Which sedimentary structures can you make?
Making sedimentary structures in the classroom using simple apparatus and materials

Most sedimentary rocks are made from loose grains of earlier rocks, which have been compacted and cemented to form new rocks. They often contain clues which tell you how they formed when they were loose material in the rivers, seas or deserts etc.

Study the photographs of these sedimentary structures in sandstones and shales and look for evidence of their formation.

Then look at the photograph showing some simple apparatus. Suggest ways in which each of the sedimentary structures seen in the photographs of the rocks might be reproduced using some of the apparatus. You will have a supply of washed sand, a jar containing some sediment of mixed grain size and a small amount of mud.

Discuss your ideas with your teacher, ask for the apparatus and then set to work. You could try making a short video of your investigation to show the processes as they happen.

Photographs of some sedimentary structures.

Symmetrical ripples.

Cross-bedding.

Plane-lamination in shale (with fossils).

Graded bedding.

Asymmetrical ripples.

Large-scale wind-blown dunes (Note: to try to make this structure in the classroom, don't blow loose sand around the room! Instead, see if you can find a way of measuring the angle at which a pile of dry sand will settle).

Plane-bedding in fine sandstone

The apparatus and materials, consisting of: gutter with end stop; square plastic box; circular plastic box; measuring cylinder; scoop; beaker; dessert spoon; wood block; protractor; jar with lid; washed yellow sand in tub; washed red sand; mud in jar with lid; mixed sediment in jar with lid; bucket of water.

The back up

Title: Which sedimentary structures can you make?

Subtitle: Making sedimentary structures in the classroom using simple apparatus and materials.

Topic: A revision activity, involving investigating how sedimentary structures are formed in loose sediment.

Age range of pupils: 14 years plus

Time needed to complete activity: About 20 minutes for a small group to devise an investigation, with the rest of the lesson being used for pupils to share their ideas and results with the class.

Pupil learning outcomes: Pupils can:

- appreciate that “the present is the key to the past”.
- explain that directions of flow, which created a range of structures, can sometimes be deduced from the evidence in the rocks.
- relate the energy levels at the time when loose sediment was being transported and deposited to specific sedimentary structures.

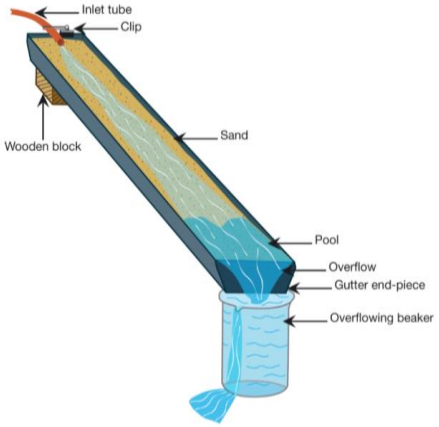
Context: To fit in with lesson timing, the teacher can allocate one structure per small group of students, share out the apparatus and then compare notes afterwards.

Methods for investigating each of the sedimentary structures shown above are described in the Earthlearningidea activities referred to in Useful Links below. However, these are not prescriptive, and students may well devise better methods themselves. The following photographs are taken from these activities (some of them were taken in the field to demonstrate sedimentary structures in front of outcrops where they are displayed).

Plane-bedding in sand

Plane-lamination developing in mud as it settles in salt water

Graded-bedding

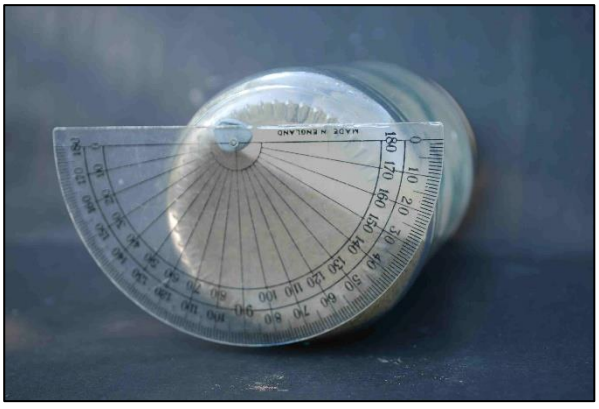


Cross-bedding – the gutter set-up (Earth Science Education Unit)

Cross-bedding in a microdelta at the end of the gutter (*Photo; Chris King)*

Asymmetrical ripples.

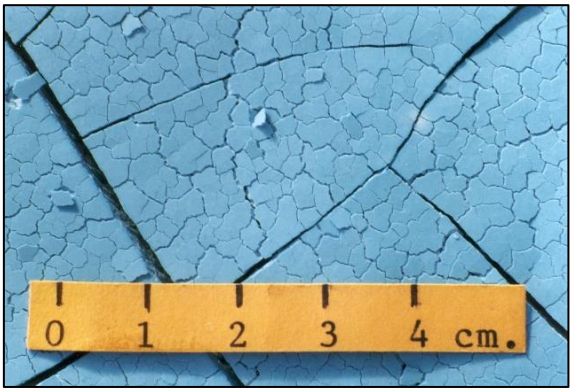
Symmerical ripples (in a circular bowl, but a square one works better)



Testing the angle of rest of dry sand, as in a desert dune

Following up the activity:

- Set up a demonstration to see if mud will settle more quickly in sea water than in freshwater, by using two identical containers (e.g. measuring cylinders), one with tap water and the other with salt solution. This usually happens in the natural world, owing to flocculation of the mud particles in the salt water.
- Display the photograph of desiccation cracks in a siltstone, below, and ask the class how they could reproduce these in the lab. It is possible to allow very wet clay, compressed into a plastic box, to dry out and crack, but a more spectacular method using cornflour is described in https://www.earthlearningidea.com/PDF/47_Mudcracks.pdf



Desiccation cracks in cornflour dyed blue

Underlying principles:

- Sedimentary rocks contain clues, such as sedimentary structures which may show how they were formed.
- Most sedimentary rocks are formed from loose sediment which in the past was carried by currents of water, ice or in the air. These currents transport vast quantities of previously weathered and eroded material from one place to another.
- A bed is defined as a layer of sediment which was formed in a single phase of deposition.
- A single phase of deposition may take a few seconds, or it may take many years.

Thinking skill development:

Thought processes of construction are involved when observing the outcomes of the demonstration. Cognitive conflict may occur when the outcomes of the investigations do not match students' expectations. Bridging skills are needed to relate the lab observations to the real world.

Resource list:

- gutter with end stop
- square plastic box
- circular plastic box
- measuring cylinder
- scoop; beaker
- dessert spoon
- wood block
- protractor
- jar with lid
- washed yellow sand in tub
- washed red sand
- mud in jar with lid
- mixed sediment in jar with lid
- bucket of water

Useful Links

https://www.earthlearningidea.com/PDF/Asymmetrical_Ripple_Marks.pdf
https://www.earthlearningidea.com/PDF/Symmetrical_Ripple_Marks.pdf
https://www.earthlearningidea.com/PDF/177_Graded_bedding.pdf
https://www.earthlearningidea.com/PDF/330_Make_own_cross_bedding.pdf
https://www.earthlearningidea.com/PDF/66_Sandcastles.pdf
https://www.earthlearningidea.com/PDF/223_Interactive_re-creation.pdf

Source: Earlier Earthlearningidea activities (see above). This teaching idea originally appeared in the free-to-download textbook '*Exploring Geoscience*' at: http://www.igeoscied.org/wp-content/uploads/2019/12/Geotextbook_Dec_2019.pdf
All photographs by Peter Kennett, except where stated.