Teacher's notes: Fossilised footprints

This experiment will teach pupils all about fossils with a fun, hands on experiment.

Level: NI: Key stage 2
ROI: 3, 4, and 5th class

Time required: 15/20mins activity, plus 5/10 mins set up

Curriculum links: This experiment links with the National Curriculums of Northern Ireland (The World Around Us) and Ireland (Geography, History and Science)

Northern Ireland	Ireland
Change Over Time: Ways in which change occurs over both short and long periods of time in the physical and natural world (KS2): How the world has changed over time; How change is a feature of the human and natural world and may have consequences for our lives and the world around us **How change is a feature of the human and natural world and may have consequences for our lives and the world around us (KS2):** How the world has changed over time; How some materials can change or decay while others do not, such as fossil formation	**Geography - Natural Environments:** The local natural environment; Land, rivers, and seas of my county; Rocks and Soils; Weather, climate and atmosphere
Place: Features of, and variations in places, including physical, human, climatic, vegetation and animal life (KS2): Places then and now	**History - Local Studies:** Buildings, sites or ruins in my locality; My locality through the ages; Continuity and change in the local environment;

Interdependence: The effect of people on the natural and built environment over time (KS2): Ways in which the use of natural resources through time has affected the local and global environment; Local habitats; Ways in which the use of natural resources through time has affected the local environment	**Science – Living Things:** Human life; Plant and animal life

The learning intention:
Students will understand:

- what a fossil is
- how fossils provide clues to Ireland's past
- that Ireland's landscapes have undergone significant change
- that fossils are rare and should not be collected

Students will have developed their skills in:

- Using pictures, maps and globes
- Investigating and experimenting
- Observing
- Recording and communicating

They will use these resources:

- Pictures of fossils
- Pictures of modern day equivalents
- Experiment card

Prior Knowledge:
Pupils should be familiar with the following terms and concepts:

- The concept of extinction
- Plate tectonics, the Earth's crust

Stages of the lesson and methods used:

- A general discussion should take place on what a fossil is, and how it has been preserved.
- Students should be asked to carry out the fabulous fossils activity, up to the point where they need to leave their footprints to set.
- Students should be given pictures of fossils found in the Geopark area and then asked if they recognise any of these animals.

- Students should then be circulated images of their modern equivalents and asked if they can match them up.
- A discussion should take place as to where these creatures are found at the present day, and if all of these creatures were found in a shallow, tropical sea, then why are they found in the rocks in this area.
- The concept of change over time, and plate tectonic movement should be explained and that man of our rocks formed many millions of years ago when the island of Ireland was in very different locations than it is today.
- Once the plaster-of-Paris has set, the rest of the experiment should be carried out. Care should be taken when turning out the contents of the tub.
- If this experiment is to be extended, tubs could be swapped and once footprints uncovered, students could be asked to correctly identify the dinosaur that made them.
- Students should also be asked to consider the fact that many fossil sites are protected by law. This means that no fossils should be collected unless they occur as loose blocks. They are representative of creatures that lived millions of years ago and can never be replaced so even if not protected, they should not be destroyed.
- A follow-up activity would be to experiment with making footprints, or prints from other objects, in different materials such as wet sand, dry sand, clay, mud, soils and observing what happens to these footprints. What happens if these are left for a few days, which one is still visible and what does that tell us about how likely these are to be preserved?

Background Information

What is a fossil?

A fossil is the remains of a prehistoric plant or animal embedded in rock. When most people think of fossils they think of dinosaur skeletons and large bones, but there are many different types of fossils to be found.

Fossils are divided into body fossils and trace fossils. Body fossils are the remains of the actual body of a plant or animal whilst a trace fossil is a preserved trace that the fossil has left behind from when it was alive. Examples of these would be dinosaur footprints or worm burrows.

How are fossils preserved?

When an animal or plant dies its remains usually rot away to nothing. Sometimes, the conditions are just right and if it's buried quickly then it may turn into a fossil. Generally, only the hard parts of any animal (such as bones or teeth) are preserved, but in exceptional circumstances soft parts (such as skin) may be preserved as well.

What can fossils tell us?

As the preserved remains of animals and plants from many millions of years ago, fossils represent environments that have long disappeared. The fossils that we find represent the ancestors of the animals and plants that are alive today, so we use these as clues to interpret the environments that are preserved in the rocks.

Fossils in the Geopark area

All of the fossils found in the Geopark area formed during the Carboniferous period that lasted from 359 to 299 million years ago. Although the experiment gets you to make dinosaur footprints, the rocks of the Geopark area are too old to contain dinosaur fossils of any kind. However, in rocks of similar age in North-East England, fossil footprints from a four-legged reptile have been found, representing a precursor to the dinosaurs, so it is possible that these could also be found in the Geopark area.

Most of these fossils are found in limestone that formed in a shallow tropical sea about 330 million years ago, when the island of Ireland would have been just south of the equator. This environment would be roughly equivalent to the Bahamas. Some of the fossils are found in sandstone that formed in a tropical river delta about 320 million years ago. This environment would be roughly equivalent to the Amazon River.

Some of the fossils found are:

1. **Brachiopods:** a marine animal made up of two shells (or valves). They are commonly referred to as lamp shells as they resemble pottery oil-lamps. Today they are only found in the sea.
2. **Solitary (rugose) corals:** a now extinct order of coral, often referred to as a horn coral as they resemble an animal horn with a wrinkled (or rugose) surface. They lived on the sea floor and would have had tentacles to help catch prey. Their modern equivalent is found in all regions of the oceans and do not build reefs.
3. **Compound corals:** living in colonies, these are found today in clear, nutrient-rich shallow tropical waters and are the world's primary reef builder.

4. **Crinoids:** a marine animal that is part of the same family as starfish and sea urchins. This creature is also known as a sea-lily as it resembles a plant attached to the sea bottom by a stalk, with a number of radiating arms at the top. Today, crinoids are found in shallow water and in areas of up to 6000 metres depth.
5. **Bivalves:** found in both marine and freshwater, bivalves are made up of two identical shells (valves) with the best known examples being scallops, mussels and oysters.
6. **Goniatites:** a now extinct type of ammonoid, these coiled-shell sea creatures are related to the squid and octopus. They resemble the modern Nautilus that is found in the Indo-Pacific region between 30°S and 30°N, where they are known to inhabit the deep slopes of coral reefs.

Examples in the Geopark area

1. **Legacurragh, Co. Fermanagh**
    a. One of the finest examples of compound corals found in the Border Uplands area. This limestone surface is at the head of a dry valley and is a fossil layer that is known all the way across Fermanagh and Leitrim.
2. **Swanlinbar River, Co. Cavan**
    a. The small river in the town of Swanlinbar has a bed that is full of solitary corals that resemble animal horns. The river should only be visited in low water, when there will be a number of fossils exposed as well as loose boulders and cobbles.

Experiment - Fossilised Footprints

Aim: To recreate the preservation of dinosaur footprints on a river bed

When Dinosaurs Ruled the Earth
When dinosaurs roamed our planet, the world was very different. There were very few of the animal groups that we see today, no birds, no mammals, and no lizards. There was also a great deal of difference in the plants that existed all those millions of years ago, there were no flowering plants and no grass!

When the dinosaurs died out over 60 million years ago, they left behind clues as to what they looked like and how they lived. Much of our knowledge has come from dinosaur body fossils, so parts of the actual dinosaurs themselves. There is another form of fossil however that has also given us clues, trace fossils. This is the name given to the trace that was left behind by any creature as it lived. This could be the cast of a worm burrow on the beach, or in this case, a footprint as a dinosaur walked along a sandy river bank.

What You'll Need
1 empty butter tub
A toy dinosaur (small enough so that it can set into the tub)
Some clean damp play sand
Plastic cup
Spoon
½ cup of plaster of Paris
Small paintbrush

Instructions

1. First make your river bank. Fill the empty butter tub two-thirds full of sand.
2. Let your dinosaur 'walk' across the 'river bank'. Press the model dinosaur into the sand so that it makes a good clear set of footprints.
3. Now mix up the 'mud' that will preserve the footprints. Mix up some plaster of Paris in a small cup. Add in half a cup of plaster of Paris followed by a small amount of water. Mix until smooth.
4. Pour the plaster of Paris on top of your river bank until the footprints are completely covered.
5. Once the plaster of Paris is dry it is time to become a palaeontologist. Carefully tip your butter tub out onto a table. Using a brush, carefully remove all of the sand until the fossils are revealed.
6. Compare these footprints to your original dinosaur.

Fossil Brachiopod

Fossil Solitary (rugose) Corals

Fossil Compound Coral

Fossil Crinoid

Fossil Bivalve

Fossil Goniatite

CUILCAGH LAKELANDS GEOPARK

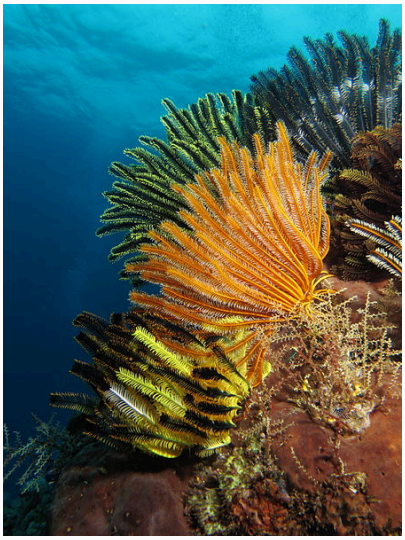
unesco Global Geopark

Modern Brachiopods

Modern Compound Corals

Modern Bivalves

No modern equivalent of Solitary Corals



Modern Crinoids

***Nautilus* a close modern relative of the Goniatite**