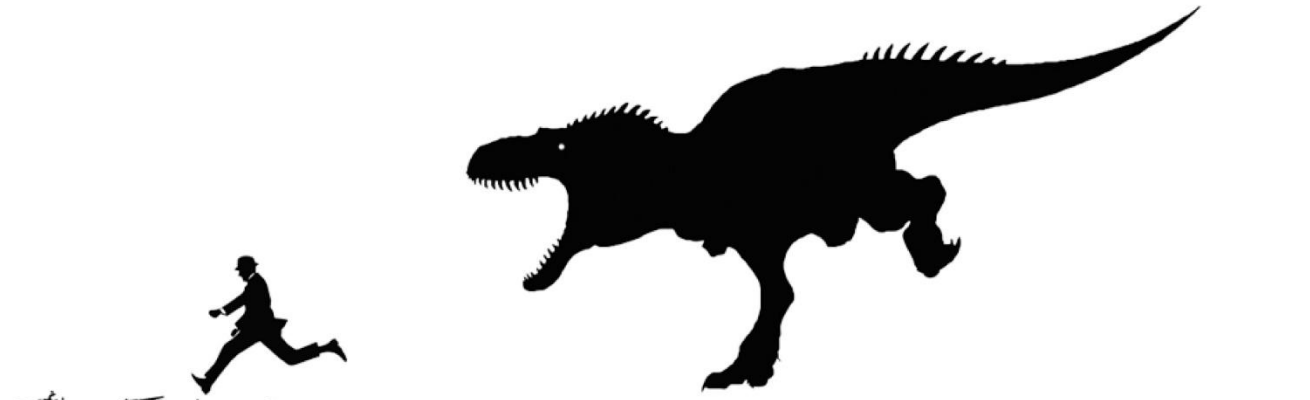

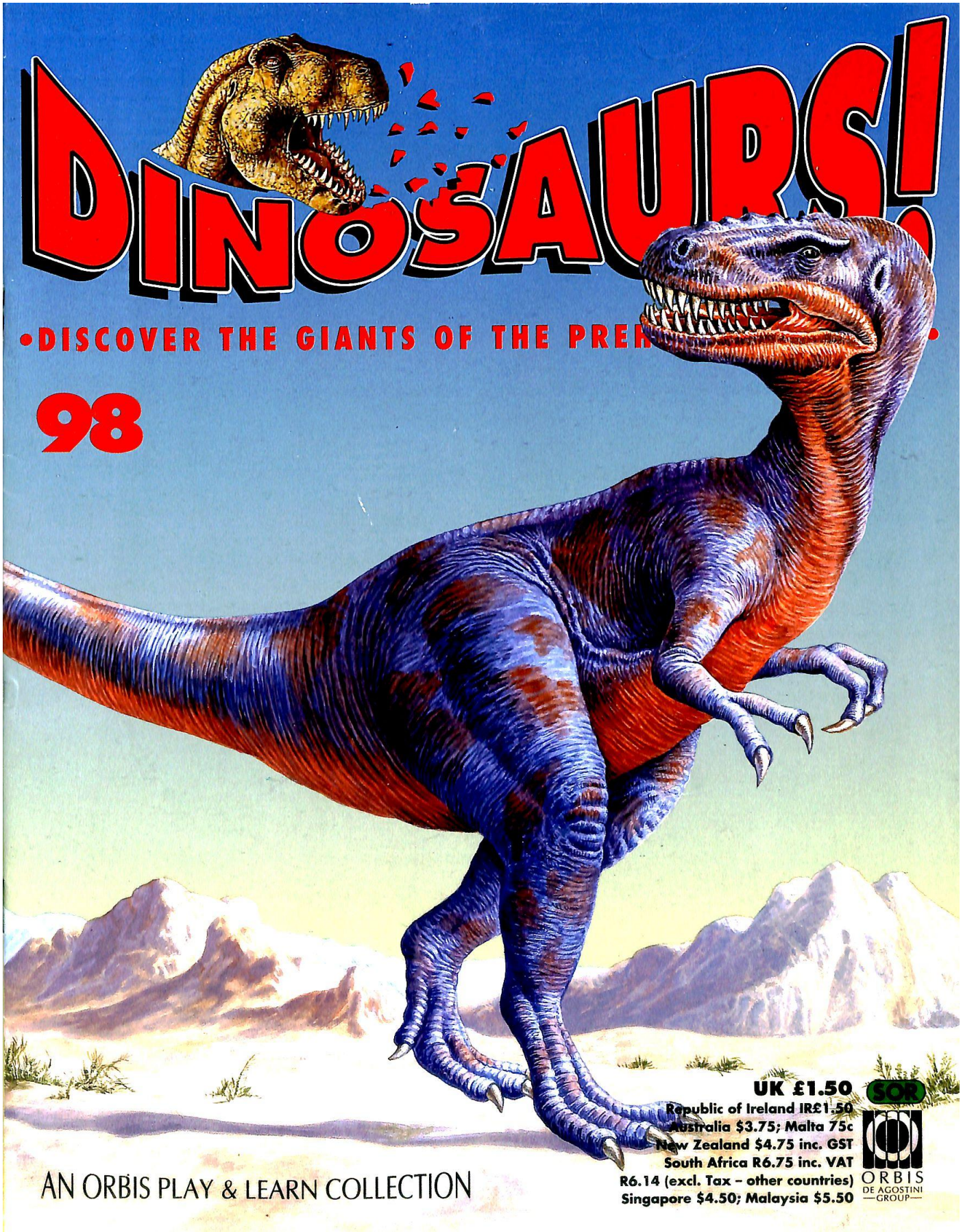

DINOSAURS!

• DISCOVER THE GIANTS OF THE PREHISTORIC WORLD •

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DINOSAURS! is published by
Orbis Publishing Ltd
Griffin House
161 Hammersmith Rd
London W6 8SD

EDITORIAL & DESIGN by
Tucker Slingsby Ltd
3G London House
66-68 Upper Richmond Rd
London SW15 2RP

N98 95 02 16
ISBN 0 7489 1698 9

Printed in Italy by Officine Grafiche De Agostini, Novara

TYLOSAURUS

Giant *Tylosaurus* ruled the seas more than 65 million years ago.

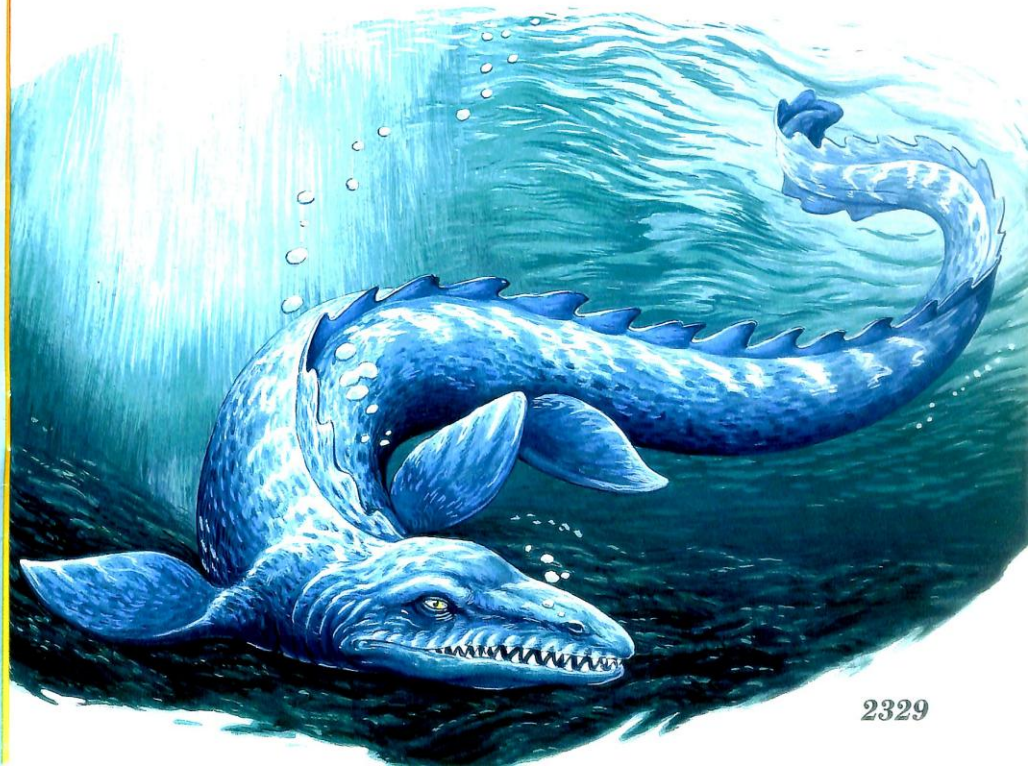
Many large and fearsome meat-eating reptiles lurked in the prehistoric oceans. Most died out along with the dinosaurs. Some of the biggest of these sea monsters were the mosasaurs, which included *Clidastes*, *Platecarpus* and *Tylosaurus*.

GIANT LIZARDS

These fierce monsters were giant sea lizards, swimming in the shallows of the Late Cretaceous seas.

TAKE OVER

Mosasaurs, such as *Tylosaurus*, took over from the fish-like ichthyosaurs as the fiercest and fastest hunters in the sea. The mosasaurs' closest living relative is the monitor lizard, which lives on land.



SEA MONSTER
Tylosaurus was one of the largest mosasaurs – over twice as long as *Clidastes*, an early mosasaur. *Tylosaurus* grew up to 8m in length, which is almost as long as a double-decker bus.

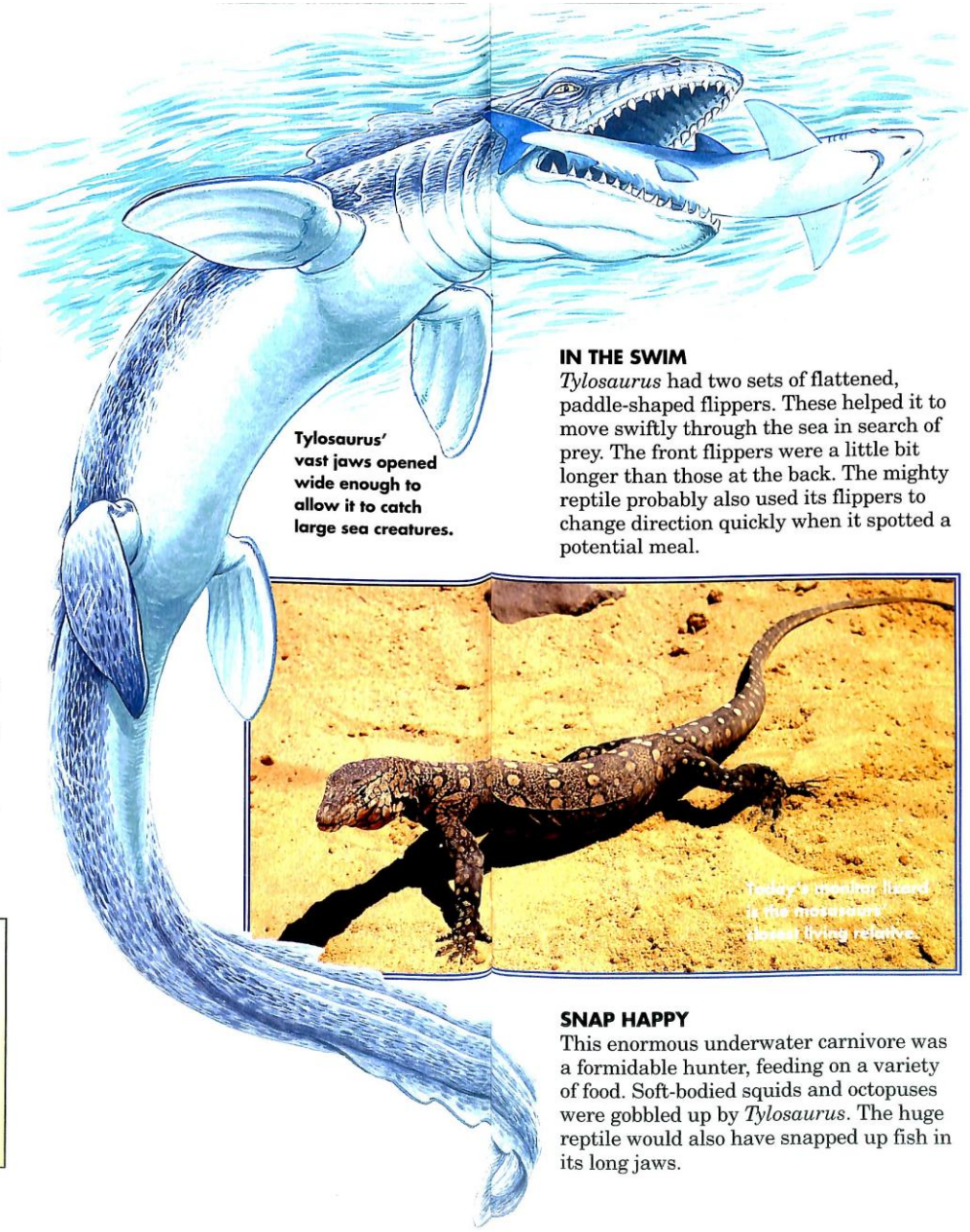
SCALY SKIN
Tylosaurus had a short neck, but a long head and powerful jaws lined with sharp, curved teeth. Its nostrils were set high up on its skull. Experts believe the body of *Tylosaurus* was probably covered in scaly skin, just like that of today's snakes.

OPEN WIDE
Mosasaurs had flexible joints between their skull bones and across their lower jaws. This enabled them to open their mouths very wide to attack and eat large sea creatures.

SNAKES ALIVE
Mosasaurs were fully adapted to life at sea. A mosasaur needed strong muscles to move its great body through the water. *Tylosaurus* probably swam in a snake-like way by swinging its long, streamlined body from side to side. It also had a long tail that was well-designed for swimming. The tail's deep, flat-sided shape and the broad fin at the end would both have helped the creature push itself forwards.

MONSTER FACTS

- **NAME:** *Tylosaurus* (tie-low-saw-rus) means 'swollen reptile'
- **GROUP:** reptile
- **SIZE:** up to 8m long
- **FOOD:** fish, shellfish
- **LIVED:** 70 million years ago in Late Cretaceous North America and New Zealand

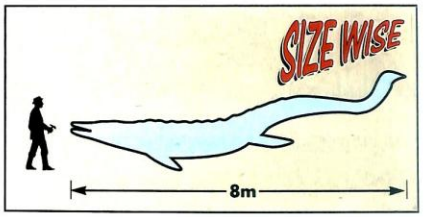


Tylosaurus' vast jaws opened wide enough to allow it to catch large sea creatures.

IN THE SWIM
Tylosaurus had two sets of flattened, paddle-shaped flippers. These helped it to move swiftly through the sea in search of prey. The front flippers were a little bit longer than those at the back. The mighty reptile probably also used its flippers to change direction quickly when it spotted a potential meal.

Today's monitor lizard is the mosasaurs' closest living relative.

SNAP HAPPY
This enormous underwater carnivore was a formidable hunter, feeding on a variety of food. Soft-bodied squids and octopuses were gobbled up by *Tylosaurus*. The huge reptile would also have snapped up fish in its long jaws.



HARD DIET
Tylosaurus probably tackled well-armoured ammonites, too. Thousands of different species of ammonite teemed in the Mesozoic seas, but each one was protected by a tough, coiled shell.

GET CRACKING
Most of the underwater meat-eaters were put off the ammonites by their hard shells, and steered clear of them. But scientists have proof that mosasaurs, such as *Tylosaurus*, crunched them up. They have found fossilized ammonite shells scarred with V-shaped, mosasaur tooth marks.

SHELL SHOCK
Some of the shells had been bitten into as many as a dozen times. So even the sharp-toothed mosasaurs must have found it difficult to crack open ammonites!

IT'S A FACT

SHORT BUT SWEET

The mosasaurs were successful hunters, but the group did not last very long. They appeared towards the end of the Age of the Dinosaurs, and did not survive the great extinction.

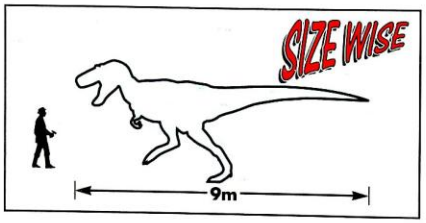
ALECTROSAURUS

Mighty *Alectrosaurus* was one of the terrifying 'tyrant lizards'.

The most famous tyrannosaur, or 'tyrant lizard', was *Tyrannosaurus rex*. *Alectrosaurus* was smaller than *T rex*, but just as fierce. Experts know a great deal about *T rex*, the 'tyrant king', because they have found many fossils, including two almost complete skeletons. But so far only a few leg and skull bones of *Alectrosaurus* have been discovered.

BIG MYSTERY

Many scientists believe *Alectrosaurus* was probably more closely related to the tyrannosaur *Alioramus* than to *T rex*. *Alectrosaurus* and *Alioramus* both lived in what is now Mongolia. Remains of *Alectrosaurus* have been discovered in the Gobi Desert in Mongolia.



THREE OF A KIND

Alectrosaurus was larger than *Alioramus*, but it had the same long skull. Unlike *Alioramus*, however, *Alectrosaurus* had a smooth snout. It also had larger front legs and larger claws on its fingers than the later tyrannosaur. Both would have hunted the duckbilled dinosaurs that roamed the plains in great herds.

MONSTER FACTS

- **NAME:** *Alectrosaurus* (uh-leck-truh-saw-rus) means 'eagle lizard'
- **GROUP:** dinosaur
- **SIZE:** up to 9m long
- **FOOD:** meat
- **LIVED:** about 90 million years ago in the Late Cretaceous Period in Mongolia

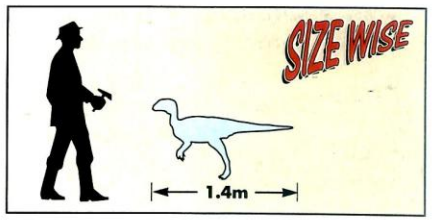
OTHNIELIA

Othnielia, a small, deer-like dinosaur, was built for speed.

Othnielia belonged to the same family of plant-eaters as *Hypsilophodon*, but was only half the size of its better-known relative.

FIRST AND LAST

The fleet-footed hypsilophodonts (gazelle dinosaurs) flourished from the Late Jurassic to the end of the Age of the Dinosaurs. *Othnielia* was among the earliest of the hypsilophodonts.

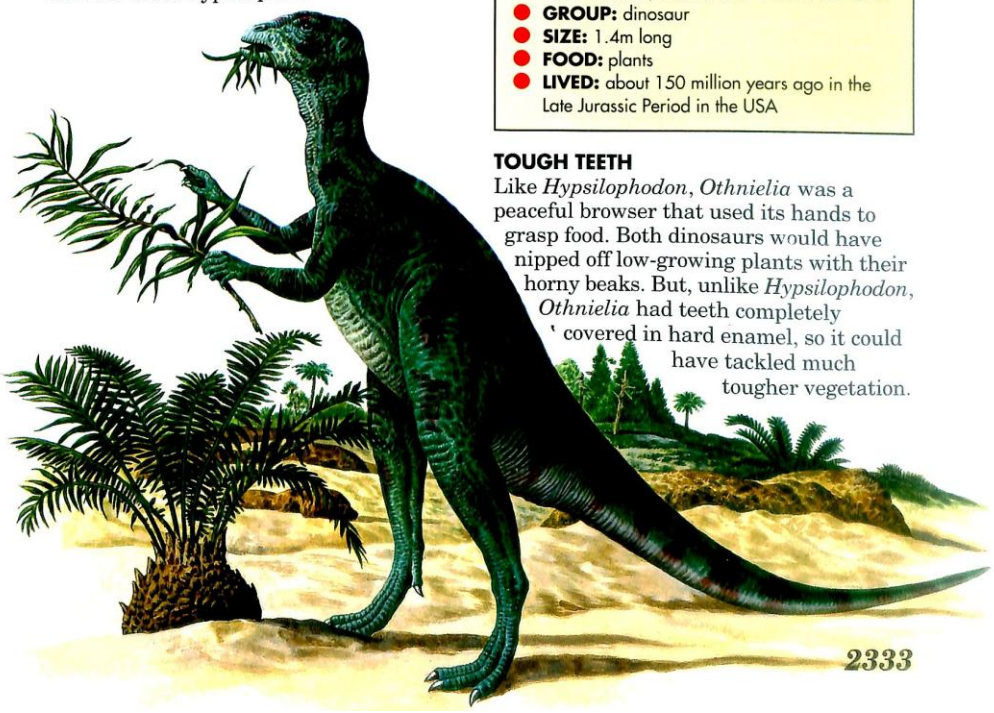


MONSTER FACTS

- **NAME:** *Othnielia* (oth-nee-lee-uh) means 'after Othniel', named after Othniel C. Marsh
- **GROUP:** dinosaur
- **SIZE:** 1.4m long
- **FOOD:** plants
- **LIVED:** about 150 million years ago in the Late Jurassic Period in the USA

TOUGH TEETH

Like *Hypsilophodon*, *Othnielia* was a peaceful browser that used its hands to grasp food. Both dinosaurs would have nipped off low-growing plants with their horny beaks. But, unlike *Hypsilophodon*, *Othnielia* had teeth completely covered in hard enamel, so it could have tackled much tougher vegetation.



DINO SAFARI

LATE TRIASSIC ARIZONA

The landscape is unfamiliar here, and there is a nasty smell of volcanic sulphur in the air. You are in Arizona, USA, about 220 million years ago.

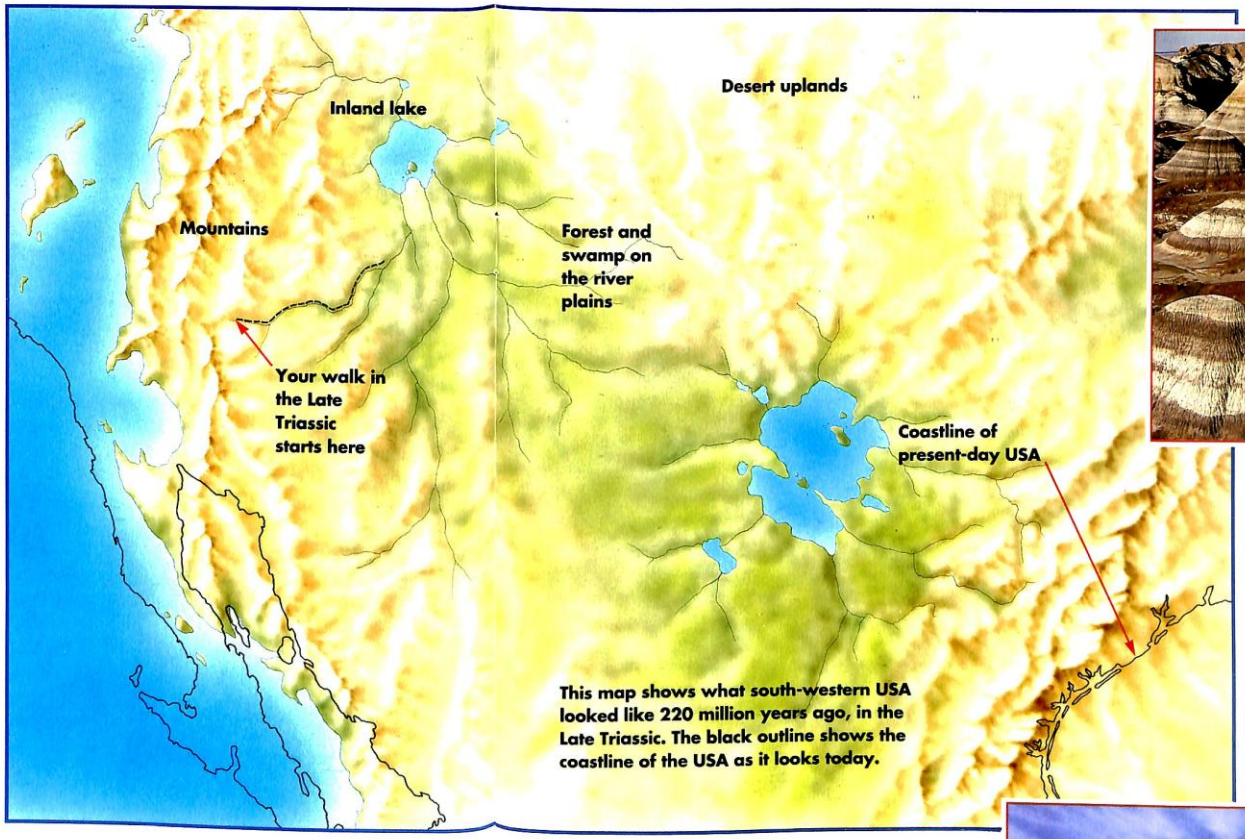
You are standing on a mountainside, looking down on a river plain dotted with tall trees. Mountain streams glint in the early-morning sunshine as they twist through the vegetation, before reaching the broad swamps and lakes on the plain.

DRY HEAT

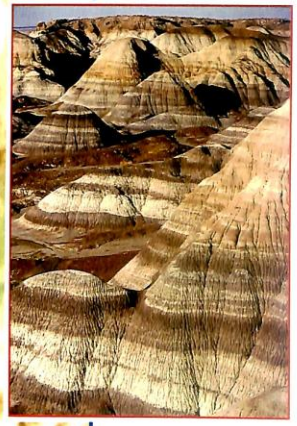
The sun is rising and it is going to be another hot, dry day. You had better go down the mountain and take shelter in the shade of the woodlands. You might even see some dinosaurs there. You follow a stream down a gully, noticing trees such as cedars and ginkgos on the way. The woodland on the foothills is open, with fern-like bushes scattered here and there.

HARMLESS BROWSERS

A movement catches your eye – big sheep-like shapes browsing on the scrubby vegetation. You leave the stream to take a closer look. They are mammal-like reptiles called *Placerias*. Heavy-bodied and big-headed, these creatures dig in the ground with their tusks, pulling up roots and stripping leaves from low-growing plants.



This map shows what south-western USA looked like 220 million years ago, in the Late Triassic. The black outline shows the coastline of the USA as it looks today.



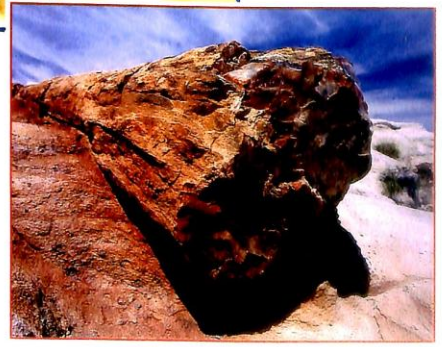
The Petrified Forest National Park in Arizona, USA, (above) has given scientists lots of information about what the land was like millions of years ago. This is because it is full of ancient fossilized, or petrified, trees (below) as well as animal fossils.

DARK AND DAMP

You make your way back to the stream and continue downhill. As the land flattens out, the vegetation becomes very thick. The trees tower up to 60m above your head and their trunks are only about 4m apart. The branches close in and only a few shafts of sunlight now reach the ground. To speed up your journey you wade through the stream, watching the fishes and amphibians swimming there.

BEWARE BEASTS!

Something floats to the surface in front of you. It is a huge amphibian called *Metoposaurus*. The head opens to reveal rows of tiny, sharp teeth and you turn towards the bank for safety. But your way is blocked by a fierce, crocodile-like animal. It is a phytosaur called *Rutiodon*. Crocodile or not, you don't trust those teeth! You splash through the shallows to the muddy bank and pull yourself to safety.



RAINSTORM

You have reached the shelter of the forest just in time. It has started to rain heavily. Lightning flashes across the sky and thunder rumbles round the mountains.

ARMOURED PROTECTION

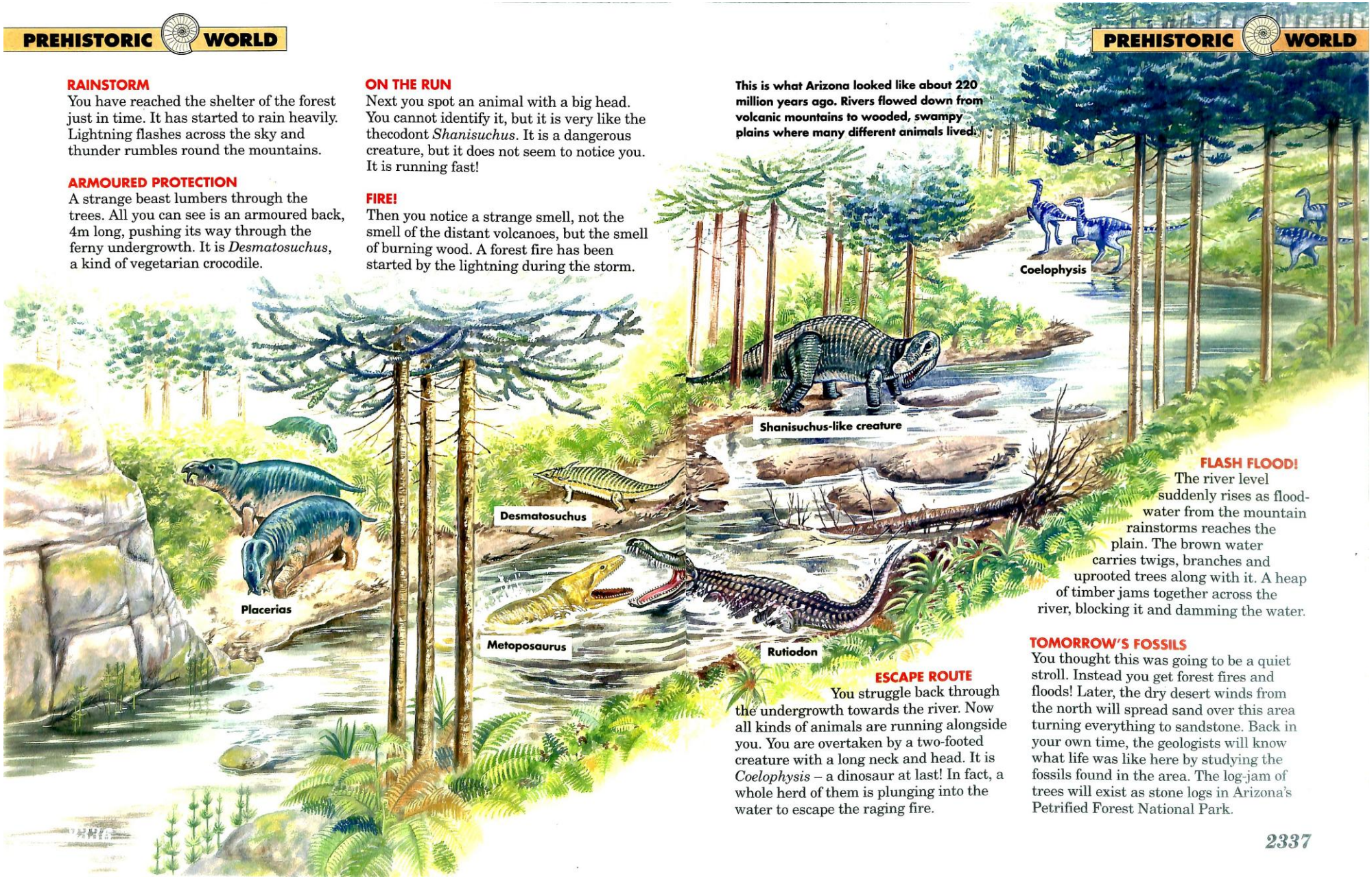
A strange beast lumbers through the trees. All you can see is an armoured back, 4m long, pushing its way through the ferny undergrowth. It is *Desmatosuchus*, a kind of vegetarian crocodile.

ON THE RUN

Next you spot an animal with a big head. You cannot identify it, but it is very like the thecodont *Shanisuchus*. It is a dangerous creature, but it does not seem to notice you. It is running fast!

FIRE!

Then you notice a strange smell, not the smell of the distant volcanoes, but the smell of burning wood. A forest fire has been started by the lightning during the storm.



This is what Arizona looked like about 220 million years ago. Rivers flowed down from volcanic mountains to wooded, swampy plains where many different animals lived.

ESCAPE ROUTE

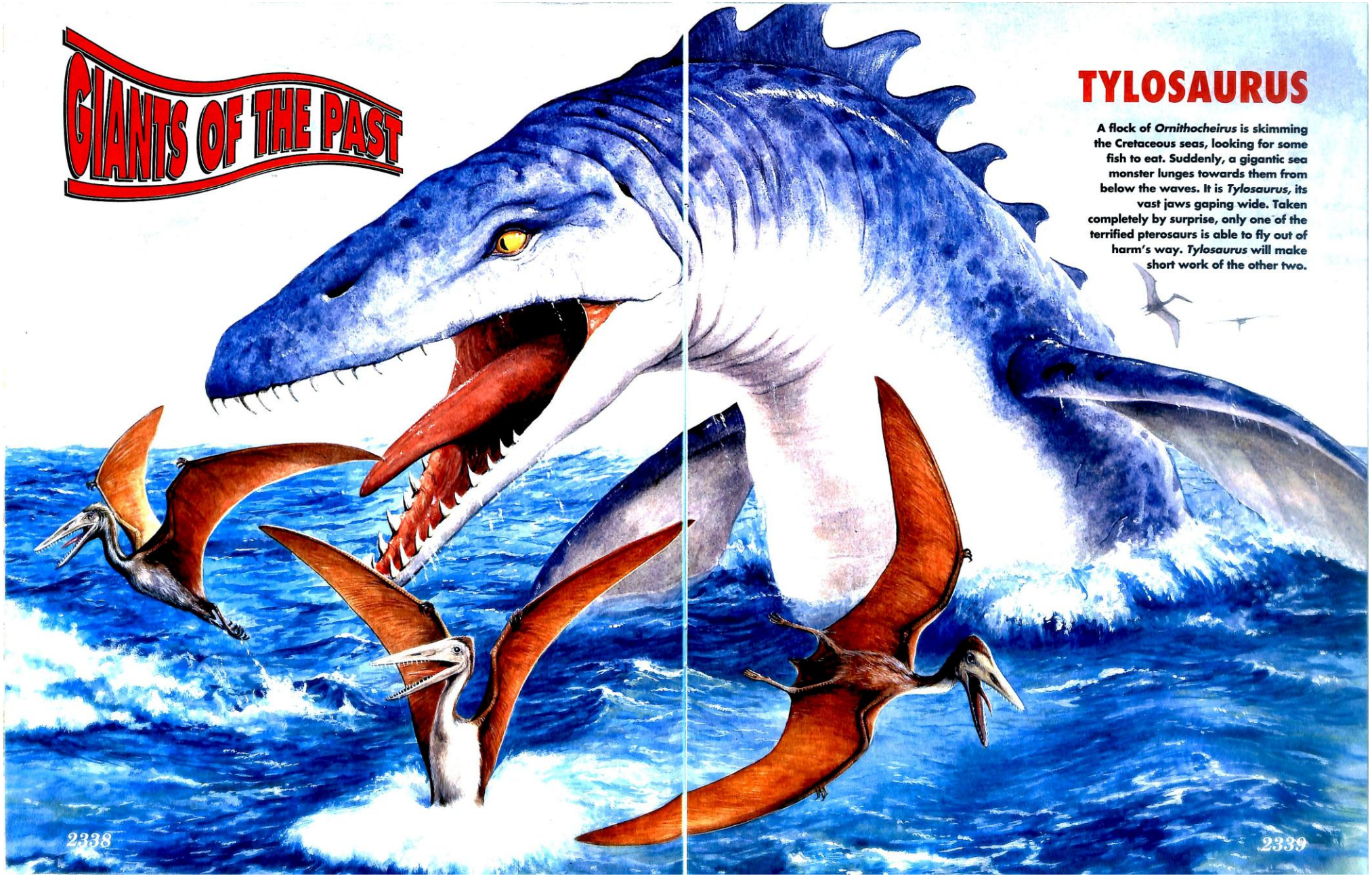
You struggle back through the undergrowth towards the river. Now all kinds of animals are running alongside you. You are overtaken by a two-footed creature with a long neck and head. It is *Coelophysis* – a dinosaur at last! In fact, a whole herd of them is plunging into the water to escape the raging fire.

FLASH FLOOD!

The river level suddenly rises as flood-water from the mountain rainstorms reaches the plain. The brown water carries twigs, branches and uprooted trees along with it. A heap of timber jams together across the river, blocking it and damming the water.

TOMORROW'S FOSSILS

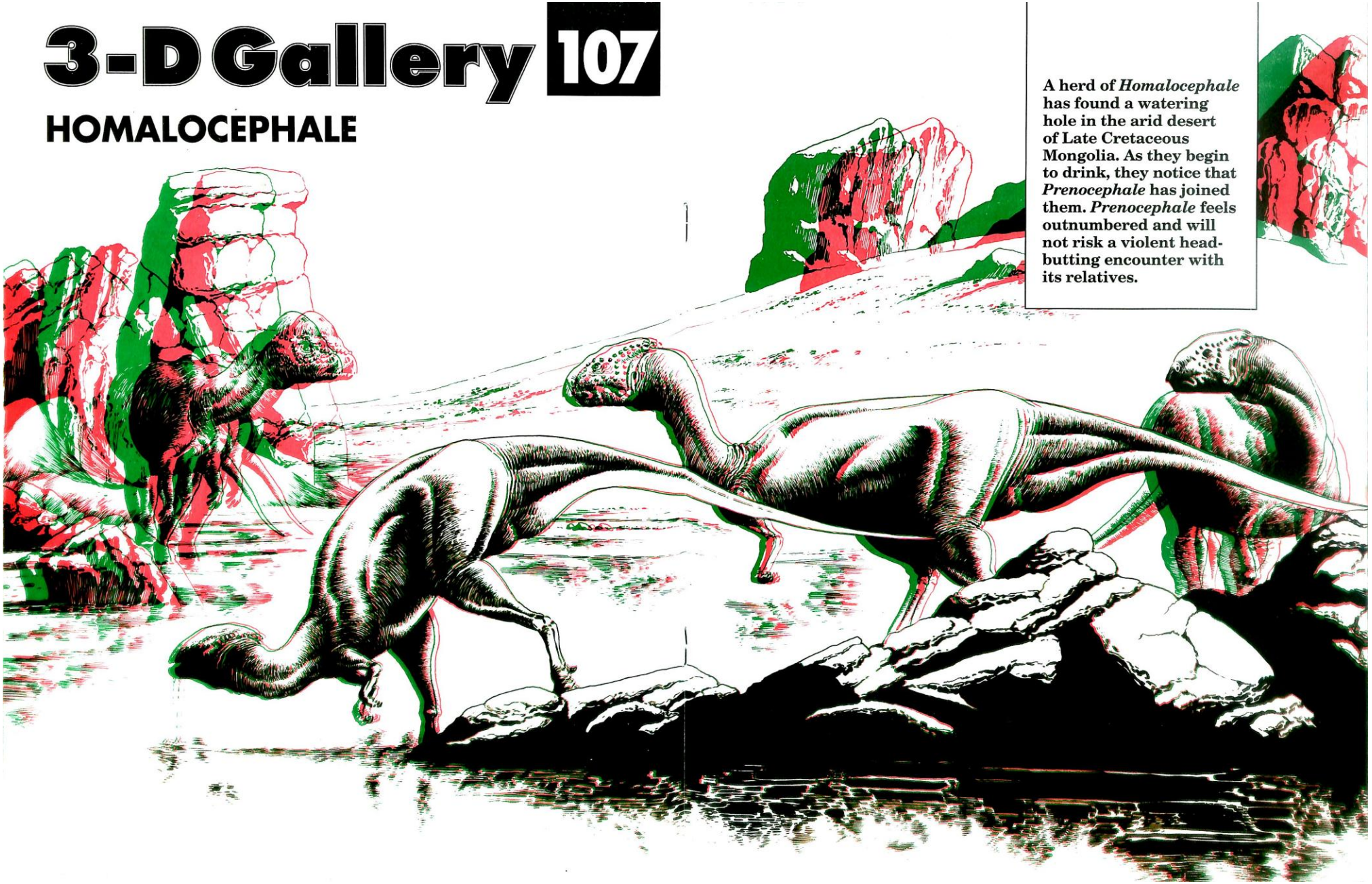
You thought this was going to be a quiet stroll. Instead you get forest fires and floods! Later, the dry desert winds from the north will spread sand over this area turning everything to sandstone. Back in your own time, the geologists will know what life was like here by studying the fossils found in the area. The log-jam of trees will exist as stone logs in Arizona's Petrified Forest National Park.



3-D Gallery 107

HOMALOCEPHALE

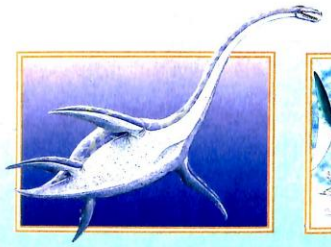
A herd of *Homalocephale* has found a watering hole in the arid desert of Late Cretaceous Mongolia. As they begin to drink, they notice that *Prenocephale* has joined them. *Prenocephale* feels outnumbered and will not risk a violent head-butting encounter with its relatives.



On Parade: sea monsters

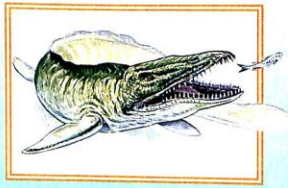
Over millions of years, a huge variety of creatures have evolved to live in the world's oceans. Many are so fierce or so strange that they could be called monsters. Could the Loch Ness monster be one of these?

Life began in the water. The prehistoric seas and oceans swarmed with animals, from tiny creatures without backbones to huge hunters over 20m long. Here you can see some of the fish, reptiles and mammals that ruled the prehistoric seas.



NAME: *Elasmosaurus*
GROUP: reptile
SIZE: up to 14m long
LIVED: Late Cretaceous in Asia and North America

NAME: *Cladoselache*
GROUP: fish
SIZE: 50cm to 1.2m long
LIVED: Late Devonian in Europe and North America



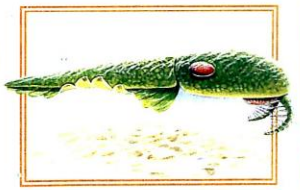
NAME: *Mosasaurus*
GROUP: reptile
SIZE: 4 – 9m long
LIVED: Late Cretacous North America, Africa and Europe

NAME: *Henodus*
GROUP: reptile
SIZE: 1m long
LIVED: Late Triassic in southern Germany

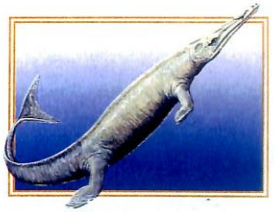
NAME: *Basilosaurus*
GROUP: mammal
SIZE: 15 – 23m long
LIVED: Early Tertiary in Africa and North America

NAME: *Hybodus*
GROUP: fish
SIZE: 2m long
LIVED: Triassic oceans throughout the world

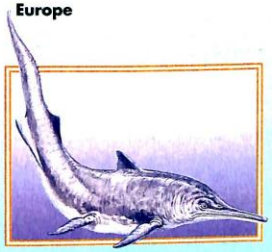
NAME: *Macropoma*
GROUP: fish
SIZE: about 55cm long
LIVED: Late Cretaceous in Europe



NAME: *Anomalocaris*
GROUP: unknown
SIZE: up to 60cm long
LIVED: Early Cambrian throughout the world



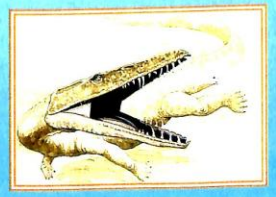
NAME: *Geosaurus*
GROUP: reptile
SIZE: about 3m long
LIVED: Late Jurassic in South America and Europe



NAME: *Mixosaurus*
GROUP: reptile
SIZE: 1m long
LIVED: Middle Triassic in Asia, Europe and North America

NAME: *Dunkleosteus*
GROUP: fish
SIZE: up to 9m long
LIVED: Devonian in North America and Europe

NAME: *Xiphactinus*
GROUP: fish
SIZE: about 4.3m long
LIVED: Cretaceous in southern North America



NAME: *Nothosaurus*
GROUP: reptile
SIZE: up to 3m long
LIVED: Mid Triassic in Germany and South Africa

NAME: *Kronosaurus*
GROUP: reptile
SIZE: up to 12m long
LIVED: Late Cretaceous in Australia

KEY

CAMBRIAN PERIOD *570-505 MYA*
ORDOVICIAN PERIOD *505-438 MYA*
SILURIAN PERIOD *438-408 MYA*
DEVONIAN PERIOD *408-362 MYA*
CARBONIFEROUS PERIOD *362-290 MYA*
PERMIAN PERIOD *290-245 MYA*
TRIASSIC PERIOD *245-208 MYA*
JURASSIC PERIOD *208-145 MYA*
CRETACEOUS PERIOD *145-66 MYA*
TERTIARY PERIOD *66-2 MYA*

Fossil weather

What was the climate like during the Age of the Dinosaurs? Clues from rocks and fossils, and today's weather can help us to find out.

An *Allosaurus* strides from the shade of a conifer, out into the dazzling sunlight. It is looking for food. A hot wind is blowing dust across the surface of the bare ground, drying up what little moisture is left. The low plants are shrivelling up in the summer heat. No plant-eating animal would be out in the open under these conditions.

GETTING SLUGGISH

A row of trees and bushes in the distance show where a sluggish river is winding its way across the plain. The hungry *Allosaurus* makes its way towards the water.

DRYING UP

The broad river is almost dry. Only a trickle of water winds its way between the teardrop-shaped sandbanks. The river branches into smaller streams and then reunites on its long journey to the sea.

ONCE A LAKE

Allosaurus continues downstream, across the vast expanse of a dried-up lake bed. In the wet season this would be a broad sheet of water. Now, all that is left of the lake is a flat pan of dried, cracked mud.

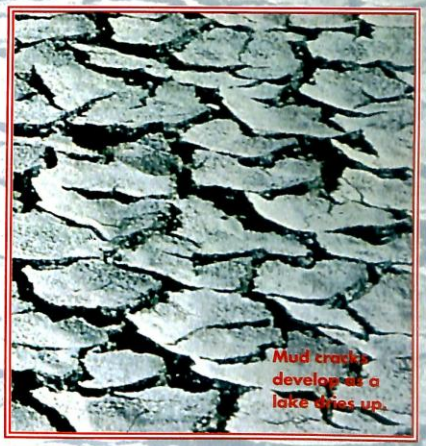
TO THE SEA

The dinosaur strides on in the dry wind. In the distance, a horizon of sparkling light shows the edge of the shallow sea. Before long, the dinosaur finds itself on a beach with wind-blown sand dunes and water lapping at the edge of the shore. But even here there is dryness in the air. Between the dunes there are broad lagoons that have dried up in the seasonal drought.

AT LAST, FOOD!

Then, success! A big *Stegosaurus* lies dead by the side of a lagoon. Maybe killed by thirst, or poisoned by the extreme saltiness of the water it could not resist drinking. The smell of flesh reaches the *Allosaurus*, telling it there is food about. It finds the body quickly and begins to eat.

***Allosaurus* comes across the body of a big *Stegosaurus* in a dried-up lagoon. This kind of dry surface is good for making fossilized footprints. Millions of years later, a trackway like this can tell us the story of a dinosaur walking across a dry lake bed to look for food or water.**



Mud cracks develop as a lake dries up.

THE DROUGHT BREAKS

While *Allosaurus* is eating, the sky grows dark. A storm cloud has been building up unnoticed over the sea. Now heavy raindrops begin to splash against the flanks of the dinosaur, and thud into the dusty soil at its feet. The drought seems to be over, for the time being at least.

FACT, OR FICTION?

This is just a story. But how sure are we that these kinds of weather actually existed at the time of the dinosaurs?

What is? UNIFORMITARIANISM

A big word invented by Scottish geologist James Hutton in 1795. It means that conditions on the Earth's surface today – climate, weather, erosion and so on – are the same as those that existed at any time in the Earth's history. By studying modern conditions, we can work out what things were like in prehistoric times. As James Hutton put it: 'The present is the key to the past.'

WRITTEN IN STONE

All the clues to what the climate and weather were like in the past are here in the rocks for us to read today. We know that different types of rock are formed under different conditions. Shales form from mud deposited in quiet waters. Sandstones form from sand deposited on beaches or in deserts, and siltstones form from silt deposits in rivers. The different structures in these rocks can tell us even more about the weather and climatic conditions in prehistoric times.

ARID LANDS

In dry climates, the hot sun and wind draw up any moisture out of the ground. Minerals, such as calcite, dissolved in the ground water are left near the surface as the water evaporates (dries up). This produces a layer of limestone nodules (lumps) just under the top of the soil.

HARD EVIDENCE

We can see these lumps today in the dry plains of India and the grasslands of East Africa. We also find the limestone layers in the Late Jurassic rocks of North America, along with the skeletons of *Allosaurus*, *Apatosaurus* and *Stegosaurus*. So we know that these dinosaurs lived on dry plains.

WATER SHAPES

Rivers carry lots of ground-up rocks (silt) and sand. When the river slows, it drops the sand and silt on its bed. This material builds up into long tongue-shaped mounds.

Lightning sometimes fossilizes! If a sandy area is struck by lightning, the heat will cause the sand grains to join together into a tube. This picture (right) shows the result of lightning striking volcanic ash, which has small, sand-like particles.

TIME DETECTIVE

THE SHAPE OF THE PAST

Eventually the silt and sand turn to rock – siltstone and sandstone. You can tell which rocks were formed in rivers because they are full of sloping, S-shaped layers. The same kind of shapes are found in rocks formed in sand dunes, but the layers are much bigger.

CRACKING UP

When a lake or a pond dries up, the top layer of mud shrinks in the sun and cracks up. These mud cracks are sometimes found preserved in mudstones. When we see them, we know the weather was dry at that time.

THE SANDS OF TIME

Waves washing against a beach push the sand into ripples. These can be seen in some rocks. They tell us where there were beaches.

NEW CRYSTALS FOR OLD

If a pool of seawater dries up slowly, the salt forms large cube-shaped crystals. These salt crystals will eventually dissolve away, leaving cube-shaped pits in the dried mud. The next layer of mud will fill in these pits and take the shape of the crystals. When we find these shapes in the rocks (called 'pseudomorphs' by geologists), we can tell that seawater dried out here.

FOSSILIZED RAIN

Sometimes we find fossil rain. Raindrops hitting mud will produce rounded pits. These rain pits in mudstone prove that there was rainfall in this place long ago.

WEATHER DETECTIVE

As well as all this evidence, the scientists can look at plant fossils to see if there were dry-climate plants or rainforest plants living at a particular place. By putting these clues together, scientists can work out what the weather and climate were like when the dinosaurs lived.

Weather can leave evidence in the rocks, and this helps today's experts to work out what conditions were like millions of years ago.

HISTORY IN PICTURES

SEAVOLUTION!

MILLIONS OF YEARS AGO, ON THE OCEAN BED, A **COELACANTH** SWIMS PAST A BATTLE BETWEEN A PAIR OF **BELEMNITES** AND A SMALL AMMONITE.

MEANWHILE, A FEW FEET ABOVE, A YOUNG PLESIOSAUR PADDLES PAST THE COELACANTH, SNAPPING ITS JAWS TO FEED FROM A COLOURFUL CLOUD OF FISH. BUT, BEFORE IT CAN SWALLOW, IT TOO BECOMES PREY...

... BEFORE THE PLESIOSAUR KNOWS WHAT HAS HIT IT, A **GEOSAURUS'** SHARP TEETH RIP INTO ITS SIDE.

NORMALLY, THE SEA-CROCODILE **GEOSAURUS** WOULD IGNORE AN ADULT PLESIOSAUR AND GO FOR THE COELACANTH, BUT THIS FEMALE IS ABOUT TO GIVE BIRTH AND NEEDS AS MUCH FOOD AS POSSIBLE.

SOON AFTER EATING THE PLESIOSAUR, THE GEOSAURUS GIVES BIRTH. THE BABIES CAN SWIM AS SOON AS THEY ARE BORN.

GEOSAURUS BREATHE AIR, SO THE MOTHER NUDGES HER YOUNG UP TO THE SURFACE. SHE SNAPS AT THE LURKING COELACANTH TO KEEP IT AWAY FROM HER DEFENCELESS BABIES.

UNFORTUNATELY, A PTEROSAUR HAS SPOTTED THEM SWIMMING IN THE CRYSTAL-CLEAR WATER.

SUDDENLY, AN **ICTHYOSAURUS** SLAMS THROUGH THE WATER. THE STARTLED PTEROSAUR FRANTICALLY FLAPS AWAY.

AS THE MILLENIA PASSED, FAST-SWIMMING, BONY FISH EVOLVED, GRADUALLY REPLACING THE SLOWER FISH THAT THE SEA-CROCODILES LIVED ON.

UNABLE TO COMPETE FOR FOOD, THEY SLOWLY DIED OUT, LEAVING THE UNDERWATER WORLD TO SHARKS, WHICH HAD EVOLVED LONG BEFORE, AND OTHER DEADLY CREATURES.

MOSASAURUS, ONE OF A GROUP OF SWIMMING LIZARDS, IS ONE OF THESE CREATURES. SHARKS AND MOSASAURUS ONLY ATTACK EACH OTHER IF THE PREY IS MUCH SMALLER THAN THE PREDATOR.

THE BELEMNITES, AMMONITES, SEA-CROCODILES, MOSASAURS AND MANY OF THE FISHES THAT SWAM ALONGSIDE THEM HAVE LONG SINCE VANISHED. BUT 370 SPECIES OF SHARK REMAIN, RANGING IN SIZE FROM LITTLE DOG-FISH TO MAN-EATING GIANTS.

SCIENTISTS KNEW ABOUT THE COELACANTH FROM FOSSILS, BUT THOUGHT THAT IT HAD DIED OUT MILLIONS OF YEARS BEFORE. THEN, ONE DAY IN THE 1930s, OFF THE COAST OF SOUTH AFRICA...

WHAT IS IT?

IT TURNED OUT TO BE A COELACANTH — A WITNESS TO THE WORLD OF SEA-CROCODILES, MOSASAURS, PLIOSAURS AND THE OTHER BEASTS THAT USED TO TERRORISE THE UNDERWATER WORLD!

Improve and test your knowledge with...

FACT FILE

Dimetrodon holds all the answers. See how you score in the quiz.

Noisy places

The noises that dinosaurs made would have depended on their habitat. Those living in open plains would have used low growls – sounds that bounce along the ground. Those in forests would have used high squeaks that would penetrate the foliage.

Familiar names

Palaeontologists give nicknames to the particular skeletons they are excavating. Various specimens of Tyrannosaurus have been named 'Black Beauty', 'Scotty' and 'Sue'. The big Seismosaurus skeleton is called 'Sam'.

1 What was *Amebelodon*?
a) an amoeba
b) an elephant
c) a poisonous plant

2 Where did the dinosaur *Alectrosaurus* live?
a) Mongolia
b) Canada
c) USA

3 What is ichnology the study of?
a) fossilized lightning
b) prehistoric footprints
c) prehistoric diseases

4 What are shales formed from?
a) mud deposited in quiet water
b) ash left by volcanoes
c) fossilized bones

5 *Cladoselache* was a:
a) mammal
b) reptile
c) fish

Varied diet

Diplodocus had a tooth and mouth structure that would have allowed it to eat just about any kind of plant that grew in Late Jurassic North America.

6 What did *Homalocephale* use to defend itself?
a) its beak
b) its head
c) its tail club

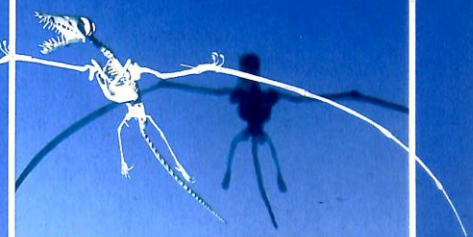
7 What is *Tylosaurus'* closest living relative?
a) the monitor lizard
b) the great white shark
c) the crocodile

8 What was *Desmatosuchus*?
a) a meat-eating alligator
b) a vegetarian crocodile
c) a fish-eating shark

9 *Othnielia's* teeth were completely covered in:
a) holes
b) plaque
c) enamel

10 Which believed-to-be-extinct animal was discovered in the 1930s?
a) dodo
b) coelacanth
c) roc

Pterosaur terror



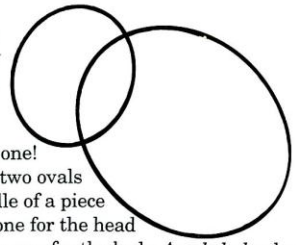
Imagine this beast landing on your bird-table! This is a skeletal restoration of the pterosaur Rhamphorhynchus. Notice its sharp, forward-pointing teeth. These helped it to grip slippery fish. Many fossil Rhamphorhynchus have been found at the Solnhofen limestone quarries.

Answers to the questions on inside back cover

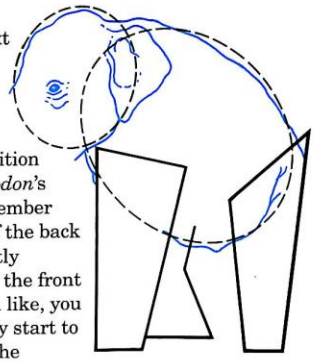
HOW TO DRAW

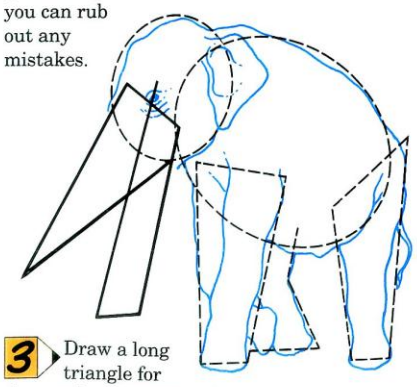
AMEBELODON

1 It is easy to draw an elephant, even a prehistoric one! First draw two ovals in the middle of a piece of paper – one for the head and a larger one for the body. *Amebelodon* has a short neck, so make the ovals overlap. Draw quite softly so you can rub out any mistakes.

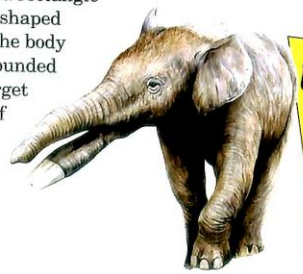


2 Next put in some rough guidelines for the position of *Amebelodon*'s legs – remember that one of the back legs is partly covered by the front legs. If you like, you can already start to sketch in the details of the head.

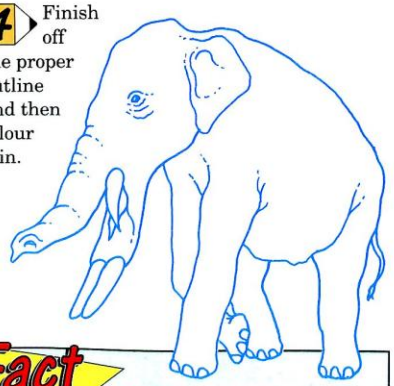




3 Draw a long triangle for the trunk and a rectangle for the shovel-shaped tusks. Fill in the body outline with rounded lines. Don't forget the other set of tusks and the tail.



4 Finish off the proper outline and then colour it in.



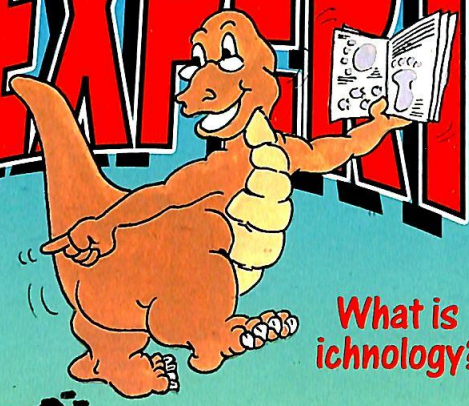
Fact box

- **NAME:** *Amebelodon* (am-eh-bel-oh-don) means 'blunt weapon tooth'
- **GROUP:** mammal
- **SIZE:** up to 7m long
- **FOOD:** water plants
- **LIVED:** about 10 million years ago in the Late Miocene in North America

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

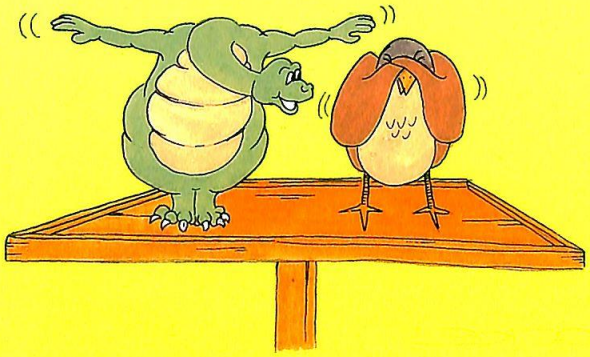
Dr David Norman of Cambridge University answers your dinosaur questions

ASK THE EXPERT



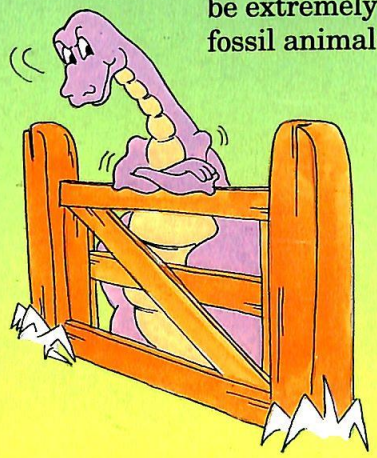
Might there have been really tiny dinosaurs – the size of a sparrow today?

Dinosaur babies are known from fossil finds to be very small – in the range of 10 – 20cm long. This is tiny compared to their adult size, but they grew extremely quickly to avoid being small and vulnerable for too long. Really tiny adult dinosaurs are not at all well known. Being small is quite a difficult and dangerous lifestyle for many active vertebrates. It seems likely that the things that made dinosaurs so successful were largely linked to their greater size. Lizards, small mammals and birds (which may, in fact, be the only successful small dinosaurs) seem to have conquered the small-scale world very effectively. So, birds and babies apart, I do not think that there were any naturally tiny dinosaurs.



What is ichnology?

Put very simply, this is a branch of palaeontology which is devoted to the study of footprints. If you think about it, a footprint is one of the very few pieces of evidence that tells us what a fossil creature did when it was alive – we are mostly dealing with odd bones or skeletons of a dead animal. The footprint was left by an animal when it was alive, and this can be extremely useful in our studies of all fossil animals, not just dinosaurs.



Did dinosaurs have territories or did they roam everywhere?

I do not think there is a simple answer to this. It is likely that some were very territorial, while others wandered all over the place. Just like animals today, it would have depended upon their lifestyle. I think that dinosaurs covered the full range of possibilities – from highly territorial to completely non-territorial.

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