

UC Earth Science Garden

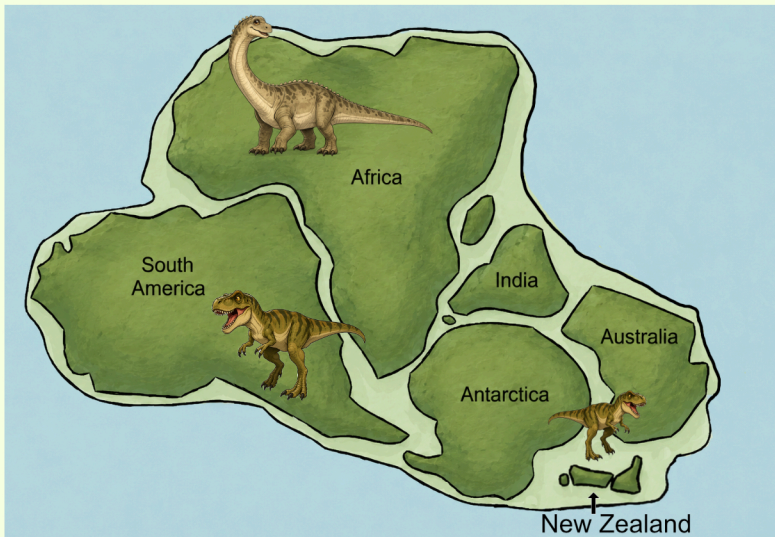
Geology Landscapes of Te Wai Pounamu South Island



Discovering Fossils

Learn to identify fossils from the
South Island of New Zealand

Gondwana - 80 million years ago



New Zealand was part of Gondwana, a HUGE super continent. Dinosaurs roamed across Gondwana and were even in New Zealand. South of Dunedin there are fossil forests from when New Zealand was part of Gondwana.

Dino Fossil Hunt

No dinosaur bones have been found in the South Island. You could be the first!

Where would you go look for dino bones?
(Circle the correct one)

Types of rock:

Sedimentary Rocks

Igneous (volcanic) rocks

The age of the rocks:

10 million years old

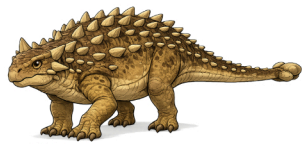
30 million years old

70 million years old

Where they formed:

Rocks that formed underwater

Rocks that formed on land



New Zealand's Dinosaurs

Match up these dinosaur names:

Theropod - carnivore with sharp teeth

Ankylosaur - armoured herbivore, club-like tail

Ornithopod - herbivore, walked on two legs

Titanosaur - huge, plant-eating sauropod

Extinction

Dinosaurs went extinct about 66 million years ago. The current theory is that an asteroid impact, combined with massive volcanoes, caused dinosaurs to die out.

Joan Wiffen (1922–2009) was a self-taught New Zealand fossil hunter who changed our understanding of New Zealand's prehistoric life.

Before her discoveries, many scientists believed dinosaurs had never lived in New Zealand.

In the 1970s, she discovered dinosaur bones in the Hawke's Bay region, providing the first confirmed evidence of dinosaurs in the country.

Her finds included remains of theropods, sauropods, ankylosaurs, and pterosaurs, as well as important fossils of ancient marine reptiles and birds.



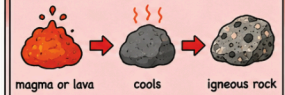
The Three Types of Rock

IGNEOUS ROCK

Formed when molten rock (magma or lava) cools and hardens.

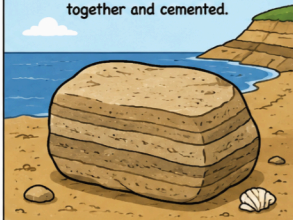


How it forms:

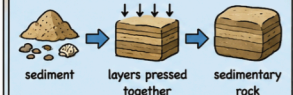


SEDIMENTARY ROCK

Formed when layers of sediment sand, silt or shells are pressed together and cemented.



How it forms:



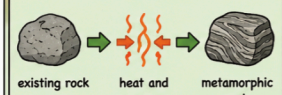
★ Most fossils are formed in sedimentary rock.

METAMORPHIC ROCK

Formed when existing rock is changed by heat and pressure deep in the Earth.



How it forms:



Common sedimentary rocks

Limestone (often white)

Formed when New Zealand was mostly underwater. Made up of calcium carbonate from the skeletons of tiny animals.

Mudstone and Siltstone

Forms in deep water and made up of very tiny grains. The concretions in the garden were formed in mudstone.

Sandstone

Forms closer to shore than mudstone and is made up of larger grains. Similar sand on the beach but made into a rock.

Coal (usually black or dark)

Compressed plant matter, great for finding fossil leaves.

Find one of each rock types in the garden

Sedimentary Rock



Metamorphic Rock

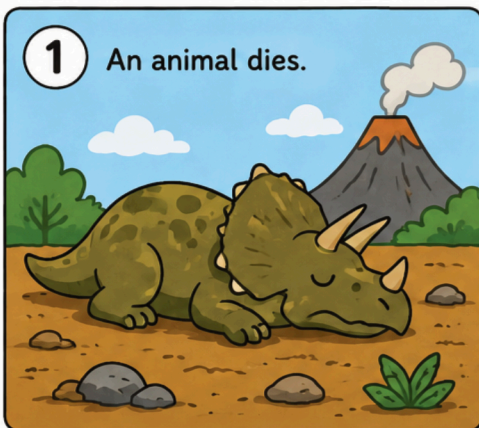


Igneous (volcanic) Rock



How fossils form

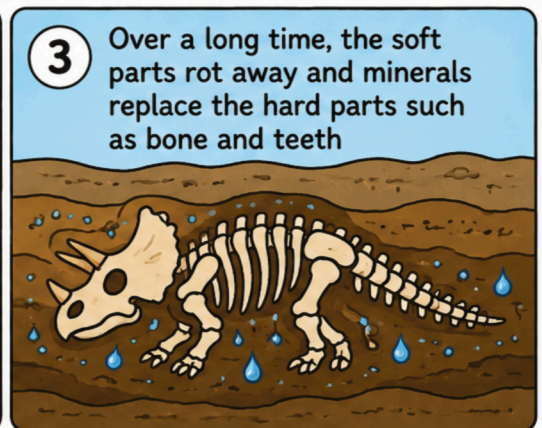
1 An animal dies.



2 It is quickly buried by mud, sand, or ash.



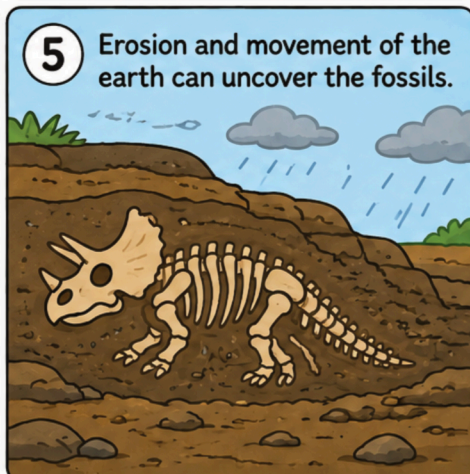
3 Over a long time, the soft parts rot away and minerals replace the hard parts such as bone and teeth



4 The remains turn to rock over millions of years.



5 Erosion and movement of the earth can uncover the fossils.



6 We find fossils and study them to learn about the past!



Fossil Detectives

Once we find a fossil, the fun really starts! Help me gather more data about these fossils.



Moa TMT

I found this moa TMT bone washed up on the beach. Measure it to figure out what species it is.

Little Bush moa: 17cm and less
Eastern moa: 18cm to 25cm
Heavy footed moa: 25cm to 30cm
South Island Giant moa: 30cm to 60cm

What moa does it belong to?



Moa Femur

This moa femur is from Otago where it was sticking out of some mud. Measure it to figure out what species it is. Add 2cm for the bits that were worn away.

Little Bush moa: 15cm and less
Eastern moa: 18cm to 22cm
Heavy footed moa: 23cm to 35cm
South Island Giant moa: 40cm to 60cm

What moa does it belong to?



Mystery bird bone block

Look closely at the edge of the bone where it is worn away. Are the bones hollow like flying birds? Or quite solid like birds that spend time diving underwater?

The exposed bones are part of the wing or flipper of a bird.

What kind of bird is this?

Why would solid, heavy bones help it find food?



Whale mandible maths

This is a small section of whale mandible (lower jaw)

Measure the thickest part of this whale mandible. Multiply your answer by 18 to get an estimate of the total length.

How many centimetres would the mandible have been?

Fossil hunting time!

Scattered across the garden are some fossils from across the South Island of New Zealand, especially from the North Canterbury area. See how many you can find.



Mystery bones in limestone

Age: 25 - 30 million years

These bones appears to be ribs from a large marine animal.

What animal could it be from?



Stem of a Triassic fern

Age: 170 million years

This is a cross section of the stem of a fern.

Measure the diameter of it (this is how wide it is).

How wide is the fern stem?



Mosasaur vertebra

Age: 70 - 75 million years

This broken concretion contains vertebra and ribs from this predator. Some of the outer part of the bone has been worn away allowing us to see the bone texture inside.

What do you think mosasaurs ate?

Hint: it was a carnivore that lived in the ocean



Dolphin or whale vertebrae

Age: 10 million years

These bones make up part of the spine of this cetacean which is the name for dolphins, whales, and porpoises.

How many vertebrae do you see?



Whale ear bone

Age: 10 million years

This bone is called the tympanic bulla and can tell scientists what kind of whale it is - this is from an ancient baleen whale.

Why do whales need special ear bones to hear?

Ask one of the team to explain if you don't know



Dinosaur-aged shark tooth and belemnites

Age: 80 million years

You will have to look closely to spot this shark tooth among all the calcite filled belemnites.

Draw the shark tooth



Mystery fossil

Age: 10 million years

Try and identify this fossil, it is from a creature you have probably seen and lives in both saltwater and freshwater.

What animal is this?

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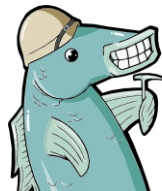


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Acknowledgements:

Lesson plan authored by Mamlambo Fossils



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UC  EARTH AND ENVIRONMENT

Te Kura Aronukurangi

