WOLFE CREEK METEORITE CRATER

On 3 April 1997, the President Kevin Kenneally welcomed the 55 members present and spoke about the success of the Rock Art Seminar. He advised that the proceedings should be available within a few months and then presented the immediate past President Cathie Clement with a bouquet of flowers in recognition of her dedicated work for the Society.

Kevin then introduced Dr Alex Bevan who is now with the WA Museum and was previously with the Natural History Museum in London. Alex first showed a slide of the moon's surface and pointed out the many deep craters which mean there was an intense bombardment by debris of the solar system 3,800 million years ago. The many facts that followed revealed that Earth is the most geologically active planet in our solar system – mountains have been built and worn down, volcanoes erupt and subside and, with the surface constantly changing, very old meteorite impact craters have been erased. The Kimberley rocks are 140 million to three billion years in age, whereas the oldest Australian rocks—in the Pilbara in WA—are 3,800 million years old.

Meteorites preserve a unique record of the making of the solar system. There are about 140 structures of confirmed or probable meteorite impact origin in the world. Five of these are in the Kimberley and there are 23 in the whole of Australia. Meteors are "falling stars" which are destroyed by the heat of friction as they pass through the troposphere. Meteorites of 100s to 1000s of tons and more cause crater-forming events, and Earth is a large ancient target for these. Our largest crater is 35-90 km diameter in South Australia.

Of all the craters in Australia, Wolfe Creek Meteorite Crater is visually the most spectacular and also one of the best studied. Situated 100 km south of Halls Creek and a little to the east of Wolfe Creek itself, it was discovered from the air in 1947. It is almost perfectly circular, its diameter varying between 870 and 950 m and its rim rising 35 m above the surrounding sandplain. The crater floor lies as much as 25 m below the level of the plain. Originally, it would have been much deeper, maybe even 150 m, but is now largely filled by sand. During a crater-forming event, the meteorite travels fast, 511.2 km/sec even, penetrating the ground at a speed of 5 km/sec. There is colossal energy which is converted into heat; the bulk melts; and some vaporises. The rim is bent back, rocks beneath are pulverised into breccia and meteoritic material. Because the bulk of the projectile is destroyed, a simple bowl-shaped structure is formed with rocks melted at the sides. Recent sediments are deposited in the base of the crater, which is estimated to be 300,000 years old and has been deeply weathered in the meantime and the rim worn down. Remnants of the meteorite are now converted into iron oxide by time and erosion. There are

also melt glasses (melted sandstone) which superficially resemble tektites—splashes of molten rock that fall back to Earth from an impact.

In addition to Wolfe Creek Crater, in order of increasing age, the other craters and structures in the Kimberley are:

1. Snelling Crater, estimated to be 5,000 years old and 29 m in diameter, situated south of Wolfe Creek Meteorite Crater. It should contain meteorites but none have been recognised.
2. Goat Paddock, north of Mueller Range, 5 km in diameter, formed 55 million years ago and much eroded. Melted and fractured rocks and shatter cones testify to its meteoritic origin.
3. Piccaninny Structure in Purnululu (Bungle Bungle Range) is 7 km in diameter, an area of intensely deformed rocks around 360 million years old showing much folding and faulting and breccias. It is cut by the gorge and is the least convincing of the structures.
4. Spider Structure is 11 km across and 13 km long, so deeply eroded it is hard to see. The sandstone ridges are delineated by faults and prolonged erosion giving it a spider-like appearance from the air. First seen by J. Harms 35 years ago, it is the Kimberley's oldest structure at 700 million years and has superb shatter cones.

What are these impacting objects? They come from a belt of asteroids in earth-crossing orbit and, from a study of ancient impacts, the frequency with which they will occur can be predicted. The crater-formers are battleship size and bigger.

Dr Bevan illustrated this talk with many interesting slides. At the conclusion, he answered questions from the audience and was thanked in the customary manner. The President made some announcements and asked members to bring in items of interest which could form a 'focus' after the talks. Supper was then served.

Suggested reading: Alex Bevan and Ken McNamara, *Australian Meteorite Craters*, Western Australian Museum Publication, 1993, 27 pp; and *Australian Impact Structures, AGSO Journal of Australian Geology and Geophysics*, Volume 16, No. 4, 1996, 625 pp.

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