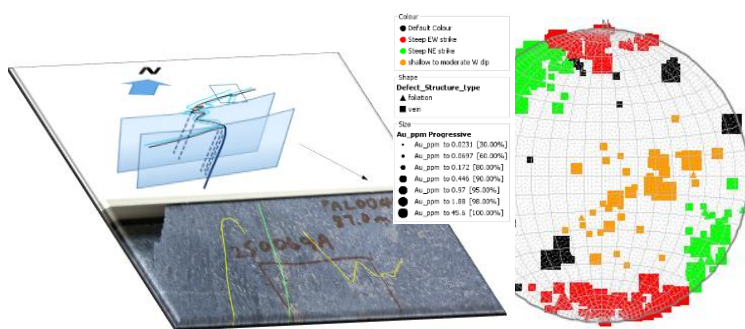




First Circular: Workshops for Geologists

Week of May 21, 2018

Fusing geochemistry and structural geology for exploration, mining and research



Two 1 ½ day courses repeated;
in Helsinki (May 21-22)
and Luleå (May 24-25)
(venues to be confirmed)

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Nils.jansson@ltu.se
Nickoliver@hcovglobal.com

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, iron, nickel and most other metals.



NICK OLIVER (PhD, MSGA, FSEG, FAIG, MGSAust) is an Australian-based consultant working globally, 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 and Curtin Universities, then Professor of Economic Geology at James Cook University (1997-2010), and Director of the Economic Geology Research Unit (EGRU). He has delivered short courses to over 4000 geologists. His R&D and consultancies in Precambrian mineral systems (Australia, Brazil, Finland, Ghana, South Africa, Tanzania; base metals, iron, gold, U-REE) have been augmented in recent years by working with younger mineralized rocks (Cu, Au, Ag) in New Zealand, Indonesia, Philippines, eastern Russia, Mongolia, Armenia, Turkey, Colombia, Peru and Chile. In Finland, he spent many years as an academic on

collaborative projects with the GTK, but more recently has been involved with two companies working in southern and northern Finland, and northern Sweden, on Au and Cu-Au projects. 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.

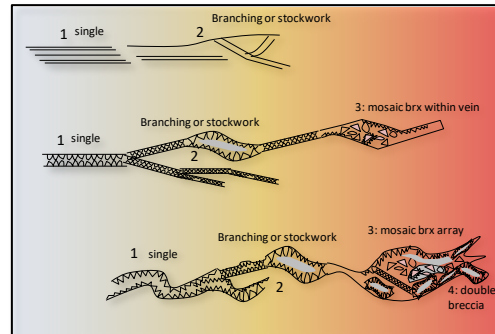
COSTS (subject to change until registration opens): €350 per 1 ½ day course, €100 for full time students and unemployed geologists, reduced fees for SGA members and multiple registrants from one company or organisation. Travel grants available for some students. Details in 2nd Circular (March 1).

- **Includes** electronic course notes, morning and afternoon tea/coffee and refreshments.
- **Students:** The total numbers of students may be capped. Register your expression of interest now to avoid disappointment later. Contact Aleksi (Finland) or Nils (Sweden) regarding possible further subsidy options; some travel grants are available.
- **Support** is in place and details are being negotiated with SGA including the Baltic Student Chapter, the European Institute of Innovation and Technology through its ExpLORE MSc program, the Finnish Union of Geologists and Finnish Association of Environmental Experts.

Can't see the forest for the trees? Too often the analysis of geochemical, structural and geophysical data is separated according to specialisation within mineral 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.

| Sample ID | mFrom | mTo | Ti_pct | Ce_pp | Mg_pp | S_pct | Au_pp | Ag |
|-----------|--------|--------|--------|-------|-------|-------|-------|----|
| 293466 | 427.1 | 428.4 | 0.36 | 35.90 | 1.85 | 2.21 | 0.04 | |
| 293469 | 428.4 | 429.6 | 0.40 | 35.80 | 2.17 | 2.00 | 0.03 | |
| 293470 | 429.6 | 430.7 | 0.24 | 27.60 | 1.44 | 4.78 | 0.13 | |
| 293472 | 430.7 | 432 | 0.34 | 39.10 | 1.57 | 3.17 | 0.14 | |
| 293475 | 432 | 433 | 0.33 | 36.20 | 1.79 | 3.40 | 0.21 | |
| 293477 | 433 | 434.34 | 0.35 | 35.00 | 1.74 | 2.30 | 0.04 | |
| 293478 | 434.34 | 435.85 | 0.22 | 27.50 | 1.29 | 4.89 | 0.86 | |
| 293479 | 435.85 | 437.1 | 0.33 | 30.00 | 1.64 | 3.10 | 0.04 | |
| 293480 | 437.1 | 438.45 | 0.40 | 37.20 | 1.57 | 3.26 | 0.03 | |
| 293481 | 438.45 | 439.9 | 0.38 | 34.40 | 1.53 | 2.75 | 0.04 | |

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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.

The workshop will cover:

- Extracting litho-geochemical 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 litho-geochemistry
- Using geochemistry to extract structural information from unoriented core or RC chips
- The pitfalls of paragenesis and geochronology – 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 in Excel and ioGAS)
- 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 working in mineral systems with complex structure and complex geochemistry, including minerals explorers, mine geologists and researchers. 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. For more experienced geologists, it provides some new ways of data fusion that are both simple and innovative. 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 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/Masters to PhD-level students working in deformed, geochemically complex rocks.



REGISTER YOUR INTEREST NOW. Official registration opens March 1.