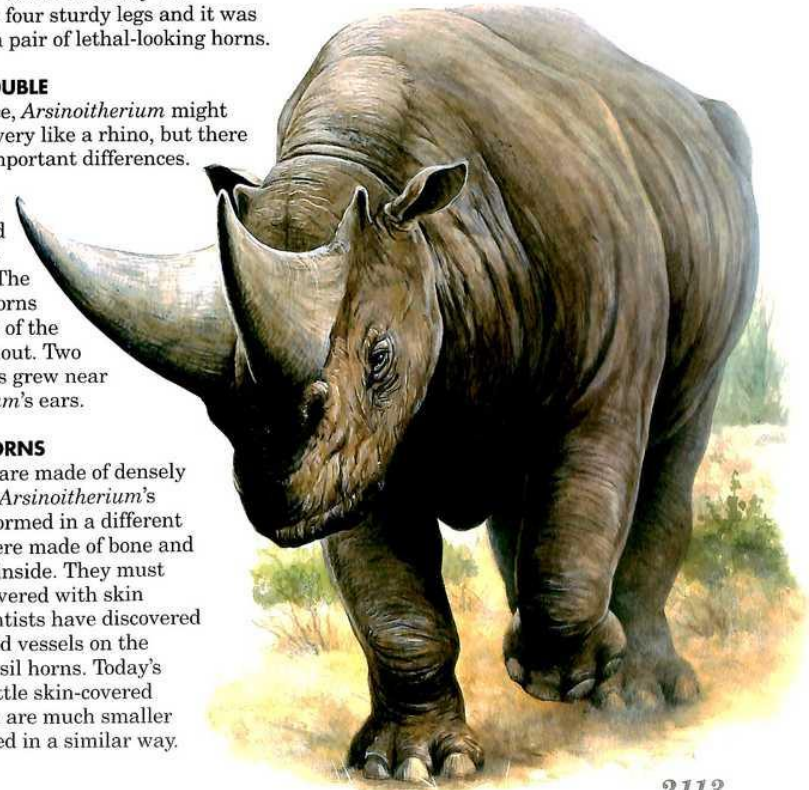
It had two large, curved horns instead of the rhino's single horn. The base of the horns covered most of the mammal's snout. Two smaller horns grew near *Arsinootherium's* ears.

### HOLLOW HORNS

Rhino horns are made of densely matted hair. *Arsinootherium's* horns were formed in a different way. They were made of bone and were hollow inside. They must have been covered with skin because scientists have discovered traces of blood vessels on the surface of fossil horns. Today's giraffe has little skin-covered 'horns' which are much smaller but are formed in a similar way.

### HIS AND HERS

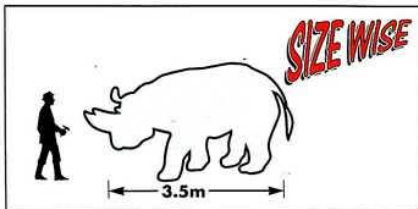
Male *Arsinootherium* had huge, pointed horns. But the horns of the females were smaller and round-tipped. Like today's rhino, this massive plant-eater may have charged its enemies with its head lowered, ready to run them through with its enormous, curved horns.







## IDENTIKIT



### AFRICAN GIANT

*Arsinoitherium* lived in the Early Oligocene, about 36 million years ago, in what is now Egypt in North Africa. By that time, today's continents had nearly taken shape. The creature was named after an ancient Egyptian queen, who had a palace near the site where the first fossil was found.

### LEFT IN PEACE

*Arsinoitherium* was one of the larger plant-eaters living in Africa at the time. The sight of a huge, horned *Arsinoitherium* on the attack would probably have scared off many predators.

### ODD ONE OUT

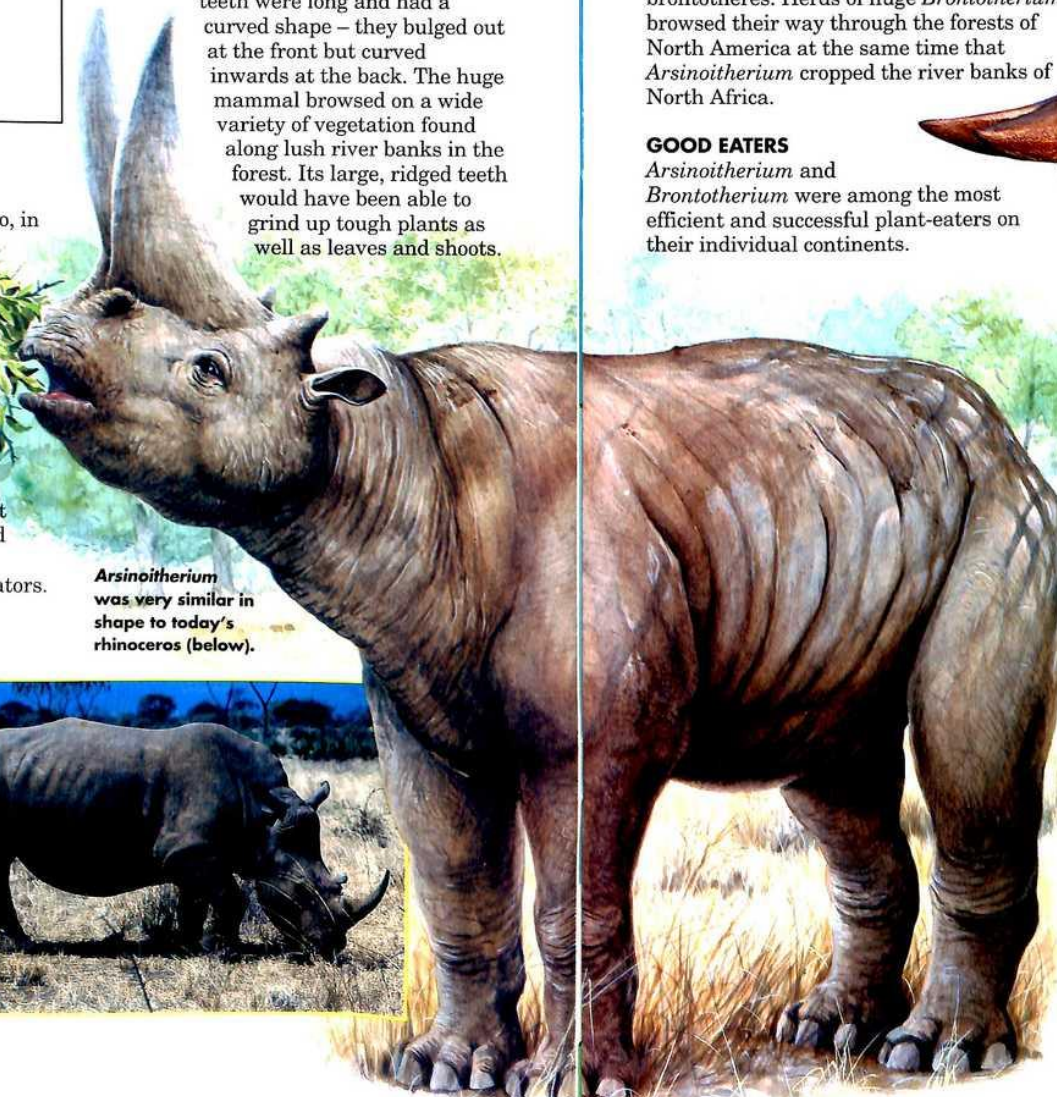
This giant was a member of a group of animals called the embrithopods. They were prehistoric mammals, but scientists are still unable to say exactly what animals *Arsinoitherium* originated from, or what particular animals descended from them. They could have been distant relatives of the elephant or the sea cow.



### DAILY GRIND

*Arsinoitherium* had 44 teeth set closely together in its upper and lower jaw. The teeth were long and had a curved shape – they bulged out at the front but curved inwards at the back. The huge mammal browsed on a wide variety of vegetation found along lush river banks in the forest. Its large, ridged teeth would have been able to grind up tough plants as well as leaves and shoots.

*Arsinoitherium* was very similar in shape to today's rhinoceros (below).



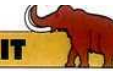
### EAST AND WEST

*Arsinoitherium* had a similar lifestyle to a group of prehistoric animals called the brontotheres. Herds of huge *Brontotherium* browsed their way through the forests of North America at the same time that *Arsinoitherium* cropped the river banks of North Africa.

### GOOD EATERS

*Arsinoitherium* and *Brontotherium* were among the most efficient and successful plant-eaters on their individual continents.

## IDENTIKIT



A 35-million-year-old skeleton of *Arsinoitherium* (above) on display at the Natural History Museum, London.

## IT'S A FACT

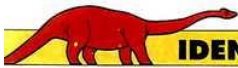
### ALL CHANGE

The climate had become drier by the Middle Oligocene and a lot of woodland became flat, dry plains. *Arsinoitherium* may have died out because it could not cope with the change. Lighter plant-eaters, better suited to the plains, took over.

## MONSTER FACTS

- **NAME:** *Arsinoitherium* (ar-sin-oy-thee-ree-um) means 'Queen Arsinoe's beast'
- **GROUP:** mammal
- **SIZE:** 3.5m long and up to 2m high
- **FOOD:** plants
- **LIVED:** about 36 million years ago in the Early Oligocene in North Africa





# YUNNANOSAURUS

This big plant eater could be the ancestor of towering *Brachiosaurus*.

**Y**unnanosaurus belonged to a group of early long-necked, plant-eating dinosaurs called prosauropods. This group contained the first herbivores that were able to browse high up in the tree tops.

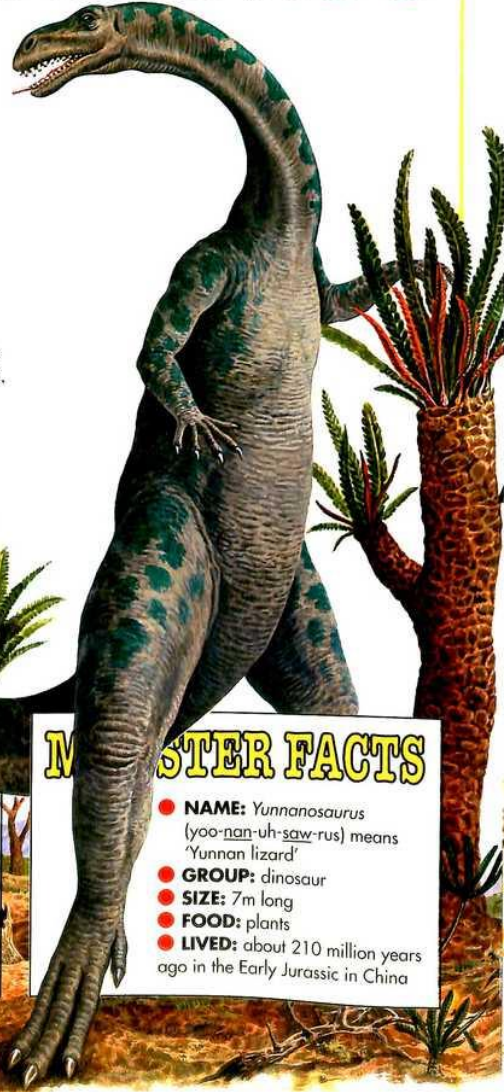
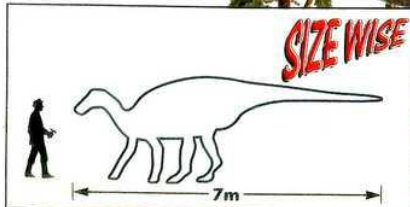
### GOING UP

*Yunnanosaurus* was one of the larger prosauropods. It could stand on its hind legs to browse in the trees, or graze on all fours.

### CUTTING EDGE

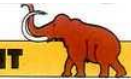
*Yunnanosaurus* had self-sharpening, chisel-like teeth with a good cutting edge. This made its teeth much more advanced than those of other plant-eaters that lived at the same time. In fact, they were almost identical to those

of the sauropod *Brachiosaurus*, which thundered through the forests about 70 million years later.



## MONSTER FACTS

- **NAME:** *Yunnanosaurus* (yoo-nan-uh-saw-rus) means 'Yunnan lizard'
- **GROUP:** dinosaur
- **SIZE:** 7m long
- **FOOD:** plants
- **LIVED:** about 210 million years ago in the Early Jurassic in China



# SHANSISUCHUS

Crocodile-like *Shansisuchus* was a fearsome prehistoric carnivore.

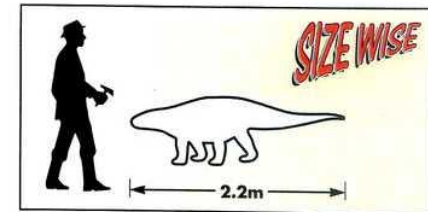
**H**uge meat-eaters, such as *Shansisuchus*, ruled the land many millions of years before the first dinosaurs appeared. They were members of the most successful group of reptiles ever – the archosaurs.

### LIFT OFF

The first archosaurs were the thecodonts. They appeared on Earth more than 250 million years ago. The first thecodonts were water-living reptiles that could only squirm along on land. They developed into creatures like *Shansisuchus*, which had strong, pillar-like legs for holding its bulky body off the ground.

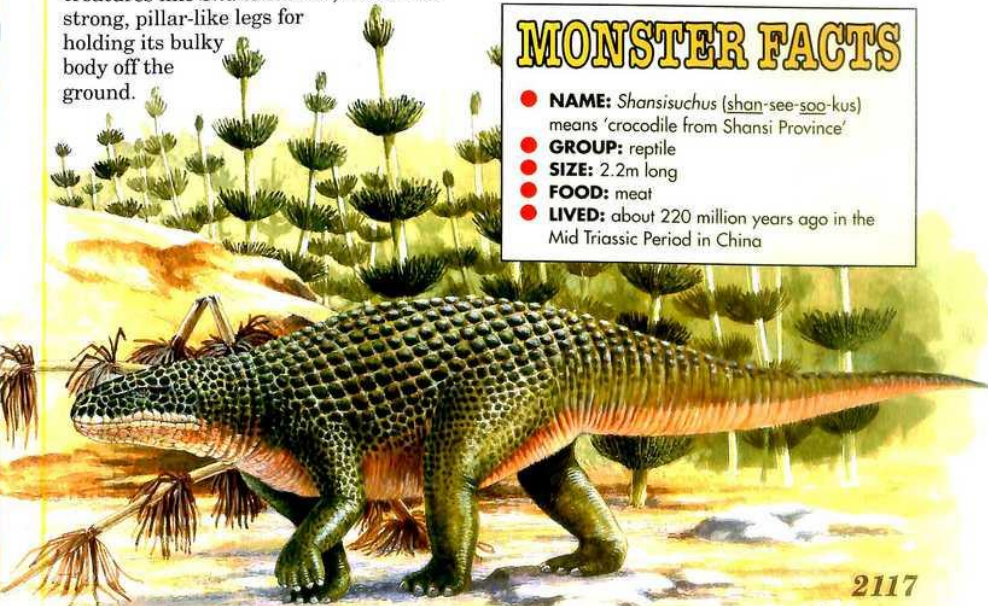
### FIERCE HUNTER

Like today's crocodiles, *Shansisuchus* was a fierce hunter, with well-developed, powerful jaws. *Shansisuchus* was not as fully upright as the dinosaurs when it walked, but it could probably move quite quickly for its size. It may well have fed on smaller, less agile reptiles.



## MONSTER FACTS

- **NAME:** *Shansisuchus* (shan-see-soo-kus) means 'crocodile from Shansi Province'
- **GROUP:** reptile
- **SIZE:** 2.2m long
- **FOOD:** meat
- **LIVED:** about 220 million years ago in the Mid Triassic Period in China





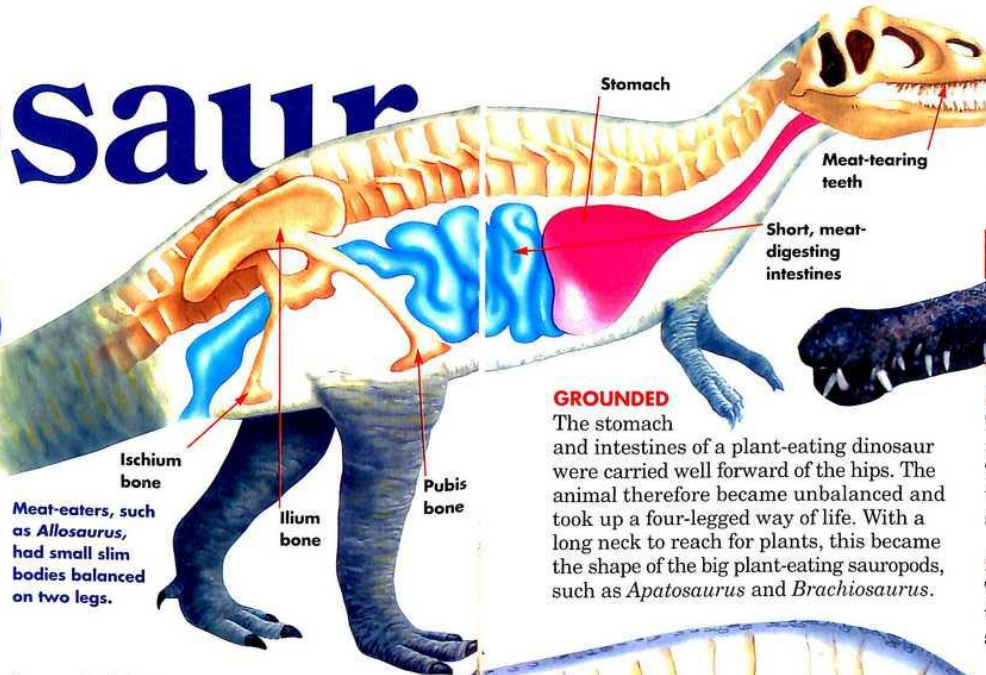
# Dinosaur diets

Have you ever wondered why some dinosaurs trotted about on two legs while others lumbered along on four? It is all to do with what they ate.

The earliest dinosaur was a meat-eater. It was a bit like a crocodile, but as its hind limbs were longer than its front ones, it walked about on two legs. This gives us the basic shape of the meat-eating dinosaur – the theropod – and these beasts, such as *T rex* and *Compsognathus*, existed throughout the age of the dinosaurs.



Birds have no teeth and so they cannot chew their food. Many birds that eat mostly plant food, such as turkeys and ostriches, swallow stones. These help to grind up the food in their stomachs.

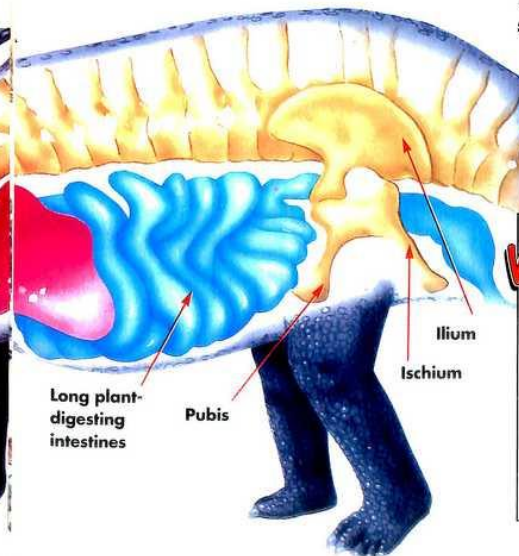


Meat-eaters, such as *Allosaurus*, had small slim bodies balanced on two legs.

Long-necked plant-eaters, such as *Diplodocus*, had big bodies supported on four legs.

### BIGGER PLANT-EATERS

Before long, some of the dinosaurs began to eat plants. Plant material requires a lot more digesting than meat. The stomach and intestines of a plant-eating animal are therefore much bigger than those of a meat-eater.



### GROUNDING

The stomach and intestines of a plant-eating dinosaur were carried well forward of the hips. The animal therefore became unbalanced and took up a four-legged way of life. With a long neck to reach for plants, this became the shape of the big plant-eating sauropods, such as *Apatosaurus* and *Brachiosaurus*.

A flesh-eating reptile such as the crocodile has long jaws with sharp teeth for tearing meat – just like the flesh-eating dinosaurs.



### AID TO DIGESTION

Tough plant material needs to be broken up thoroughly before it can be digested. That is why plant-eaters have to chew their food very well before it is in a suitable state to be swallowed.

### STOMACH CHURNING

The sauropods did not have the teeth or the jaws for chewing. They probably swallowed stones, as some of today's birds do. These stones would have churned about in the stomach, mashing up swallowed plant material and making it good and tender before the digestive juices got to work on it.

## What is?

### A LIZARD HIP

Both the theropod and the sauropod dinosaurs had the same arrangement of hip bones – an ilium bone along the top holding the main leg muscles, a pubis bone sticking down and forward, and an ischium bone pointing down and back. This is the same arrangement as found in a lizard today, and so the theropods and sauropods are together called the 'saurischia' – the lizard-hipped dinosaurs.



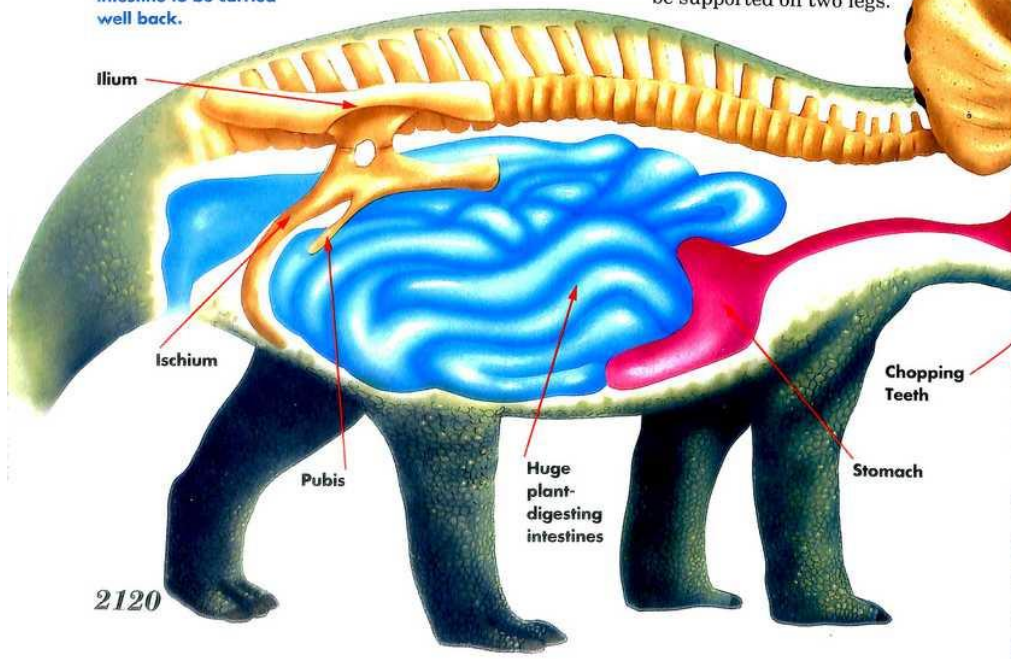
**POT BELLY**

Another type of plant-eating dinosaur developed a different-shaped hip bone. This had a big hollow underneath it which meant that the plant-eater's huge intestine could be carried well back. These dinosaurs could still walk on two legs, with the big pot-belly slung in between.

**BETTER EATING**

These animals developed a much more efficient chewing system. Their mouths had banks of grinding teeth and the rough surfaces of these teeth scraped past one another as the jaws opened and closed. This action shredded the plant material that they ate.

Horned dinosaurs such as *Triceratops* were four-footed creatures, despite the fact that the bird hip allowed the intestine to be carried well back.



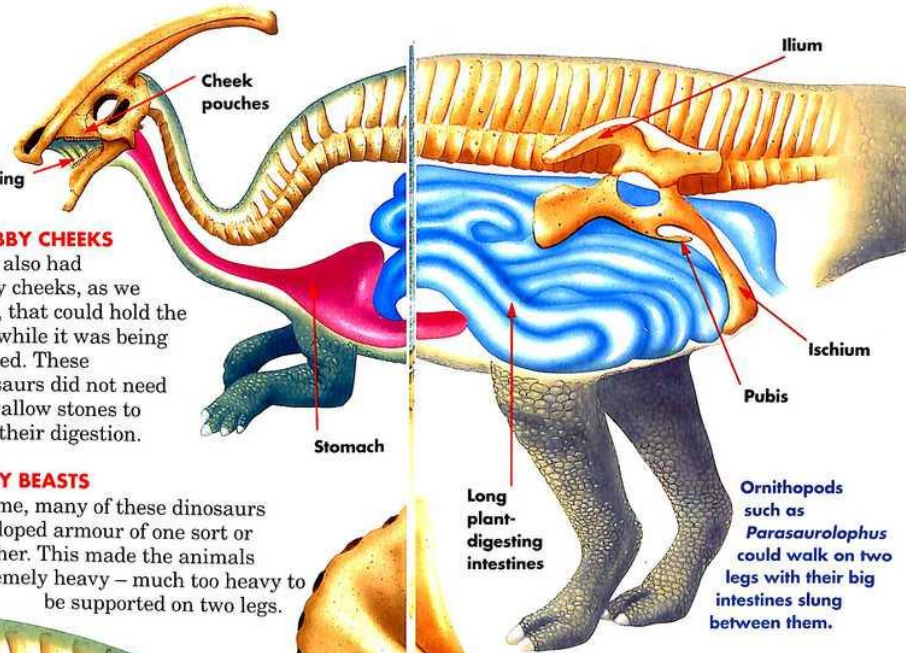
Grinding teeth

**CHUBBY CHEEKS**

They also had fleshy cheeks, as we have, that could hold the food while it was being chewed. These dinosaurs did not need to swallow stones to help their digestion.

**HEFTY BEASTS**

In time, many of these dinosaurs developed armour of one sort or another. This made the animals extremely heavy – much too heavy to be supported on two legs.



Long plant-digesting intestines

Ornithopods such as *Parasaurolophus* could walk on two legs with their big intestines slung between them.

**HEAVY LOAD**

Because they were so heavy, most armoured dinosaurs were four-legged. This was despite the fact that they had the kind of hip bone that allowed their large plant-eating guts to be carried well back in their bodies.

**WELL PROTECTED**

Many different types of dinosaur with armour evolved. These included horned dinosaurs such as *Styracosaurus*, and plated dinosaurs such as *Stegosaurus* and *Ankylosaurus*.

Chopping Teeth

Stomach

**What is? A BIRD HIP**

The ornithopods and the armoured and horned dinosaurs did not have lizard hips like the meat-eaters or the long-necked plant-eaters. The main difference was that the pubis bone, instead of sticking down and forward, was swept back and lay along the ischium bone. This left a big gap that could be filled with intestines. Birds have the same arrangement, and so the ornithopods and the armoured and horned dinosaurs are called the 'ornithischia' – the bird-hipped dinosaurs.

**CHOP CHOP**

Most of these armoured dinosaurs had teeth that worked like scissors, chopping up the food rather than grinding it. They also had cheek pouches to hold the food. They, too, did not swallow stones.



A plant-eating mammal, such as a cow, has muscular cheeks. Like the ornithopods and armoured dinosaurs, it can chew great mouthfuls at a time.



# GIANTS OF THE PAST

## ARSINOOTHERIUM

A young *Arsinoitherium* is struggling to scramble up the steep bank of a river in Oligocene North Africa. But it is pulled down again and again by the torrential rush of water. The water is not the only danger. On the other side of the river, two vicious-looking prehistoric crocodiles are slithering into the water, hoping for an easy meal. An adult *Arsinoitherium* desperately encourages the young one, but time is running out...

2122

2123



# 3-D Gallery 98

## TROODON

A ravenous *Troodon* charges a herd of *Orodromeus*. The peaceful plant-eaters scatter in panic. But they had better be fast on their feet - *Troodon* is a highly dangerous enemy. With its large, forward-facing eyes, it can locate its prey with deadly accuracy.





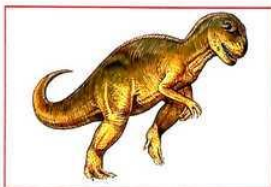
# Are **you** size-wise?

Dinosaurs came in all shapes and sizes. They ranged from giants that were taller than a house, to mini-dinosaurs no bigger than chickens.

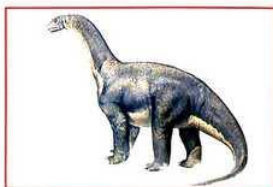
**T**here were many reasons for this great variety of size and shape. Smaller dinosaurs could move swiftly to escape predators. It was also easier for them to hide in the undergrowth or in cracks in rocks.

**BIG AND SLOW**  
Large dinosaurs had the advantage of size and weight. But they were also slow-moving and couldn't escape danger quickly. Small-brained sauropods were the biggest of all. They had long necks to help them reach leaves in high trees.

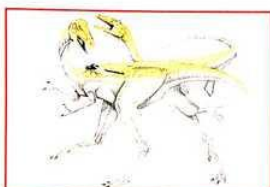
**QUIZ TIME**  
See how well you know your dinosaur sizes. The six dinosaurs below will help you to answer the questions posed in the quiz on the opposite page.



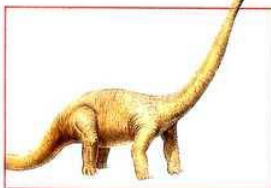
**ALLOSAURUS**  
LIVED: Late Jurassic  
FOOD: meat  
CLUE: a terrifying predator



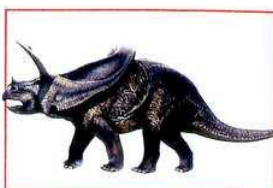
**CAMARASAURUS**  
LIVED: Late Jurassic  
FOOD: plants  
CLUE: look at its thick legs



**COMPSOGNATHUS**  
LIVED: Late Jurassic  
FOOD: meat  
CLUE: swift, birdlike predator



**MAMENCHISAURUS**  
LIVED: Late Jurassic  
FOOD: plants  
CLUE: a massive sauropod



**TOROSAURUS**  
LIVED: Late Cretaceous  
FOOD: plants  
CLUE: heavily armoured



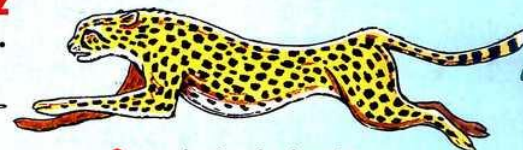
**TROODON**  
LIVED: Late Cretaceous  
FOOD: meat  
CLUE: quick thinker

## DINO-SIZE QUIZ

Which dinosaur...



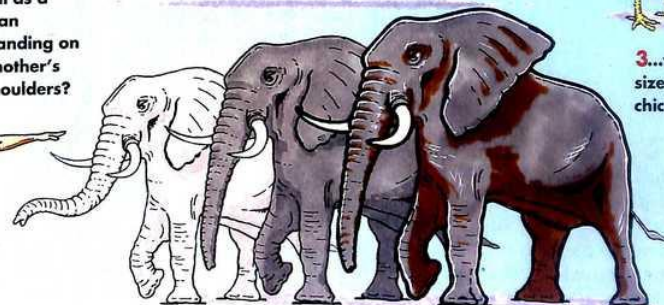
1...was as tall as a man standing on another's shoulders?



2...was the size of a cheetah?



3...was the size of a chicken?



4...weighed the same as three elephants?



6...had a neck longer than a coach?

5...had a head the size of a small car?



**ANSWERS:**  
1 A tall man standing on another man's shoulders would have been able to peer into *Allosaurus'* mouth.  
2 About the size of a cheetah, *Troodon* preyed upon small mammals and young or weak dinosaurs, which it could attack with lightning speed.  
3 About the size of today's chicken, *Compsognathus* was a swift bird-like predator, and one of the smallest dinosaurs.  
4 The giant *Camarasaurus* weighed up to 20 tonnes. This huge plant-eater needed legs as thick as tree trunks to support its massive body.  
5 Although *Torosaurus'* skull was about the size of a small car, it didn't have a very big brain to match.  
6 *Mamenchisaurus* had the longest neck of any animal that has ever lived. It stretched for 10m - almost half the dinosaur's entire length.





# Palaeontologist at work

If you think that a palaeontologist spends the whole day digging up dinosaur bones, think again.

Variety is definitely the spice of a palaeontologist's life. They teach, write, raise money, invent machinery, do research, travel, go on digs, mark exam papers and appear on television. And, if they are lucky, they might even find a dinosaur!

### WONDERFUL WORK

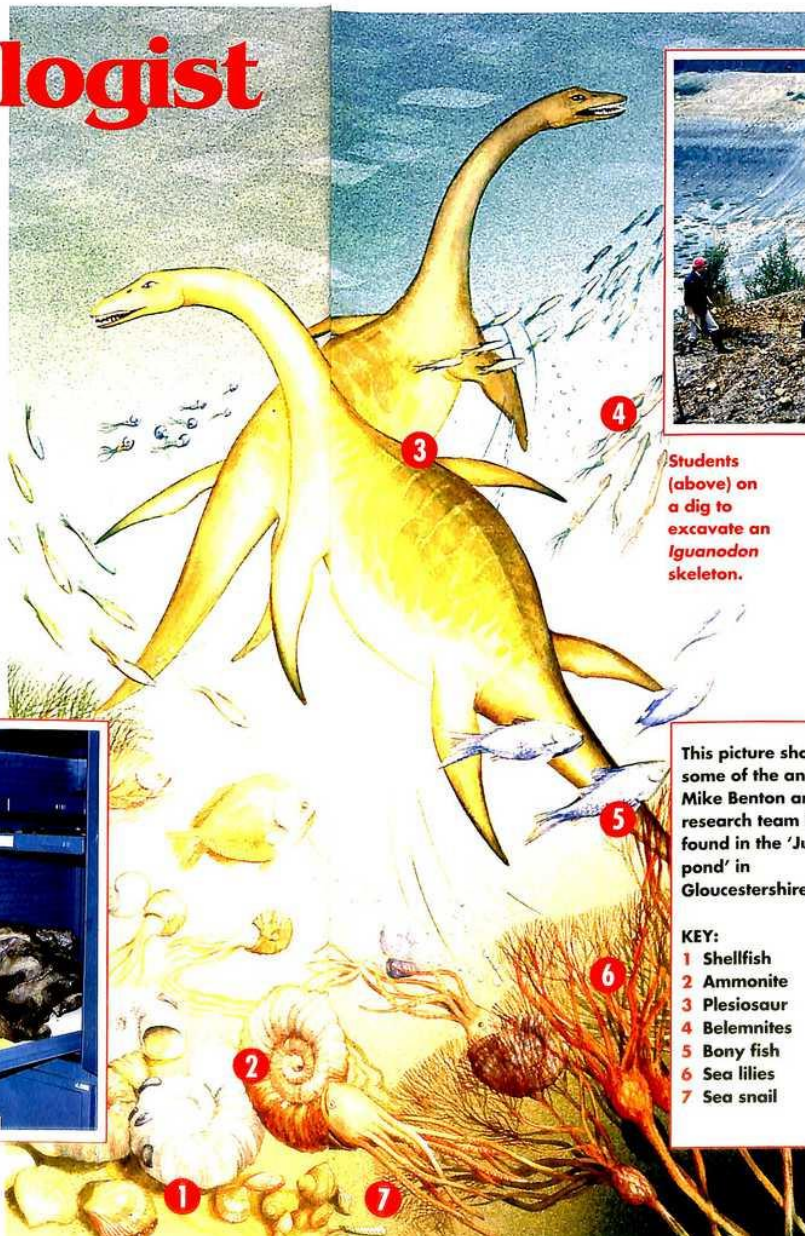
Mike Benton loves his work. He is a famous palaeontologist who teaches at the University of Bristol, in the south west of England. He is one of those fortunate people who do the work they've always wanted to.

### STARTING OUT

When he was seven, Mike read a little American paperback book called *The Golden Guide to Fossils*. 'I decided then that I wanted to be a palaeontologist,' he says. 'It's great, I learn all the time, and to be paid for something I enjoy so much is wonderful. It's still a very exciting field for me.'



Mike examines a hadrosaur skull (below) at the Royal Tyrrell Museum in Alberta, Canada.



Students (above) on a dig to excavate an *Iguanodon* skeleton.

### THRILLING FINDS

When Mike was a student he went on dinosaur digs in Alberta, Canada. The team he worked with found hadrosaurs, ceratopians and ankylosaurs. 'They were real dinosaurs! It's probably one of the most exciting things I've done,' says Mike. He also worked at the dig in Sussex, England, where *Baryonyx* was found.

### TEACHING TIME

Now, most of Mike's day during term time is spent teaching students at the university. He gives lectures about palaeontology and geology and, like all teachers, he has to do lots of marking, too.

### SITE WORK

Mike also oversees students who work on digs such as the 'Jurassic pond' in Gloucestershire, England. In the Jurassic there was a large area of water on this site. Scientists have found lots of different fossilized animals on the dig. They now have a good idea of what life was like there millions of years ago.

This picture shows some of the animals Mike Benton and his research team have found in the 'Jurassic pond' in Gloucestershire.

- KEY:
- 1 Shellfish
  - 2 Ammonite
  - 3 Plesiosaur
  - 4 Belemnites
  - 5 Bony fish
  - 6 Sea lilies
  - 7 Sea snail



**MAD LAB**

Mike and his students take fossils from the 'pond' back to a laboratory at Bristol University. It looks just like the lab of a cartoon mad scientist, with piles of rocks, fossils, and weird, whirring machines.

**MIKE'S MACHINES**

The research team sometimes invents machines. One looks like a giant food mixer. It is full of muddy water swirled round to act like a river. This shows how water wore down fossils millions of years ago. Another machine is a sifter with a water jet inside. This washes mud and sand away from fossil bones and teeth.

**DINO ART**

Mike often works with artists and photographers. The two reconstructions shown here were drawn by Pam Baldaro. Mike Benton briefed her on the fossils that were found, and then she drew pictures to show what life was like at these sites.

**PAPER CHASE**

Researching and writing scientific papers is all part of Mike's work. These papers are published in scientific journals. Mike has also written several children's books.

**FINDING AND FUNDING**

Finding new research projects for his students, and the money to pay for them, is another time-consuming part of Mike Benton's work. He tries to persuade scientific organisations to give money.

**KEEPING UP WITH THE BONES**

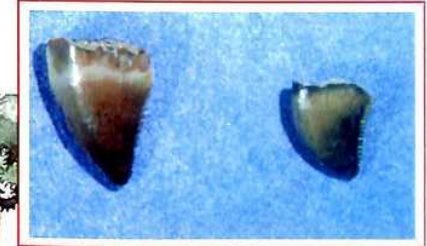
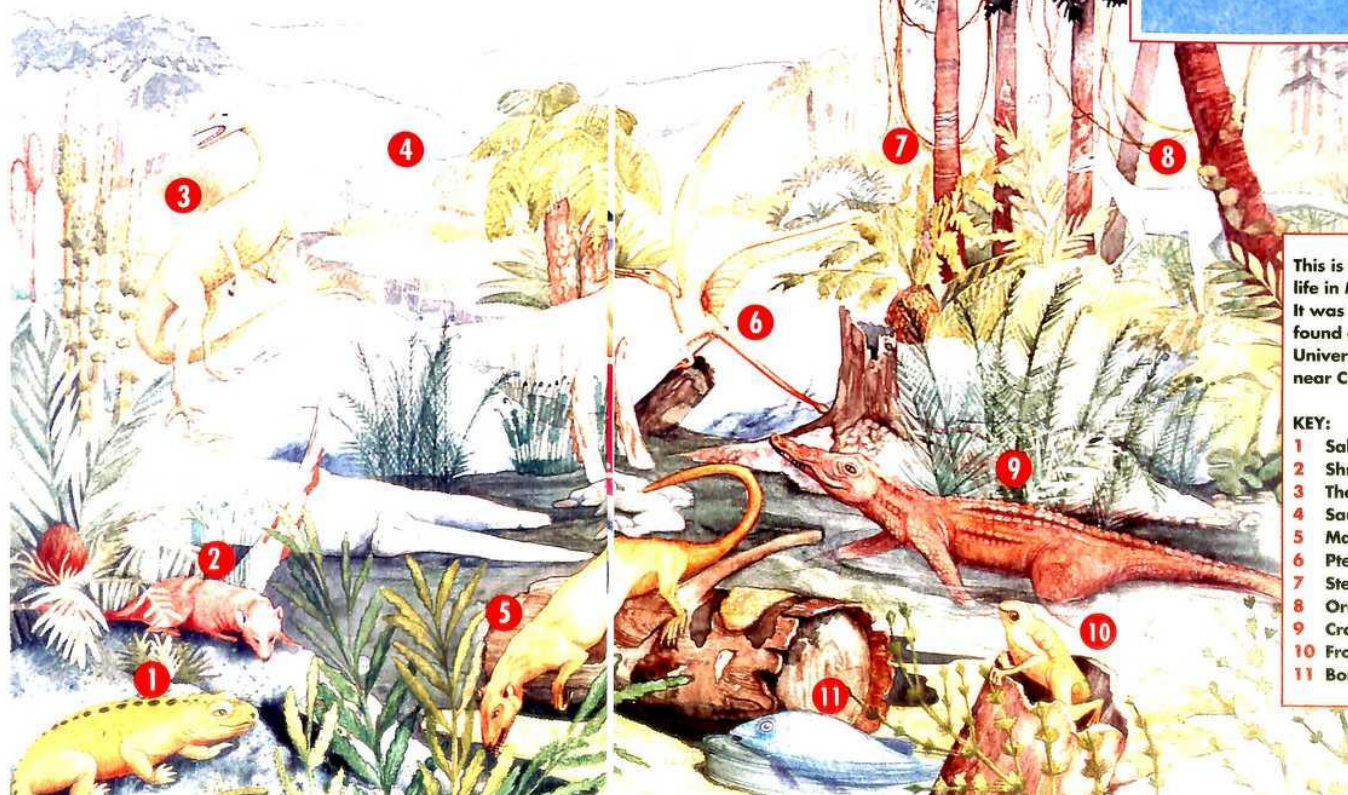
Mike has to keep up with new discoveries and research. He has just been to Russia to meet fellow scientists, and hopes his students will now be able to do field work there. He visited Romania, too, where there may be three or four birds almost as old as *Archaeopteryx* in one site. To keep up with other scientists' research, Mike has to read a mountain of books and papers.

**PICTURES OF THE PAST**

Mike has just added an important book of his own to the mountain. *The Fossil Record 2* is huge. It is a major work and sets down the entire fossil record of the world so far. Mike edited it and wrote some articles. Since the book was finished, he has been entering all the data into a computer and getting print-outs of the fossil records of all land and sea organisms.

**FIDDLING WITH BONES**

With all his other work, there's not much time left for 'fiddling with bones'. But Mike still wants to work on fossils like his incomplete skeleton of a rhynchosaur. 'I only have to find the time to write about it... I'm relishing the thought of that,' he says.



These two small dinosaur teeth (above) were found in the 'Jurassic pond' dig.

This is a reconstruction of life in Mid Jurassic England. It was based on fossils found on another University of Bristol dig, near Cheltenham.

- KEY:**
- 1 Salamander
  - 2 Shrew-like mammal
  - 3 Theropod
  - 4 Sauropod
  - 5 Mammal-like reptile
  - 6 Pterosaur
  - 7 Stegosaur
  - 8 Ornithopod
  - 9 Crocodile
  - 10 Frog
  - 11 Bony fish



# DRAGON BONES

IN 1913, BROTHER R. MERTENS, A GERMAN MISSIONARY WAS TRAVELLING IN THE SHANDONG PROVINCE OF CHINA WHEN HE STUMBLED UPON SOMETHING HE HAD NEVER SEEN BEFORE.

WHAT ON EARTH IS THIS?

BROTHER MERTENS HAD COME ACROSS SOME FOSSILIZED BONES, WHICH HE EXCAVATED AND CARRIED BACK TO THE MISSION STATION.

BROTHER MERTENS! WHAT ON EARTH ARE YOU CARRYING?

I DON'T KNOW. I FOUND THEM IN THE MOUNTAINS.

DRAGON BONES!

BUT THE FIND WAS NOT REPORTED TO ANY PALAEOLOGIST AND WAS SOON FORGOTTEN!

IN 1914, SWEDISH GEOLOGIST JOHANN GUNNAR ANDERSSON WAS HIRED BY THE CHINESE GEOLOGICAL SURVEY.

## CHINESE GEOLOGICAL SURVEY

GOODBYE JOHANN! WE'RE EXPECTING GREAT THINGS FROM YOU. NEW COAL MINE SITES AND ORE BEDS.

THANK YOU SIR. I'LL DO MY BEST.

I WONDER IF I'LL FIND ANY FOSSILS!

ANDERSSON TRAVELLED WIDELY IN CHINA, AND OFTEN STOPPED TO BUY MEDICAL SUPPLIES.

DO YOU WANT ANY DRAGON BONES, SIR? GOOD FOR TOOTHACHE, BACKACHE, EARACHE, HEADACHE...

DRAGON BONES! THESE ARE THE FOSSIL TEETH OF SOME EXTINCT ANIMAL.

WHERE DO YOU GET THEM FROM?

I BUY THEM, SIR. BUT I DO NOT KNOW WHERE THEY COME FROM.

AFTER SOME TIME, THE SOURCE OF THE DRAGON BONES WAS FOUND BY ANDERSSON'S ASSISTANT, OTTO ZDANSKY.

I KNOW THE PHARMACISTS GIVE YOU MINERS 300 YUAN. I'LL GIVE YOU 500.

500! OK.

ANDERSSON AND A CHINESE GEOLOGIST, H.C. T'AN, TRAVELLED BY RAILWAY, AND THEN CART TO THE SOURCE OF THE BONES.

ARE WE ALMOST THERE?

NOT FAR NOW.

THEY STARTED TO DIG NEAR THE VILLAGE OF NING CHIA KOU.

I THINK WE'D BETTER CALL IT A DAY FOR NOW.

NO! I THINK I'VE FOUND SOMETHING.

THEY TOOK THE FOSSILS THEY FOUND TO A NEARBY MISSION STATION.

WE FOUND THESE CLOSE BY.

THEY'RE JUST LIKE THE ONES BROTHER MERTENS FOUND SOME YEARS AGO. I'LL SEE IF I CAN FIND THEM!

NOW THEY TELL US!

BUT HELOPUS HAD ALREADY BEEN USED. SO, IN 1956, IT WAS RENAMED EUHELOPUS ZDANSKYI - 'ZDANSKY'S GOOD MARSH FOOT'. AND MANY CHINESE CONTINUE TO BELIEVE THAT ITS POWDERED BONES ARE GOOD FOR TOOTHACHE, BACKACHE, EARACHE, HEADACHE...

THE FOLLOWING YEAR, T'AN AND ZDANSKY RETURNED TO THE AREA AND FOUND SEVERAL BONES. JUST WHEN THEY HAD FINISHED WRAPPING THEM...

BANDITS! LEAVE THE BONES AND RUN FOR YOUR LIVES.

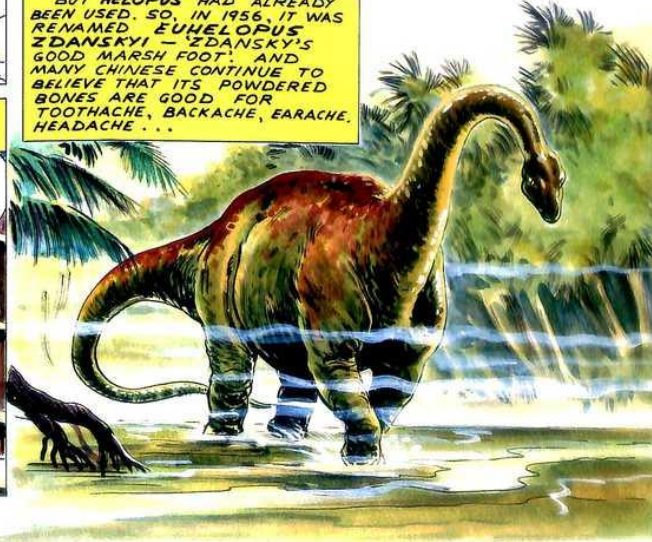
WHEN THE TWO MEN RETURNED TO THE SITE...

HAVE THEY DAMAGED THEM?

NO! THEY'VE JUST UNWRAPPED THEM AND LEFT THEM UNHARMED.

THE BONES WERE SENT TO SWEDEN FOR IDENTIFICATION.

THESE ARE DINOSAUR BONES. AND THIS BEAST HAD HUGE FEET! I SHALL CALL IT HELOPUS ZDANSKYI!





# FACT FILE

Improve and test your knowledge

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

**1** *Troodon's* large eyes were:  
a) on swivels  
b) forward-facing  
c) in the back of its head

**2** *Stegosaurus* was a:  
a) horned dinosaur  
b) bird dinosaur  
c) plated dinosaur

**5** *Lystrosaurus* was:  
a) a reptile-like mammal  
b) a mammal-like reptile  
c) a fish

**3** Palaeontologist Mike Benton teaches at the:  
a) Digalot Research Centre  
b) University of Bristol  
c) Bonesville Laboratory

**6** *Arsinoitherium* horns are made from:  
a) matted hair  
b) bone  
c) ivory

**4** *Yunnanosaurus* had teeth that were:  
a) self-sharpening  
b) rotten  
c) in double rows

**7** *Camarasaurus* weighed the same as:  
a) three elephants  
b) six sheep  
c) two hippos

**8** Which dinosaur had the most neck vertebrae?  
a) *Longosaurus*  
b) *Omeisaurus*  
c) *Mamenchisaurus*

## Foot pads

When a sauropod skeleton, such as *Diplodocus*, is mounted in a museum, it looks as if it is walking on its toes. When it was alive, the space under the heel would have been filled with a dense fibrous pad to support the weight, just as in an elephant's foot.

## Wrong way up

The down-curving tusks on the lower jaw of the extinct elephant, *Deinotherium*, look so odd that the first scientist to study them put the lower jaw on upside down.

## No angels

In the 19th century, the quarry workers who found the fossils of Devonian giant sea scorpions gave them the name 'seraphim'. This was because the leg bones reminded them of angels' wings.

## Swiss fish-eater



This *Ceresiosaurus* skeleton is an excellent example of one of the nothosaur fossils found in Monte San Giorgio in Switzerland. *Ceresiosaurus* was a marine reptile with a slim body and a long neck. It hunted for fishes in the Triassic seas.

**9** *Shansisuchus* was like:  
a) a crocodile  
b) an armadillo  
c) an alligator

**10** To help digestion, sauropods swallowed:  
a) milk  
b) stones  
c) fish oil

## What a mouthful

The sea reptiles called mosasaurs had lower jaws that were hinged in the middle. This meant that they must have been able to swallow prey bigger than their own heads, as snakes can today.

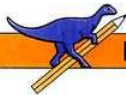
Answers to the questions on inside back cover

2135

**Loadsabones**  
A 1910 expedition to East Africa was so successful that it sent 250 tonnes of bones back to Berlin.

2134

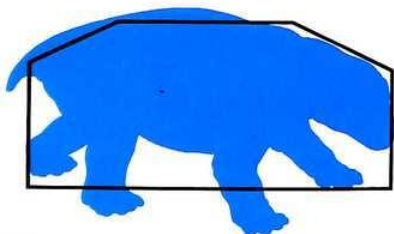




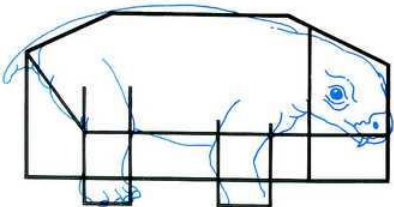
## HOW TO DRAW

# LYSTROSAURUS

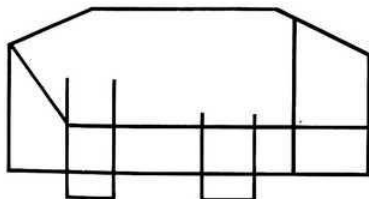
**1** Using straight lines, draw the basic shape of *Lystrosaurus* in pencil. It looks a bit like a house, with the roof sloping down slightly more on the right.



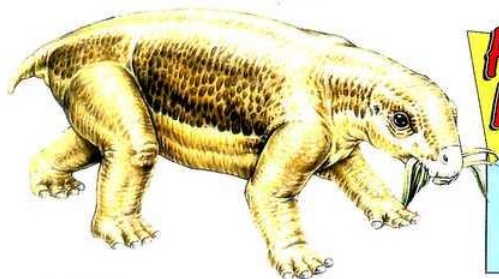
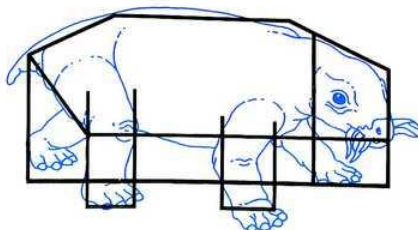
**3** Still working in pencil, start to add the detail. Keep to the guidelines you made in Steps 1 and 2. Don't press too hard, so that you can rub out any mistakes.



**2** Pencil in guidelines to give the proportions and positions of *Lystrosaurus*' head, body, tail and the two legs nearest to you.



**4** Finish your sketch by drawing the other two legs and completing the front right foot. Add any extra detail you like – perhaps *Lystrosaurus* is munching on a plant?



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### Fact box

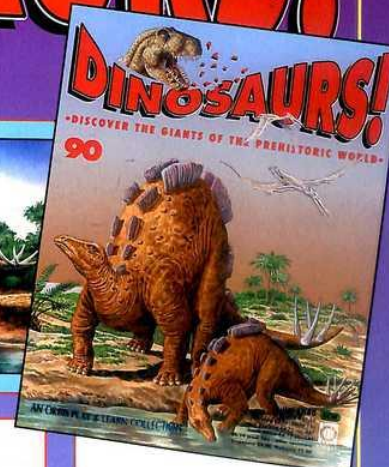
*Lystrosaurus* was a mammal-like reptile that lived all over the world.

- **NAME:** *Lystrosaurus* (ly-stro-saw-rus)
- **GROUP:** mammal-like reptile
- **SIZE:** up to 1.5m long
- **FOOD:** plants
- **LIVED:** worldwide in the Early Triassic

COMING IN PART 90 OF

# DINOSAURS!

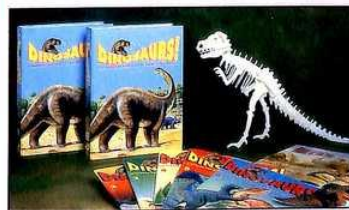
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Learn about dinosaur stamp collecting in **SPOTTER'S GUIDE** and **GIANTS OF THE PAST 3-D GALLERY HISTORY IN PICTURES**

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ANSWERS TO FACT FILE QUESTIONS: 1A, 2A, 3A, 4A, 5B, 6A, 7A, 8A, 9A, 10A



# ASK THE EXPERT



## What is a paramammal?

Paramammals could be described as 'the ancestors of mammals' or 'not quite mammals'. The term was first used many years ago by a British scientist called

Beverley Halstead.

It really refers to all the members of the mammal-like reptile, or synapsid, group. They were the ancestors of true mammals.

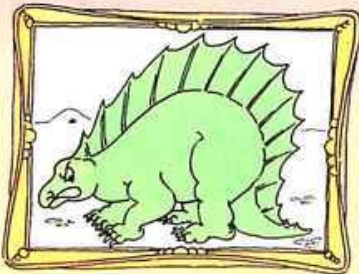
Many different creatures are included in the

paramammal group, from the ancient sail-backed reptiles known as pelycosaurs, such as

*Dimetrodon*, to the

dicyodonts, such as *Lystrosaurus*, and the cynodonts, such as *Cynognathus*.

Paramammals lived during the Late Carboniferous, through the Permian, up until the end of the Triassic Period. At the end of the Triassic, the first true mammals appeared and paramammals became extinct. 'Paramammal' is neither a very common, nor particularly scientific, name for the group – most palaeontologists refer to them as synapsids or mammal-like reptiles.



## Why does it take such a long time to name dinosaurs?

When new dinosaur discoveries are made, first the bones have to be shipped back to the laboratory. There, they are carefully cleaned (this can sometimes take years) and hardened, before being studied. Then, all the findings have to be written up as a scientific report, which is then published. The study, writing and publication may take two or three years. So, a great deal of work has to be done to make sure that the scientific conclusions are as accurate as possible, before a dinosaur is named.



## Which dinosaur had the most neck vertebrae?

This is probably *Mamenchisaurus*, the long-necked Chinese sauropod. One species had as many as 19 vertebrae, which is considerably more than the majority of sauropods, which tended to have between 12 and 16 vertebrae in the neck.

