Worksheet: The fossilization process

With very few exceptions, fossils occur mostly in sedimentary rocks. Sedimentary rocks are the most common rocks found at the Earth’s surface. Sedimentary rocks may form on land or in water. They may be made up of pieces of other rocks which broke down as local rocks underwent weathering, and matter like sand, clay and mud that settled in layers at the bottom of rivers, lakes and oceans, or blew across the land’s surface. After a really long time, the layers of sediments are compacted by the weight of overlying sediments and cemented together to form sedimentary rocks such as limestone, shale and sandstone. Sometimes plants, bones, sea shells, leaves, pollen and other bits of living things get caught in the layers. These buried plant and animal remains become fossils within the sedimentary layers. This is why fossilization is closely tied into the sedimentary process. Because these rocks are formed of sediment (bits and pieces of matter), they are called sedimentary rocks. The age of the rock layers in which the fossil is found may be dated to work out the relative age of the fossil.

Conditions necessary for fossilization
The word fossil is from the Latin word meaning ‘to dig’ and it was originally applied to any animal, plant or object that was dug out of the ground. In time, the word came to be connected with any preserved prehistoric plant or animal. Fossils provide us with a valuable record of plant and animal life, and the type of environmental conditions that existed millions, even billions, of years ago.
Fossils are only formed once the plant or animal dies and if the conditions are just right, for example:

- the animal must be buried quickly such as in a flood, sand storm, volcanic eruption, or an earthquake.
- the animal must be buried quickly to save it from being eaten by scavengers or from decaying or weathering.
- the animal must be buried in sediment that is mineral-rich, so while the bones decay, the bone’s minerals are replaced by other minerals from the surrounding sediment. Recrystallization (where a mineral crystal changes its form) may also occur.

The process of fossilization thus involves the dissolving and replacement of the original minerals in the bone/shell/tooth/eggshell etc with other minerals. This process results in a heavy, rock-like copy of the original object - a fossil. The fossil has the same shape as the original object, but is chemically more like a rock.

**Activity 1: Making your own fossils using natural objects**

**You will need the following:**

1. Bring in a few natural objects from home to "fossilize", for example, twigs, leaves, bones, shells, flower petals or plant stems.
2. A plastic container for mixing
3. A paper plate
4. Modelling clay
5. Plaster of Paris
6. Waxed paper
7. Small amount of vegetable oil

**Method:**

**Part 1:**

1. Prepare the Plaster of Paris and pack it onto the paper plate until it fills the whole plate.
2. Make an impression by gently pressing in the object and then removing it.
3. Once the impressions have been made, remove the objects from the plaster. Be careful not to touch the plaster, as it will need time to harden and dry. Leave the plaster to set.
4. Write down any observations that you noticed about your fossils

**Questions:**

1. Which parts of the objects made very visible impressions in the plaster?
2. Which ones are harder to see?
Part 2:

1. Choose four natural objects.
2. For each of them, place a large ball of clay on a piece of waxed paper and flatten it into a thick circle.
3. Apply a small amount of vegetable oil to the impression surface to make it non-stick.
4. Take the Plaster of Paris, which should be a smooth, thick consistency, and spoon it into each impression thoroughly until it has been filled in.
5. Leave the plaster to dry completely overnight, and then peel away the “clay” to reveal your fossil.

Questions

1. Is your “fossil” a reliable representation of an actual fossil? Explain.
2. What kind of fossil have you made?
3. What similarities does Plaster of Paris have to the rock surrounding actual fossils?

Activity 2: Complete after the Fossil Park visit

1. Fossils can be classified into types, according to how they were fossilized. Find out what these are.
2. What type of fossils do we find at the West Coast Fossil Park? Explain.
3. Illustrate diagrammatically how the fossilization process occurs.
Teacher notes

Activity 1: Making your own fossil using natural objects

Assess practical activity using the following rubric:

<table>
<thead>
<tr>
<th>Assessment Criteria</th>
<th>Performance Indicator Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific accuracy</td>
<td>Model incomplete/incorrect</td>
</tr>
<tr>
<td>Size and scale</td>
<td>Too big/too small/lack of scale</td>
</tr>
<tr>
<td>Use of recycled material</td>
<td>Only expensive/new material used</td>
</tr>
<tr>
<td>Clear &amp; accurate explanation/key</td>
<td>Absent</td>
</tr>
<tr>
<td>Workspace</td>
<td>Messy worker</td>
</tr>
<tr>
<td>Cleaned up</td>
<td>Did not clean up</td>
</tr>
<tr>
<td>Objects</td>
<td>Did not bring</td>
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</tbody>
</table>

Questions
1. Learners own answer. Ensure that they give a suitable reason for their answer.
2. A trace fossil.
3. The Plaster of Paris hardens around the fossil, roughly mimicking the formation of sedimentary rock, when the sediments surrounding a fossil compact and harden to form rock.

Activity 2:
1. Fossils can be classified into types, according to how they were fossilised.

**Mummies** - When an animal perishes in a very dry environment e.g. a desert cave, its body may dry out so rapidly that it mummifies, with a minimum of putrification (rotting) taking place. Such a fast-drying process may result in the preservation of body parts such as skin and hair.

**Body fossils** are the remains of a dead animal or plant that has turned into a rock-like replica of the original through the process of fossilisation. The process of fossilization involves the dissolving and replacement of the original minerals in the object under-going fossilization with minerals from the surrounding sediment.
**Trace fossils** are not the remains of animals themselves, but rather fossils of the tracks, tailprints, eggs, toothmarks, animal faeces (coprolites) and burrows, they have left behind them. Trace fossils are extremely important because they provide information about how, and where, ancient animals lived and behaved.

2. The fossils of the now extinct animals which lived some 5 million years ago are examples of body fossils. The bones are heavily mineralized, but not petrified. The West Coast Fossil Park at Langebaanweg, in the Western Cape, is one of the richest Early Pliocene fossil sites in the world. Large numbers of fossil bones were found buried many metres below the land’s surface.

3. Flow chart