Folding & Faulting - Teacher Background

The crust of Earth is under continuous pressure from rising molten asthenosphere at mid ocean ridge divergence, from down dragging slabs of crust at zones of convergence and from the growing mass of sediments accumulating in basins.

Although stresses are greatest at the edges of continental plates, the whole fabric of the plate must make adjustments to these pushes and pulls. The Australian plate is presently sliding northwards under the Asian plate and growing larger through ocean floor spreading to the east, south and west margins.

Competence is a measure of resistance of rocks to deformation. Competent rocks will break or fault while incompetent rocks will bend or fold. Competence is affected by heat and pressure. E.g. limestone at the surface will fault whilst deeper in the crust it will fold. Igneous rocks tend to be more competent than sedimentary rocks because their crystals interlock making them more rigid.

Folded incompetent Hamersley Formation sediments at Hamersley Gorge.

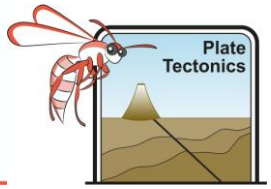
When rocks fold downwards they create **synclines** and when they form domes we call these **anticlines**. Anticlines are important in the oil and gas industry because they can be traps.

Hint You can remember which way a syncline folds because "Sinners go down to Hell!"

Folding results in shortening and thickening of the Earth's crust. It creates mountains . Folding can be modelled by pressing the ends of layers of plasticine or cloth. Australia is fortunate not to lie on the active edge of a crustal plate. It is therefore less likely to suffer catastrophic earthquakes as plates that are folded, faulted and subducted. Pressure on plate margins however stresses all parts of the plate to a lesser degree. This is often released by reactivating old fault lines. Many of our faults are in a semi-continuous state of movement resulting in tiny imperceptible earthquakes.
www.ga.gov.au/earthquakes/staticPageController.do?page=earthquake-activity

Faults are breaks in rock where one side is displaced from the other. Fault displacements can be on any scale from millimetres to kilometres. The picture is of fault displacement of a competent dolerite dyke in less competent gneiss. Major fault lines define the Yilgarn and Pilbara Cratons, the Stirling Ranges and most of the underlying geology of our state. The Darling Fault runs over 1,000km north to south defining the western edge of the Yilgarn Craton. The western side has been down-faulted over 15km in many small movements over millions of years.

Folding & Faulting - Teacher Background

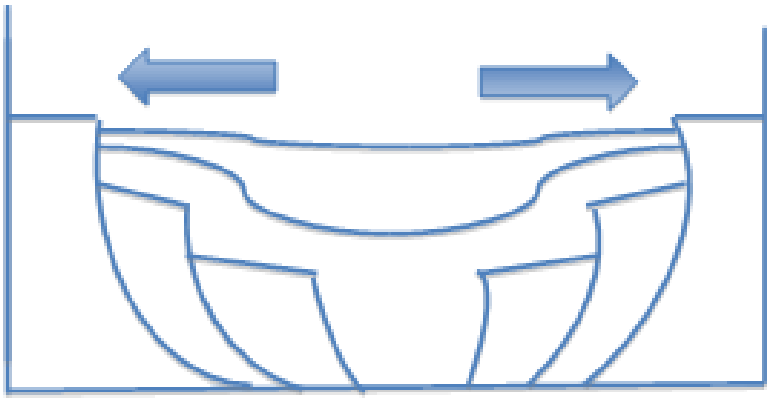


Offshore faults also define the northern and western boundaries of oceanic and continental crust. Geological maps of our state can be obtained from http://www.dmp.wa.gov.au/7818.aspx and indicate many of the major faults lines in Western Australia. The Darling and Fraser fault systems have a major impact on our geography and land use

Normal faults result in extension
Reverse faults result in contraction
Where the crust is being sheared and blocks move laterally, transverse faults occur.

Where the crust is being stretched or extended "normal" faults occur. During ancient geological times Australia, India, Africa, New Zealand and Antarctica were welded together to form the supercontinent of Gondwanaland. About 184 million years ago the supercontinent began to break up and the present continental plates started to move apart. Continental crust between the separating plates was stretched thin and was split by a series of faults. The stretched crust then sagged to create a marine sedimentary basin.

WEST EAST



Where the crust is being compacted and blocks are slipping over and under each other "reverse" faults occur. Reverse faulting is responsible for throwing up the Southern Alps in New Zealand where the Australian and Pacific plates converge.

This picture is of a transverse fault in banded gneiss.
The major fault running through New Zealand also has a transverse movement. This is responsible for many earthquakes.

Of course food cannot be eaten in the laboratory. Folding and faulting activities can however be a great excuse for using cakes and sandwiches outside.