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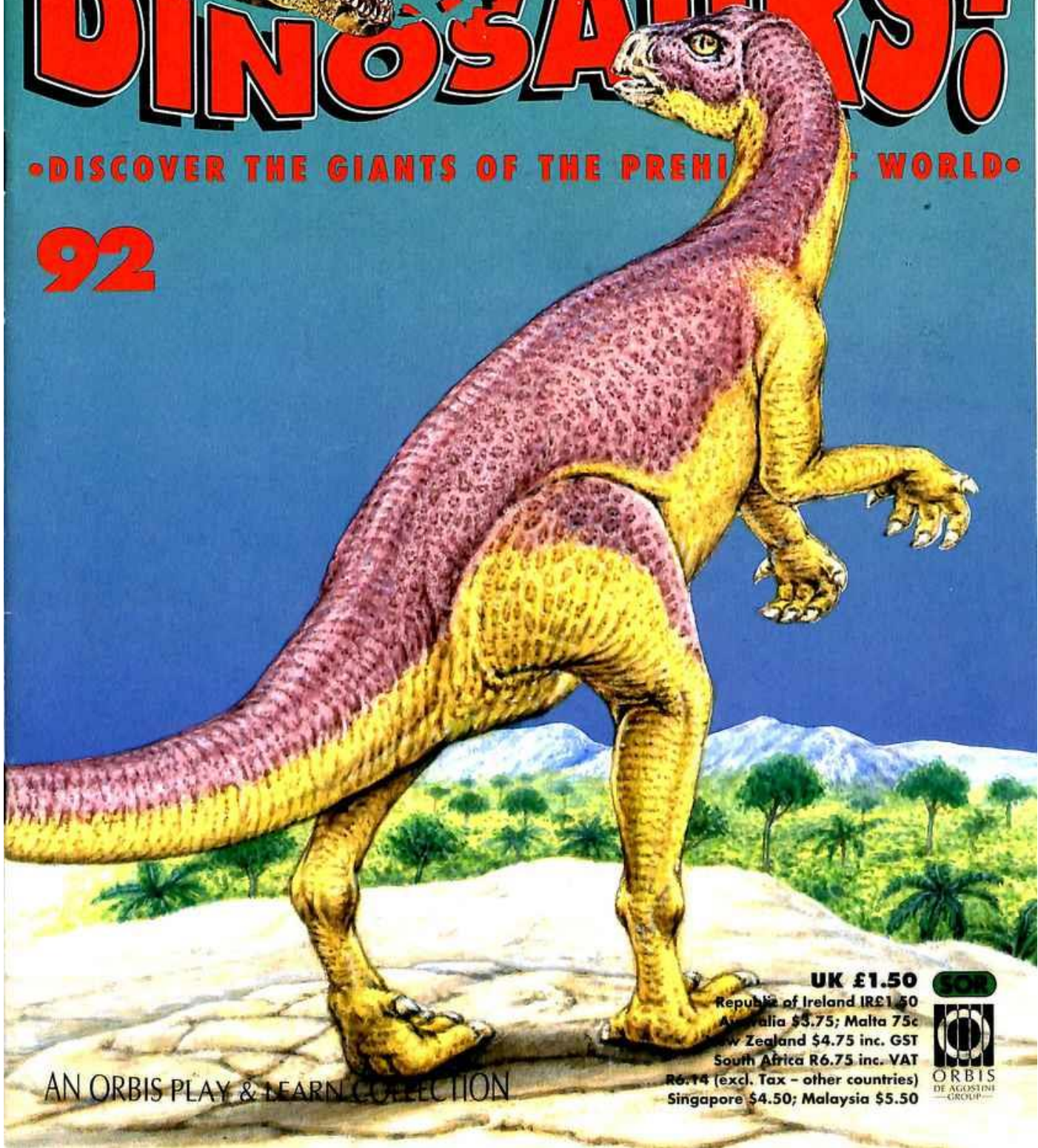
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DINOSAURS!

• DISCOVER THE GIANTS OF THE PREHISTORIC WORLD •

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DINOSAURS!

• DISCOVER THE GIANTS OF THE PREHISTORIC WORLD •



IDENTIKIT

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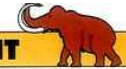
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IDENTIKIT



SYNDYOCERAS

Deer-like *Syndyoceras* had horns on its nose as well as on its head.



This remarkable animal belonged to a group of plant-eaters called the protoceratids. These looked like deer but were, in fact, more closely related to the camels.

BUMPS AND BRANCHES

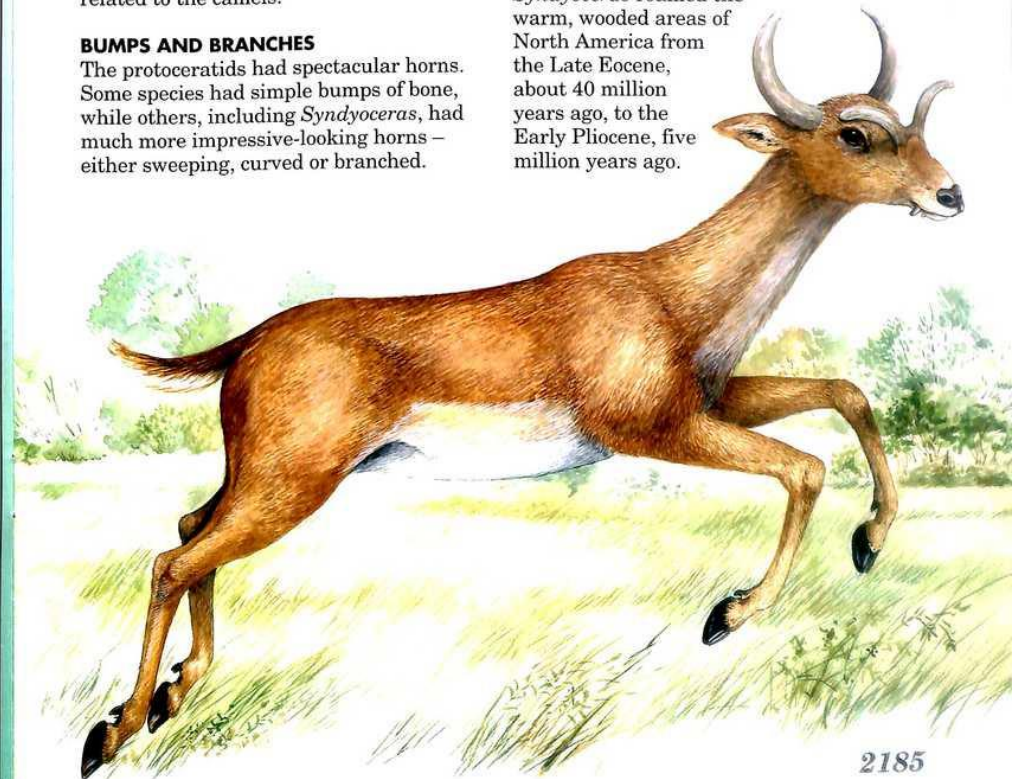
The protoceratids had spectacular horns. Some species had simple bumps of bone, while others, including *Syndyoceras*, had much more impressive-looking horns – either sweeping, curved or branched.

OVER AND OUT

Syndyoceras had two sets of horns. One pair of curved horns jutted upwards above the ears. Another, shorter pair forked outwards from the nose. The horns were made of bone and covered in skin, rather like the horns of today's giraffe.

WOOD DWELLING

Syndyoceras roamed the warm, wooded areas of North America from the Late Eocene, about 40 million years ago, to the Early Pliocene, five million years ago.



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DOUBLE TROUBLE

Syndyoceras probably moved about in a herd, just as deer do today. It is likely to have behaved in a similar way, too. Male *Syndyoceras* may have locked horns in trials of strength to determine who should become the leader of the herd and who should mate with the females. The horns could have inflicted a nasty wound, and the male who used his double set most effectively would have won the battle and become the new leader.

THEN AND NOW

The earliest protoceratids had front teeth at the top of their jaws, but *Syndyoceras* developed a more advanced way of feeding. It didn't have these front teeth, but instead chewed up tough plants and grass by pressing them into a pulp between a bony pad in its upper jaw and lower front teeth. Deer today feed in the same way.

ROOTS AND BRANCHES

Syndyoceras had another very useful eating aid. The prehistoric plant-eater was armed with a pair of canine tusks. These were similar to those of some small deer today. Experts believe that *Syndyoceras* could have used the tusks to root about in the ground when looking for juicy bulbs and shoots to eat.

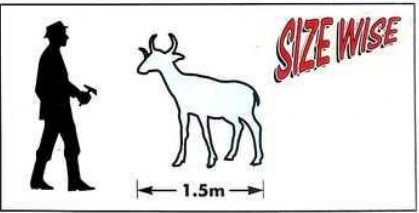
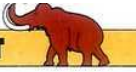
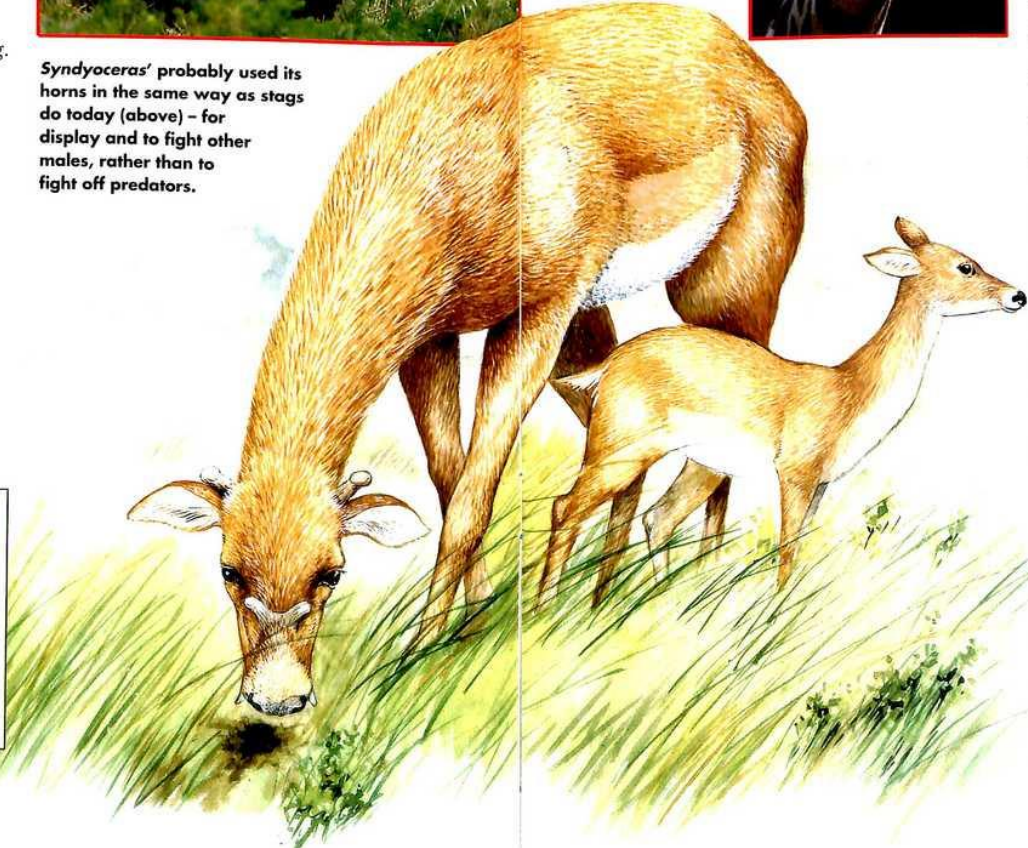
MONSTER FACTS

- **NAME:** *Syndyoceras* (sin-dee-oh-see-ras) means 'fused pair of horns'
- **GROUP:** mammal
- **SIZE:** 1.5m long
- **FOOD:** plants
- **LIVED:** about 40 million years ago in the Early Miocene Period in North America



Syndyoceras' horns were covered in skin, just like the horns of today's giraffe (right).

Syndyoceras' probably used its horns in the same way as stags do today (above) - for display and to fight other males, rather than to fight off predators.



QUICK GETAWAY

Today's deer are fast movers. They can sprint away if danger threatens and can often outrun a hungry predator. *Syndyoceras* probably also used speed as its main form of defence. Like a deer today, it had long, slim legs which were ideal for fast getaways.

ON ITS TOES

Another advantage that *Syndyoceras* had, was that it ran on its toes, just like today's deer, camels and llamas. This would increase its running speed.

EXTRA PROTECTION

Syndyoceras would have avoided battles with predators by running away. But if it was cornered, it could probably have inflicted a nasty wound on the attacker with its four sharp horns.

IT'S A FACT

MUZZLE PUZZLE

Syndyoceras' nose bones were similar to those of today's saiga antelope, whose muzzle is shaped like a small hump. Experts believe *Syndyoceras'* muzzle may have been the same humped shape.

XIAOSAURUS

Speedy *Xiaosaurus* may have sprinted as fast as today's gazelle.

This small, plant-eating dinosaur probably belonged to the hypsilophodontid family. These herbivores appeared in the Middle Jurassic Period, about 165 million years ago, and died out 66 million years later.

FAR OUT

Xiaosaurus were discovered in China, but were so successful that they could have spread across the world, using the land links that existed during the Middle Jurassic times.

MONSTER FACTS

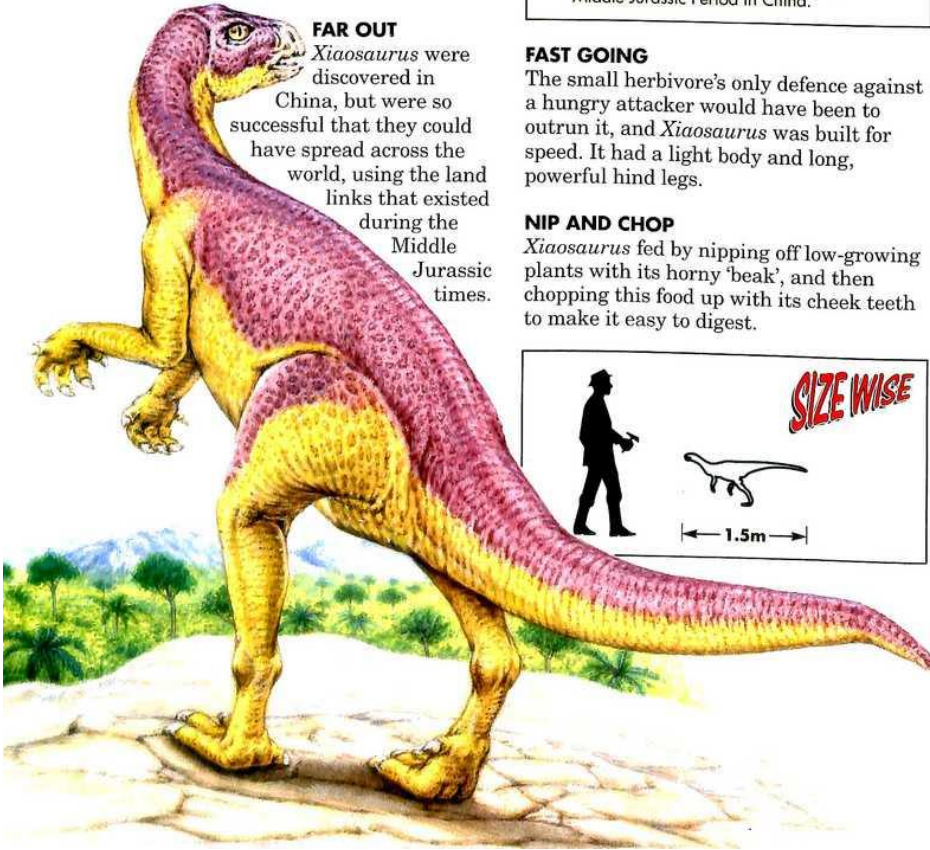
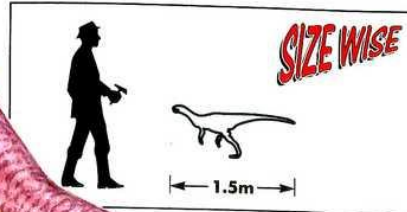
- **NAME:** *Xiaosaurus* (zhou-saw-rus) means 'small lizard'
- **GROUP:** dinosaur
- **SIZE:** about 1-1.5m long
- **FOOD:** plants
- **LIVED:** about 165 million years ago in the Middle Jurassic Period in China.

FAST GOING

The small herbivore's only defence against a hungry attacker would have been to outrun it, and *Xiaosaurus* was built for speed. It had a light body and long, powerful hind legs.

NIP AND CHOP

Xiaosaurus fed by nipping off low-growing plants with its horny 'beak', and then chopping this food up with its cheek teeth to make it easy to digest.



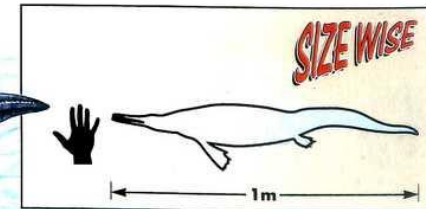
NANCHANGOSAURUS

Mysterious *Nanchangosaurus* swam through shallow seas about 230 million years ago.

The discovery of a fossil skeleton of *Nanchangosaurus* in China greatly excited and puzzled experts. It looked like a cross between the ichthyosaur *Ichthyosaurus*, the dolphin-like reptile, and the sharp-toothed placodont *Placodus*. Although it looked rather more like *Ichthyosaurus*, *Nanchangosaurus* had a row of protective bony knobs along its back, just like *Placodus*.

MONSTER FACTS

- **NAME:** *Nanchangosaurus* (nan-chan-gow-saw-rus) means 'reptile from the Nanchang region'
- **GROUP:** reptile
- **SIZE:** up to 1m long
- **FOOD:** fish
- **LIVED:** about 230 million years ago in the Middle Triassic Period in China

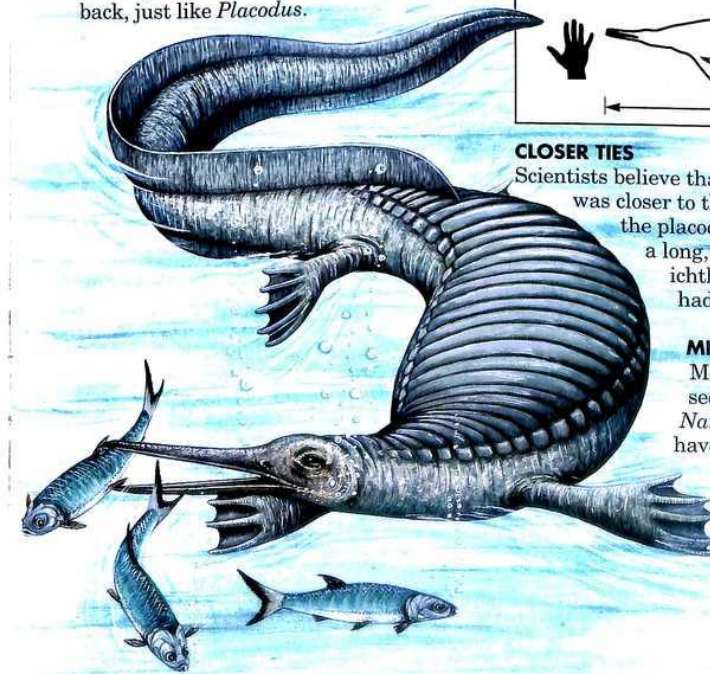


CLOSER TIES

Scientists believe that *Nanchangosaurus* was closer to the ichthyosaurs than the placodonts. The reptile had a long, slender snout like the ichthyosaurs, although it had no teeth.

MISSING LINK

Most experts now seem to think that *Nanchangosaurus* could have been a link between the earliest ruling reptiles and the ichthyosaurs.




Could dinosaurs survive today?



Daspletosaurus

survive today?

If dinosaurs were brought back to life, could they live in today's habitats and compete successfully with today's animals?

 Imagine 'Jurassic Park' was for real and some dinosaurs escaped into the wild today. Would they survive? Let's put a few different species of dinosaur on to the African savannah today and see how they get on! Our expert knowledge, built up from studying fossil remains, will tell us how the dinosaurs are likely to behave in these surroundings.

NICE AND WARM

The African savannah is hot and dry for most of the year. The heat would suit most dinosaurs, as the world during the Age of the Dinosaurs was generally hotter than it is today. So the climate shouldn't be a problem for our 20th-century dinosaurs.

GRASS? WHAT IS GRASS?

But plant-eating dinosaurs would face an immediate problem. No dinosaurs ever ate grass because it evolved less than 30 million years ago. Tough, dry grass stems need a lot of chewing, and most dinosaurs will not have the right teeth for the job.

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How would today's rhinos and lions on the African savannah cope with dinosaurs? Would they be wiped out by the prehistoric interlopers?



Oviraptor



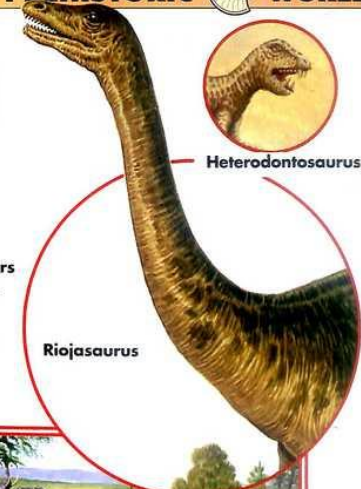
Ouranosaurus



Montanoceratops



Heterodontosaurus

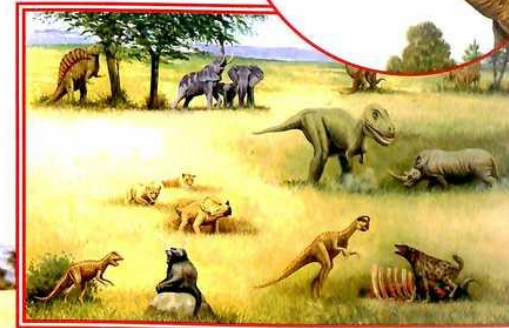


Riojasaurus

WHAT ABOUT THE COMPETITION?

It's easy to think that the powerful meat-eating dinosaurs would quickly make mincemeat of their rivals today. But think again! Dinosaurs would probably have quite a struggle competing with today's quick-thinking and fast-moving mammals. On the following pages you can see how our team of dinosaurs survives on the savannah.

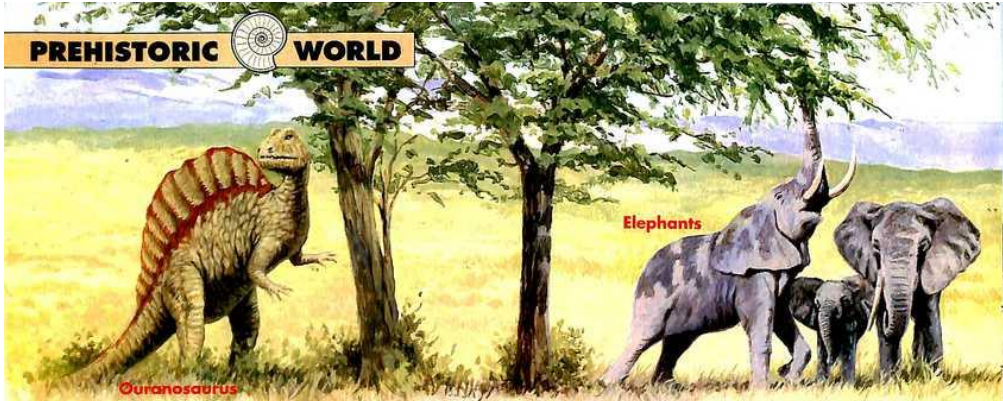
Meet the six daring dinosaurs (far left, above and right) that are going to take part in our African experiment.



What is? PALEOECOLOGY

It is the ecology of prehistoric times. Ecology studies how animals and plants fit together and into the surroundings. It looks at where things live, what they eat, who eats them, and the temperature, rainfall and other conditions that suit them best. Paleocology means using fossils and other clues about the past to rebuild the ecology of ancient times. It helps us to imagine the daily lives of dinosaurs, and how they fitted in with other animals and plants in their prehistoric world.

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Ouranosaurus

Elephants

OURANOSAURUS AND ELEPHANTS

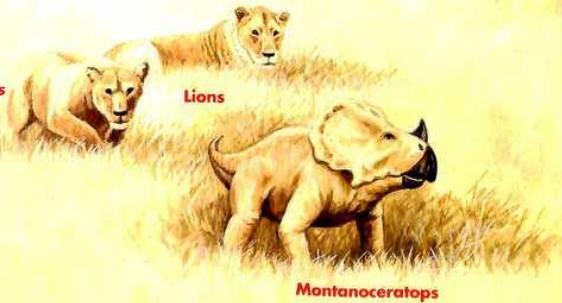
The heat at midday can be scorching. Animals jostle for the shade of the few trees. The elephants wave their huge ears to lose heat. *Ouranosaurus* uses its sail like a radiator, to give off heat from its body. At least this dinosaur would have no problem coping with the weather. Its problem would be finding enough to eat. Grass might not suit a dinosaur used to eating conifer branches.

MONTANOCERATOPS AND LIONS

The top predators of the African grassland are the big cats. These lions are stalking *Montanoceratops*. This dinosaur is about as big as a wart-hog and is used to dryness and heat. But it does not have the keen senses of the zebras, antelopes and other herbivores around. Nor can it outrun a charging lioness. Even its scaly skin will not save it.

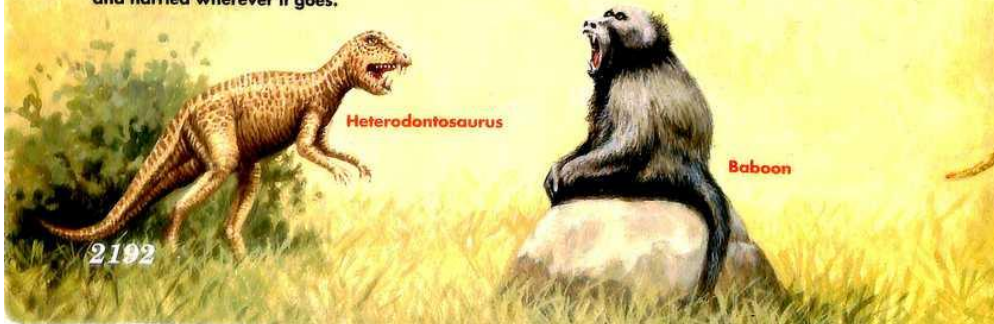
HETERODONTOSAURUS AND BABOONS

A baboon objects to *Heterodontosaurus* appearing on its territory. The baboon and the dinosaur eat similar foods - leaves, fruit, stems, insects and other small animals. *Heterodontosaurus* threateningly curls back its lip to reveal large, pointed canine teeth. The baboon does the same! Baboons work in a team dozens strong. *Heterodontosaurus* will be hassled and harried wherever it goes.



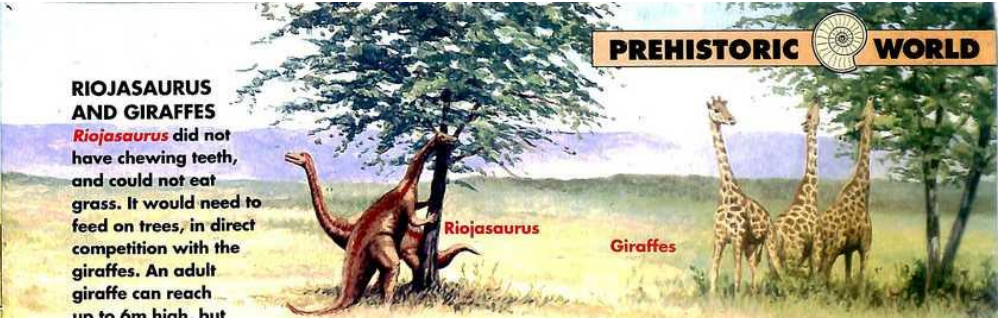
Lions

Montanoceratops



Heterodontosaurus

Baboon



RIOJASAURUS AND GIRAFFES

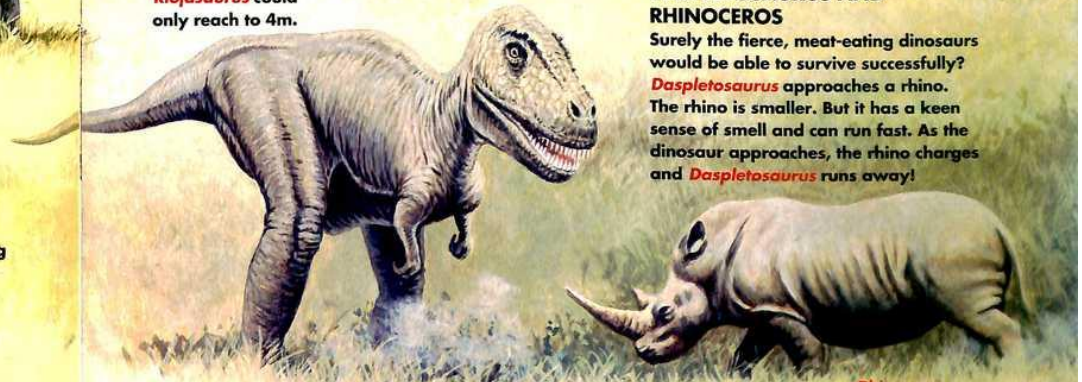
Riojasaurus did not have chewing teeth, and could not eat grass. It would need to feed on trees, in direct competition with the giraffes. An adult giraffe can reach up to 6m high, but *Riojasaurus* could only reach to 4m.

Riojasaurus

Giraffes

DASPLETOSAURUS AND RHINOCEROS

Surely the fierce, meat-eating dinosaurs would be able to survive successfully? *Daspletosaurus* approaches a rhino. The rhino is smaller. But it has a keen sense of smell and can run fast. As the dinosaur approaches, the rhino charges and *Daspletosaurus* runs away!

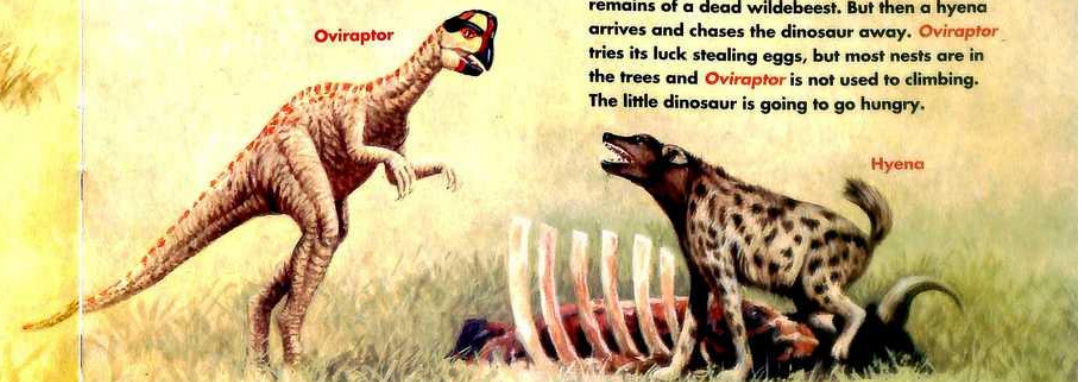


Daspletosaurus

Rhinoceros

OVIRAPTOR AND HYENA

Oviraptor is doing well, scavenging on the remains of a dead wildebeest. But then a hyena arrives and chases the dinosaur away. *Oviraptor* tries its luck stealing eggs, but most nests are in the trees and *Oviraptor* is not used to climbing. The little dinosaur is going to go hungry.



Oviraptor

Hyena

GIANTS OF THE PAST

A herd of *Syndyoceras* is peacefully grazing on the North American plains of the Late Eocene. Suddenly, the tranquil scene is shattered as two male *Syndyoceras* charge at one another. The battle for the supremacy of the herd commences. But the contest will soon be over – one lunge from a sharp horn can inflict a nasty wound, and the victim will quickly give up the fight. The rest of the herd look on to see who will be their new leader.

SYNDYOCERAS



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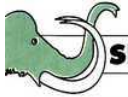
3-D Gallery

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APATOSAURUS



A herd of *Apatosaurus* has spotted some juicy plants and is making its way down a steep mountain slope to reach them. In its eagerness to feed, one *Apatosaurus* slips, crashing into the others. The impact of this 20-tonne creature is enormous, setting off a huge dinosaur avalanche as the entire herd plummets to certain death.



Flights of fancy

Millions of years ago, small furry mammals floated and flew from tree to tree in search of food.

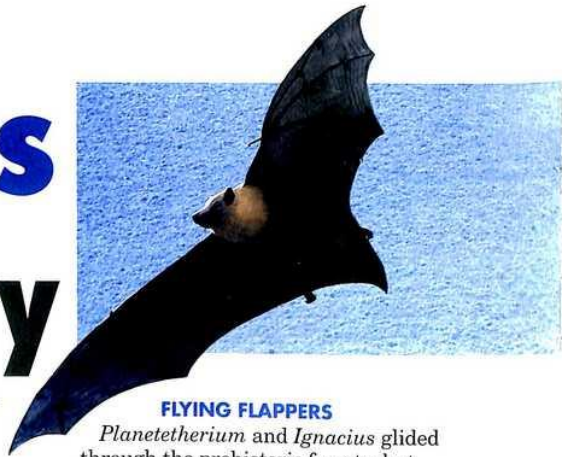
Prehistoric flying mammals, known as 'skin wings', were divided into two main groups. There were those which glided through the air, snapping at their prey as they went. And there were the bats, which could flap their wings and fly through the sky.

SAILING ALONG

Only a few gliding mammals survive today. They include the colugos of South East Asia. Colugos have a furry web of skin that stretches from their front legs to their tails, to help them ride air currents.

LITTLE CHANGE

A squirrel-like 'skin wing' called *Planetetherium* probably glided through forests 50 million years ago. But until a perfectly preserved 'skin wing' skull was found, scientists did not know for certain that such 'skin wings' really did glide. This skull belonged to *Ignacius*. The arrangement of certain bones inside its head is identical to those in a colugo today.



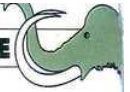
One of the earliest megabats (large fruit-eating bats) was probably *Archaeopteropus* (left). It lived in the Early Oligocene and had a 1m wingspan.

Archaeopteropus was very similar to today's megabats, such as the Indian flying fox bat (above right) and the South African yellow fruit bat (right).

FLYING FLAPPERS

Planetetherium and *Ignacius* glided through the prehistoric forests, but another group of early 'skin wings' could fly as well as birds. They were bats. Just like today's bats, they could flap their wings and chase after insects.

Planetetherium soared through the air just like today's colugos (also known as flying lemurs). Like colugos, it steered itself by moving its webs of skin with its fingers.



NOW AND THEN

The first bats hunted at night and slept during the day, just as their descendants still do. Living bats fall into two groups – the microbats and the megabats. *Icaronycteris* was the first known bat, and it was almost identical to the insect-eating microbats of today. It was about the same size as today's mouse-eared bat, *Myotis*. Insect-eating *Icaronycteris* lived in the Early Eocene Period, 55 million years ago. Like today's bats, *Icaronycteris* had a light, furry body, and large wings made from skin stretched over long finger bones.

FRUIT-EATERS

The megabats are the large, fruit-eating bats of the Old World tropics. Their fox-like faces have earned them the name 'flying foxes'. Unlike microbats, fruit bats do not have big ears or outgrowths on their noses. And since soft fruit is a large part of their diet, most fruit bats also have smaller teeth. The earliest megabat fossil may have been *Archaeopteropus*, from the Early Oligocene.



Is it true

that *Icaronycteris* hunted using its own natural radar system?

Yes. *Icaronycteris* fossils contain evidence that prehistoric bats were able to pick up the special high-pitched squeaks that today's bats make. The reason they make these squeaks is to detect their prey in the darkness. The system is called echolocation, and it works rather like radar. The squeaks a bat makes bounce off objects in its path, so it can locate prey when it is too dark to see.

Warm- or cold-blooded dinosaurs?

Were some dinosaurs warm-blooded? Studying today's warm-blooded and cold-blooded animals may help us to make up our minds.

Let's look at today's cold-blooded lizard and an active, warm-blooded bird. What is the difference in lifestyle between a lizard and a parrot? How do they compare with the lifestyles of dinosaurs?

A LIFE IN THE SUN

When a lizard wakes in the morning, it is slow. Its body is cold, because it has cooled down in the night. Slowly, it crawls on to a rock to bask in the sun. The sun heats it up. The warmer the lizard becomes, the more active it is. Soon it can move fast enough to hunt for insects. By midday it has eaten, but now the sun has heated the lizard's body so much that it cannot function well. The lizard rests in the shade to cool off. It may hunt again in the afternoon, but at night its body becomes too cold to be active.

IT'S ALL GO

The parrot, on the other hand, has been able to keep its body warm in the night. It can start to feed as soon as it wakes. The heat of the midday sun does not worry it too much because its body can stay at the same temperature. The parrot is able to make its own heat and to keep itself cool. So the bird can eat all day long.

TEMPERATURE CONTROL

The main difference between the two animals is that the lizard's body temperature goes up and down depending on the outside temperature, while the parrot's body temperature remains the same all the time. We say that the lizard has a poikilothermic metabolism and the parrot has a homiothermic metabolism.



Today's cold-blooded frilled lizard (left) uses its frill to heat up its body.

Perhaps a dinosaur such as *Struthiomimus* (below) had a similar lifestyle to today's warm-blooded emu (right).



DINOSAURS — COLD...

So, were the dinosaurs cold- or warm-blooded? When dinosaurs were first discovered, everybody realised that they were reptiles. As today's reptiles are cold-blooded, experts believed that dinosaurs must have been cold-blooded, too. This wasn't questioned and was the widely held view until relatively recently.

FOOD FOR ENERGY

These big words are much too clumsy to use all the time. Instead, we often say that the lizard – along with every other reptile and amphibian – is cold-blooded, while the parrot – along with every other bird and mammal (including ourselves) – is warm-blooded. To keep the body at the same temperature for the whole day takes a lot of energy. To find this energy, a bird must eat about 10 times as much food as a lizard of the same size. For this reason, the lifestyles of cold-blooded and warm-blooded animals are quite different.

...OR HOT?

Then, in 1964, John Ostrom of Yale University, in the USA, found the first skeleton of the big-clawed dinosaur *Deinonychus*. He noticed that the skeleton was very like the skeleton of a bird. He wondered if it might have had the lifestyle of a bird as well. Indeed, could the animal have been warm-blooded? His unusual idea led to great discussions among scientists.



The cold-blooded chameleon moves slowly, sometimes staying motionless for hours.



Plant-eating *Diplodocus* may have been closer to cold-blooded animals.



Was meat-eating *Struthiomimus* closer to warm-blooded animals?



A warm-blooded bird, such as this parrot, can keep active all day.



Would a feathered *Velociraptor* have looked like this?

ALL WARM-BLOODED?

One of Ostrom's colleagues, Robert Bakker, was very taken with the warm-blooded theory. He knew that warm-blooded animals needed more food than cold-blooded animals. Bakker counted the numbers of dinosaurs in different areas and found there were many more plant-eaters. He came to the conclusion that there would have been enough plant-eaters to provide food for meat-eaters. He even went as far as saying plant-eaters were warm-blooded, too.

NO! NO! NO!

Other scientists thought this was nonsense. How could a creature as big as *Apatosaurus*, with its tiny head and long neck, possibly eat enough to support a warm-blooded body? Anyway, climates during dinosaur times were very even. As there were no great temperature changes, cold-blooded animals could have remained active all the time.

TOO BIG TO GET COLD

Some scientists believed that the bodies of large dinosaurs were so big that, once the animal had warmed up, it would have taken a very long time to cool down again. After a cold night, the dinosaur's body would still have been warm enough from the previous day to keep it active.

HEATED DEBATE

Since then, scientists have argued fiercely on the subject. Some have even suggested that dinosaurs were covered in feathers or fur.

THE STUFF OF BONES

However, scientists can now study dinosaur bones in detail. Some chemicals laid down in the bones depend on the temperature of an animal's body. A recent study of *Tyrannosaurus rex* bones showed that, in life, the legs and feet were the same temperature as the rest of the body. This only happens in warm-blooded animals.

FAST DEVELOPMENTS

Scientists can also look at how the bones grew. Usually, warm-blooded animals grow fast during childhood, then stay about the same size. A cold-blooded animal grows at the same rate throughout its life.

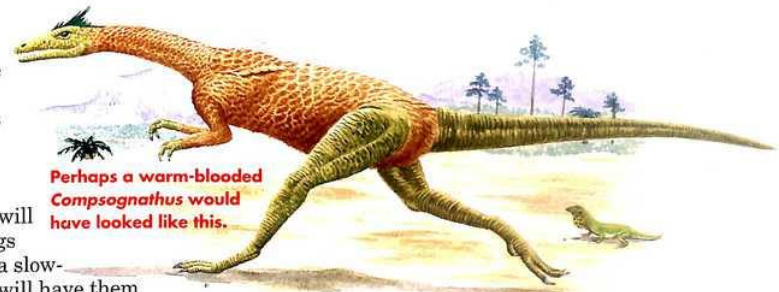


Some scientists believe that dinosaurs were covered in feathers or fur. This is an artist's impression of what *Coelophysis* would look like with and without feathers.

GROWING BONES

If you cut a bone across, you can see growth rings in it, rather like those in a tree trunk. A fast-growing animal will have growth rings far apart, while a slow-growing animal will have them close together. What do dinosaur bones tell us about how quickly dinosaurs grew? The result is something of a

surprise. One expert, Dr Anusuya Chinsamy, found that some dinosaur bones suggest one thing, while others suggest another!



Perhaps a warm-blooded *Compsognathus* would have looked like this.

A BIT OF BOTH

It looks as if all the scientists may have been wrong. What we would call cold-blooded and warm-blooded are just two ends of a scale. The dinosaurs come somewhere in between. The meat-eating dinosaurs, for example, *T rex*, *Struthiomimus*, *Deinonychus* and *Velociraptor*, lie close to the warm-blooded end of the scale. The big plant-eaters, such as *Apatosaurus*, *Diplodocus* and *Brachiosaurus*, lie close to the cold-blooded end of the scale.

ONGOING ARGUMENT

This, however, is not the last word on the subject. You can be sure that scientists will be arguing about this for a long time yet!

Is it true that cold-blooded means cold and warm-blooded means warm?

No. These are misleading terms. The proper name for cold-blooded is poikilothermic, and means that an animal's body changes its temperature according to the temperature of its surroundings. The proper name for warm-blooded is homeothermic, and means that an animal's body can stay at the same temperature, whatever the conditions outside.



DYING FOR A DRINK



120 MILLION YEARS AGO, IN PART OF THE LANDMASS THAT IS NOW NORTHERN EUROPE...

THE LITTLE MAMMALS THAT LIVE ALONGSIDE THE DINOSAURS AND PREDATORY MEAT-EATERS DO WHAT THEY CAN TO KEEP OUT OF THEIR WAY, SO THEY COME TO DRINK WHEN IT IS NOT QUITE LIGHT.



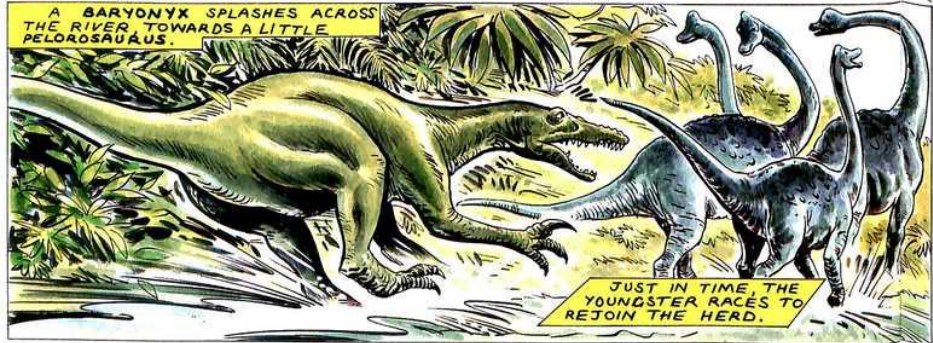
BUT EVEN THEN, IT IS NOT ALWAYS SAFE.



A HERD OF PELOROSAURUS AMBLE UP TO THE RIVER FOR A DRINK. THERE THEY ARE JOINED ON THE BANK BY AN IGUANODON.

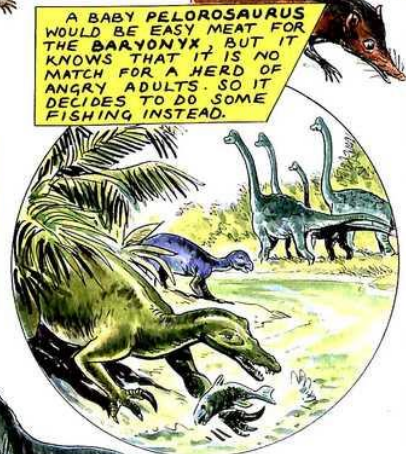


WHEN THEY HAVE DRUNK THEIR FILL, MOST OF THE PELOROSAURUS TRUNDLE BACK TO THEIR FEEDING GROUND. NEARBY, SUDDENLY, THE PEACE IS SHATTERED...

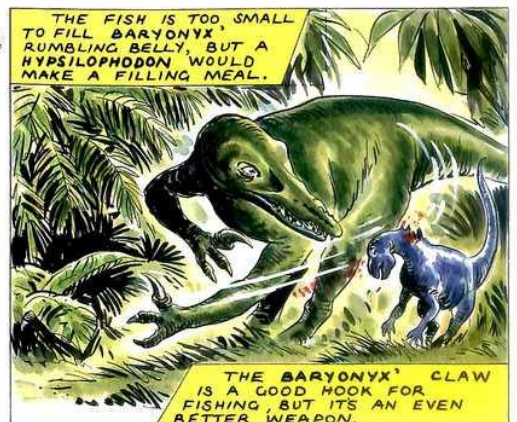


A BARYONYX SPLASHES ACROSS THE RIVER TOWARDS A LITTLE PELOROSAURUS.

JUST IN TIME THE YOUNGSTER RACES TO REJOIN THE HERD.

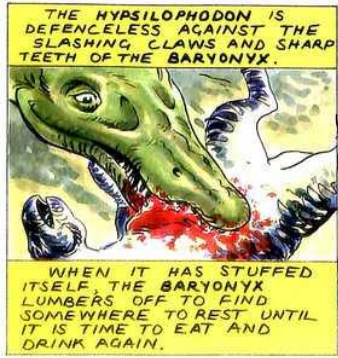


A BABY PELOROSAURUS WOULD BE EASY MEAT FOR THE BARYONYX, BUT IT KNOWS THAT IT IS NO MATCH FOR A HERD OF ANGRY ADULTS. SO IT DECIDES TO DO SOME FISHING INSTEAD.



THE FISH IS TOO SMALL TO FILL BARYONYX'S RUMBLING BELLY, BUT A HYSILOPHODON WOULD MAKE A FILLING MEAL.

THE BARYONYX' CLAW IS A GOOD HOOK FOR FISHING, BUT IT'S AN EVEN BETTER WEAPON.



THE HYSILOPHODON IS DEFENCELESS AGAINST THE SLASHING CLAWS AND SHARP TEETH OF THE BARYONYX.

WHEN IT HAS STUFFED ITSELF, THE BARYONYX LUMBERS OFF TO FIND SOMEWHERE TO REST UNTIL IT IS TIME TO EAT AND DRINK AGAIN.



LATER IN THE DAY THE IGUANODON AND PELOROSAURUS RETURN TO DRINK. BEFORE THEY TOO, GO TO FIND A SAFE PLACE TO SPEND THE NIGHT...



... AND AS THE LIGHT FADES AND THE DINOSAURS LEAVE THE RIVER THE LITTLE MAMMALS DART OUT OF THE UNDERGROWTH, KNOWING THAT IT IS SAFE FOR THEM TO COME OUT AGAIN.

Improve and test your knowledge with... FACT FILE

Fascinating facts to read and 10 fun questions to answer!

1 Prehistoric flying mammals are known as:
a) 'skin wings'
b) 'thin wings'
c) 'soaruses'

2 Small, plant-eating *Xiaosaurus* had a horny:
a) foot
b) beak
c) claw

3 Dinosaurs may have had dust baths to:
a) sharpen their claws
b) hide from enemies
c) remove skin parasites

4 How many horns did *Syndyoceras* have?
a) two
b) four
c) six

5 The body temperature of warm-blooded animals:
a) remains the same
b) changes according to climate
c) changes at night

6 *Ouranosaurus* used its sail to:
a) hide behind
b) swim across rivers
c) warm and cool its body

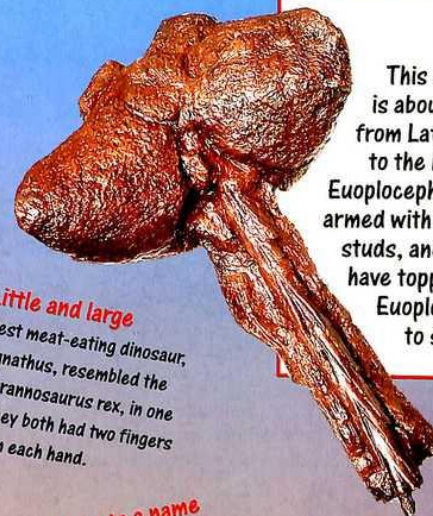
7 Poikilothermic is the technical term for:
a) red-blooded
b) warm-blooded
c) cold-blooded

8 Megabats are:
a) wingless bats
b) large, fruit-eating bats
c) day-flying bats

9 *Nanchangosaurus* had no:
a) feet
b) eyes
c) teeth

Swiss dragon

An ancient book, *Mundus Subterraneus*, written by philosopher Anastasius Kircher in 1678, has a picture of a dragon that lived in Switzerland. Some scientists think that this was based on the skeleton of a plesiosaur that Kircher had seen.



Little and large

The smallest meat-eating dinosaur, *Compsognathus*, resembled the biggest, *Tyrannosaurus rex*, in one respect - they both had two fingers on each hand.

More to a name

The name plesiosaur means 'more lizard-like'. This is because early scientists found it more like a lizard than the other famous aquatic reptile, the ichthyosaur.

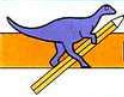
Club rule

This extraordinary fossilized tail club is about 70 million years old and comes from Late Cretaceous Canada. It belongs to the heavily armoured ankylosaur *Euoplocephalus*. Hefty *Euoplocephalus* was armed with an amazing variety of plates and studs, and one swipe from this club would have toppled the most fearsome predator. *Euoplocephalus* had powerful muscles to swing the tail from side to side.

Treasure map

Although the first dinosaur eggs officially discovered were those of *Proceratops*, found by Roy Chapman in the Gobi Desert in the 1920s, those of *Hypselosaurus* in Aix-en-Provence in France had been found earlier. When Raymond Dughi, the director of the Musée d'Histoire Naturelle in Aix, excavated them in the 1950s, he did so by following the directions given in a magazine published in 1869!

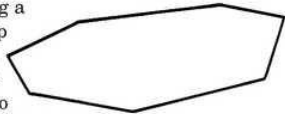
10 Paleocology is the study of:
a) prehistoric ecology
b) animal friendships
c) dinosaur colourings



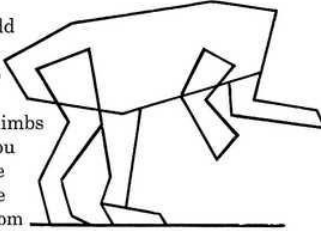
HOW TO DRAW

PSITTACOSAURUS

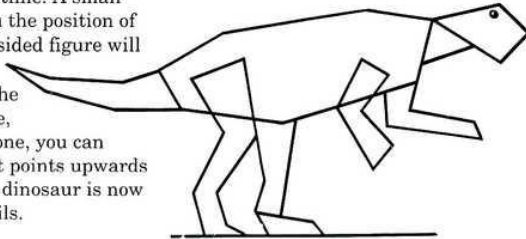
1 Using a sharp pencil, first follow these guidelines to give yourself the basic shape of *Psittacosaurus*' body and the angle in which it is pointing. It is a very simple seven-sided shape. Try not to press too hard with your pencil, so you can rub out any mistakes you make.



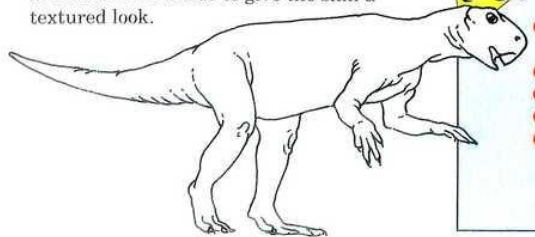
2 Now add some simple lines to get the basic outline of the limbs and to show you where they are attached to the body. The bottom sections of the rear limbs indicate where the feet go, but don't worry about the hands yet.



3 Now complete the outline. A small triangle will give you the position of the neck and a simple four-sided figure will give you the shape of *Psittacosaurus*' head. Into the top corner of the head shape, draw an eye. Once this is done, you can attach the tail. Make sure it points upwards and tapers at the end. Your dinosaur is now ready for the finishing details.



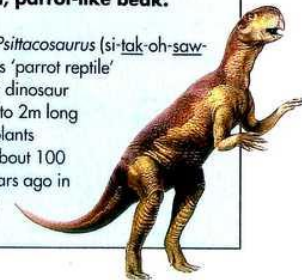
4 Finally, the fun part – adding the flexible, long fingers and the claws on the hands and feet. Fill in all the details of the skin and head. When colouring in, use more than one shade to give the skin a textured look.



Fact box

Psittacosaurus was a horned dinosaur with a curved, parrot-like beak.

- **NAME:** *Psittacosaurus* (si-tak-oh-saw-rus) means 'parrot reptile'
- **GROUP:** dinosaur
- **SIZE:** up to 2m long
- **FOOD:** plants
- **LIVED:** about 100 million years ago in Mongolia

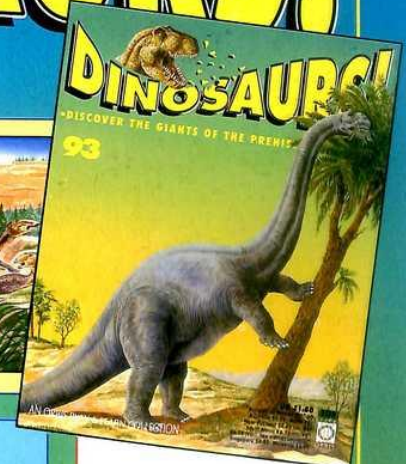


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PLUS

ASK THE EXPERT – your questions answered by Dr David Norman
And HISTORY IN PICTURES
TIME DETECTIVE
GIANTS OF THE PAST

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



Dr David Norman of Cambridge University answers your dinosaur questions

ASK THE EXPERT

Which country spends the most on dinosaur research?

Probably the United States. This is a reflection of the large size of the country, and its number of universities and museums with dinosaur experts. However, whichever country you look at, the amount that it actually spends is very small compared to almost any other area of research that you care to mention.

Might dinosaurs have taken dust baths, as birds do today?

Dust-bathing is common to a great number of animals and seems to be one of several ways of drying the skin, absorbing grease, and in some cases of removing skin parasites. It seems highly probable that dinosaurs would have hosted a population of parasites on their skin, so it is extremely likely they took dust baths.



What is the highest number of dinosaur fossils found in one place?

I do not know – I doubt anyone has bothered to count such a thing. However, John R. Horner, from Bozeman in Montana, has told me of a place in Montana where a solid layer of dinosaur bones has been found. It covers an area several kilometres square. The remains appear to be all of a hadrosaur known as *Hypacrosaurus*. A rough estimate has led Horner to suggest there could be as many as 20,000 skeletons of this dinosaur there – perhaps a giant herd that was poisoned by toxic gases released from a nearby volcano.

