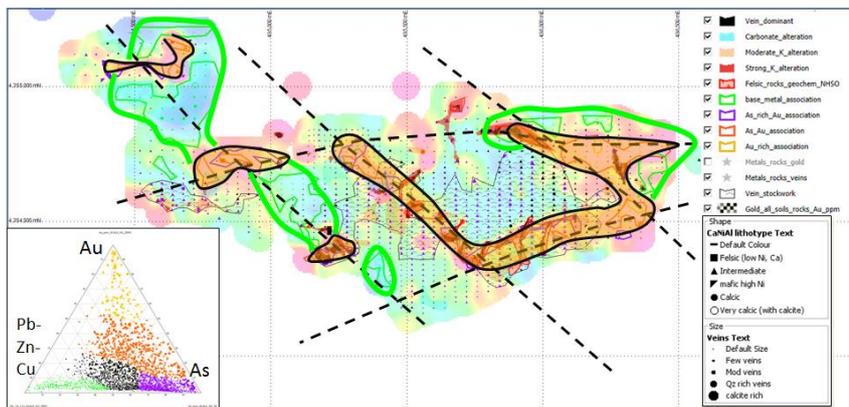# Workshop in association with Target2017

Fusing geochemistry and structural geology for best practice exploration and mining

Tuesday April 18,

Course leader:
Nick Oliver (HCOVGlobal)

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Or
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The main aim of this course is to provide you with a new set of skills, to specifically deal with how to extract and blend aspects of structural geology and geochemistry to simplify the complexity of a typical orebody or ore target. It is suitable for geologists and researchers working in gold, base metals, nickel, iron and most other metals.

Too often the analysis of geochemical, structural and geophysical data is pigeonholed according to specialisation within companies and research groups, particularly in the area of fusing geochemistry and structural geology. In all Precambrian and many Phanerozoic hydrothermal deposits, deformation, metamorphism and alteration conspire to make many complex patterns. The ways of gathering data typically end in complex datasets where structural logging/mapping and geochemical sampling and analysis fall at opposite ends of the spectrum of work, and are rarely seen together in a way that maximizes potential for discovery or efficient resource extraction.

This course is focussed on pragmatic, simple solutions for dealing with the complexity of mineral deposits and targets from the perspective of both geochemistry and structural geology. It is hands-on, with practical and rock specimen components. You will need to bring your own laptop with Excel and ioGAS loaded if possible (optional).

The workshop will cover:

- Extracting lithogeochemical information from good and bad datasets, and using these to populate maps and 3D models (folds, faults, lithostratigraphy)
- Principles of ductile deformation and the geochemical response to folding and shearing
- Principles of brittle/ductile deformation and fluid flow – how fractures and reactions work together in hydrothermal systems (including overprinting sedimentary and orthomagmatic ores)
- Alteration and mineralisation geochemistry in the context of veins, faults and breccias, from the ground up.
- Classification and simplification of structural datasets; complexity mapping and how to relate to alteration and/or primary lithogeochemistry
- Using geochemistry to extract structural information from unoriented core or RC chips
- The pitfalls of paragenesis – how to be objective and not waste time
- Seeing the forest from the trees – how to work out what is important to gather, blend, or discard from giant datasets, or equivalent strategies for generating new data
- Categorizing structures by geochemistry and vice versa (with brief introduction to software tricks)
- Practical exercises using real rock samples and real structural and geochemical datasets
- Best practice workflows in regional and local exploration, and in mine mapping, core logging and sampling

Who should attend

The course is suitable for geologists of any experience who have been exposed to the difficulty of approaching the problems associated with mineral targeting and development in mineral systems with complex structure and complex geochemistry. If you feel comfortable with geochemistry and want to boost your structure; or comfortable with structure and want to boost your geochemistry, this course is ideal. It is suitable for geologists working in gold, iron ore, base metals, nickel and many other metals, as the principles deal with deformation both as a modifier of early (syngenetic, diagenetic, magmatic) mineral systems and as a controller for epigenetic systems. It is an ideal technical complement for geologists attending the Target2017 conference in Perth, and is suited for geoscientists in companies, government, or research, interested in improving their own (or their group's) capacity to best use geochemical and structural data sets. It is also suitable for any Honours to PhD-level students working in deformed, geochemically complex rocks.
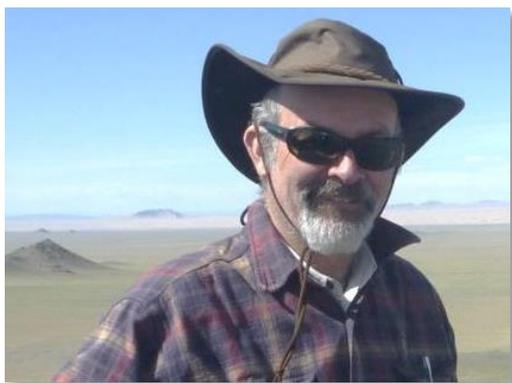
NICK OLIVER (PhD, FSEG, FAIG, MSGA, MGSAust) is a consultant specialising in the assessment and fusion of geochemical, structural, and geophysical datasets and application of these to solving field- and mine-based problems. He was formerly Lecturer in petrology and structural geology at Monash University and then Curtin University, before becoming Professor of Economic Geology at James Cook University (1997-2010), Director of the Economic Geology Research Unit, and Fluids Program Coordinator (2001-2005) in the Predictive Mineral Discovery CRC. His previous R&D, and his consultancies, stretch from pure structure to pure geochemistry, and his love of Precambrian mineral systems (Australia, Brazil, Finland, Ghana, Tanzania; base metals, iron, gold, U-REE) has been augmented in recent years by exposure to younger mineralized rocks (Cu, Au, Ag) in New Zealand, Indonesia, Philippines, eastern Russia, Mongolia, Armenia, Turkey, Colombia, and Chile. In Western Australia he has been involved in major programs on iron ore (Hamerlsey) and tectonics/metamorphism (Kimberley) as an academic, prior to gold-focussed consultancies in the Eastern Goldfields, the Murchison, and also the developing REE district at Browns Range near the Kimberley. He has also run field- and class-based workshops, both public and in-house, to over 3500 industry geologists over a 25 year period, centred on applied geochemical and structural techniques. Together with Rod Holcombe (HCOVGlobal) and REFLEX geoscientists, he assisted in the development of linked stereographic projections and geochemical analysis in REFLEX's ioGAS software package.