Earth science out-of-doors: preserving the evidence

What evidence of the present times might we find in a million years from now?

Take the class outside, to an area with some bare soil exposed, and perhaps some grass. Sitting beneath a large tree in the shade could make for an ideal setting – as well as being comfortable if it is hot!

Explain that we are going to look around us at familiar surroundings, but that we will think about what evidence of the present day might possibly become preserved in the geological record. Lead into the discussion by asking,

- "What is happening around us today, or has happened in the last few hours?" Ask the class to suggest at least six processes that they can tell are going on (*for example, the sun might be shining*).
- Then ask, "What is the evidence for these processes taking place?" (*e.g. I can feel the sun's heat, the ground has become dry and cracked*).
- Ask, "Which of these pieces of evidence might be preserved if this area became buried under more and more sediment?" (*e.g. mudcracks formed when the ground dried out may become buried*).
- Then ask, "Which of these pieces of evidence might still be preserved after millions of years?" (*e.g. mudcracks millions of years old can be found in the rock record).*
- Ask, "Using the evidence preserved in the rocks, what would you be able to say about the area in which the sediment was laid down; i.e. what was the environment like?"
- Explain that, in each of these stages, some of the evidence is lost, but some evidence is likely to be preserved.
- Finally, explain that this thinking sequence is the opposite of the way a geologist normally thinks. Get out a sedimentary rock with some key feature like mudcracks to show how geologists think. The mudcracks are millions of years old, they were buried by sediment, they provide evidence of warmth when the rock was being laid down, so it is likely that the sun was shining then as well. Similarly a dinosaur footprint shows not only that dinosaurs lived there in the past, but that the area was land, there was probably vegetation around for food or food for other animals being eaten) so the sun must have shone to cause photosynthesis for the plants to grow and it must have rained to give water, etc. We can build whole pictures of the past from small pieces of evidence.

A suitable setting for thinking about the environment (*Photo: Adam Slade, www.ituna.net*)

Sun-dried cracks in mud (*Photo: P. Kennett*)

Mudcracks in an ancient sedimentary rock (*Photo: P. Kennett*)

The back up

Title: Earth science out-of-doors: preserving the evidence

Subtitle: What evidence of the present times might we find in a million years from now?

Topic: A contemplative exercise, asking pupils to sit outdoors and to state what processes are going on around them; how they know; and what evidence of those processes might be preserved in the rocks of the future.

Age range of pupils: 10 -18 years

Time needed to complete activity: 15 mins

Pupil learning outcomes: Pupils can:

- observe what processes are going on around them;
- state which of their senses have enabled them to observe these processes;
- use their experience of current conditions to predict what evidence might be preserved in the future;
- realise that rocks may contain good evidence about ancient conditions at the time when they were formed.

Context:
Possible answers to the questions asked during the activity could include:

- "What is happening around us today, or has happened in the last few hours?" (*It could be hot, cold, (temperature changing), raining, dry (humidity changing), windy, calm, (atmospheric pressure changing), etc. Plants might be growing, or wilting; animals such as worms or dogs might be moving; it might have rained during the last few hours, etc.*
- "What is the evidence for these processes taking place?" *(Pupils can use their senses to feel the heat, cold, wet, wind: to see the sun, leaves blowing about, rain drops falling, to smell the rain landing on the earth, flower scent etc. to touch wet ground, leaves etc.*
- "Which of these pieces of evidence might be preserved if this area became buried under more and more sediment?" *(mudcracks, piles of wind-blown sand; ripple marks in water-washed sand in a gully; soil structure seen in profile; worm burrows, footprints of dogs or people in hardened mud etc.)*
- "Which of these pieces of evidence might still be preserved after millions of years?" *(most of the things above may still be preserved, but some may be lost)*
- "Using the evidence preserved in the rocks, what would you be able to say about the area in which the sediment was laid down; i.e. what was the environment like?" *(For most school situations, the evidence would indicate a land environment. Such environments, by their very nature, often leave scant evidence, but pupils may be aware of such features as dinosaur footprints, where the animal walked across a damp muddy area. If there is a lake, a river or a sea shore nearby, which can be safely used for this exercise, then there is a wider range of evidence that would be more likely to be preserved in the record of the rocks.*
- Several types of sediment, sedimentary structure or fossil can be used to build a picture of the past

Following up the activity: Use real specimens, (or photographs from the internet) of rocks displaying good sedimentary features and encourage pupils to interpret the environment at the time of their deposition.

Underlying principles:

- The usual geologist's approach is to use Lyell's principle that "the present is the key to the past". The current activity involves geological reasoning in reverse, i.e. trying to predict the future from the present. Concerns about global climate change have recently involved geologists trying to predict the future from the past.

Thinking skill development:

- There is a progressive loss of evidence as we go back in time (a pattern).
- Considering which things are likely to be preserved involves potential cognitive conflict.
- This activity demonstrates the thinking of a geologist in reverse (bridging).

Resource list:

- access to an open space where pupils can be comfortable for 15 minutes or so and can observe processes going on around them.

Useful links: Try the Earthlearningidea activities 'What was it like to be there – in the rocky world' (published 14th January 2008) and 'What was it like to be there – bringing a fossil to life' (published 11th August 2008)

Source: This activity is based upon one devised by Chris King of the Earthlearningidea team and issued under the same title by the Earth Science Education Unit, www.earthscienceeducation.com.