Teacher Resource to support Student Digital Learning Inquiry

Fossils Provide Evidence of Evolution

This inquiry examines four geological periods in South Australia that provide evidence of how animals have adapted and evolved to survive in their environment.

Developed to support Yr 5-6 students in Science and Geography.


This education resource for schools has been developed through a partnership between DECD Education and the South Australian Museum. Outreach Education is a team of DECD specialist teachers based in major South Australian public organisations.

This student digital inquiry can be used as a standalone resource or as part of a video conferencing session. It supports teachers and students to develop an understanding of the fossils discovered in South Australia.

**Big Idea:** South Australian fossils provide evidence of adaptation

**Concepts:** Evolution, Adaptation, Change, Environment

**Year levels:** 5 - 6

**Australian Curriculum Outcomes:**

**Science**
- Living things have structural features and adaptations that help them survive in their environment. (Year 5)
- The growth and survival of complex life is affected by the physical conditions of the environment. (Year 6)
  - This inquiry table can also be used as an introduction and thought provoking resource for years 7 - 10: Scientific knowledge changes as new evidence becomes available and some scientific discoveries have significantly changed peoples understanding of the world.

**Geography**
- Significant events that connect people and places throughout the world.
- The various connections Australia has with other countries and how these connections change people and places.
- Evaluate sources for their usefulness and represent data in different forms, for example, maps, plans, graphs, tables, sketches and diagrams.

**An inquiry into:**
- Fossils in South Australia
- South Australia’s four geological periods
- How fossils provide evidence of change, evolution and adaptation
- How animals evolve and make improvements to survive in a given environment.
- Changes to the Australian environment and landscape over time.

**Inquiry Questions:**
- What is a fossil?
- Where have fossils been found in South Australia?
- What types of fossils have been found?
- What information do fossils tell us about living things, today and in the past?
- How do changes to the earth’s environment and surface affect living things?
**Key Inquiry Tasks:**

Students will use this resource to complete the following tasks:

- Select a fossil from each of the geological periods. Give a short description of each fossil and details to show how the fossilised animals have changed over time.
- Examine the fossil information and compare an animal from the oldest geological period with an animal from the youngest geological period. Note your findings.
- Find a fossil that resembles an animal living today. Give reasons for your response.

Students will be encouraged to record additional questions they have about fossils and adaption.

**Prior Knowledge Tasks:**

Prior to starting the inquiry, students should have an understanding of the following:

Some of this information is located in the “Extra Information” folder in the inquiry (shown in italics below), and further information can be sourced through independent research (bold below).

- Familiarise yourself with the map of South Australia and the locations of the geological finds.
- Locate these areas on a current map of South Australia.
- Source images and information to show the current landscape and climates of these locations.
- Find out what a fossil is and why they are important.
- Identify the four geological periods and the significance of each.

**Extension Tasks:**

Following the inquiry, student thinking and ideas can be challenged through the following tasks:

- Fossils are not only found in Australia. Choose one geological period given in this resource, and identify another major site in the world in which fossils have been found.
- Select one of the fossils. Draw an image of what you think the animal looked like. Consider the size and the possible diet of the animal. Give reasons for your choices.
- Consider animals and plants today. If they were to become fossilised and discovered a million years from now, what information would they give about the living thing?
- Use papier-mâché to create your own fossil.
- Take on the role of a palaeontologist. Record an interview sharing information about the job you do.
- Write a report about a fossil find.
Acknowledgements:

- Video content and fossil images courtesy of the South Australian Museum

- World map showing geological periods courtesy of the U.S. Geological Survey
**FOR TEACHERS:**

Summary of content to support teachers and students in undertaking this inquiry.

Palaeontology is the study of ancient life from its fossil record in rocks and the genomic record of living organisms. The fossil record in South Australia spans more than 600 million years of Earth’s history, from the evolution of animals to the extinction of Australian megafauna. This digital inquiry examines the fossils discovered in South Australia that represent the four geological periods outlined below.

<table>
<thead>
<tr>
<th>World View</th>
<th>Location in SA</th>
<th>Key Image</th>
<th>Major Fossil Finds</th>
<th>Start/End</th>
<th>Evolution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ediacaran Period</strong></td>
<td>Flinders Ranges</td>
<td>Dickinsonia, Spriggina</td>
<td>542 - 635 million years ago</td>
<td>LIFE EVOLVES IN THE SEA Soft bodied – first signs of animal life</td>
<td></td>
</tr>
<tr>
<td><strong>Cambrian Period</strong></td>
<td>Kangaroo Island</td>
<td>Anomalocaris, Trilobite</td>
<td>541 - 485 million years ago</td>
<td>LIFELESS LAND – TEEMING OCEAN Exoskeleton - protection (developed spines)</td>
<td></td>
</tr>
<tr>
<td><strong>Jurassic</strong></td>
<td></td>
<td></td>
<td></td>
<td>Dinosaurs</td>
<td></td>
</tr>
<tr>
<td><strong>Cretaceous Period</strong></td>
<td>Coober Pedy</td>
<td>Belemnite, Plesiosaur</td>
<td>145 - 65 million years ago</td>
<td>MARINE REPTILES Animals that could swim</td>
<td></td>
</tr>
<tr>
<td><strong>Pleistocene Epoch</strong></td>
<td>Naracoorte (and Burra)</td>
<td>Diprotodon, Wonambi</td>
<td>2.5 million -10,000 years ago</td>
<td>LARGE OR GIANT LAND ANIMALS Eg. Mega fauna</td>
<td></td>
</tr>
</tbody>
</table>
Ediacaran – Flinders Ranges
635 Million Years Ago

- Provides evidence that the world looked very different from today, with a single giant continent surrounded by an enormous sea.
- During this period, areas of Australia were part of this giant continent and were located in the northern hemisphere near the equator. The east coast of this continent is now a part of South Australia.
- It is thought that these creatures evolved because of an increase in oxygen levels on the Earth’s surface at this time.
- The animals that lived in this time had no hard shells or skeletons, and the impressions left by their soft bodies are difficult to interpret. There is much scientific debate about what kinds of organisms they were, but it is thought that most of them were probably not the ancestors of any animals that live today.

Dickinsonia
Lived around 550 million years ago. It is one of the oldest fossils known. Dickinsonia was a flat segmented animal that moved and fed on the sea floor. Dickinsonia was one of the common animals in the Ediacara biota of South Australia. It had no mouth but absorbed nutrients from the decaying organic matter underneath its body. This feeding method resulted in a series of “resting traces” on the seafloor.

Spriggina
Spriggina was the first animal with a well-defined head and a segmented body. It was an arthropod. Spriggina was a possible ancestor to shrimps, millipedes and centipedes.

Other fossils from this period:

Aborea   Kimberella   Parvancorina – Shield Bug
Cambrian – Kangaroo Island
541 Million years ago

- Provides evidence that the single supercontinent broke apart and by the early to mid-Cambrian there were two continents. The continents were Gondwana, near the South Pole, (Africa, Australia, South America, Antarctica and parts of Asia) and Laurentia, nearer the equator (North America and part of Europe).
- In the early Cambrian, the Earth was generally cold but was gradually warming.
- There was increased coastal areas and shallow sea environments.
- At this time there was a dramatic expansion of animal life in the sea. There was no life on land.
- Some fossils found in this period have similar features to modern animals. The oceans were teemed with animals such as worms, jellyfish, trilobites and brachiopods.
- At this time some animals had evolved tough body parts, such as shells or exoskeletons, (which are more readily preserved as fossils).
- Predators evolved, fuelling the need for animals to develop defensive features such as spines and hard shells. The predator/prey arms race had begun!

**Anomalocaris**
Anomalocaris is thought to have been a predator. It propelled itself through the water using the flexible lobes on the sides of its body. It is believed to have fed on hard bodied animals, including trilobites.

![Anomalocaris image](image)

![Anomalocaris – Grasping Arm](image)

**Trilobite**
Trilobites were the most abundant animal of this period, with 17,000 species being found. Trilobites are arthropods and lived in a marine environment. Fossilised remains of trilobites have been found on every continent.

![Trilobite – Atops](image)

![Redlicha + Isoxys](image)

![Redlichia Takooensis](image)
**Cretaceous – Coober Pedy**
**145 Million Years Ago**

- Provides evidence of an inland sea inhabited by large marine reptiles.
- During this period, Australia was joined to Antarctica, New Zealand and South America, and made up the southern landmass of Gondwana.
- Australia had a cool, wet climate, and for several weeks each year, it is thought that Australia may have had parts where there was an icy polar winter, including semi-darkness.
- A shallow inland sea called the Eromanga Sea covered nearly one-third of Australia.
- Large conifer forests covered most of Australia, with smaller plants such as ferns, gingkoes, cycads and horsetails created an understorey. The first flowering plants had begun to bloom.
- Giant reptiles inhabited Australia at this time. Flying reptiles shared the skies with early forms of birds. Giant marine reptiles inhabited the seas. Australia's first mammals, including relatives of the platypus lived here.

**Belemnite**
Belemnites were squid like animals with a bullet-shaped internal skeleton. It had a streamlined body with a head and tentacles at the other end. Belemnites probably hunted near the surface like schools of squid do today.

**Plesiosaur**
The Plesiosaur was a marine reptile that swam and hunted in the icy seas of inland Australia 110 million years ago.

**Other fossils from this period:**
Pleistocene – Naracoorte (and Burra)
2.5 Million Years Ago

- Provides evidence that the sea levels were much lower than in previous geological periods.
- The climate in Australia continued to change rapidly between icehouse phases (cold, dry conditions) and greenhouse phases (warmer, wetter conditions).
- It is thought that humans evolved during this time and may have first arrived in Australia.
- During this time the megafauna ruled the landscape (animals with an adult body weight of over 44 kg).

**Diprotodon**
Diprotodons were the largest of all Australian megafauna. They were gentle giants browsing on trees and shrubs. The Diprotodon was thought to have lived in herds and was widespread across the Australian continent.

**Wonambi**
Wonambi was a giant snake with an estimated length of 6 metres, a diameter of 250mm and a weight of 50 kilograms.

**Other fossils from this period:**
**How to use the Student Digital Inquiry**

Follow the steps outlined below:

1. **Read this information first.** (There are 3 tabs)

2. The information in this folder will give you some background information about fossils and geological periods.

   This folder contains maps showing the locations of geological discoveries in South Australia.

3. **Open the Notebook to find your inquiry questions.** You can record your response and findings here.

   **NOTE:** Student responses cannot be saved, and must be printed before logging off.

These folders contain images, text and videos about each of the geological periods.

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**SOURCES**

- Extra Information
- Maps of South Australia
- Ediacaran
- Cambrian
- Cretaceous
- Pleistocene
Notebook

Your notebook will look like this:

Click on **Student questions** to see the inquiry tasks.
Click on **Your notes** to add any notes or ideas you have.

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Student questions

Use the folders in this inquiry table to learn about some of the fossil finds in South Australia.

Look closely at the images and read the information to learn about how these fossils provide evidence of animal adaptation.

Answer the questions below:

Select a fossil from each of the geological periods. Give a short description of each fossil and details to show how the fossilised animals have changed over time.

Add answer

Examine the fossil information and compare an animal from the oldest geological period with an animal from the youngest geological period. Note your findings.

Add answer

Find a fossil that resembles an animal living today. Give reasons for your response.

Add answer

List any questions you have about fossils and adaptation.

Add answer
1. Double click on a folder to reveal the contents.

2. Click on the page or subject you would like to look at.

3. The content will appear like this.

4. Each page has an attached reference note. This will give you additional information, or pose a question to provoke thinking. You can hide the reference.

- In the Cambrian period, there was an increase of animal life in the sea.
- Some fossils found in this period show similar features to modern animals.
- The oceans were full of worms, jellyfish, trilobites and brachiopods.
- Some animals had developed tough body parts, such as shells or exoskeletons to protect themselves from predators.