

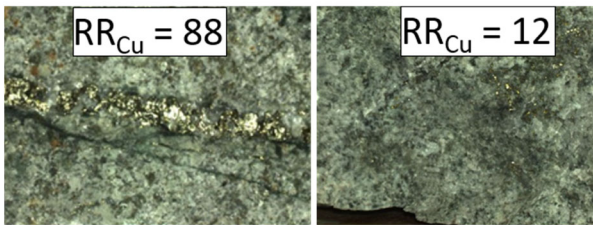
# GEOLOGICAL CONTROLS ON GRADE-BY-SIZE FRACTIONATION

Project number: P1-006  
 Program 1 Coordinator: Greg Wilkie, CRC ORE  
 Project Leader: Dr Julie Hunt, CODES/UTAS  
 Timing: June 2019 – May 2021  
 Participants: CODES (Centre for Ore Deposit and Earth Science) University of Tasmania (UTAS)

## PROJECT OUTCOMES

Links between grade-by-size fractionation and geological parameters were identified for gold and copper deposits using systematic logging, portable (hardness, magnetic susceptibility, hyperspectral, XRF) and bench-scale (hyperspectral, XRF) tools.

Ores with vein textures tend to have higher potential for pre-concentration by screening than those with disseminated textures. Upgrade potential, defined by Response Ranking (RR), a parameter developed by CRCORE, is related to: distribution of valuable phase(s) – vein density and spacing, dense disseminations vs barren rock; rock hardness – soft vs hard minerals, fracture frequency, mineralogy; abundance of altered rock.



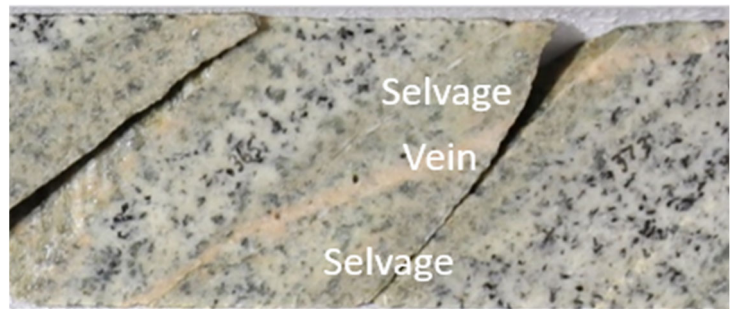
Example of porphyry copper deposit rocks with different RR values for Cu. Left = vein, Right = disseminated sulphides.

(Low grade) heterogeneous zones suitable for pre-concentration can be identified through incorporation of detailed systematic logging and testing into routine drill core logging during exploration programs or on mine sites. Use of data from (semi-) automated data collection techniques can be used to improve efficiency and precision of logging. Logging and testing in P1-006 includes:

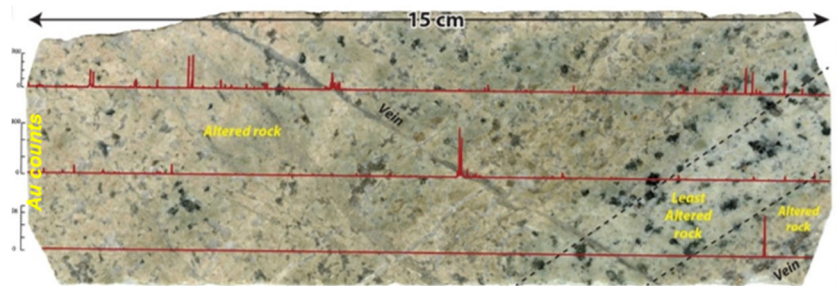
- core logging that identifies vein mineralogy, vein spacing, vein volume (visual, high-resolution imaging)
- hardness and petrophysical parameters (rebound hardness, magnetic susceptibility)
- chemistry that reflects mineralization and/or degree of alteration (whole rock chemistry, portable/bench-scale XRF)
- mineralogy (portable/bench-scale hyperspectral SWIR, TIR; calculated from assay)
- deportment and distribution/heterogeneity of valuable phase(s) (visual logging; low-resolution rapid laser-ablation ICP-MS for drill core pieces)

## BACKGROUND TO THE PROJECT

Grade-by-size fractionation is the tendency for rocks to break into barren/low grade particles and particles containing valuable minerals/elements and for these particles to be separable by screening. This propensity for fractionation had been identified anecdotally and by earlier CRCORE programs, however, predictive models to identify potential targets were at concept level (TRL2). The aim of this project was to identify geological drivers that can contribute to prediction and provide an early indication of the variability in grade-by-size response based on drill cores as this is critical in identifying which deposits have strong potential for pre-concentration via screening and are viable for larger-scale testing.



Detailed logging requires vein mineralogy, alteration and paragenesis plus vein volume and spacing. Information can be obtained from detailed, systematic visual logging and/or analysis of high-resolution images. This image was collected during (semi-) automated bench-scale XRF logging.



Example of Au deportment in drill core, identified using low-resolution laser ablation at CODES technology services. Au peaks are shown in red.



Examples of different amounts of veins, vein types and host rock in two intervals (each 10 m long) from a gold deposit. Upper interval (RR Au = 100) has more abundant V1 and V2 veins and less least altered rock than the interval with a lower RR Au.

\*RR = Response Ranking, a measure of upgrade potential developed by CRCORE