Worksheet: The life of a palaeontologist

Intermediate Phase
Grade: 4 - 6
Learning area: Natural sciences
Strand: Life and living
Theme: Biodiversity, Change and continuity
Specific Aim 1: Acquiring knowledge of natural sciences

Activity sheet

Activity 1: Complete before you go to the West Coast Fossil Park

A scientist, who studies fossils of prehistoric plants and animals to learn what the Earth was like many years ago, and how and why it is different to today, is called a **palaeontologist.**

Fossils are the remains or evidence of prehistoric plants and animals, including any traces of their activities, which have been preserved in rock due to the process known as fossilization. Palaeontologists search the sedimentary rocks to find the fossils of dinosaurs and other animals and plants which lived millions of years ago. The palaeontologist uses various scientific methods to find out more about the fossil plant or animal life forms, and asks questions regarding the age of the fossil and whether it was fossilised on land, or under water. They use this, and other information, to learn more about the history of our Earth.

A palaeontologist uses many tools when looking for fossils. These include picks, chisels, drills, shovels, brushes, trowels or even magnifying glasses.

Palaeontologists walk through an area where they know the rocks or sediments are a similar age to the fossils they are seeking. They search the rocks and ground to see if they can see any fossil bones or teeth sticking out. They get so good at finding fossils that they are able to identify a piece of fossil as small as your thumb nail. If the fossils are situated in soft sediment, they are dug out and then transported to a research institution such as a museum. If the fossil is embedded in rock, the rock surrounding it is removed with the fossil *in situ* (in place) and taken to a research institution. Dental drills (yes, the same kind of drills that dentists use on your teeth!) are then used to drill away the sedimentary rock surrounding the fossils. Once all the covering rock is drilled away, scientists study the animal or plant which is exposed to daylight once again, millions of years after it died.

Once fossils have been discovered the new fossil will be compared to other fossils, and sometimes with skeletons of living animals. Animals which are extant (extant means 'living today') and which are related to fossil animals can provide information about fossil species.

Question 1: Rock types

a) We talked about sedimentary rocks. What are the other two types of rocks?

b) We described how sedimentary rocks form, how do the two types of rocks form?

c) Would you find fossils in them?

Question 2: Would you make a good palaeontologist?

Read the questions in the questionnaire below to see if you have the personality to become a palaeontologist.

Description	Check ✓
I love the thrill of discovering things.	
I am patient and determined to spend days searching for fragments of bone that may be a sign of something worth digging up.	
I enjoy getting my hands dirty.	
I am curious about how old the Earth is and finding out more about the history of life on Earth.	
I am a thorough person and enjoy taking detailed notes.	
I enjoy working in teams and sharing information.	
I enjoy doing research and finding out more about things.	
I am eager to grow my knowledge.	
I enjoy sleeping in a tent and working in a wild environment.	

Question 3: What is it like to be a palaeontologist?

If you had to meet a palaeontologist at the West COast Fossil Park, what questions would you ask him or her?

Question 4: Finding a fossil

Here are just some of the things that you would need to do once you have found a fossil:

1. You would need to compare your fossil to other similar fossils, and to existing living animals or plants.

2. You would try to find out more about the anatomy of the fossil, that is, what do the shells/teeth/bones/plant structure look like.

3. How and where did your fossil live?

4. You would try to reconstruct the environment in which it lived by looking at the sequence of sedimentary rocks above and below the fossils.

5. You would photograph or draw, and write about your find.

6. You would take measurements to make careful comparisons.

Explain why you think you would have done the actions listed above, once you have found a fossil.

Activity 2: Complete after your visit to the West Coast Fossil Park

Question 1: Rules and fossils

In your group, discuss the following: What you think are the important rules all palaeontologists should remember when finding and dealing with fossils?

Question 2: Palaeontology as a career

1. What aspects of palaeontology interest you?

2. Do you think palaeontology is an important science? Why?

3. What would be the responsible thing to do if you discovered a fossil? Explain your answer.

Teacher notes

Activity 1: Complete before visit to the West Coast Fossil Park

Question 1: Rock types
a) metamorphic and igneous

b) **Metamorphic rock formation**
Over time, earthquakes or movements of the Earth's crust may move rocks up and down within the crust, and this may lead to them experiencing chemical or physical alteration. Rocks that have been changed by underground pressure or heat are called metamorphic rocks.

Igneous rock formation (Extrusive (basalt) and Intrusive (granite)
The inside of the Earth is very hot and is filled with molten rock called 'magma'. When 'magma' erupts out onto the surface of the Earth, it is called 'lava' (no longer 'magma'). These eruptions of lava result in the formation of 'extrusive' igneous rocks. Igneous rocks which are formed from magma that cools underground are 'intrusive'. The speed,at which lava cools, as well as its chemical make up, will influence how the igneous rock will form.

Granite, also an example of igneous rock, is formed deep within the Earth's crust when magma, which is rich in a mineral called silica, rises up into the crust and then cools slowly, forming the large crystals you can see in granite. Over time these rocks are exposed on the land's surface when the rocks and sediments covering them are eroded away.

c) **Metamorphic rock** – No, as metamorphic rock has been transformed by heat and/or pressure. The heat and pressure may cause recrystalization, folding, or squashing of a rock that contains fossils, making the fossils unrecognizable due to distortion. Once again, fossils appearing in metamorphic rock are highly unusual, but not unheard of.

Igneous rock – No, igneous rocks are mostly formed from hot lava ejected from the Earth, so rarely contain fossils, since the heat tends to destroy whatever might otherwise have been preserved in the rock.

Question 2: Would you make a good palaeontologist?
Learners own answer.

Question 3: What is it like to be a palaeontologist?
Learners own answer - Teacher can suggest some example questions.
When did you decide to become a palaeontologist?
Where have you done most of your work?
Would you choose this as a career if you had the choice again? Why?
How do you feel about children collecting fossils?
Have you ever sold a fossil?
Have you ever had a fossil found by you displayed in a museum? How did it make you feel?
What is the best and worst part of your work?
What kind of education do you have?

Question 4: Finding a fossil

1. You would need to compare your fossil to other similar fossils, and to relevant existing living animals or plants.

If you find a sabre tooth cat skeleton. Compare a sabre tooth cat to an ordinary cat. Modern cats dont have the huge 'sabre' tooth which sabre toothed cats had. This means they kill/killed, and eat, their prey differently. Sabre-tooths were larger, so ate larger prey. They are likely to have shared many similarities with modern cats eg. hunt nocturnally, use their claws to climb and grab prey, were probably good stalkers of their prey etc.

2. You would try to find out more about the anatomy of the fossil, that is, what do the shells/teeth/ bones/plant structure look like.

If the fossil is a plant, look at the manner in which leaves/flowers are arranged on the stem, the pattern of veins on the leaf, the kind of roots (if present), or seeds, and see which modern species this most closely resemble. If the fossil is a bone look at its shape and size, work out what bodypart it is, and see which living animal has a similar bone.

3. How and where did your fossil live?

For example, if you find a fossilised shell which looks similar to existing species which live in lagoons and dams, and if you found the fossil shell in rock which had formed from lagoon mud sediments, you can be pretty sure it was some kind of water snail which probably lived a similar lifestyle to modern water snails and filled a similar ecological niche. The lifestyle and ecological niche utilized by your fossil will be reflected in the skeleton, the morphology (shape) and size of the bones, and especially in the teeth, which will be adapted to a particular diet.

4. You would try to reconstruct the environment in which it lived by looking at the sequence of sedimentary rocks above and below the fossils.

The type of sedimentary rock can tell you about the environment in which the fossil fossilized. The presence of shells - fresh or seawater - may indicate an ocean, river or lagoon. The shape and size of the sediments making up the sedimentary rock can tell you about the circumstances under with they accumulated eg large stones may indicate the sediments formed in the wave zone of a beach.

5. You would photograph or draw, and write about your find.

Most scientific research is published in scientific journals which are widely read by other scientists. In such a publication you would include a detailed description of your fossil and where you found it (giving details as to the geology of the area), give it a name, describe its most interesting and relevant features, and draw or photograph them for the publication.

6. You would take measurements to make careful comparisons.

Generally, measurements of the jawbones and teeth are used when describing fossils, eg. the length of the tooth row, however, various features of postcranial bones are also used and measured in the description of a fossil.

Activity 2: Complete after visit to West Coast Fossil Park

Question 1: Rules and fossils
Declare your findings.
Get permission to dig.
Work in well-organised teams.
Clearly label where the fossil was found and what you think it to be.
Manage damage of surrounding areas when digging up the fossil.
Fill in the site with sand bags when you leave to protect any fossils and sediment which is left.
Always leave something behind so that future generations, who will have much better tools and technology than you, will be able to come and get out more information from the site.

Question 2: Palaeontology as a degree

1. Learners own answer

2. Learners own answer - Teacher can suggest some example questions.
Palaeontology is defined as: The scientific study of life in the geologic past, especially through the study of animal and plant fossils. The study of past life helps us understand the past and how, and why, species evolved and went extinct. It helps us understand the earth, and the things that affect the environment and climate of the past, and the present. This information is vital to helping us predict future environmental and climatic change. Such knowledge could make the difference between our survival, and our extinction as a species. It also helps us understand how all living things are linked, and prevent further extinction of animal and plant species, and damage to the environment.

3. Learners own answer - Teacher can suggest some example questions.
Inform a palaeontologist at a museum or university, or a Heritage practitioner, so they can arrange for the protection, and study of the fossil.
Do not remove the fossil. Once it has been removed, it loses its value as it no longer as a context.