INFORMATION SHEET

Watarrka National Park

The Geology of Kings Canyon

Kings Canyon is a valley that cuts firstly through a layer of Mereenie Sandstone, deposited about 400 million years ago, now forming shear cliffs. Below the cliffs, the slope is less steep and the valley cuts through the softer Carmichael Sandstone, deposited about 440 million years ago (mya).

Between the Mereenie and the Carmichael Sandstone is a thin layer of purple mudstone, which represents deposits laid down when the environment was changing from shallow marine (Carmichael) to an inland dune field in which there were rivers and lakes (Mereenie).

At Kings Canyon, the Mereenie Sandstone is cut by a very well developed set of west-north-west and a poorly developed set of north-north-east trending vertical joints. Erosion is proceeding along these joints. For instance, Kings Creek upstream of the main canyon flows along a series of straight lines; the lines forming right angles with each other and conform to the directions of the joint sets. Many joints can be seen on the plateau on either side of the canyon. The best developed are parallel to the canyon wall. Some extend down for many metres and range from several metres wide down to hairline cracks.

Geological Time

When Scientists speak of geological time they talk in terms of millions of years, and it is said to have taken about 400 million years for the canyon to form. To give you some idea of the time scale we have compressed time to fit into sixty minutes:

- 60 mins ago (4,600 mya) the earth was formed
- 46 mins ago (3,600 mya) the first sign of life appeared in the oceans.
- 11 mins ago (800 mya) the rock that forms the MacDonnell Ranges was laid down.
- 8 mins ago (550 mya) the rock that has formed Uluru (Ayers Rock) and Kata Tjuta (The Olgas) was being laid down from a separate mountain building event (500-550 mya).
- 6 mins ago (440 mya) the sandstone of the canyon was deposited; first life on land appeared.
- 4 mins ago (300 mya) formation of the Central Ranges occurred (including the George Gill Range and the MacDonnell Ranges); this had no affect on the shape of the present day outline of Uluru and Kata Tjuta.
- 1 min ago (65 mya) the dinosaurs died out.
- 1 SECOND ago our ancestors appeared and our lifetimes don't even register on this time scale.

Cross Bedding

A good example of this can be seen in the domes just before the cycad information sign on the Kings Canyon Rim Walk.

The domes are old sand dunes and if a sand dune were to be cut in half today the same pattern would be found. The cross bedding is a result of the sand being deposited in one direction by the action of the wind. Some time later the wind direction changes, the top of the dune is cut off and the sand is then deposited in another direction. This cross bedding can also be found in tidal environments but the layers will be much thinner.

The Canyon

The south wall of the canyon is the face of a joint which appeared in the range when it was uplifted 300 mya. Erosion of the Carmichael Sandstone on the north side has continually undercut the Mereenie Sandstone, eventually widening the canyon. The undercutting has resulted in some blocks of Mereenie Sandstone which are larger than a house to tumble to the canyon floor below.

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The Domes

The features of the canyon itself and the domes are a result of jointing and weathering. These deep cracks or joints criss-cross the local sandstone, resulting in quicker erosion, to form isolated blocks of sandstone. Further weathering by wind and rain have then eroded the top corners and sides of the blocks to form the domes that are visible today. The sandstone is quite soft rock and easily broken. Be careful where you put your feet when walking and especially when climbing. Help us to protect this fragile environment by keeping on the track.

The Garden of Eden

This section of Kings Creek is called the Garden of Eden because of its lush vegetation. The lush state of the Garden of Eden relates back to the geology of the area.

(see figure below)

The canyon is made up of two layers of sandstone with a layer of hard mudstone in between. Rainwater percolates through the Mereenie Sandstone but the layer of shale stops the water soaking through into the Carmichael Sandstone. This creates a water table in the Mereenie Sandstone, above the layer of mudstone. The Garden of Eden cuts this water table, allowing stored water to slowly trickle out of the sandstone to water the lush vegetation.

Fossils

It should be noted that the Kings Canyon sandstone was laid down in a shallow marine environment and at that time there was only life in the deep oceans. Life was only just appearing on land at this time. In the Mereenie Sandstone fossils are very rare, but some traces such as worm trails can be found in isolated locations. This differs to the Carmichael Sandstone where fossilised burrowing tracks called cruziana, created by arthropods like trilobites (a creature similar to a Morton Bay Bug) can be seen.

Colour

The Mereenie Sandstone is a clean white sandstone. It was deposited in an environment which ranged from aeolian (i.e. in the air) to lacustrine (fresh-water lake) to marine. The red colour is believed to be due to an iron-rich dust blown onto the rock surface and then chemically fixed to the sand grains by a form of fungi which thrive on iron, silica and ephemeral (short lived) rainwater.

Height

Kings Creek is 650 metres above sea level and the canyon walls range from 100 to 150 metres above the creek. The highest point of the George Gill Range is near Carmichaels Crag, 908 metres above sea level.