Australian Government
Parks Australia

Fact Sheet
Uluṟu-Kata Tjuṯa National Park

GEOLOGY

The evolution of Uluṟu and Kata Tjuṯa is explained differently by the park's traditional owners and European scientists. This fact sheet explains the creation from the perspective of a geologist.

What are Uluṟu and Kata Tjuṯa made of?

A quick close-up look at Uluṟu and Kata Tjuṯa will leave you in no doubt that they are made of different types of rock. Uluṟu rock is arkose, a course grained sandstone rich in the mineral feldspar. The sandy sediment which hardened to form this arkose was eroded from huge mountains composed largely of granite. Kata Tjuṯa rock is a conglomerate. The conglomerate is gravel consisting of pebbles, cobbles and boulders cemented by sand and mud. Most of the gravel pieces are granite and basalt, and give the conglomerate a plum pudding effect.

How and when were Uluṟu and Kata Tjuṯa formed?

Uluṟu and Kata Tjuṯa lie near the southern margin of an area called the Amadeus Basin. This depression in the earth's crust formed about 900 million years ago, and received layer upon layer of sediment over several hundred million years. This stopped about 300 million years ago.

At times the Amadeus Basin was a shallow sea collecting sediments. Sections of the basin were blocked from the sea and the water evaporated leaving crusted salt, and a cold period left further deposits of glacial rock. The older sediments in the Amadeus Basin were crumpled and buckled about 550 million years ago in an event geologists call the Petermann Ranges Orogeny.

At this time there were no trees or grasses covering the landscape. Bacteria and algae were the only life forms and they helped break down the jagged mountain ranges. These bare mountains eroded easily. Huge amounts of sediment washed away and when it rained, formed alluvial fans adjacent to the ranges. It is the remains of these alluvial fans that are seen today as Uluṟu and Kata Tjuṯa.

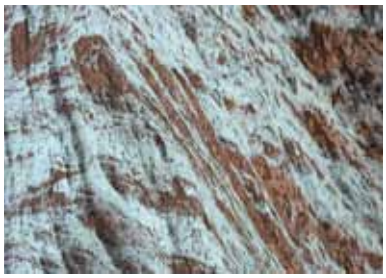
As the ranges eroded, the building of the alluvial fans slowed. About 500 million years ago the region was again covered by a shallow sea. The arkose and conglomerate layers, at least 2.5 kilometres thick, were buried by fine silts and other sediments. These overlying sediments compressed and cemented the arkosic sand into arkose and the coarse gravels of Kata Tjuṯa into conglomerate.

The sea receded approximately 300-400 million years ago and the rocks were folded and fractured again. This second major folding and faulting event is called the Alice Springs Orogeny. It raised the region above sea level.

During this event, the horizontal layers of the Uluṟu arkose were turned nearly 90 degrees to their present position. The Kata Tjuṯa conglomerates were tilted only about 15-20 degrees from the horizontal. The initially, the rocks eroded rapidly. This erosion still continues now at a slower rate.

Uluṟu and Kata Tjuṯa are the visible tips of rock which extends far beneath the ground. It is possible they extend down as far as six kilometres.



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Uluru-Kata Tjuta National Park

What caused the interesting shapes of caves and patterns?

Knowledge of the sand blasting technique leads many to presume that the action of sand and wind formed the shapes of Uluru and Kata Tjuta. Scientists believe this is only partly true. Since sand is only raised a few metres during sand storms, it could only affect that small part of the rock near ground level. The sculptured shapes are more likely a combination of mechanical erosion and other events such as chemical changes caused by moisture.

The major valleys of Kata Tjuta may reflect fractures which formed during the Alice Springs Orogeny. Chemical weathering by ground water widened these fissures and rain water run-off gradually formed the canyons we see today.

On many of the surfaces of Kata Tjuta you can see smooth pavements of cleanly cut boulders. These boulders previously protruded from the surface. Temperature changes caused them to expand and contract at a different rate to parts of the boulder below the surface. When the tension became too much the rocks above the surface split away smoothly.

Unlike Kata Tjuta, there are no major joints and fractures visible in Uluru. Water erosion from rain runoff has formed steep valleys with pot-holes and a series of plunge pools in the arkose on the southern side of Uluru.

On the north-western side, weathering has produced parallel ridges outlining the sedimentary layers.

The flaky surface of Uluru results from the chemical decay of minerals. The characteristic rusty colour of the exposed surface of these flakes is just that - rust. It is caused by the oxidation of the iron in the arkose. The fresh arkose is greyish in colour.

Underground water in the region?

Between Uluru and Kata Tjuta is an old valley which is filled with sediment up to 100 metres thick. The sand layers in these sediments hold water which eventually seeps into Lake Amadeus.

Bores drilled into these sands provide water for the resort. The water table lies 25 metres deep near Kata Tjuta but shallows to 12 metres near the airport. It is slightly salty and is desalinated before use. Geologists have dated the water and found ages range from modern to 7,000 years! Most of the water is modern, having soaked in after recent rains.

Do the sand dunes move?

The landscape the first Aboriginal settlers saw over 22,000 years ago looked much the same as it does now. Geologists have found that the dunes have remained in their present position for 30,000 years. However the crests of the dunes are looser and sands shift with the wind.

Why do Uluru and Kata Tjuta appear to change colour at sunset and sunrise?

These colour changes have less to do with the geological make-up of the rock than with the effects the earth's atmosphere has on the sun's rays.

When the sun is low in the sky the atmosphere acts like a giant prism, splitting the sun's rays into a colour spectrum. The light reaching Uluru and Kata Tjuta near sunrise and sunset is mainly from the red end of the spectrum and its reflection from the rock and any clouds in the sky gives the spectacular colour. The reddish-brown colour of the rocks and surrounding sand enhance these effects.