



Annual Conference
Guildford April 2017

What makes physical geography accessible?

Activities to help remove misconceptions and improve understanding.

Topic or Theme **Unlocking the secrets of what happens beneath moving ice**

What is frequently misunderstood or not grasped?

When learning about ice movement, students will often assume that the ice itself erodes the land. Not surprisingly when respected sites such as the National Snow and Ice Data Center has this sentence; 'A glacier's weight, combined with its gradual movement, can drastically reshape the landscape over hundreds or even thousands of years' <https://nsidc.org/cryosphere/glaciers/questions/land.html> Of course ice alone will not scratch and shape bedrock. However once students understand the concept that it is material in the ice carrying out the work, the secrets of how the land is shaped can be examined. Striations (parallel lines or scratches on the surface of a rock) help determine which direction the glacier flowed as it moved across the land.

At A level and for fieldwork activities the direction and depth of striations can tell us both how the ice moved and what depth the ice was.

Several fieldwork sites in the UK offer opportunities to study striations that show that ice flow has taken a number of slightly different directions. In North Wales striations show that the most recent extensive glaciation was the Devensian where the flow was largely South to South East. However, subsequently a smaller Loch Lomond re-advance saw valley glaciers radiating from the central highland area. Thus students can better understand the concept of ice advance and retreat within an ice age.

Activity Description

Students are asked to predict and record what they think will happen when they rub the various ice cubes across the plasticene. Then they undertake the activity and explore what happens in reality. Relating the scratch marks on the plasticene to glacial striations on rocks and hence to the formation of landscapes of glacial erosion helps grasp the concept of landscape change.

Materials

- Trays of ice cubes with one tray of pure ice and others with material of different sizes embedded in the ice – sand, fine gravel and coarse gravel
- Modelling clay, Plasticene or PlayDoh
- Photo(s) of Striations and glacial landscapes e.g. (see over)



(a) Striations near Termignon, Vanoise National Park, France



(b) Rocks at the base of the ice Mer de Glace France

Set-Up and Procedure

1. You will need to pre prepare the ice trays and bring them to school in a cool box. Keep them in the freezer until you are ready.
2. The activity is a little messy – you end up with water and sand in the classroom so you need a few cloths on hand to clean up
3. Issue the ice trays and modelling clay (anything you can scratch works in place of modelling clay)

Follow Up

- (i) The Earth Learning Idea website provides some excellent ideas for follow up work

Modelling glacial striation-formation by calculation

Where there is a glacially scratched (striated) surface in the field with till (boulder clay) deposited on top, you can calculate the approximate thickness of the ice sheet that made the scratches. The downward force that made the striations on the bedrock platform can then be calculated from the equation:

$$\text{force (kg) to make striation} = \frac{\text{scratch force (kg)} \times \text{striation depth (mm)}}{\text{depth of scratch (mm)}}$$

http://www.earthlearningidea.com/PDF/258_Ice_striations.pdf

How moving ice can grind away rocks

http://www.earthlearningidea.com/PDF/60_Grinding_gouging.pdf

- (ii) YouTube video with students carrying out the process in class
<https://www.youtube.com/watch?v=hkFUoIG06Nc>