

## Co-Genetic Magmatic Cr and Ni-Cu-PGE Deposits in the Ring of Fire

*M.G. Houlé (GSC-Q), C.M. Leshner (MERC-LU), and R.T. Metsaranta (OGS)*

Magmatic Cr and Ni-Cu-(PGE) deposits are both often associated with ultramafic to mafic magmas, but a close association of significant Cr and Ni-Cu-(PGE) deposits within the same magmatic system is rare (e.g., Uitkomst, South Africa; Shebandowan, Ontario). The best example of Cr and Ni-Cu-(PGE) association occurs in the Double Eagle (DEI) and the Black Thor (BTI) intrusions, which form part of the Meso- to Neoproterozoic McFaulds Lake greenstone belt (a.k.a. “Ring of Fire”) in northern Ontario (Canada). These ultramafic-dominated bodies (thick lower ultramafic zone and thin upper mafic zone) are exposed over a strike length of about 15 km with a maximum width of 3 km (measured over their feeder conduits), and host at least six chromite deposits (Black Thor, Black Label, Black Creek, Big Daddy, Black Horse, Blackbird 1, and Blackbird 2) with combined resources that currently exceed 285.8 Mt @ 31.5% Cr<sub>2</sub>O<sub>3</sub> and one Ni-Cu-(PGE) deposit (Eagle’s Nest) with total reserves and resources of 20.1 Mt @ 1.1% Ni, 1.14% Cu, 1.16 g/t Pt, 3.49 g/t Pd, and 0.3 g/t Au. Future Cr production from the Ring of Fire region, should position Canada as one of the five leading producers worldwide.

In general, chromite mineralization within these intrusions occurs as relatively continuous and thick horizons, up to 100m-thick near the upper third of the ultramafic zone, underlain by peridotitic units and overlain by olivine pyroxenitic to pyroxenitic units. Chromite textural facies include finely disseminated, patchy disseminated, patchy net-textured, net-textured, semi-massive, and massive. These facies are commonly complexly interlayered, ranging from very thinly laminated (<1 mm) to very thickly bedded (>60 cm). The only Ni-Cu-(PGE) deposit is associated with the DEI and consist of sulfide-rich conduit-style mineralization within a bladed dike (Eagle’s Nest) where it is characterized mainly by net-textured sulfide facies with lesser semi-massive and disseminated sulfide facies. However, there are several Ni-Cu-(PGE) occurrences in the feeder to the BTI (Blue Jay), along the lower contact of the BTI near the feeder (Blue Jay Extension), and within the BTI associated with a late websterite phase that has brecciated the Black Label chromite horizon (NW, Central, and NE Breccia Zones).

This magmatic ore system is most likely composed of two separate but co-magmatic intrusions that coalesced over time with magma inflation within a highly dynamic komatiitic system to form the Esker Intrusive Complex. This composite architecture appears to have resulted from the coalescence of an elongate sill/chonolith represented by the BTI and a funnel-tube shaped intrusion represented by the DEI, which are flanked by feeder funnels (Blue Jay) and bladed dikes (Eagle’s Nest), respectively. The exceptional metal endowments of EIC highlight the likelihood of discovering additional mineral resources within the MLGB but also elsewhere within the Superior Province and other frontier areas throughout the Canadian Shield.