Fold Movement – Teacher Notes

During tectonic movement plates are stretched and compacted.

1. **Plates Moving Apart - The Continental Crust Extends and Sags**

When parts of continental crust move apart or diverge, the stretched mid section sags to form a sedimentary basin. Sediments weathered and eroded from marginal areas are deposited here. The sediments are sometimes called rift-sag deposits. Sediments are compacted and cemented to form sedimentary rock. Sedimentary rock is more plastic than igneous rock because it is not constrained by interlocking crystals.

A demonstration of sag using “silly putty” or play dough can be used but plasticine is too stiff unless seriously warm.

Recipe for play dough

- 2 cups of plain flour
- 1 cup of salt
- 2 tablespoons of cooking oil
- 4 tablespoons of cream of tartar
- 2 cups of very hot water
- Food dye

Place all in a bowl and stir.
Remove and knead to a smooth elastic ball
This recipe can be used for all fold and fault activities although at least three different colours of dough is necessary.

In Western Australia the Hamersley Basin formed between the Pilbara Craton and the Yilgarn Craton about 2.4 billion years ago. Into this depression poured the weathered and eroded volcanic rocks that make up our Banded Iron Formations (BIFs) that weathered to create our iron ore deposits.

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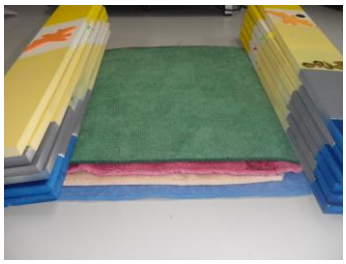
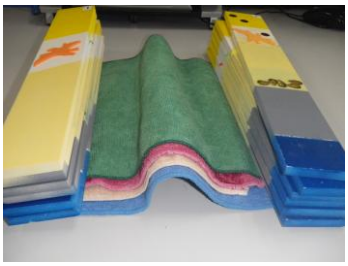
2. Plates Moving Together - The Continental Crust Crumples and Shortens

When plastic rocks move together they crumple and form folds. A demonstration of folding can be made using soft fabrics such as towels pressed together by large books.


This activity demonstrates the formation of anticlines (domes) well but does not demonstrate synclines (down warp) as the table surface restricts downward movement. Continental crust however can down warp into the underlying denser oceanic crust. Most large mountain ranges such as the Himalayas have deep 'roots". These mountains are being forced upwards by the northward movement of the continent of India.

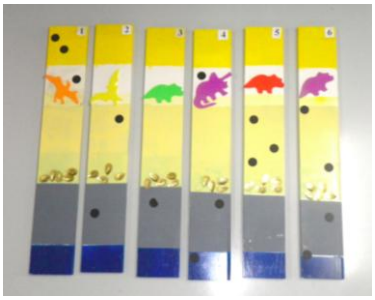
One of the major concepts in Earth Science is "The Principle of Original Horizontality". Most sediment is laid down in horizontal beds. Although in detail such materials as dune sands may have local bedding dips, over geographical distances the bedding is functionally horizontal. We assume any change from horizontality is caused by tectonic events. These are BIFs from the Hamersley Basin which were originally horizontal but have been folded by tectonic forces.

AIM **To model folding**

Most sediment is originally deposited as horizontal beds in sedimentary basins. Younger beds are deposited on top of older beds. Incompetent (plastic) beds will respond to pressure by folding. Hard, competent beds will fault.
Earth movements deform these into folds and faults.

MATERIALS per student

- Cardboard
- Coloured pens & pencils
- Ruler
- Option adhesive stickers to indicate fossils
- Scissors



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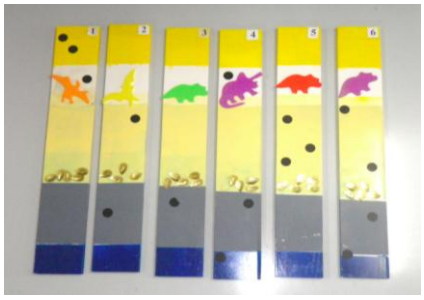
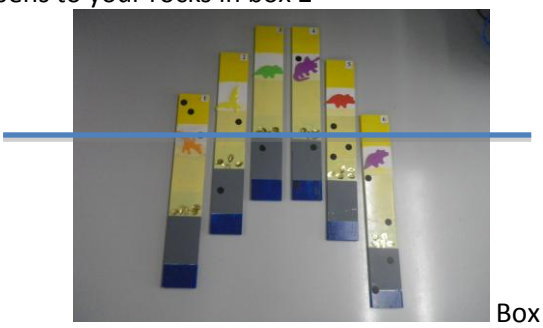
Method:
1. Draw a series of horizontal beds on the cardboard and colour.
2. Add fossils either by drawing them or using stickers. Please note that fossils of the same age should be on the same bed.
3. Rule the cardboard into six vertical sections and cut to create six rock columns. These will represent drill cores cut down into the rock.

Will the oldest rock be at the top or at the bottom? At the bottom.
Sketch your rock beds in box 1 provided in the worksheet


Box 1: **Horizontal strata (control)**

Compressive forces will force your sediment to bend to form an anticline (dome)
Sketch what happens to your rocks in box 2


Box 2: **An anticline**

Draw a horizontal line across your rock columns to represent the eroded surface.

If erosion wears away the anticline to a horizontal surface like this one, will the oldest or youngest rocks be in the centre? The oldest rocks are at the centre of the anticline

If the rocks are compressed they may also form a syncline (be deformed into a downward curve)
Sketch what happens to your rocks in box 3

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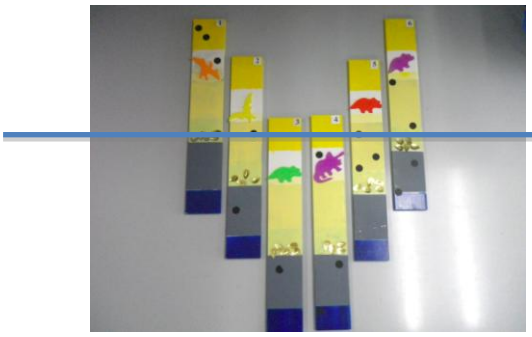

Box 3: **A syncline**

Draw a horizontal line across your rock columns to represent the eroded surface.

If erosion wears away the anticline to a horizontal surface like this one, will the oldest or youngest rocks be in the centre? The youngest rocks are at the centre of the syncline

Would the mountains be folded into synclines or anticlines? Both

As a result of folding, would the length of a piece of crust be shortened or lengthened? Shortened.

As a result of folding, would the thickness of a piece of crust be increased or decreased? Increased.

The Australian continent is slowly moving northward to push up against the Asian continental plate. Would the folded mountain ranges in Papua New Guinea be the result of compression or extension? Compression

Extension

Repeat this activity with rocks whose beds dip to the left

The oldest rocks are still in the centre of the anticline and at the outer edge of the syncline. Any surface outcrops would however be asymmetric.