16TH BIENNIAL MEETING
SGA 2022

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KEYNOTE SPEAKER

In concurrent session:
Distal signatures and vectors toward mineralisation in carbonate rocks: porphyry, skarn, vein, and replacement deposits

Peter Megaw

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Manganese-based vectoring in distal carbonate replacement deposits

Manganese is virtually ubiquitous in the distal zones of Skarn-Carbonate Replacement Deposits (CRDs) and provides inexpensive direct and indirect exploration vectoring guides to sulfide mineralization. The most obvious is Argentiferous Manganese Oxide Mineralization (AMOM); visually distinctive, pink to black, silver-bearing manganese-oxides deposited in carbonate and other wallrocks distal to sulfides. Visually less obvious, at least in daylight, are manganese-bearing “fugitive calcite” veins that commonly mark “feeder” and “bleeder” structures within, surrounding and extending outwards from skarn and sulfide replacement zones. AMOM ranges from fracture coatings and fillings to fracture-controlled, three-dimensionally penetrating dendritic infusions. Although commonly modified by weathering, AMOM retains boxwork textures and geochemical and isotopic signatures indicating a primary origin from residual/distal ore fluids. Broadly, AMOM can provide an easily mapped and sampled, multielement geochemical halo outlining the overall limits of a subject CRD system. Importantly, distal AMOM generating fluids follow many of the same permeability controls as primary mineralization and therefore can be used to map and broadly understand these controls and potentially vector directly towards ore. Fugitive calcite derives from host rock calcite dissolved during the coupled carbonate dissolution - sulfide precipitation replacement process. Carried away in the residual ore fluids, this calcite remains in solution until being redeposited as distal fracture and pore fillings. Trace quantities of manganese and lead are incorporated into the crystal lattice of fugitive calcite and induce a distinctive fluorescence color spectrum from gaudy orange to deep red under shortwave ultraviolet light. Lamping outcrops and core readily and inexpensively reveals the fugitive calcite veinlet network and paragenesis. Combined with UV color, this can illuminate the dominant structural controls on fluid escape pathways and potential vectors towards mineralization. Fluorescence color differences can also help guide consistent veinlet-based selective sampling for detailed, district-scale geochemical and carbon/oxygen isotopic halo definition and vectoring programs.

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Peter is a Consulting Exploration Geologist and President of IMDEX/Cascabel and co-founder of MAG Silver. He has a PhD in Economic Geology from the University of Arizona and more than 30 years of exploration-focused studies of Carbonate Replacement Deposits (CRDs) in Mexico. He has published extensively on CRDs and received the PDAC 2017 Thayer Lindsley Award for Outstanding Exploration Success.