

Geological postcards 1 - granite and chalk

Picture postcard puzzles

Imagine that your class is studying the way that the landscape is affected by the nature of the rocks beneath it. Granite and chalk are two such 'landscape-forming' rocks. The rocks are very different; as are the landscapes they form.

You have been learning that:-

granite is:

- a resistant igneous rock, made up of three main groups of minerals - quartz, feldspars and micas, seen in the photo;
- cracked by fractures called joints, running in several directions, but being igneous, has no bedding planes;
- non-porous and mostly impermeable (i.e. water cannot get into the rock itself and cannot readily pass through it);
- breaks down to form white clay minerals, which are easily washed out of the rock, thus weakening it.



Granite (Photo by Peter Kennett)

chalk is:

- a relatively soft sedimentary rock made up of very fine grains of calcium carbonate, from the dead bodies of millions of plants and animals; it may contain layers of grey flint;
- well-bedded and broken by joints;
- porous and permeable (i.e. it can soak up water and can also let it pass through the rock);
- weathers by dissolving in rainwater, especially when it has become more acidic by passing through soil and plant cover.



Chalk, a very fine-grained limestone, with a fossil shell
(Photo by Peter Kennett)

Then, the mail arrives, bringing postcards from two of your friends who are on exchange visits to other parts of the country. [Note: these 'postcards' use UK examples, so are mainly applicable to Northern Europe. It may be better to make up 'postcards' for your own region if your landforms are very different.]

Study each postcard (below) and decide whether the landscape shown on it has been formed on granite or on chalk. Explain the reasons for your decision.

The back up:

Title: Geological postcards 1 - granite and chalk

Subtitle: Picture postcard puzzles

Topic: Using 'postcards' of landscape features as clues to the nature of the underlying rocks.

Age range of pupils: 14 - 16 years

Time needed to complete activity: 10 minutes

Pupil learning outcomes: Pupils can:

- relate a list of properties of two different rock types to photographs of these rocks;
- understand the relationship between the physical and chemical properties of rocks and the characteristic landscapes which have developed on each of them;

- explain that the exploitation of useful resources depends on the nature of the rocks;
- be stimulated to try to understand landscapes in their local area or when they are on holiday elsewhere.

Context: This activity can be used as a revision exercise in the properties of different rock types. It can also help to bridge the divide between science and geography in schools. The real locations of the photographs are:

CHALK:-

P 211514 Dry valley at Uffington, Oxfordshire:

P212485 Shoreham Cement Works, Sussex;

P005814 Chalk cliff and stack, The Foreland, E. of Studland, Dorset:

A cave eroded along a fault in beds of Chalk and flint, Seaford Head, Sussex.(PK)

GRANITE:

P006057 Lands End Granite at Land's End, Cornwall:

P212310 Logan Rock, Treen, Cornwall:

P209710 China clay workings, Great Pit, Lee Moor, south Dartmoor:

Cattle on Dartmoor (PK)

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Following up the activity:

The landscape of the area around the school can be related to the underlying geology, using the local geological map, rock samples and photographs. Pupils could be taken on a local field excursion to examine landscapes and geology at first hand.

Underlying principles:

- The resistant nature of granite usually leads to the formation of upland country inland and rugged headlands at the coast.
- Granite is largely impermeable, so there are many surface water features such as rivers, streams and lakes. Boggy ground with reeds and coarse grass is common.
- Granite breaks down by surface weathering, or by the action of fluids below ground, to form clay minerals. These may produce economic deposits of china clay. The unweathered minerals (mostly

quartz) are waste and are dumped in characteristic conical mounds.

- Chalk is weaker than granite and tends to form more gentle rolling hills and valleys.
- Chalk is porous and permeable, so there is very little surface water and valleys formed in earlier times are now largely 'dry'.
- Chalk may form surprisingly high vertical cliffs at the coast. This is because erosion is mainly by undercutting of the cliff by the sea, with consequent sheer collapse of the rocks above. This has a more pronounced effect than sub-aerial weathering of the chalk, and its permeable nature means that there is little erosion by rainfall, which would otherwise reduce the cliff profile.
- Chalk is a type of limestone and is a source of calcium carbonate. This is needed by the chemical industry, for lime-making and in the manufacture of cement powder.

Thinking skill development:

Pupils study the photographs to build up a cognitive pattern. Cognitive conflict may occur in matching the properties of the rocks to the postcards. If pupils follow up the activity by relating rock types to other landscapes, bridging skills are involved.

Resource list:

- class sets of 'postcards' and photographs of granite and chalk printed from these sheets;
- (optional) samples of granite and chalk to accompany the photographs.

Useful links: The website of the British Geological Survey contains an extensive library of excellent photographs of landscapes and geological features, and geological map extracts, which may be freely used in the classroom situation. See <http://www.bgs.ac.uk/opengeoscience/home.html>. Teachers in countries other than the U.K. may prefer to use a search engine to find photographs of rocks and landscapes in their own country and under their own climatic conditions.

Source: Devised by Peter Kennett of the Earthlearningidea team.

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Postcard 1



Postcard 2

