



16th SGA BIENNIAL MEETING KEYNOTE SPEAKER



Dave Crow

Geology Department, University of Otago, PO Box 56, Dunedin 9054, New Zealand

Orogenic gold mining and exploration in the Otago Schist, New Zealand

Orogenic gold was emplaced in the metasedimentary Otago Schist in two distinct pulses, in Early and Late Cretaceous, and exposed at the surface during Cretaceous-Cenozoic erosion. Historic mining yielded <0.5 Moz Au compared with >8 Moz Au produced from placer deposits in the region. Historic mining focused on shallow parts of the steeply dipping quartz vein deposits where coarse free supergene gold was easily extracted. Gold grades and particle sizes decreased below ~50 m depth, where Au was predominantly encapsulated in pyrite and arsenopyrite, and difficult to separate. The modern Macraes mine has developed in a 30 km long, shallow dipping brittle-ductile shear zone (Early Cretaceous), with >5 Moz Au produced since 1990 from a total resource of >12 Moz. Macraes has only minor quartz veins, and the ore is mostly sulfidic sheared schist with abundant hydrothermal graphite. Gold recovery was initially hindered by the refractory sulfide-hosted Au, and graphite-related preg-robbing in the cyanidation system. Introduction of fine grinding (~15 µm) and a pressure-oxidation autoclave have facilitated production from ore grades near 1 g/t Au. Bulk mining of low-grade ore, without a focus on higher-grade quartz veins, has been a key to success at Macraes. This success has in turn transformed the principal targets for regional exploration in the Otago Schist, to focus on large-scale shear zones rather than the small-scale quartz vein systems mined previously. The most prominent example is the Rise & Shine Shear Zone, a >7 km long Late Cretaceous structure located ~100 km NW of Macraes, which has been, and still is being, extensively prospected. Both Macraes and Rise & Shine systems were mined historically in their minor quartz vein components before the shear zone extensions were discovered. This approach is likely to dominate orogenic gold exploration in Otago, and possibly elsewhere, in the future.

Dave Crow

Dave is an Emeritus Professor in the Geology Department, University of Otago, Dunedin, New Zealand. He has worked on gold and tectonically driven hydrothermal fluid flow in ancient and modern mountain belts around the world for the past 35 years. He has particular experience with orogenic and placer gold deposits of the South Island of New Zealand, including the Otago Schist and the world-class Macraes orogenic gold deposit.
