



16TH BIENNIAL MEETING
SGA 2022

16th SGA BIENNIAL MEETING KEYNOTE SPEAKER

In concurrent session:
Porphyry and high sulphidation epithermal deposits



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Alkalic Au-Cu deposits of the Cadia Valley (New South Wales) and Red Chris (British Columbia) – unconventional ancient porphyry deposits associated with post-subduction magmatism

Some of the world's largest and highest grade alkalic porphyry Au-Cu deposits occur in the circum Pacific. Silica-saturated alkalic deposits of the Cadia Valley (~50 Moz Au, ~9.5 Mt Cu) in the Ordovician Macquarie Arc (New South Wales) and Red Chris (~13 Moz Au, ~3.7 Mt Cu) in the Triassic Stikinia Arc (British Columbia) share many geological similarities in their environments of formation. These deposits formed in post-subduction, trans-tensional environments after the initial stages of the accretion of remanent arc fragments. Highly oxidized and K-rich ore-related magmas were derived from an enriched mantle source, previously modified by subduction processes. In both cases, their emplacement appears facilitated by deep-crustal, arc normal transverse zones that provided permeable pathways for magma ascent to upper crustal levels (2–3 km depth) favorable for porphyry ore formation.

Deep mineralization in the Cadia Valley and at Red Chris is hosted by sheeted and stockwork quartz – sulfide veins associated with potassic alteration that follows linear intrusive corridors. Mineralized alteration assemblages have limited spatial distribution, extending only a few tens of metres from the alkalic dykes and stocks. Potassic alteration grades laterally into proximal, hematite-bearing propylitic alteration, and transitions upwards from deep K-rich to mineralogically complicated Na-K-Ca metasomatic zones. Zones of mineralization can be up to 2 km in vertical extent, with some of the best developed mineralization positioned at a transition between thick sedimentary successions and overlying volcano-sedimentary pile (e.g. Ridgeway, Cadia Valley, Red Chris – East Zone). This relationship highlights a lithologically controlled permeability important for deposit localization outside of that being created by the repeated emplacement of narrow hydrous magma columns.



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Post-mineralization geological processes were critical for the preservation of both porphyry districts. Partially exhumed mineralization was buried beneath regionally extensive basin-fill immediately after porphyry emplacement. Subsequent tectonic burial beneath thrust sheets at Cadia Valley ensured the preservation of its Paleozoic alkalic porphyry deposits.

Anthony Harris

Anthony is Chief Geoscientist at Newcrest Mining Limited. He has been involved in the expansion of Golpu (Paupa New Guinea), Lihir (Paupa New Guinea), and Red Chris (Canada) and discovery of Havieron (Australia). He is involved in technical guidance from exploration targeting through to building new geological models to enhance metal recoveries. Anthony is technical lead responsible for the advancement of new exploration technologies, including the development of predictive targeting technologies. Working with leading researchers, Anthony has been involved with basic and applied science of gold-rich porphyry copper and epithermal ore deposits throughout Australasia, North and South America.