Hands on magnetic stripes
Demonstrating how oceanic ridge magnetic stripes form with several pair of hands

This activity works best with four people.

Person 1 puts their two hands together, as if they were praying – the top of their fingers represents the oceanic ridge.

Then person 2 puts their two hands, in praying position, in between the lower parts of the hands of the first person. As person 1 pulls their hands apart slightly, person 2 moves their hands up to become the new oceanic ridge.

The hands represent magnetic ocean floor stripes. From the view of person 1, they have their thumbs towards them and so this is ‘normal magnetisation’ (i.e. ocean floor rocks magnetised in the same direction as the Earth’s current magnetic field). But person 2 has their thumbs away from person 1, so this is ‘reversed magnetisation’.

Person 3 then inserts their hands in the same way, with the same thumb orientation as person 1, producing another ‘normal’ magnetic stripe.

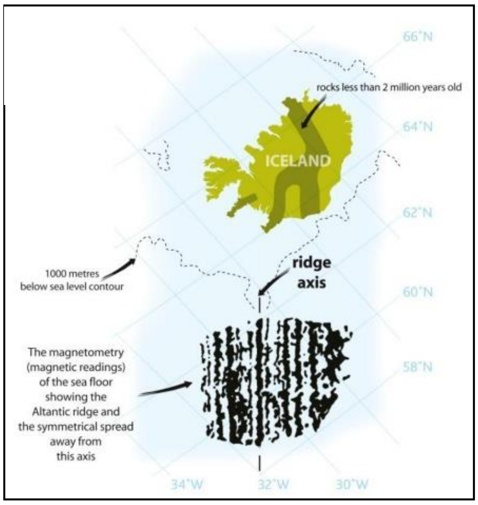
(Photos: Chris King – with thanks for the hands of the Geoscience Summer School participants at Keele University, UK, 2019).

Then person 4 inserts their hands with thumbs away from person 1 – another ‘reversed stripe’.

This can continue for as long as you have hands available and for as long as the people can contort themselves into positions to insert their hands into the growing ‘oceanic ridge’, until the whole demonstration collapses into laughter.

Point out that the pattern of stripes is symmetrical around the growing ‘oceanic ridge’ – each side is a mirror image of the other.

The pattern you have created is a demonstration of how magnetic stripes form, similar to the pattern found on the ocean floor south west of Iceland, shown below.



Magnetic anomalies over the Reykjanes Ridge © Geoscience, redrawn by ESEU.

The back up

Title: Hands on magnetic stripes.

Subtitle: Demonstrating how oceanic ridge magnetic stripes form with several pair of hands.

Topic: A class demonstration of how ocean floor magnetic stripes form, using the hands of pupils.

Age range of pupils: 12 years upwards

Time needed to complete activity: 5 minutes

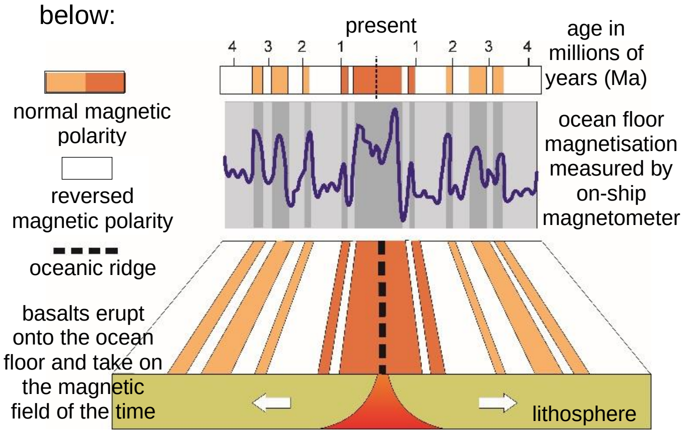
Pupil learning outcomes: Pupils can:
- explain how ocean floor magnetic stripes form;
- describe how each side is a mirror image of the other.

Context:
This activity works well as a consolidation activity, particularly following use of the 'Magnetic stripes' Earthlearningidea (at: https://www.earthlearningidea.com/PDF/81_Magnetic_stripes.pdf) which demonstrates how magnetic stripes form using a striped piece of paper with magnetised pins pulled out of a gap between two tables.

Some of the contortions necessary in this 'hands' demonstration can be seen below.

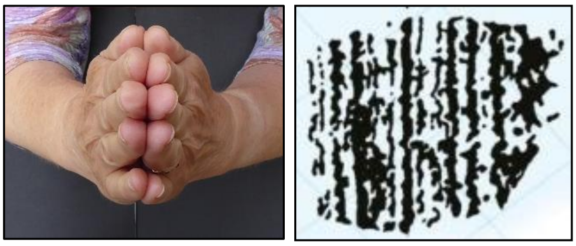
(Photo: David Bailey).

Following up the activity:
The fingers that make each magnetic stripe in this model do not make straight-sided stripes like the diagrams often used in textbooks like the one below:



Magnetic evidence for ocean floor spreading © This Dynamic Earth: the Story of Plate Tectonics, USGS, redrawn by ESEU.

Instead the edges of the hand 'stripes' go in and out around each fingertip. This is similar to the shapes of the 'real world' magnetic stripes found on the ocean floor. Ask your class why the stripes do not have straight lines but are irregular in this way.



(Photo: Chris King).

The answer is that the ocean floor magnetisation was mostly recorded in basalt lava flows. As the flows cooled down, they 'froze in' the magnetism of the Earth at that time. Because they flowed like flows do, the sea floor magnetisation is a record of the shapes of the basalt flows at the time, with no straight lines where magnetisation suddenly changed.

Underlying principles:
- The Earth has a magnetic field which is essentially bipolar (has North and South poles).
- The Earth's magnetic field is probably caused by flows within the liquid iron-rich part of the outer core of the Earth.
- For reasons which are not fully understood, the Earth's magnetic field periodically reverses, i.e. North becomes South and vice versa. The time intervals between reversals are not uniform.
- When some rocks containing magnetic minerals (particularly lavas) cool, they can retain the direction of the Earth's magnetisation at that location and at that time. This is called 'remanent magnetisation'.
- The remanent magnetisation is strong enough to influence the local value of the modern magnetic field of the Earth and can be detected by the use of sensitive magnetometers on board ships or aircraft.
- The remanent magnetisation of the igneous rocks below the oceanic ridges is symmetrical about the ridge crest.
- This observation enabled the 'Sea floor spreading' hypothesis to be developed – that eventually became part of Plate Tectonic theory.

Thinking skill development:
Pupils note the pattern of the magnetic reversals produced by the hands through construction. Relating the model to the real Earth is a bridging activity.

Resource list:
- four or more pairs of hands

Useful links:
The 'Plate tectonics' teaching strategies on the Earthlearningidea website at: https://www.earthlearningidea.com/home/Teaching_strategies.html relating to 'Constructive or divergent margins'.

Find animations of magnetic-stripe formation, by putting 'magnetic stripes on the seafloor' into a search engine and clicking 'images'.

Source: Activity devised by Domingos Adão Mendes, APPBG - Associação Portuguesa de Professores de Biologia e Geologia adaoeva@yahoo.com.