Host lithologies and ore characterization of the Dumont Sill, Quebec

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The Dumont Sill is a komatiitic Archean copper nickel ore body hosted in a large layered ultramafic sill. This sill is located 25 km west of Amos in the Abitibi greenstone belt of Quebec. The sill is completely owned by the Royal Nickel Corporation (RNC) and their property covers 4,080 hectares. The Dumont Sill is 7.5 km long and averages 700 m thick. The sill itself is thought to contain 5.1 billion tones of nickel (0.25% cutoff). The nickel mineralization is concentrated in the dunite unit. In 1987 platinum was discovered in the eastern sill through a drill program.

The dunite is variably mineralized with pentlandite, heazlewoodite, and awaruite containing nickel and chalcopyrite containing copper. This project is hoping to gain more insight into which lithologies host the different types of ore, as there were two major phases of ore generation: primary magmatic sulphides and secondary ore formed during serpentinization. This project will also try to determine which minerals host the platinum group elements and their concentrations.

This project will use approximately 30 of the samples collected in the summer of 2008 by Dr. E. Burden and possibly some PGE samples supplied by the RNC. Nine field samples from the north section of the sill represent six field stations and thirteen samples from the south of the deposit represent twelve field stations. An additional two samples were taken from a diabase to the south of the sill and five samples were taken from a mafic to ultramafic section to the west of the main deposit; this section appears to be parallel in strike. These samples will be analyzed using a petrographic microscope with polished thin sections and by using a scanning electron microscope, mineral liberation analyzer (SEM-MLA). There will also be access to whole-rock lithogeochemical data for samples collected on and around the Dumont Sill.

By using microscopy, geochemical analysis, and advanced imaging techniques it is hoped that more will be learned about the host lithologies of the Dumont Sill and the character of the ore mineralization.

Mineralogical controls on the distribution of platinum-group elements and gold in the Afton porphyry deposits, Kamloops, British Columbia

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The Afton Cu-Au porphyry system is an unusual alkalic-type porphyry deposit that is highly enriched in the platinum-group elements (PGE) Pd and Pt. The deposit is located 10 km west of Kamloops, B.C., within the Upper Triassic Nicola volcanic group and the associated dioritic to syenitic Iron Mask Batholith. The deposit contains economic amounts of Pd. However, one of the key problems is that, until now, it was believed that the PGE were associated with Cu and Au in the deposit. Consequently, some important mineralogical hosts for discrete PGE phases (pyrite and silicates) were being discarded. The present study is the first attempt to identify the most important mineral carriers for Pd and Pt, the timing of their formation, and their bearing on the overall distribution of Pd and Pt at the deposit scale. This information will lead to a conclusion about the difficulty or ease of extracting the Pd from the bulk ore. Bulk rock analyses show that Cu and Au show no correlation with PGE abundance. The best positive correlations that the PGE show in bulk rock analyses are with Ni and Hg. Inverse correlations between the PGE and Ba, Ti, U, Th, Tl, and Li were also observed. Thus far, quantitative analysis by SEM-EDS has been conducted on a sample of mounted heavy mineral separates from a high grade (>1 ppm Pd) core sample in the deposit, as well as 3 thin sections from 3 different core samples containing very high concentrations of Pd (up to 5 ppm Pd). So far, the SEM-EDS work has identified four platinum-group minerals hosted in both sulphide phases (pyrite and chalcopyrite) as well as alteration silicates: naldretteite (6 grains; Pd_2Sb), isomerteite and mercurian isomerteite (2 grains; $Pd_{11}Sb_2As_2$ or $Pd_{11}[Sb, As, Hg]_4$), mertieite-II (1 grain; $Pd_8[Sb,As]_3$), and kotulskite (1 grain; PdTe). These minerals are associated with the accessory phases electrum (avg. of 62 grains: $Au_{62}Ag_{38}$) gersdorffite (NiAsS), bromargyrite (AgBr), muthmanite (AuAgTe), and REE-rich monazite (avg. La = 6.6 wt%, Ce = 13.1 wt%; Nd = 4.7 wt%). Future work will attempt to constrain the processes that led to Pd introduction into the ore-forming system using the mineralogical and bulk chemical data combined with careful petrographic analysis of the alteration and sulphide assemblages that host the Pd carriers.

The occurrence and significance of quartzine in open spaces in a basaltic flow: Dunn Point Formation, Nova Scotia.

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Irregularly rounded masses of microcrystalline silica were discovered within a large narrow cavity (40 cm in length) in a basaltic flow within the ca. 460 Ma Dunn Point Formation, Arisaig, Nova Scotia. X-ray powder diffraction patterns indicate that the rounded masses consist of low quartz (var. chalcedony) with no trace of the polymorph moganite or opal-CT. This exceptional mineral occurrence offers an opportunity to examine the products of late geothermal fluids and provides insights into the nature and thermal history of the fluid responsible for chalcedony precipitation in the Dunn Point Formation. The chalcedony has a waxy luster, is milky white in colour,