

# Exploring Rocks & Soil

If you want to know more about the area in which you live, one of the most important things to find out is what kind of rock is underneath it. It is also very useful to know what type of soil is in the area because that will tell you which plants will grow best in that location. The types of insects, birds and animals in the area all depend on the plants that grow there; all the living things in any location are affected by the rocks and soil.

The study of rocks is called geology. There are dozens of different kinds of rock but we will concentrate on the four that are most common in Ireland:

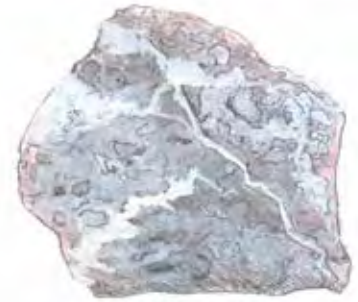
- Limestone
- Sandstone
- Granite
- Basalt



It is important to learn more about these rocks before your field trip, so they will be easier to recognise.

## **1. Limestone**

Limestone is the most common rock in Ireland, particularly in the midlands and parts of the west. The Burren in Co. Clare is made of limestone. It is a grey rock, usually pale grey, and dissolves fairly easily in water. You will therefore often find caves and underground rivers in a limestone landscape.



Limestone

### **How does limestone form?**

Most limestone was made hundreds of millions of years ago from the shells of tiny animals that died in a shallow sea. The shells sank to the bottom of the sea and were then pressed together by movements of the earth and formed into rock. Rocks that are made this way are called sedimentary rocks. Sediment is something that falls to the bottom in water or in another liquid.

### **What is it used for?**

Limestone is a useful rock. It has been used for building since ancient times (the Great Pyramid in Egypt is made of limestone) though it is not used as much today. Churches, train stations, older banks, older walls, bridges and canal locks are often made of limestone. It is also used for road chippings and in such things as cement and concrete. It is also found in toothpaste and some bread and cereals, as it provides extra calcium which is good for our bones and teeth.



Limestone wall, Aran Islands



Limestone pavement, The Burren

## **Sandstone**

The several different varieties of sandstone are also a type of sedimentary rock, formed when layers of sediment were pressed together at the bottom of the sea over millions of years. However, they are not made from the shells of animals as limestone is, but from grains of sand. This sand was often in or near water, like the sand on a beach. However, sandstone can also be made from the sand in a dry desert.



Old red sandstone

### **How does it form?**

When the sand was squeezed by movements of the earth in ancient times it turned into rock. Sand and sandstone can be many different colours. In Ireland, it is commonly a reddish-brown or a salmon colour and has a fine grain. Sometimes you can see layers of different colours in a sandstone cliff where the type of sand changed. Sandstone is most common in the south-west and is the main rock found in the mountains in Kerry.

### **What is it used for?**

Sandstone is used for building. Some types of sandstone also make good grindstones for sharpening tools or, in the old days, grinding corn into flour.



Old red sandstone wall, Co. Kerry



Slieve Mish Mountains, Co. Kerry

## **Granite**

Granite is the most common rock in the east of Ireland; the Wicklow and Dublin Mountains are mainly made of granite, however it is also found in other places, for example the Twelve Bens Mountains in Connemara are granite. Granite is a hard, coarse-grained rock and you can often see small crystals in it. It varies in colour but is usually a pinkish-grey colour.



Granite

### **How does it form?**

Granite is made from the lava that flows from volcanoes. This kind of rock is called igneous. The word 'igneous' means 'fiery', because these rocks started life as very hot liquids.

### **What is it used for?**

As granite is very tough, it is sometimes polished and used to make floor tiles or counter tops and is often used for graves. It is the most popular type of rock for rock climbing.



Former Dalkey Quarry - granite rocks



Granite cross in Ballintray Woods, Co. Wexford

## **Basalt**

Basalt is dark grey or black, and sometimes has white lines of quartz crystals in it. It is mostly found in the north-east of Ireland. It also lies further beneath the earth's surface than any other type of rock.

### **How was it formed?**

Basalt is another igneous rock, which means it once flowed out of a volcano as lava, cooled down and hardened. One of the most famous basalt formations in the world is the Giant's Causeway in Co. Antrim. At the Giant's Causeway, the lava cooled very quickly because it met the sea water, making the basalt form into six-sided columns. There is also ordinary basalt in other parts of Ireland, including parts of south Wexford and south Waterford.

### **What is it used for?**

Basalt is sometimes used by sculptors to make statues. Thin slabs of basalt can be cut and polished for use as floor tiles. Basalt can also be crushed and used as a base for new roads or as filter stones to help drain fields.



Basalt



©Nicola Smith

The Giant's Causeway, Co. Antrim



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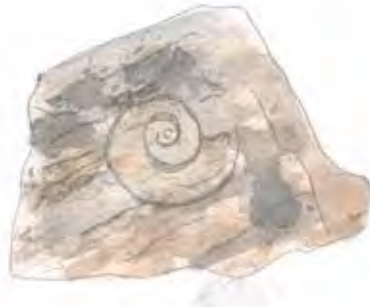
The Giant's Organ, Giant's Causeway  
Co. Antrim

## Fossils

Sometimes when sedimentary rocks are forming, a plant or an animal gets trapped in the sand or in the tiny shells that the rock is made from. Millions of years later we can still see the shape of the plant or animal in the rock. These shapes are called fossils.



Plant fossil



Snail fossil



Dinosaur fossil

Fossils are really useful for teaching us about extinct plants and animals and about how life developed. Without fossils, we wouldn't know about dinosaurs or about the animals that eventually evolved into human beings.



Fossil footprints of a 'tetrapod', Valentia Island

The oldest fossil plants in the world were found in the Slieve Bloom Mountains in the 1980s. They are about 450 million years old and date from the time when plants were starting to spread across dry land.

There is an important set of fossils on Valentia Island, Co Kerry. These fossils are footprints that were made by a four-legged creature called a 'tetrapod' about 350 million years ago.

## Soil

Most of the rock that lies beneath Ireland is covered by a layer of soil. There are some exceptions, such as the Burren in Co. Clare, the tops of steep mountains, and cliffs along the coast. We are lucky to have so much soil because without it we would not be able to produce much food.

Most soil is a mixture of finely ground bits of rock and the remains of plants and animals. In some places, such as peat bogs, the soil is just the remains of dead plants and animals, while in others areas, such as sand dunes, the soil is just pieces of finely ground up rock. However, most areas have a mixture of soil types.



Dead tree stumps in bogland



Sand dunes along the coast

The ground up rock in the soil isn't always the same kind of rock as the one directly underneath the soil. Over millions of years, rivers, glaciers, and even the wind, can move sand and gravel a long way away from where it was first formed. Living plants and animals help turn the dead plants and animals into soil by eating them. Most of these living plants and animals are very small; you would need a microscope to see them! There are also a few that are quite large, like earthworms, which are really great at making fresh soil.



Earthworm

### **Before your field trip**

It is often not easy to see the rock beneath the soil. Think about your local area. Is there anywhere where it might be possible and safe to see the rock below the soil? It could be a sea cliff, an old quarry or a cutting that has been made for a road, railway or canal. Try to get a geological map of the place in which you live. These are maps that show which rocks are found all over Ireland. You may be able to look at one in a library or to find one on the internet.

If there is sedimentary rock (limestone or sandstone) in your area, find out if there is anywhere you would be allowed to search for fossils. Many fossils are found in places such as farms or quarries, but you must always ask permission before you can start your search.

#### **Useful Equipment:**

- Hammer and cold chisel for collecting rock samples and chipping out fossils (use eye protection).
- Gardener's pH meter or soil testing kit
- Trowel
- Bottle of water – to mix with the different soils
- Notebook and pencil
- Digital camera for photographing plants, animals and insects (Taking a picture is always better than collecting a sample)
- Hand lens or magnifying glass
- Wellington boots
- Towel – to clean your hands after handling the soil



#### **Field trip check list:**

- Where is the best place to explore rocks and soil?
- How will I get there?
- When is the best time to go on the rocks and soil field trip?
- Is the weather suitable for the field trip?
- Am I wearing appropriate clothes (coat etc.) for the trip?
- Do I have all the equipment I need?
- Are there safety issues which could arise during the trip I should consider?
- Have I thought about how I should respect the countryside when on the field trip?

Remember, instead of picking wildflowers, you should photograph or draw them.

#### **Questions to prepare:**

During your field trip, you will find out lots of interesting things about the rock and soil types that are in your area.

What questions do you have about rocks and soil which you would like to answer?

Can you predict the answers to some of your questions before you set out on your trip?

### **During your field trip**

During your field trip, you will need to look closely at the rocks and soil in your area, and observe as many interesting things as you can. What types of insects, animals and plants do you see? You could take photographs and draw pictures of the area you explore, and maybe collect samples of rock and soil to take home or to school.

You can do a number of activities to find out more about the ground beneath you. The 'Activities' section below will give you some ideas.



### **Activities**

#### **Checking the soil you collect**

There are several ways you can check the type of soil on your field trip. There are three suggestions below.

##### **1. Ball-making test**

This is the easiest but messiest test! Take a handful of soil with no stones in it; if it is dry soil, add a small amount of water. Squeeze it in your hands to try and turn it into a ball. One of three things should happen.

I. The soil stays in a sticky ball when you let go of it. This means it is a clay type of soil with very small grains of rock in it.

II. The ball falls apart when you let go of it. This means it is a sandy type of soil with larger grains of rock in it.

III. Everything just turns into a mushy mess. This probably means you have a peaty soil with no grains of rock in it at all.

## 2. Acid or Alkaline?

Now try something a bit more scientific. It is important to know whether your soil is acid or alkaline because plants are fussy about this; some plants like acid but more like alkaline. This is measured on a scale of numbers from one to ten called the pH scale. Anything below seven is acid and anything above seven is alkaline.

You will need a pH meter to measure this and there are cheap ones available in all good garden centres. They work in different ways but the easiest ones to use have a metal rod that you stick into the soil and a dial that shows you the pH number. When limestone rock is ground up it produces alkaline soil. Granite, basalt and sandstone produce acid soils, and peaty soils are very acid.

## 3. Look at the plants

Another way to find out whether your soil is acid or alkaline is to look at the common wild trees and other plants that grow in your area. Insects, such as butterflies, can also give you a clue because different kinds of insects eat different kinds of plants. Remember to look for wild plants also.

### Look for:

#### *Acid-loving plants*

Oak tree



Birch tree



#### *Alkaline-loving plants*

Ash tree



Birdsfoot trefoil



Bloody cranesbill



Dandelion



### Extension Activity

#### Improving soil

Soil is very important but it is seldom perfect. Luckily, we can usually improve the soil. This is quite easy in a garden but a bit more difficult on a farm.

Ask your teacher or a parent to give you a plot of ground at school or at home. Test the soil using a ph meter and the ball-making test. Think about the type of plants you would like to grow, and try to improve the soil to suit these plants.

Then....

1. If the soil is too acid, add some ground-up limestone.
2. If the soil is too alkaline, add peat.
3. If the soil is too sandy (which makes it dry out very quickly when there is a shortage of rain), add household compost or peat and some ground-up limestone.
4. If the clay is heavy, which gets waterlogged when it rains, add sand or household compost.
5. If the soil doesn't have enough dead material in it, add household compost or well-rotted manure.
6. If the soil is very stony, you will just have to pick out the stones!
7. Be nice to your earthworms, they are your best friends! Earthworms are very important in helping to break down food in the composter. They also create lots of little holes in the soil that allows it to breathe and drain when it rains.



ph meter



Why not create your vegetable garden at home or at school?

### After your field trip

#### **Rocks and Soil Report**

You have learned a lot about the different types of rocks and soil in Ireland and particularly in your area. You have also found out that different plants like to grow in different types of soil.

Put all your photographs, drawings and records of the different types of rocks, soils and plants you found into a folder to create a report.



By creating a report on what you did and what you found on your field trip, you will be able to use it to compare how different soil types affect the plant life in an area.

### Focus: Environmental awareness and care

It is very important that we all try to protect our soil. Healthy soil provides us with food, trees and wood, lots of different wildlife, and it also helps to keep the air and water clean.

#### **Question:**

How can we help to protect our soil?



#### **Suggestions:**

- Instead of picking a flower or plant, always take a photograph or draw a picture of it instead. Plants help to bind the soil and prevent the wind from blowing it away (wind erosion) so it is important not to disturb them.
- Make sure to collect all your belongings and rubbish before returning from your field trip. Soil can become polluted from any rubbish left behind. This can also cause damage to the insect life in the ground.
- Never pour any liquids, other than water, over the ground. These may cause damage to the soil.

### Share your learning with others

You can share your field trip findings, including your project and report, with others on the ENFO website. On [www.enfo.ie](http://www.enfo.ie), just click on 'ENFO Kids' and you will find the Where We Live section. You can display your project on any page in this section by clicking on the Upload button on the page and filling in the details. You will be able to upload text, photos, audios and videos.