Potential Honours Projects in Economic and “Hard Rock” Geology

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Deflector Gold Mine, Murchison Domain, Yilgarn Craton

Project 1: Mafic dikes in the Deflector Mine Stratigraphy

Numerous thin mafic dikes are found in drill core at the Deflector Mine. Understanding the nature of these dikes has implications for understanding the late geodynamic evolution of the Murchison Domain and, possibly, the nature of mineralization. If the dikes are Archean Shoshonitic lamprophyres, then analogies with gold mineralization in other Archean districts may apply.

This study will examine the dikes using major and multi-trace element whole rock analyses combined with petrographic studies to characterize the rocks and to compare them with late mafic dikes in other gold districts of Australia and Canada.

Project 2 (Suitable for 1.5 year MPhil): Gold and Copper Mineralization at Deflector: Orogenic, porphyry or epithermal?

There are substantial but variable amounts of copper in the gold loads of the Deflector mine and the gold loads are not focused on shear zones but occur as quartz-sulphide veins, sometimes filling open spaces. These are not typical characteristics for late Archean “orogenic gold”, which raises the possibility that a) mineralization is not of the “normal” orogenic type or b) two mineralization events are superimposed.

This study will use trace element geochemical analyses to characterize the “signature” of the mineralizing fluids in order to compare them with classic orogenic systems and other gold deposit types described in the literature. Comparisons with these deposit types and rare hybrid deposits identified in other Archean gold districts will be made in order to resolve the mineralization style and assist with the identification of “vectors” to mineralization in the region.

Rio Tinto Centre for Mine Automation

Project 3: Assessing rock type properties for (automated) mine modeling

Mine automation in remote localities will require techniques that accurately characterize rock types and ore grades for constant, “on the fly”, revisions to mine models. This project will investigate material types from Hamersley martite goethite deposits. It will assess the similarities and differences between the mineralogy and chemistry of various materials in the weathered ore horizon. It will also evaluate the degree of consistency of physical properties within the rock type classes already defined by Rio Tinto mining procedures at West Angelas and other deposits. The project will use XRF/XRD, thin sections, geophysical data for drill cores (hardness, gamma, magnetic susceptibility), and possibly hardness tests. The candidate should have both a good geological capabilities and the capacity to undertake some mathematical modeling. The project will be co-supervised by Katie Silverside and Arman Melkumyan of the RTCMA.