

## **GEOLOGICAL SURVEY ACTIVITIES IN THE KIMBERLEY**

In his talk on 5 April 2000, Rick Rogerson of the Geological Survey of Western Australia (GSWA — a Division of the WA Department of Minerals and Energy) gave us a potted history of mineral exploration and mining in the Kimberley. He weighed up the contributions made by industry and Government to the discovery of mineral resources. He also touched on the discovery and development of groundwater resources by Government geologists, and their contribution to the establishment of major infrastructure projects such as dams.

Rick also took the opportunity—whilst discussing '116 Years Service to the Kimberley'—to mention both a new product that draws geological maps “on demand” and the recent GSWA discovery of what is thought to be the World’s fourth largest meteorite impact crater (the Woodleigh impact structure near Shark Bay).

### ***Kimberley mineral industry***

From 1884 to 1920, there was hope for a bright future for mining in the Kimberley. Gold was first discovered in the Kimberley (and WA) in 1882, and in 1884, Government Geologist Edward Hardman was sent to the area to report. His geological map and report, published in 1886, the same year that the Kimberley Gold Field was proclaimed, helped to promote the prospectivity of the Kimberley. Today, 116 years later, the GSWA, whose main role remains the promotion of WA’s prospectivity, continues its involvement in the Kimberley.

Pioneering geological survey work was also carried in the period 1908 to 1910 by H Talbot, another government geologist, who accompanied Mines Department employee, A Canning, on a survey of a newly discovered route, now known as the Canning Stock Route, between Wiluna and Halls Creek. During Talbot’s 426-day field trip, many fundamental geological observations were made, including the first discovery of gold at Larranganni Bluff in the Tanami desert region of WA. This discovery was followed up by Glengarry Resources in the middle 1990s and is now known as the Cuckoo prospect.

Unfortunately, early hope for the Kimberley as a gold mining centre was not fulfilled and the last major gold mine in the Kimberley, the Ruby Queen, closed in 1908.

Between 1921 and 1959, little mineral exploration was carried out in the Kimberley and the Geological Survey did little systematic work. GSWA Annual Progress Reports during the period described occurrences of tin, lead, silver, fluorite, iron ore, tantalum, niobium, gold, uranium and ground water.

This situation changed in the 1960s, when modern mineral exploration began in the Kimberley and the pace of Geological Survey work increased. Pickands Mather and other companies carried out regional exploration, focussing on base metals (copper, lead, zinc), chromite and nickel. The Commonwealth Bureau of Mineral Resources and GSWA began systematic 1:250 000 geological mapping in the Kimberley and discovered some base metal and platinum-bearing chromite occurrences. In the period 1960 to 1974, GSWA published many reports on ground water and the engineering geology of dam sites (eg Ord and Fitzroy).

The Kimberley's modern mining period began in 1975 and continues to the present. GSWA began systematic 1:100 000 geological mapping in 1990 and currently, a major survey of over 1330 mineral occurrences in the Halls Creek region is nearing completion.

In 1998, the Kimberley produced 8% by value of the State's mineral product. The main commodities were lead (\$17.3 million), zinc (\$99.9 million), silver (\$0.8 million), and diamond (\$610.4 million) for a total of \$728.4 million. Although direct mineral industry employment in the Kimberley is about 1500, a total of over 3000 for both direct and indirect employment is likely given the multiplier used to calculate indirect employment in the mineral industry.

### ***The Woodleigh impact structure***

In 1998, but only publicized in April 2000, Robert Iasky and Arthur Mory, senior GSWA geoscientists, discovered the largest proven impact crater in Australia hidden beneath the red sand country east of Shark Bay. The crater has been estimated to be 120 km in diameter and therefore the fourth largest in the world. The extraterrestrial body that caused it was probably about 5 km in diameter.

An impact of this size is probably related to a significant extinction in the fossil record, similar to Chicxulub (Gulf of Mexico), which has been linked to the extinction of the dinosaurs at the end of the Cretaceous period, 65 million years ago. The Woodleigh crater, however, lies buried below more than 100 m of Cretaceous and Jurassic (100–200 million years old) sedimentary rock, and so predates that event. The youngest possible age for the impact is about 200 million years ago in the Lower Jurassic, based on the age of the crater in-fill sediments. The oldest possible age for the impact is constrained by isotopic analysis of crater floor samples, which indicate a Late Devonian age (about 364 million years ago).

Geophysical data, and to a lesser extent surface drainage, were used to detect the crater, and to estimate its size. The central part of the crater, where the force of the impact caused the rock to "rebound" to form a dome of highly fractured rock, is

about 20 km in diameter. This process is similar to the central peak that forms when a pebble is dropped into a pond.

Rick's informative talk was well received and more than one member of the audience was seen to drool over the speed, efficiency and capacity of the new technology for producing geological maps "on demand". This work, which has not yet been extended to the Kimberley, is no doubt a great boon to prospectors and mining companies operating further south.