

Questions for any rock face 5: sedimentary grains

What questions about sedimentary grains might be asked at any rock exposure?

The ELI* series of ‘Questions for any rock face’ helps teachers to plan investigative fieldwork at any rock exposure**. In each case some possible questions are given, with some likely answers, to help you to decide whether the questions might work well at your site, or whether they would be asked better elsewhere. Answering the questions will provide basic understanding of the evidence preserved in rocks of the processes that formed them.

Sedimentary grains

All sediments and sedimentary rocks are formed of grains from boulder-size to mud-grade. The size and shapes of the grains can give clues to how they were transported and deposited.

Take the pupils to a site where sedimentary grains can clearly be seen and preferably where there is some variety of grain size/shape; a hand lens may be helpful for finer-grained rocks. Then ask these questions:

Possible questions	Possible answers
How big is the largest grain you can see? (estimate the length in mm or cm)	Boulder, pebble, sand or mud-size
When the sedimentary grains were being laid down, how might they have been moved here – by wind, water, ice or gravity?	Most sediments are water-laid and can contain grains up to pebble size (several cm across). Wind-laid deposits contain mainly sand-grade sediment. Gravitational fall deposits (e.g. scree) or ice deposits can contain large boulders
Was this deposit laid down in low, medium or high energy conditions? (More energy is needed to move and deposit large grains than smaller ones)	In water-laid deposits, large particles are laid down by high energy flash floods or storms at sea; sands and muds are lower energy deposits
Does the rock have several sizes of grains or just one size? (The further grains are carried, the more they tend to be sorted out into coarse, medium and fine sizes)	Mixed sediment (pebbles, sand and mud together) is probably near the original source of the sediment and was dumped in a storm. Separated sediment (pebbles, sand or mud) has been sorted out during longer transportation (long river transport or movement by waves and currents in the sea)
Have these grains travelled far? (Grains with sharp corners have not moved far but rounded pebbles will have travelled a long way)	As grains are transported they abrade one another (attrition) becoming rounded as corners are removed
What does the grain evidence tell you about this sedimentary deposit?	This question invites a summary of the evidence



Conglomerate, Woodton Formation, New South Wales, Australia (scale bar in cm).

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Coloured mudstone.

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* ELI = Earthlearningidea

** An exposure is where rocks can be seen at the Earth's surface, exposed by natural or artificial means; anywhere where a rock reaches the surface, even if it is covered by soil, etc. is an outcrop, so an exposure is also part of an outcrop.

The back up

Title: Questions for any rock face 5: sedimentary grains

Subtitle: What questions about sedimentary grains might be asked at any rock exposure?

Topic: Helping teachers to use questions about grain size and shape to find evidence for the way sediments were transported and deposited.

Age range of pupils: 9-16 years

Time needed to complete activity: 10 minutes

Pupil learning outcomes: Pupils can:

- explain how the sizes of grains in sedimentary deposits can be used to work out whether the sediment was deposited in a high, medium or low energy environment;
- explain how the shape and sorting of the grains gives evidence for how the sediment was transported and deposited (e.g. by water, wind, ice or gravity).

Context:

Grain size and shape can provide important clues for the environment of transport and deposition of sediments and sedimentary rocks. This activity helps pupils to use this evidence to interpret past environments of deposition.

Remember to carry out a risk assessment before taking anybody to any rock exposure.

Following up the activity:

Continue with other 'Questions for any rock face' Earthlearningideas

Underlying principles:

- Large sedimentary grains or clasts can only be moved by gravity, by ice or by very powerful flows of water.
- Sand-sized grains can be moved and deposited by wind as well as by water, ice and gravity.
- Mud-sized grains can only be deposited by melting ice or in very low energy water conditions, such as in lakes, tidal flats and the deep sea.
- Mixed-size sedimentary grains are sorted during transportation, so that the greater the distance of travel (or movement by wave and tidal currents) the greater the sorting.
- Wind deposits sand-sized grains, since larger grains have not been picked up, and finer mud-sized grains are usually carried out of the area (and then settle from the air over the oceans).
- The greater the distance of transport the greater the rounding of grains (by grinding together or attrition).

Thinking skill development:

Pupils apply the pattern of grain size and shape they have developed to understand sedimentary deposits through bridging to the natural world.

Resource list:

- the resources needed for pupil fieldwork listed in the Earthlearningidea, '*Planning for fieldwork: preparing your pupils before setting out to "ask questions for any rock face"*

Source: Devised by Chris King of the Earthlearningidea Team.

The 'Questions for any rock face' series of Earthlearningideas and the sites where they may be applicable

'Questions for any rock face' Earthlearningidea	Site
Planning for fieldwork	Preparation in school beforehand
1: weathering	Any exposure (cliff, coastal exposure, quarry, cutting) or weathered constructions (wall, gravestone, monument)
2: erosion	Any exposure and many walls
3: soil	Some exposures have a useful soil profile at the top (but many do not)
4: rock group (igneous or sedimentary)	Any exposure of igneous or sedimentary rock or both; also applicable to sedimentary and igneous building stones, gravestones or monuments
5: sedimentary grains	Any exposure of sedimentary rock and also building stones, gravestones or monuments
6: fossils	Any exposure containing readily found and obvious fossils, including some building stones, gravestones or monuments
7: tilted or folded rocks	Any exposure of clearly tilted or folded rocks
8: faults	An exposure where rocks are clearly faulted, preferably where beds can be matched up on either side of the fault
9: metamorphism	An exposure where metamorphic features are clearly visible and preferably, where there is also evidence of the former rock type
10: sequencing	An exposure where a sequence of geological events can be relatively dated using 'Stratigraphic Principles'
11. tectonic plates	An exposure of sedimentary rocks containing evidence of deposition in different climates and altitude/depths from today, with further evidence of plate margin processes
12. quarry/ cutting potential	An exposure in any quarry or cutting
13: quarry economics	An abandoned (or working) quarry
14: recording	Any exposure

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