EARTHQUAKE WALK
MEREWETHER TO GLENROCK

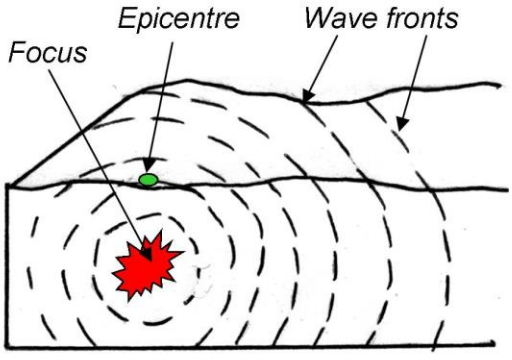
Hidden Treasure Hotel, Laman Street after the 1989 Newcastle Earthquake.

EARTHQUAKE TERMS

Focus - where the rocks break, the source of the earthquake.

Epicentre - the place on the Earth's surface directly above the focus.

Seismic waves - waves made by rocks breaking and moving, causing the Earth to shake.



EARTHQUAKE!

On 28th December 1989, during the Christmas-New Year holidays, Newcastle trembled from an earthquake. A large block of rock tumbled from Merewether cliffs, crashing onto the rock platform below. Beaumont Street in Hamilton undulated like an ocean wave. Brick buildings cracked and windows shattered. Shop awnings fell down and part of Newcastle Workers Club (now Newcastle Panthers) collapsed, killing 12 and injuring about 160 people.

The earthquake measured 5.6 on the Richter scale, a moderate earthquake. Study of the recorded earthquake waves suggested that the earthquake originated about 13 km below the Earth's surface at Boolaroo, at the north end of Lake Macquarie.

Many people were surprised that Newcastle had an earthquake. However, records show that since European settlement several moderate earthquakes, with their epicentres in the lower Hunter, had shaken Newcastle.

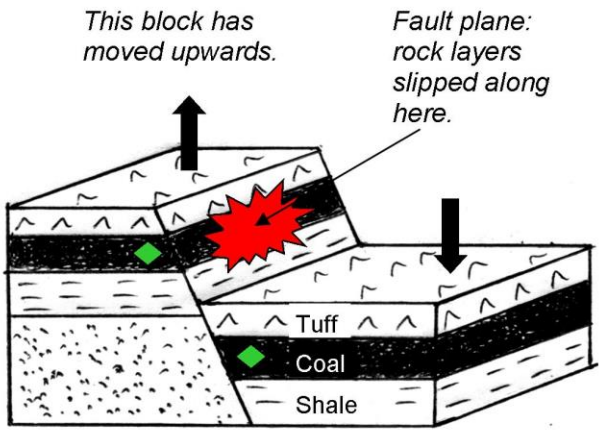
STRETCH, SQUEEZE, SNAP

What happens to the Earth when an earthquake occurs? Rocks can change almost like a breaking stick. Try to break a stick, some are easier to break than others. Watch how it bends before snapping, then straightens out after it breaks.

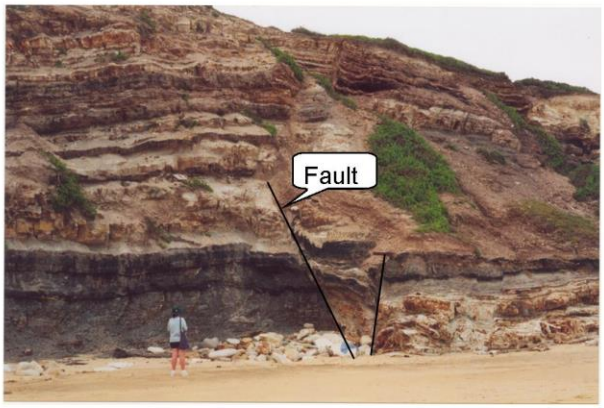
Rocks do the same thing during an earthquake. Rocks deep under the ground are slowly pushed, squeezed or stretched for many years, bending and storing strain energy. When the stress exceeds the strength of the rock, the rock breaks. Masses of rock slide past one another, slipping into a new stable position.

The breaking rock causes the strain energy stored in the rock to suddenly escape. Shock waves of energy, **seismic waves**, radiate through the Earth, producing the shaking of an earthquake. Seismic waves travel outward from the focus like ripples on a pond.

Layers in rock that have snapped and slipped no longer line up and are faulted.



Sketch of a normal fault. Before faulting the tuff, coal and shale layers were continuous.



Faults in the Newcastle Coal Measures between Burwood Beach and Glenrock Lagoon. Grey shale, black coal and white tuff layers are broken and no longer line up. *Photo: Shayne Kerr*

Earthquake damage in Western Australia. Main water supply pipe was telescoped by over one metre by the Meckering earthquake in 1968. *Photo: Roz Kerr*

A **fault** is a crack in the Earth's crust where movement has occurred. Rock on one side of the fault may have moved up, down, or sideways in relation to the rock on the other side.

ANCIENT EARTHQUAKES

In the coastal cliffs from Merewether to Glenrock Lagoon we can see places where rock layers have broken and moved while they were buried deep underground. The faulting of these rocks would have caused earthquakes in the distant past. Today we can see what happened to some sections of rock when, in the past, they were subjected to such strong forces that they snapped and scraped past one other into a new position. The layers no longer line up.

WHY CAN WE NOW SEE ANCIENT EARTHQUAKE SOURCES?

The rocks making up the cliffs and rock platforms are sedimentary rocks of the Newcastle Coal Measures. The coal measures were laid down some 250 million years ago in the Late Permian period, before the time of dinosaurs. The layers of sandstone, conglomerate, shale, coal and tuff you can see today originated as river sand and gravel, floodplain mud, peat swamps and volcanic ash layers, respectively. Burial by about 4 km of later sediments compacted the Permian sediments into rock.

About 100 million years ago the Earth's crust in eastern Australia started to be slowly stretched. Eventually, about 80 million years ago, the crust broke along the line of the present edge of the continental shelf. A large rift valley appeared, splitting New Zealand from eastern Australia. The valley continued to spread and sink, allowing ocean water to flow in, forming the Tasman Sea. During these Earth movements the rocks in the Newcastle area were gently folded and faulted. The breaking rocks generated earthquakes.

After uplift of our coastal region, extensive erosion over millions of years removed several kilometres of overlying cover rock, revealing the faulted sedimentary layers now visible in the coastal cliffs.

Prepared by Roz Kerr for Coastcare & Newcastle City Council, 2006.