



GSNZ Hochstetter Lecture Tour

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Tectonics and genetics in topographic evolution

Tuesday 20th June 2017

7 pm

**Auckland War Memorial Museum
Auditorium**



The landscape of New Zealand is spectacular in its expression of the active tectonic processes that occur along the Pacific-Australian plate boundary. However, it is difficult to determine the geological history of development of the onshore topography because previous configurations in the evolution of that topography have been eroded. Some of the native fauna carry a biological memory of the topographic environments in which they evolved, in their genetic makeup (DNA). Native freshwater fish are the most useful for this type of study. In particular, the genus *Galaxias* has numerous freshwater-limited species and populations that have been isolated by changes in the river drainage pattern. The South Island vividly displays the resultant biological diversity and co-evolution of topography and fish. The genetic variations of the fish can be used to document the nature and timing of river capture events and mountain range growth, especially since the Plio-Pleistocene but with some extensions into the Miocene. Hence, these biological tools provide some new insights into the development of the onshore landscape since the submergence or near-submergence of the NZ landmass in the Oligocene. The biological memory approach to understanding topographic evolution could be extended to all endemic NZ fauna and flora for which suitable distribution and genetic data are available.

**Complementary Lecture - Wednesday 21st June at 1 pm
University of Auckland, Science Centre 302 Room 130 (23 Symonds St)**

Tectonically driven fluid flow and gold mineralisation in actively deforming convergent orogens
Professor Dave Craw

The island of Taiwan and the Southern Alps of New Zealand are well-exposed active collisional tectonic belts that provide views into the processes of tectonically driven fluid flow. Minor gold mineralisation occurs in parts of these belts as a result of these processes. Taiwan is the simplest such orogen, in which Cenozoic sediments are being stacked to form high mountains (~4 km) with an extensive tectonic-hydrothermal system. The Southern Alps are being formed by reactivation of Mesozoic metasedimentary rocks into thickening crust beneath the mountains. Metamorphic dehydration is occurring in both belts as the rocks are being transformed to amphibolite facies gneisses. Gold and arsenic are mobilised into the metamorphic fluids during upper greenschist facies metamorphic transformations, and are transferred in solution to shallow levels. In Taiwan, orogenic gold is being emplaced in greenschist facies rocks while hydrocarbons are being generated and trapped in the nearby fold-thrust belt. Gold is being transported beneath the Taiwan orogen by remobilised connate brines that are diluted by metamorphic water, and these fluids are further diluted by meteoric water during upward migration. High rainfall on the western slopes of the Southern Alps causes head-driven incursion of meteoric water to the BDT and beyond. This meteoric fluid dominates the fluid budget of the NZ orogen, but metamorphic fluids at depth facilitate deformation and large-scale mobility of gold, arsenic, antimony and tungsten. These processes occur in many collisional mountain belts around the world, and also occurred in ancient belts where gold deposits are larger and more economically significant.