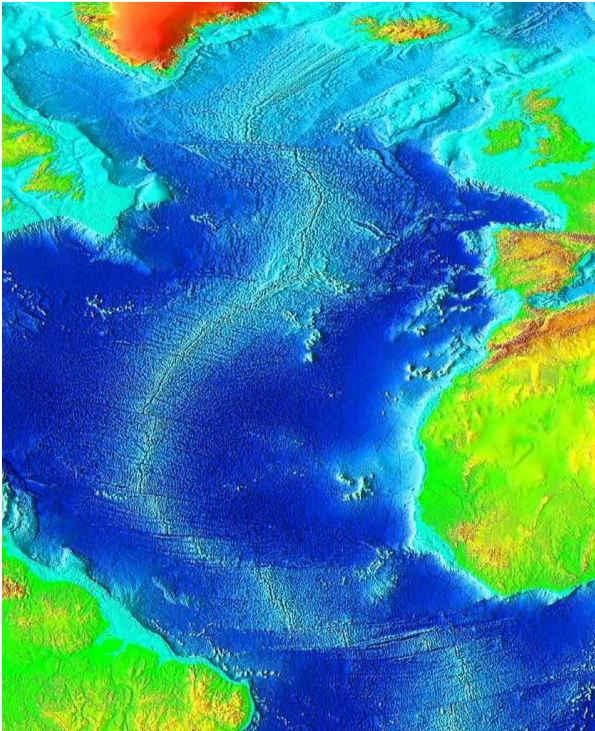


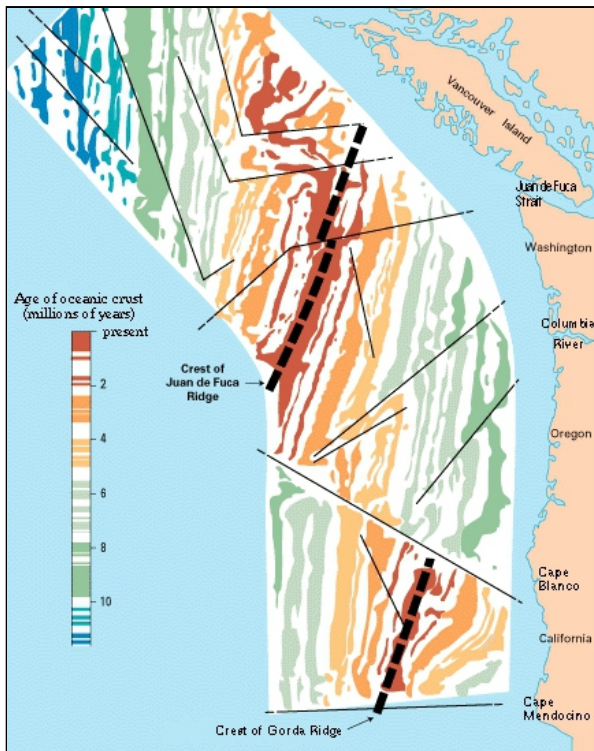
## Model a spreading ocean floor offset by transform faults A model of the transform fault 'steps' in oceanic ridges and their magnetic stripes

Ocean floor maps, like this one of the Northern Atlantic Ocean, clearly show that oceanic ridges have a series of 'steps', called transform faults.



*is in the public domain - it originally came from the U.S. National Oceanic and Atmospheric Administration.*

The transform fault 'steps' can also be seen in the offsets of 'magnetic stripes' shown in this map of the oceanic ridges, off western Canada/USA.



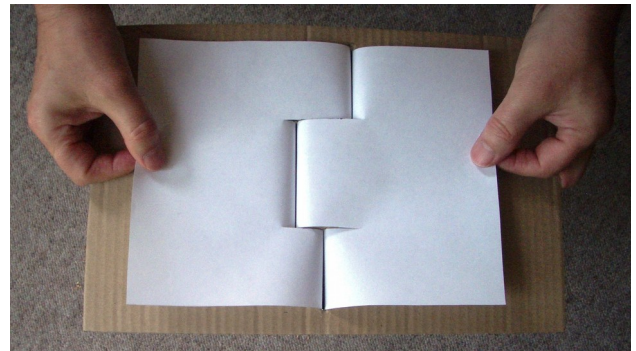
*magnetic.html, with permission.*

You can make your own model of a spreading oceanic ridge, offset by transform faults as follows:

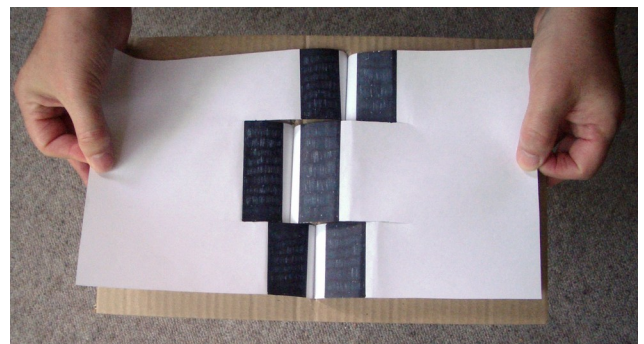
- cut out a piece of stiff cardboard (eg. 25 x 35 cm);
- cut slits in the cardboard, each about 2 mm wide as shown (eg. 3 slits) – as shown here;



- place a piece of white paper on the cardboard and cut the paper so that flaps of paper can be pulled down into the slits; repeat this for another sheet of paper on the other side – as in this photograph;



- draw lines across each of the flaps at the place where they descend into the slits, and pull out the pieces of paper;
- draw black 'magnetic stripes' across each of the flaps at intervals (eg. we drew stripes that were, in order: black – 3m wide; white – 2 cm wide; black – 2.5 cm wide; white – 3 cm wide; black – 1 cm wide);
- replace the papers into the slits;
- finally draw the papers slowly and steadily out of the slits to simulate the spreading ocean floor, offset by transform faults.

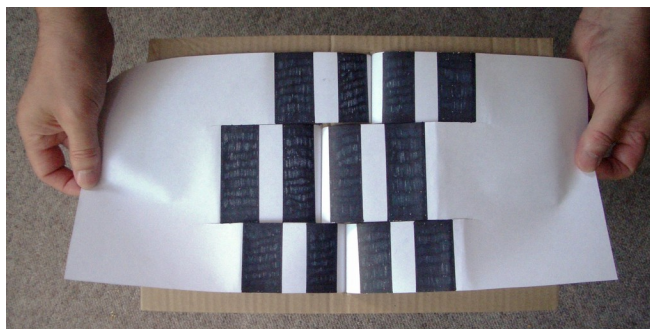


## The back up

**Title:** Model a spreading ocean floor offset by transform faults

**Subtitle:** A model of the transform fault 'steps' in oceanic ridges and their magnetic stripes

**Topic:** Making a working model showing how sea floors spread, offset by transform faults. The fully 'spread' model looks like this:



**Age range of pupils:** 14 – 19 years

**Time needed to complete activity:** It takes about an hour to make the model but only a few seconds to spread your own ocean floor.

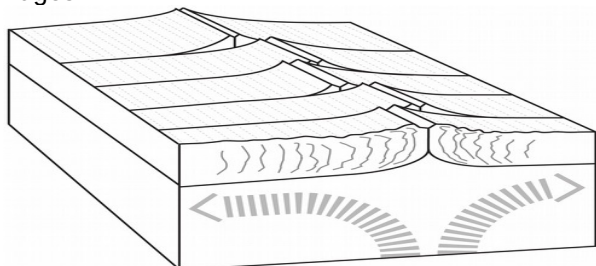
**Pupil learning outcomes:** Pupils can:

- describe how the spread of ocean floors from oceanic ridges can be seen from the magnetic stripes;
- describe how the magnetic stripe pattern also shows offsets by transform faults;
- explain the 'mirror image' pattern shown by magnetic stripes;
- explain how the model represents reality.

### Context:

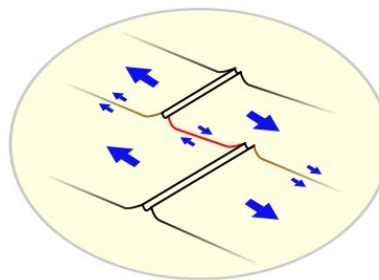
Transform faults are one of the three types of plate boundaries and are also called 'conservative plate margins' (the other two types of plate margin are the 'constructive/ divergent plate margins' that form oceanic ridges like the ones shown in the maps above, and 'destructive/convergent plate margins', where plates are subducted).

This diagram shows how transform faults offset oceanic ridges.



*Drawing of transform faults by Dave King.  
Photos by Pete King.*

Transform faults can be detected on the ocean floor by the offset topography of oceanic ridges and the offset magnetic anomalies. They are very unusual faults.



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The arrows on the diagram above show that in the area **between** the two ridges (shown in red), the two sides of the fault move in **opposite** directions relative to one another; however, **beyond** the ridges, the two sides of the fault move in the **same** direction. So the sense of movement is different in the three different segments of the fault. All other faults on Earth have just one segment – and so are different from transform faults.

### Following up the activity:

Ask pupils to highlight the transform faults on an ocean floor map or diagram.

### Underlying principles:

- As new plate material is formed at oceanic ridges, sea floors spread apart.
- Magnetic minerals in the lavas, and other igneous rocks that form the new oceanic plate, record the magnetisation of the Earth's magnetic field at that time.
- The Earth's magnetic field 'flips' from time to time, producing the ocean floor 'magnetic stripes'.
- Oceanic ridges and their magnetic stripes are offset by transform faults.
- Transform faults have special characteristics, as described above.

### Thinking skill development:

Linking the cardboard model to the reality of a spreading oceanic ridge involves bridging.

### Resource list:

- a piece of stiff card, eg. 25 x 35 cm
- two pieces of white A4-sized paper
- a knife to cut slits in the card
- scissors to cut the paper
- a ruler and black pen to draw the 'magnetic stripes'

### Useful links:

The US Geological Survey has published a useful downloadable book about plate tectonics on its website, called 'This dynamic Earth: the story of plate tectonics' available at:

<http://pubs.usgs.gov/gip/dynamic/dynamic.html>

A more complex model showing sea floor spreading and subduction can be found at:

<http://pubs.usgs.gov/of/1999/ofr-99-0132/>

### Source:

The model was first published in the course materials of the Open University Department of Earth Sciences. These materials are now out of print.

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