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If you are interested in sharing your experience of using these materials, we'd be grateful if you'd take the time to give us your thoughts via our resources survey (via the resources section of the website), or directly by email to geobus@st-andrews.ac.uk.

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GeoBus supporters 2012 - 2018:

Coring Through Time

These workshop notes are designed for use along with the accompanying slides which contain explanatory images etc.

Year Group: S3-S6

Length: ~50 minutes

Set-up Time: 5 minutes [plus 10-20 minutes prep to core chocolate bars, depending on numbers!]

Room requirements: A classroom space with desks for up to 30 students. This lesson uses food products to illustrate different rock layers in a core so any relevant allergies should be considered.

Summary:

The geological record contains valuable information about Earth's past, but large parts of it have been eroded away over time. In this edible workshop, students will learn how we use a knowledge of the world around us to fill in the gaps and piece together geological stories, helping us to find valuable resources from water to precious minerals.

Equipment:

- 2-3 cores per person[1]
- Apple corer
- Plates/boards/paper towel
- Rock core samples (if available)
- Playdough/salt dough
- Empty yakult pot (or similar)
- Short lengths of clear plastic straw
- *Optional: vinegar + bicarb*

[1] Suggested: Toffee Crisp, Twix, Mr Kipling Angel Slices, Boost, Jaffa Cakes (Mars Bars are too sticky, Caramel Wafers and Clubs fall apart)

Use the apple corer to prepare the cores in advance by pressing out samples of the chosen chocolate/cake bar or, for small groups, cover/wrap the 'samples' in tinfoil and get pupils to create their own cores without peeking! If cores are then eaten, watch out for any stray bits of foil.

Content:

Cores are taken using a drill (usually with a diamond cutting bit) that drills out a cylindrical sample and leaves behind a borehole. The longest vertical borehole is the 'Kola Superdeep Borehole' in Russia – it is over 12km deep (but only 23cm wide).

Cores allow us to look at sequence/patterns in the layers that have built up over time. The rock type can be identified along with any repetition of events (or layers). The occurrence of different minerals can also be investigated and coring is often used in the exploration for resources (including gold) to check the suitability of sites (e.g. the best place to mine). They are therefore an easy way to relatively quickly – and cheaply – see what's under the ground and start to put together the geological story.

In rock or soil cores, ash layers from different volcanic eruptions can be identified – these serve as time markers but also allow the geographical extent of the eruption to be studied. The frequency of events, such as flooding or droughts, can also be measured and compared to climate conditions – traces of atmospheric gases can also be trapped (most commonly in ice cores rather than rock samples), and extinction events can be identified using the appearance of fossils.

Coring is also widely used to study the sub-surface of other planets and take samples – most of the exploration rovers have a drilling device to take cores. The core sample are useful because they are less altered by atmospheric processes than samples the rover can select from the surface.

Coring Through Time

In addition to rock cores, many other things can be sampled. There are currently several large projects focussed on taking ice cores to look at past climate and CO_2 levels via bubbles of trapped atmospheric gases in ice. Trees can be cored to get information on growth and seasons (and wood used in old buildings can also be cored to get information about trees even further back in time). Even medical professionals use the technique, taking tiny cores of bone to check whether it is healthy (for example to look for evidence of certain diseases).

These are all different examples of materials that can be cored but it comes down to the same scientific approach – identify the layers, consider how they formed, make an educated guess on what they represent and put together the story.

CHOCOLATE CORING

Keep it simple and describe the layers, trying to decide what each is (e.g. biscuit, caramel) and then use the information to try to deduce the source of the core.

Variations/extensions:

- Use close up photos as a starting point before giving pupils the cores to examine and use hand lenses/magnifying glasses to discuss information at different scales
- Give pupils a core sample with only one layer to start with, or the layers separately
- Pupils can't touch the sample (specimen from Mars, no contamination!)
- Send the same for 'further analysis' but allowing pupils to perform a taste test
- Lay out examples (or pictures) of the answers to make the activity easier

MAPPING VOLCANIC ERUPTIONS / SEDIMENT LAYERS

In groups, pupils create a sequence of layers which another group will then have to 'core' and try to identify the order of the layers (or where the chosen layer of importance can be found).

Lava layers:

1. Put the yakult tub in the middle of the paper plate and create a series of lava flows out of different colours of dough. Each flow can be a different shape and cover a different area but there should be some overlap and at least 3 layers in total.

   Optional: each lava flow can be created by pouring a small amount of vinegar in to the tub, then adding bicarbonate of soda to create an eruption – the edges of the flow can be marked out with pen then covered in dough. Use paper towel to 'mop-up' each eruption before the next!
2. Keep a note/make a map of the order and shape of the flows (a rough sketch is fine).
3. Swap with another group to obtain a 'finished' sequence of layers to study
4. Chose where across the sequence it might be useful to see beneath the surface (e.g. where there are different colours at the surface, where you expect there to be overlap) and carefully extract cores using the plastic straw.
5. Study the layers revealed in the core and try to put together a map of the sequence of layers and where they extend to (e.g. are all the layers all the way round?)

Sediment layers:

Carry out the same exercise as above but simply build up flat sediment layers instead of lava flows – layers can vary in shape, size and thickness (e.g. create channels, floodplain etc.).