Wolfe Creek Meteorite Crater
East Kimberley, Western Australia

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Presentation notes,
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Cultural Advice: Indigenous and Torres Strait Islander people are respectfully advised that this document contains the image of a person who has passed away.

Wolfe Creek Crater

Wolfe Creek Crater is one of the best preserved and most spectacular meteorite craters in the world. It is a highly significant site for scientific research. The site is one of the few locations in the world where local Indigenous knowledge and culture relates directly to the meteorite crater. In addition to the scientific value of the crater, the site has also become an important tourist attraction.

Location

The crater is situated at latitude -19.171822, and longitude 127.795329, in the Kimberley region of Western Australia, approximately 130 km south of Halls Creek, on the edge of the Great Sandy Desert. The crater is accessed by the Tanami Desert Road, a gravel road which links Halls Creek to Alice Springs. The crater is protected by a National Park and is managed by the Department of Environment and Conservation.
Origin and Formation

Astronomers speculate that the original meteorite which formed the crater was probably an iron meteorite weighing thousands of tonnes. The tremendous speed of the meteor on impact caused a massive blast, comparable to a nuclear explosion, resulting in a circular crater almost 900 metres in diameter and 150 metres deep.

The impact probably occurred more than 300 000 years ago. Since then, the process of erosion has slowly worn down the crater walls. Wind-blown sand and dust has partially filled the crater floor. However, the crater walls remain quite steep, and in places there are sheer cliffs, particularly on the inner side of the north eastern crater wall. The crater walls presently stand about 40 metres above the surrounding flat plain, and the almost flat crater floor is 60 metres deep; about 20 metres below the surrounding plain.

The outer portion of the crater floor is sandy, while the central portion consists of salt deposits. Sink-holes are located near the middle of the crater, and some water is present virtually all the year.

Although some small iron meteorite fragments have been discovered in the vicinity of the crater, very few particles of the original meteorite have survived. During the millennia which have passed since the impact, the meteorite has largely rusted away.
(Above) Meteor above Wolfe Creek Crater.
(Below) Aerial view of the crater.
Recognition of the crater by non-indigenous people

The first non-indigenous recognition of the crater occurred as recently as 1947. Alex Bevan and Ken McNamara note in their book “Australia’s Meteorite Craters” that F Reeves, NB Suave and D Hart observed the crater from the air during an aerial survey of the Canning basin, in 1947. A field visit took place two months later.

Site visits by John Goldsmith

My interest in Wolfe Creek Crater began mainly through astronomical photography. In May 1998, I carried out my first visit to the crater, where I accomplished night landscape images of the crater, and astronomical photography during the Eta Aquarid meteor shower (originating from Halley’s Comet). One year later, in 1999, I returned, together with Aboriginal Elder Jack Jugarie (of "The Human Race" documentary fame). I recorded video interviews with Jack Jugarie, regarding his knowledge of the crater and the night sky. Subsequent visits have extended this work further, with visits in September 2000, July 2003, August 2010 (collaborating with Gingin Observatory) and August 2011, with Jack Jugarie’s Eldest son, Keith Jugarie.

Aboriginal perspectives of the crater

The Wolfe Creek Meteorite Crater is known as “Kandimalal” to the Jaru Aboriginal. The crater is recognised in stories, personal experience, knowledge, art and song by Jaru and Indigenous people. Elders of the Jaru Aboriginal people refer to several stories relating to the crater, known locally as Kandimalal. One well known story refers to the passage of two rainbow snakes which formed the nearby Wolfe Creek and Sturt Creek as they crossed the desert. In the Dreamtime, one snake emerged from the ground, forming the crater.

In 1999, I recorded a story which relates to a “star” which fell from the sky and became buried in the ground, causing the crater to be formed. As explained by Elder Jack Jugarie, one day, the crescent moon and the evening star passed very close to each other. The evening star became so hot that it fell to the ground, causing an enormous explosion, flash, dust cloud and noise. This frightened the Jaru people and a long time passed before they ventured near the crater to see what had happened. When they ventured to crater, it was realised that this was the site of where the evening star had fallen to the Earth. The Jaru people then named the place “Kandimalal”.

Interestingly, this story closely parallels our current understanding of crater formation by large meteorites (referred to as the “evening star” which fell to Earth in the Jaru story). Elder Jack Jugarie indicated that this account was passed on from his grandfather’s grandfather, which suggests that the story originates from before the first contact with white people.

Elder and artist Stan Brumby has represented the story of the star which fell to the earth in numerous ways via his art. Examples are shown below;

Another story refers to the underground “tunnel” linking the soakwaters in the centre of the crater, with Sturt Creek. This story has been represented in several Aboriginal paintings.

Paintings of Wolfe Creek meteorite crater

Soakwater in the centre of the crater,
Wolfe Creek and Sturt Creek, association with snakes
Crater photography

Photographic documentation of Wolfe Creek Crater is a very useful method, which allows viewers to gain an appreciation of the visual form of the crater, and the particular features of the crater shown in Aboriginal art.

A substantial photographic record of the crater has been developed, including astronomical photography, timelapse, 360 degree photography and timelapse animation, during my site visits. The digital photography documentary methods used are described by my paper in Rock Art Research 2011.

Numerous night-time timelapse sequences have now been achieved, from locations including the western, southern, northern and north-eastern rim of the crater. Digital photographic methods are used, with typical exposures being between 20 to 30 seconds duration, and continues sequences ranging from 1 to 5 hours duration. When converted into High Definition (HD) video, these sequences reveal the apparent motion of the stars above the crater landscape.

Several photomosaic panoramic images have also been achieved, with this method being highly suitable for recording high resolution, extreme wide angle views of the crater.

In August 2011, a unique experimental animation was achieved. A sequence of more than 470 images were taken (2.5GB), during a four hour walk around the rim of the crater, during daylight. The images have been animated into an experimental video sequence, which shows the centre of the crater from all angles.
(Below) Looking toward the "South Celestial Pole", stars appear to rotate clockwise during the photographic exposure. The crater is illuminated by strong moonlight.

(Below) Dawn light and an alignment of planets at Wolfe Creek crater.
(Above) The western wall of the crater, viewed from the centre of the crater.

**Further reading**


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