# Dawson Informal Rock Talk
# D.I.R.T

## "Upgrading of an orogenic gold-quartz-carbonate vein system by magmatic-hydrothermal fluid in the Hope Bay Greenstone Belt, Nunavut, Canada."

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**Abstract:**

Evidence of secondary gold grade enhancement in an orogenic quartz-carbonate vein system by later stage magmatic-hydrothermal fluids is demonstrated in the Madrid deposit hosted in the Hope Bay Greenstone Belt in Nunavut, Canada. *In-situ* microanalytical approaches (SEM, Raman spectroscopy, microthermometry, LA-ICPMS, SIMS) were used to characterize the mineralogy and fluid inclusion systematics associated with the upgrading event, a feature suggested but rarely characterized in orogenic gold systems.

High-grade (upgraded; ~62 gpt Au avg.) laminated to brecciated orogenic quartz veins contain electrum but also a texturally-later Ag-Te-sulfosalt-chalcopyrite-electrum assemblage in which quartz is texturally distinct from orogenic quartz. This mineral assemblage is absent in low-grade veins (~1 gpt Au avg.) that contain only electrum. Quartz-hosted fluid inclusions ($H_2O$-NaCl±$CO_2$) of intermediate salinity (16.7±1.2wt% NaCl equiv., n=93) were identified only in high-grade veins and are present along healed planes associated with sulfosalt-electrum-quartz assemblages. *In-situ* SIMS O-isotope analyses, combined with T constraints from mineral equilibria and fluid inclusion data show that meteoric fluids had a negligible influence on fluid compositions responsible for gold precipitation. Microthermometry and Raman spectroscopy show that overprinting fluids are distinct in composition from the metamorphic/orogenic fluids and Canadian Shield basement brines also identified in the fluid inclusion record at Hope Bay. LA ICP-MS analyses indicate fluids associated with gold upgrading were enriched in As-Sb-Zn-Pb-Cs-Ba-Sr-Rb, with elevated Cs-Ba-Rb consistent with fluids exsolved from felsic magmatic systems. Trace element mapping of pyrite and associated principal component analysis confirms a strong correlation between Au and Ag-Te-Sb-Bi-W(-As) in upgraded areas, whereas only Au and As strongly correlate in low-grade veins. Gold upgrading (new gold or remobilization) by late magmatic-hydrothermal fluids is suggested by the accessory mineral, fluid inclusion and pyrite chemistry data consistent with intrusion-related, porphyry, or intermediate sulfidation epithermal settings. This work provides insights into a possibly unrecognized but perhaps common process of gold enrichment in orogenic ore systems.

4:00pm
Friday, March 16th, 2018
**Milligan Room 8th floor Biology-Earth Science Wing**