The folding of rocks: lab simulations: teacher's notes

Level

This activity is designed for students aged 14-16 as an introduction to demonstrate folding and faulting of layers of rock, caused by lateral pressure (linked to plate tectonics).

Topic

The folding and faulting of rocks caused by lateral pressure.

Description

The activity (which can be done as a demonstration or as a class experiment) simulates the folding of rock layers by compressing layers of different powders (representing different rocks) in a transparent tank or box.

Context

Ideally, this unit should be taught after similar units on sedimentary and igneous rocks.

Teaching points

The activity can be done as a demonstration or, on a smaller scale, as a class experiment. Many variations on the basic method are possible depending on the equipment available.

Timing

The activities can be completed within about 20 minutes, allowing time for discussion and writing up.

The activity

Apparatus

For a demonstration, the teacher will need

- Large transparent plastic tank of rectangular cross section (an old aquarium is ideal)
- Sheet of wood (approximately the same size as the tank's internal cross-section)
- Laboratory jack to fit inside the tank

For a class experiment, each student (or group) will need

- A small open-topped plastic box of square cross section (approximately 20 cm x 10 x cm x 10 cm, but the size is not critical). A box such as those in which Ferrero Rocher™ chocolates are sold is ideal.
- Sheet of wood or tough cardboard (approximately the same size as the box's internal cross-section)

Chemicals

The teacher (or each group of students) will need

- Soot (or other inert black powder)
- Sand
- Powdered chalk
- Powdered vermiculite

Note. The identity of these powders is not crucial. Provided a good colour contrast is obtained, virtually any inert powders can be used. For a class practical, it is sufficient to use alternate layers of dry sand and flour alone. The sand can later be recovered by sifting or winnowing away the flour.

Safety notes

- It is the responsibility of the teacher to carry out an appropriate risk assessment.

The activity

For a demonstration, proceed as follows. Fully compress the laboratory jack and place it horizontally at one end of a transparent tank. Place a sheet of wood in position as shown in Figure 1. In the rest of the tank, place thin layers of different powders one on top of the other. Ensure that there is a good colour contrast between adjacent layers. Use up to four layers each approximately 1 cm thick giving a total thickness of 4 cm.

Gradually open the jack to move the wooden sheet and compress the layers as shown in Figure 2. This displacement and deformation of the layers illustrates the directional forces involved in **orogeny** (mountain building).

The demonstration can be done without a lab jack by simply sliding the wooden sheet along the tank by hand (provided the tank is not too large), taking care to keep it vertical.

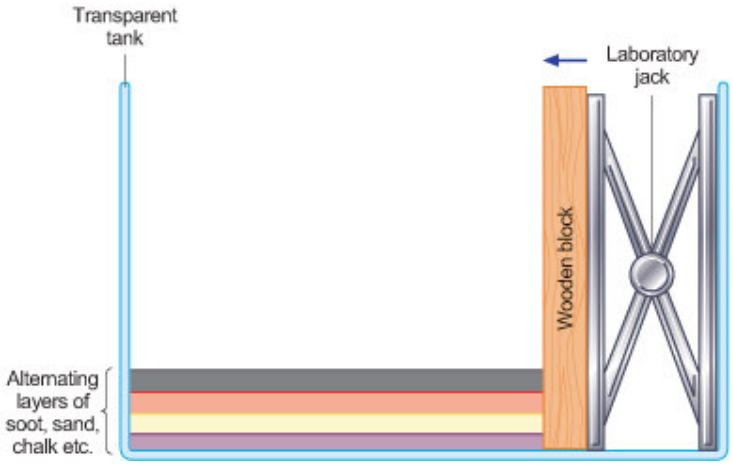

Figure 1 Before compressing the layers

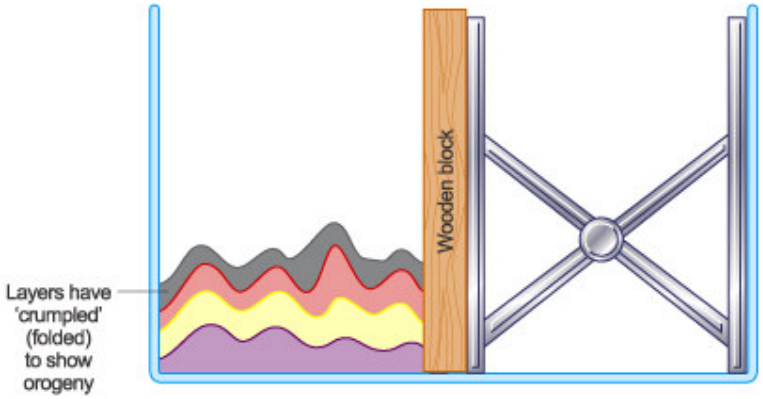

Figure 2 After compressing the layers

For the class experiment, the transparent tank is replaced by the plastic box. The piece of wood is placed vertically at one end of the box. Layers of the various materials are placed inside the box as in the demonstration version but using thinner layers. Students then slide the wood along the box, keeping it vertical, to compress the layers and produce folding. With care, folds can be seen to give way to slip planes, simulating faulting in the real world.

The disadvantage of this simulation is that it does not produce a ‘rock' or rock analogue which has a different texture from the original powder.