

FASCINATING DINOSAURS OF SOUTH AFRICA

The story of life on Earth begins many millions of years before the first human beings appeared. Scientists estimate that the age of the Earth is about 4.6 billion years. The oldest known forms of life are the fossils of simple bacteria and algae, over 3.5 billion years old.

What are FOSSILS?

The word fossil comes from the Latin, *fossilis*, meaning 'dug up'. Fossils are the hardened remains of dead animals and plants. Fossils include skeletons, teeth, tracks, leaves and even plant pollen.

Fossils have been found on every continent on Earth - maybe even close to where you live.

The earliest animals had soft bodies and left no body fossils, but they did leave a few tracks and resting traces, showing that they had lived. By 600 million years ago, larger and more advanced animals and plants lived in the oceans. They had hard shells and skeletons and left fossil remains. Scientists can date the rocks in which fossils are found and so create a calendar of life on Earth.

How are FOSSILS Formed?

Some animals were quickly buried after their death when they sank into mud or were covered by silt from floods, or by sand in sandstorms. The parts of these animals that did not rot, usually the bones or teeth, were trapped in sediment like sand, mud and small pieces of rock. Under the right circumstances (no scavengers or too much weathering) it turned into fossils over time.

Most fossils are found in sedimentary rock layers. Over time the sediment is compressed (squeezed) under more and more layers of sediment that pile up on top of it.

Over a long time, the bony parts of the animals' bones that are trapped in the sediment don't change much. The open pores and cavities in the bones, however, become filled with sediment and minerals from the environment. This process results in heavy, rock-like copies of the original bones – fossils! A fossil of a bone still looks like the bone.



What is PALAEOLOGY?

Palaeontology is the branch of biology that studies the forms of life that existed in former geologic periods, mainly by studying fossils.

How does one become a PALAEOLOGIST?

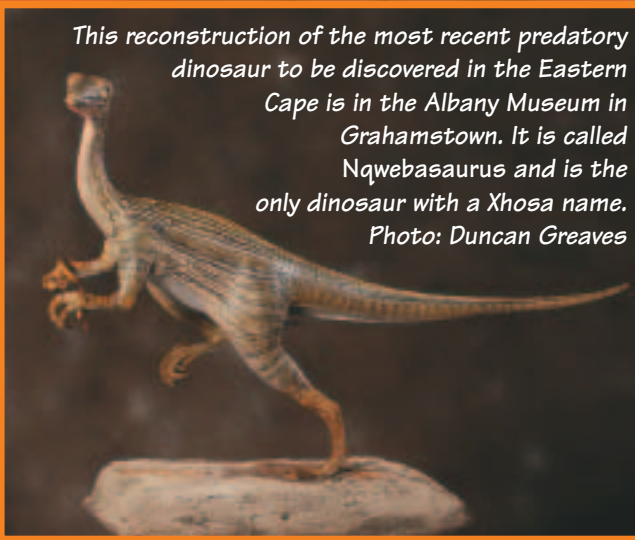
Important school subjects:

Mathematics, biology, physical science.

Qualifications:

A BSc degree with zoology and/or geology as major subject. Modules in palaeontology will give you an advantage. Masters and PhD degrees in palaeontology.

This reconstruction of the most recent predatory dinosaur to be discovered in the Eastern Cape is in the Albany Museum in Grahamstown. It is called *Nqwebasaurus* and is the only dinosaur with a Xhosa name. Photo: Duncan Greaves



Some fossils were formed when an insect or plant material became trapped in hardened tree sap, called amber.

Most animals that die do not fossilise, they simply decay. Palaeontologists think that only a small number of the dinosaurs that actually lived on Earth have been found or will ever be found as fossils.

Why are FOSSILS important?

Our knowledge of most prehistoric animals comes from their fossil remains. No humans ever saw the dinosaurs, since the last of these prehistoric reptiles died out 65 million years ago, long before there were humans on Earth. What we know of dinosaurs, scientists have learnt from their fossils that have been found.

DINOSAURS

Dinosaurs dominated the Earth from about 225 millions years ago for about 160 million years. They developed a wide variety of shapes and sizes. The largest dinosaurs were plant eaters.

In particular the long-necked, dinosaurs, called sauropods, were enormous, slow moving animals that ate huge amounts of plant food.

The largest known dinosaur was

Argentinasaurus that was about 35 metres long. Imagine 8 kombis in a row! Dinosaurs laid eggs. Some skeletons have been found with complete nests. The young were born as miniature versions of their parents. (See page 22 for the latest dinosaur egg news).

DINOSAURS OF SOUTH AFRICA

Sometimes South Africa is called the birthplace of humans, dinosaurs and mammals since it is here that some of the oldest as well as the greatest number of these fossils are found.

Plant eaters

The fossils of several early plant-eating dinosaurs have been discovered in South Africa. The most well-known one is *Heterodontosaurus* - meaning 'different-teeth lizard'. This small, plant-eating dinosaur was one of the first plant-eating dinosaurs in the world. It had three different kinds of teeth, specialised for biting, tearing and grinding its food. It was about the size of a turkey.

Another early plant-eating dinosaur that lived in southern Africa was *Lesothosaurus* from Lesotho. The lizard-like adult dinosaurs were about 90 cm long, could run fast on thin back legs, and probably fed on leaves and shoots.

Many fossils of *Massospondylus* (meaning 'long vertebrae'), a very early, medium-sized dinosaur, have been discovered in the Karoo. All sizes, from small juveniles through to adults have been discovered, as well as several fossilised nests with eggs. This plant eater swallowed small stones to help it digest the tough plant material it ate. The stones would grind up the plant material in the dinosaur's stomach.

Although no complete skeletons have been found, palaeontologists know that giant sauropods also once roamed the plains of South Africa. The first stegosaur ever discovered was our own *Paranthodon* from the Eastern Cape.

Meat eaters

Large predatory meat eating dinosaurs once roamed ancient South Africa, but unfortunately, except for some curved,

serrated teeth and three-toed fossil tracks, the rest of their skeletons have not yet been found.

Although the fossil remains of large, predatory dinosaurs are scarce in South Africa, remains of the medium-sized predatory dinosaur, *Syntarsus*, are rather well known. About three metres long and with the mass of less than 20 kg, this dinosaur was lightly built and very fast. It ran on two legs and probably lived and hunted in packs, as more than 30 individuals have been found at one site in Zimbabwe. Studies on the fine structure of

A reconstruction of a stegosaur called *Paranthodon* in the Albany Museum in Grahamstown. It was the first stegosaur ever discovered and was found in the Eastern Cape. Photo: Duncan Greaves



Syntarsus bones by Professor Anusuya Chinsamy-Turan show they may have taken eight years to reach their adult body size. *Syntarsus* was named in 1969 by South African palaeontologist, Dr Mike Raath. The name means 'fused ankle'.

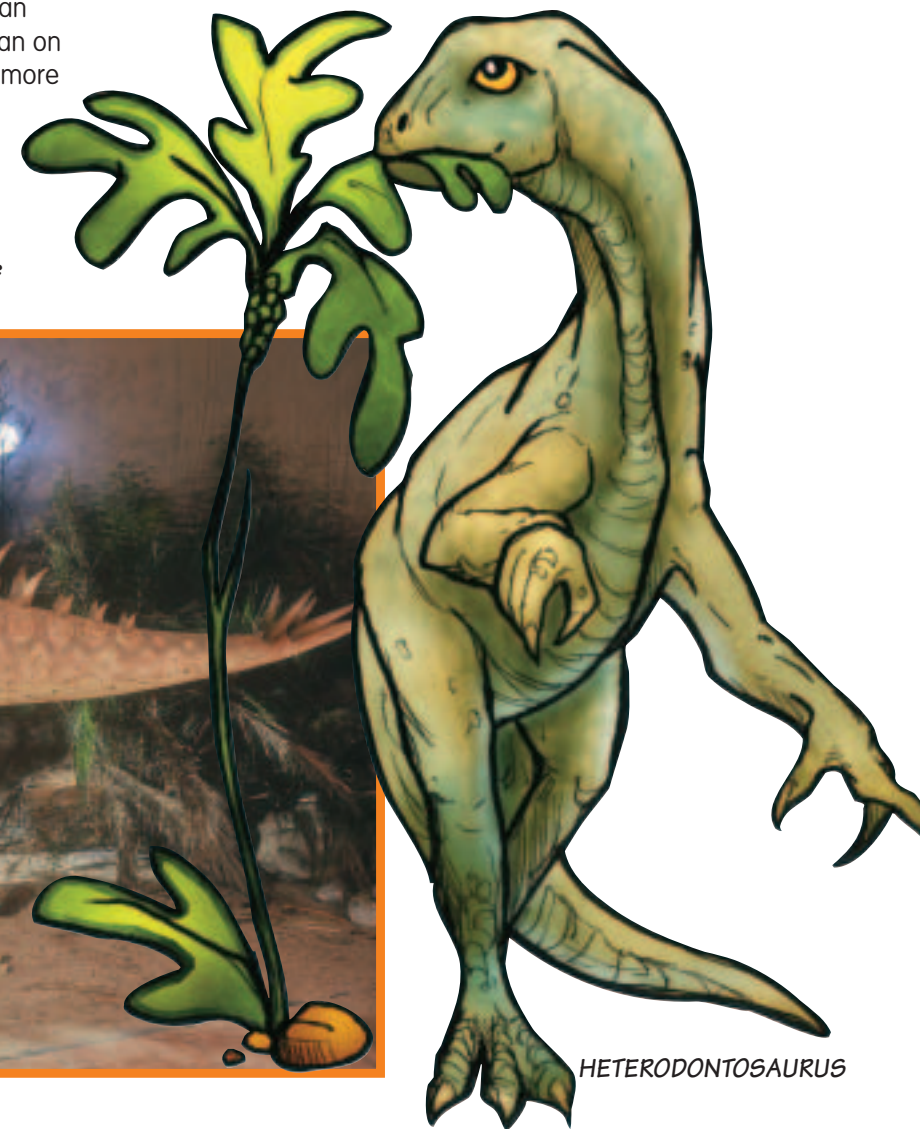
The most recent predatory dinosaur to be discovered in South Africa is *Nqwebasaurus*. This was a half-metre high, meat-eating dinosaur that had a very large claw on the first digit (finger). Seventy percent of a skeleton (nicknamed 'Kirky') was found nine years ago near the village of Kirkwood, about 50 km from Port Elizabeth in the Eastern Cape. The type species is *Nqwebasaurus thwazi*. Thwazi is an old Xhosa word for a fast-running messenger, and Nqweba is the Xhosa name for the Kirkwood area.

One of the largest predators, if not the largest that ever lived, *Carcharodontosaurus*, which grew up to 14 metres long and nearly four metres high at the hips, was found in Morocco in Africa.

The FINAL CRUNCH

About 65 million years ago, dinosaurs became 'extinct'. There are many theories about why they died out, but the most likely cause was a huge asteroid that hit the Earth with great impact. This could have caused a cascade of events such as earthquakes, larval outpourings, fires, tsunamis, and changes in global temperature. This would have been devastating for the dinosaurs, as well as many other animals that were around at the time.

However, dinosaurs were not completely wiped out. Their descendants, the birds, are still very much with us today.



CARCHARODONTOSAURUS

HETERODONTOSAURUS

SOUTH AFRICAN DINOSAUR EGGS IN THE NEWS

Palaeontologists said in July this year that they had identified the world's oldest dinosaur embryos, dating back 190-million years. Most of the other known dinosaur embryos are at least 100 million years younger.

Dr Mike Raath, curator at the University of the Witwatersrand in Johannesburg, says that one of the embryos is almost complete and nicely curled up inside its egg. It appears to be close to the hatching stage. The embryos belong to the dinosaur *Massospondylus*.

The eggs in which the embryos were found came from a cluster of seven eggs found nearly 30 years ago by Professor James Kitching in Golden Gate Highlands National Park in the Free State. The fossils were stored at Wits University for all this time.

Professors Kitching and Anusuya Chinsamy-Turan CT scanned the eggs a few years ago, but the tiny bones of the embryos did not show up well from the surrounding rock. At that time, they could not obtain permission to mechanically clean out the embryos, which are only a few centimetres long.

In 2000, Professor Robert Reisz of the University of Toronto in Canada, while on a research visit, borrowed some of the eggs and took them back to his lab, where his assistant Diane Scott did the difficult cleaning of the eggs.

The end-result produced two clearly-formed embryos from which scientists could deduce a number of interesting facts, like how the animals grew from babies to adults.

As a baby dinosaur, *Massospondylus* was pudgy and awkward-looking with a huge head, large eyes and four equally-long legs. But as it got older, its neck rapidly grew and its body proportions changed dramatically, turning into the classical-looking plant-eating dinosaur.

The embryos also showed that the dinosaurs made for caring parents. "These little dinosaurs had no teeth, which made us believe that they had to be fed by their parents," says Raath.

In 1993, Professor Chinsamy-Turan published her research on the bone microstructure of several different sized individuals of *Massospondylus*. She found that *Massospondylus* took about 15 years to reach adult size.

Compiled from information kindly supplied by Professor Anusuya Chinsamy-Turan of the University of Cape Town and Dr Mike Raath of the University of the Witwatersrand.



The skull of an adult *Massospondylus* above and the embryo in its egg below.



An artist's reconstruction of the embryo in its egg.



A fossilized embryo of the dinosaur *Massospondylus*, found in the Free State. It is one of the two oldest dinosaur embryos that have ever been found.