

STRUCTURAL GEOLOGY AND RESOURCES 2022

18th to 20th October 2022

Kalgoorlie, Western Australia

NOTICE:

Dates for this meeting, field trips and courses have changed from end-September to mid-October. The dates given here are correct, but you may find older promotional materials with incorrect dates and times.



Following the highly successful symposia Structural Geology and Resources in both 2002 and 2012, the Australian Institute of Geoscientists (AIG) will again be running a three-day symposium in Kalgoorlie. The symposium will be accompanied with field trips and short courses (in Perth and Kalgoorlie).

VENUE

The symposium will be in the raked lecture theatre at the Western Mining Centre (WMC) at Curtin University School of Mines, MacDonald Street, Kalgoorlie. For the symposium we will be using the adjacent Graduates Hall for social functions, trade displays and lunches.

SYMPOSIUM THEMES

- Tectonic setting of mineralisation
- Structural controls on mineralisation
- New developments including data integration
- 3D modelling
- Data collection
- Structure in resource evaluation
- Case studies structural geology and resources



WHO SHOULD ATTEND

The symposium, short courses and field trips are aimed at anyone with a graduate degree in geology interested in structure and ore deposits. Past meetings have attracted Company Directors, Senior Managers, Exploration and Mine Geologists, Academics and Students. We hold the meeting in Kalgoorlie with the specific aim of being accessible to local mine geologists in the early stage of their careers.

For Further Information Contact: sgrkal2022@aig.org.au

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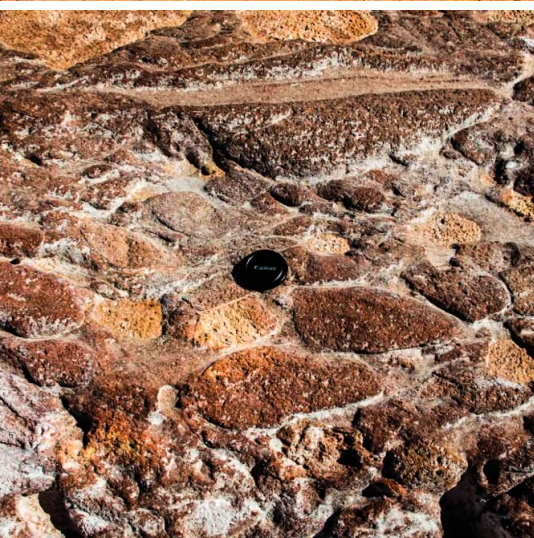


Fortescue

VISIT THE WEBSITE:

tinyurl.com/SGRKal22





AIG SYMPOSIUM VOLUME

Like 2002 and 2012, the AIG will produce a symposium volume of extended abstracts (about four pages including at least one figure). This will be edited by Julian Vearncombe and papers may be reviewed by the organising committee. Importantly, abstracts should not be advertorials for research programmes or commercial products. For guidance please view the 2012 volume at <https://www.aig.org.au/publication-shop/digital-aig-bulletin-no-56-extended-abstracts-structural-geology-and-resources-symposia-kalgoorlie-26-28-september-2012/>

Authors are asked to submit Word and JPEG (or similar) files for the abstract volume **no later than 1 April 2022**. We can achieve final formatting for consistency but please make your abstract similar to the past volumes. Proofs will be sent to authors. A pdf version of the Abstracts Volume will be available by end August 2022.

All registrations will receive a digital copy of the abstract volume.



CALL FOR PAPERS

We welcome an early indication of speaker name, affiliation and talk title.

The final date for submission of talk titles is 1st February 2022, but we are pleased to receive any time before this.

Contact: sgrkal2022@aig.org.au

The meeting will include an AIG published extended abstract volume with contributions from all speakers.

SOCIAL FUNCTIONS

The below social functions are included in registration fees.

Evening 17th October

Welcome Drinks at the Graduates Hall (adjacent to Western Mining Centre).

Evening 18th October

Visit with drinks and nibbles to Joe Lord core library, event sponsored by Geological Survey of Western Australia.

Evening 19th October

Kalgoorlie Cultural Event (pizza and beer) at the Hannans Club

REGISTRATION FEES

- The symposium registration fee for **AIG members, members Partner organisations, Sponsors and Trade exhibitors** is \$1,100.00 including GST.
- For **non-members** of the AIG the fee is \$1,300.00 including GST.
- For **full-time student, unemployed and retired members** of the AIG the fee is \$500.00 including GST (to cover catering costs).
- All fees and charges are in Australian dollars and include morning and afternoon tea/coffee, lunch and social functions.
- Short course and field trip fees per day are: **AIG members, members Partner organisations, Sponsors and Trade exhibitors** \$380.00; **non-members** \$440.00; **full-time students, unemployed and retired members** AIG \$120.00.

KEYNOTE SPEAKERS

NAME	AFFILIATION	TITLE
Tom Blenkinsop by video	Cardiff University	Failure modes in hydrothermal ore systems
Jun Cowan	JUNCOWAN	Deciphering structural controls of mineral deposits from a single column grade data
Bruce Hobbs	University of Western Australia	Analysing the spectrum of hydrothermal mineralising styles
Paul Hodkiewicz	Anglo-american	Resource evaluation and structural geology
Gianreto Manatschal	University of Strasbourg	Hydrothermal fluids, mass transfer and mineralisation in rift systems and rifted margins
John Miller	BHP	The challenge of defining what is a material structure in a resource model
Alison Ord	University of Western Australia	Vein patterns and the fluid pressure distributions in mineralising systems
Jamie Price	Cardiff University	Structural controls on shear-hosted lode-gold mineralisation in the Yalgoo-Singleton greenstone belt, Western Yilgarn Craton
Francois Robert	Consultant, Canada	Practical structural implications of the orogenic gold model
Julie Rowland	University of Auckland	New Zealand's metal transfer super-highway
James Siddorn	SRK, Canada	Key structural constraints in the exploration and definition of metallic deposits: from orogenic gold to VMS
Randy Williams	University of Wisconsin	Rethinking the role of earthquakes in mesothermal ore deposition



Gianreto Manatschal

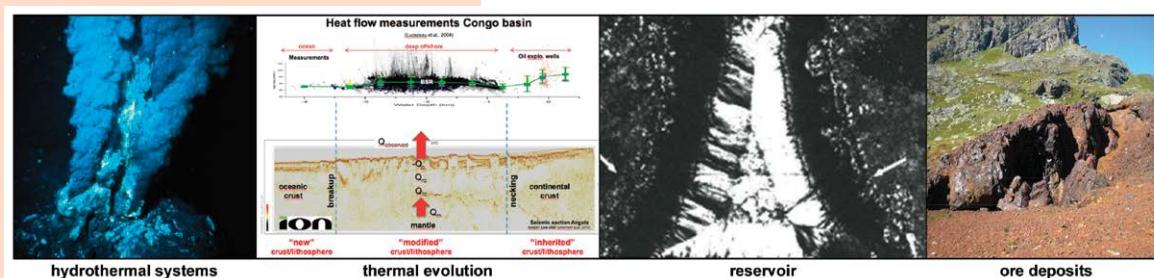
The concepts, examples and applications presented and discussed during the short course are directly linked to the research developed by Gianreto Manatschal, professor in tectonics at the Ecole et Observatoire des Sciences de la Terre at the University of Strasbourg in France. His research shows that unravelling the complexities of the enigmatic area between oceanic and continental crust and revealing the processes relating to extreme crustal thinning, mantle exhumation and onset of seafloor spreading enable to create a new exploration domain, increasing the global footprint for future research and exploration.

Fluid Transfer during Rifting and Seafloor Spreading recorded in Rift and Rifted Margins

Thursday 13th October 2022 – Pagoda Resort & Spa, Como, Perth WA
09.00 to 17.30

This short course is aimed at the exploration and R&D industry in hydrocarbons and native hydrogen. The course is based on a holistic multidisciplinary approach to mineral systems which aims to understand fluid and mass transfer at a crustal to outcrop scale.

The discovery of hyperextension and mantle exhumation, linked to magmatic systems and serpentinization at rifted margins and slow spreading systems, provides new opportunities but also challenges in exploration. During the latest stages of rifting and initial seafloor spreading, when basins are often restricted and seaways not connected, mantle exhumation, closely linked to hydrothermal systems and magmatic activity have the potential to change: (i) seawater chemistry; (ii) sustain the evolution of primitive life; (iii) control depositional environments and reservoir properties; and (iv) result in massive element-transfer of Si, Mg, Fe, Mn, Ca, Au-Ag, Co, Cu, Zn, Ni and other elements.



This course will review the new tectonic concepts of hyperextension and mantle exhumation using onshore and offshore examples and including seismic, drill hole and field observations. A second part reviews the

characteristics of these systems focusing on the link between fluid flow and mass transfer and the tectono-magmatic and sedimentary evolution of these systems.

SHORT COURSE

Dr. James Siddorn

James is a recognized expert in the structural geological analysis of mineral deposits with over 25 years experience. He develops applied practical solutions to understanding the controls on mineralisation in precious and base metal deposits, including the district-scale geological interpretation of geophysical data for exploration targeting, and applied 3D geological modelling. James is adept at working at multiple scales, integrating mine-scale with district- and regional-scale results, key for evaluating geological risk and potential. James has undertaken projects in Europe; North, South and Central America; Asia; and Africa.

Dr. Antoine Cate

Antoine is a structural geologist with over 10 years of experience. He is highly proficient in field structural mapping of ore deposits, and an expert in the analysis and interpretation of structural geology data. He specializes in the structural investigation of mineral deposits in metamorphosed and poly-deformed terranes. In addition, he has an expertise in 3D geological modelling, and in the applications of data science and machine learning in exploration. Antoine has undertaken projects in North, South and Central America; Asia; and Africa.



Folded massive sulphide mineralisation, Lalor VMS deposit, Canada

Applied Structural Geology in Exploration: From Orogenic Gold to VMS

Friday 14th October 2022
Pagoda Resort & Spa, Como, Perth WA
09.00 to 17.30

Structural geology is an important factor in the formation and post-mineralization modification of both orogenic gold and VMS deposit. Structural geology has an impact at all scales, from regional patterns to individual ore bodies. Understanding the structural geology of your project provides a foundation for successful exploration.

This short course will equip you with the tools and confidence to apply structural geology effectively at and add value to your projects, from regional grassroots exploration to mine-scale models. It will examine the key structural controls and tools that can be used in both orogenic gold and VMS exploration, highlighting the similarities and contrasts between working in each deposit type. A key aspect will be reviewing the interplay between the distribution of stratigraphy, structures, and mineralisation, and the impacts of post-mineralisation deformation on both.

The course will:

- Be practical and highly interactive.
- Be presented by experienced practitioners who know how to simplify the key messages and provide you with a workable, practical toolkit for applying structural geology to all stages of exploration.
- Comprise alternating session of practical exercises, case studies, and brief presentations all with real-world tools that participants can easily learn and apply to their exploration properties.
- The course notes will serve as an ongoing reference manual for participants.

Classic Geology around Kalgoorlie

Sunday 16th October 2022

Kalgoorlie from WMC Centre

07.00 to about 17.30

Examination of critical units and exposures, readily accessible from Kalgoorlie, that reveal the geological evolution of a typical Archaean granite-greenstone terrane through the regional stratigraphy, and landscape evolution from the Archaean to the present day.

The greenstones comprise a thick marine ultramafic to acidic largely volcanic stratigraphy and late sediments, but a rather complex subsequent tectonic history, culminating in substantial uplift, erosion, deep weathering and extensive regolith development. All these elements are well displayed in this excursion.

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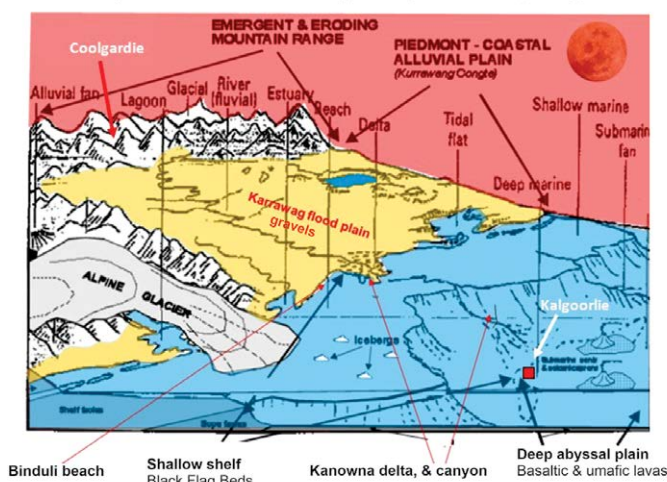
Bob Fagan

Bob Fagan has spent over twenty years lecturing in geology at the Western Australian School of Mines in Kalgoorlie and has an extensive background in the geology of the Eastern Goldfields province of WA, specialising in metamorphism, structural geology & the regolith. Bob is also a long-term mining tenement holder, and has undertaken numerous mineral exploration

programs and has held and worked numerous mining tenements in W.A. and elsewhere.

Bob will be assisted by Ivan Henderson.

Late Archaean palaeo reconstruction of the Kalgoorlie region & shoreline, looking westwards



SHORT COURSE

Mineral Systems as Chemical Reactors with no Mathematics

Sunday 16th October 2022

Hannans Club, 44 Brookman Street, Kalgoorlie

09.00 to 17.30

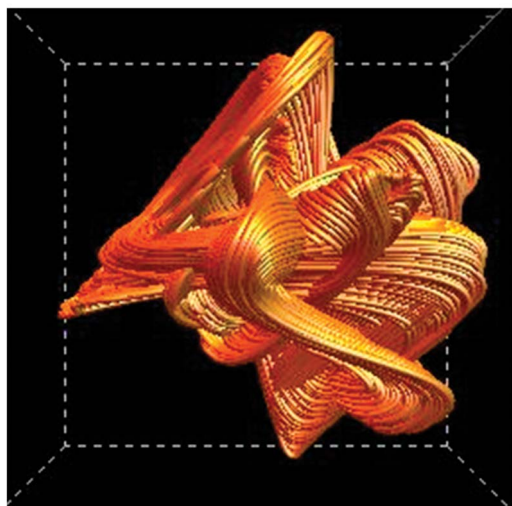
Treating mineral systems as open flow chemical reactors introduces new ways of thinking and hence new ways of analysing the immense data sets from these systems.

At all scales the probability distribution of alteration minerals and of mineralisation are indicative of the endowment of a deposit.

Small deposits tend to have different probability distributions to large ones so that data from a single drill hole are indicative of endowment; different styles of mineralisation have different probability distributions.

Nonlinear prediction techniques allow interpolation and extrapolation where data are scarce and a range of nonlinear concepts (such as entropy and determinism) allow detailed delineation of anomalies in regional data sets.

The workshop is designed as a hands-on training of these new data-integration, interpretative and synthesis techniques.



Attractor for a nonlinear system. For mineralising systems such a figure contains all the information to fingerprint the system, to assess if the system is highly or poorly endowed and to make predictions of mineral grade based on the nature of the alteration assemblages.

Bruce Hobbs

Bruce has 60 years experience as a structural geologist. The last 20 years has been spent developing analysis techniques based on regarding mineral systems as open flow chemical reactors held far from equilibrium by the influx of energy and mass.

Alison Ord

Alison is a structural geologist, interested in the mechanics of hydrothermal systems, computer modelling of deforming systems coupled with heat and fluid transport and chaotic systems. I aim to apply new tools developed for nonlinear dynamical systems to large data sets on alteration assemblages, deformation and mineralisation in mineralising systems in order to quantify and fingerprint various classes of hydrothermal mineralising systems.



Julie Rowland

JR is known for her skills in understanding crustal fault architecture, structural controls on hydrothermal fluid flow, and applied structural geology, with particular expertise in today's active tectonic/hydrothermal/geothermal environments, which gives her a unique insight into older systems. From an original focus on fluid leaking straight out of active faults in the Taupo Volcanic Zone, she's also worked in Indonesia, Chile, and eastern Africa. She is Deputy Dean of Science, seconded from Head of the School of Environment, at the University of Auckland. She is also the Society of Economic Geologists Thayer Lindsley Exchange Lecturer and former regional SEG Vice President for Oceania. JR has an extra skill from her early career as a teacher, of being able to draw, upside-down and back-to-front, tectonic/fluid flow diagrams on a portable whiteboard she holds to her chest, while simultaneously maintaining eye contact with the students.

Nick Oliver

Nick brings together diverse datasets and broad expertise across structure, geochemistry, geophysics and economic geology to understand hydrothermal systems at multiple scales. He complements JR's understanding of modern hydrothermal systems with experience in old systems, including most of Australia's Precambrian belts (and those of South and West Africa, South America, Russia and Fennoscandia), and many of the Mesozoic to Tertiary belts of the Pacific Rim. He has worked for 12 years as a full time consultant to companies all around the globe, on most hydrothermal deposit types, after an academic career which included running EGRU at JCU as Professor of Economic Geology.

A Practical Approach to Simplifying the Structural Geology of Hydrothermal Systems

Monday 17th October 2022

Hannans Club, 44 Brookman Street, Kalgoorlie

09.00 to 17.30

When faced with complex structural geology in mineral systems, many geologists struggle to move beyond a pre-imposed logging or mapping system, focus too much on collecting or trying to use unfiltered data that doesn't seem to mean anything, or get bogged down trying to follow a very specific ore deposit model, which doesn't seem to 'work' for their deposit.

This course is aimed at practical, day-to-day solutions for dealing with simplifying structural complexity in hydrothermal systems, be they epithermal, mesothermal, porphyry, orogenic and IOCG. There will be at least a couple of practical exercises with real datasets. We aim to cover:

- Controls on the geometry of ore systems, why is the gold where it is?
- The difference between what you are taught about systematic structural controls on hydrodynamics, versus reality, why are some systems "well behaved" whereas others are "naughty"?
- Why and how you should use paragenesis, and why and how you shouldn't. Also, the "traps" of geochronology.
- Clear decision paths to deal with structural complexity – the difference between mapping the complexity and mapping every structure. Pushing the geochemistry and geophysics to help. Examples and practical from drill core, drill datasets, mines and maps.
- Mechanical segmentation in ore systems: rheology, inheritance, and reworking
- Basement/cover interactions in ore systems.



FIELD TRIPS

Gerard Tripp

Gerard consults to mining and exploration companies around the globe for a range of mineral commodities and deposit types. He specialises in structural geology and stratigraphy and their application to exploration discovery and development.



Controversies around Au, Structure and Stratigraphy

Monday 17th October 2022 and Friday 21st October 2022

Kalgoorlie from WMC Centre

07.00 to late

The field trip will visit localities in the Kalgoorlie district including spectacular outcrops of major shear zones, polyphase deformation zones and key stratigraphic units, and will examine an extensive collection of polished samples from major ore deposits.

A focus is the relationship between structure, stratigraphy and gold mineralisation. The field trip will explore how these aspects have been variously highlighted and/or played down over the past 40 years in the Eastern Goldfields, and will provide insight to the origin and prevalence of controversy regarding the formation of world class greenstone-hosted gold deposits.

SHORT COURSE

Gold Deposits in Metamorphic and Igneous Environments

Friday 21st October 2022

Hannans Club, 44 Brookman Street, Kalgoorlie

09.00 to 17.30

This short course is designed to complement the structural expertise and practices required to successfully explore and mine gold deposits. Metamorphic and igneous mineral assemblages and their alteration influence the rheological contrasts, tensile strengths, structural complexities, and fluid pathways that are so important in the formation of gold deposits.

Examples will focus on gold-only deposits in greenschist facies (e.g., Kalgoorlie, Fosterville, Yandal gold province and several other goldfield), and the Big Bell / Hemlo-type gold deposits and the skills that might be valuable searching for analogues of Plutonic, Tropicana and Southern Cross goldfields in higher metamorphic grade domains. The beauty of working in these gold deposits is that you can become an expert in the core shed and underground by mastering a dozen minerals and a few structural and metamorphic concepts.

The course will mix basic principles and some recent ideas. There will be case histories highlighting the roles of improved geological understanding in some classic exploration success stories. This is suitable for geologists working in gold provinces.



Neil Phillips

Neil has focussed his career on the integration of research, mentoring and practical applications in the exploration and mining of all types of gold deposits. Regions of specialisation have included the Yilgarn and Pilbara Cratons, Victorian Goldfields, Witwatersrand goldfields, and goldfields in higher metamorphic grade domains globally.



SHORT COURSE

Stratigraphic and Structural Controls on Archean Lode Gold Deposits in the Yilgarn craton

Saturday 22nd October 2022

Hannans Club, 44 Brookman Street, Kalgoorlie

09.00 to 17.30

Geologists exploring Archean granite greenstone cratons should attend this course, which presents new insights from recent detailed mapping and high-resolution geochronology from the Yilgarn. Rapid fault-controlled sedimentation and multiple episodes of deformation created abundant planar discontinuities in the Neoarchean, including unconformities that overprinted early syn-volcanic mineralization phases, and focused late-stage deformation.

Previously unrecognized unconformities subdivide the clastic sedimentary sequences, and are spatially associated with gold mineralization. This course will describe newly identified and distinctive structural configurations created by unconformities and deformation zones, and draw out their ore genetic and exploration implications.



Tom Blenkinsop by video

Tom is a professor of structural geology at Cardiff University, UK. He works with the exploration and mining industry to apply recent advances in structural geology for efficient discovery and mining of resources.

Gerard Tripp

Gerard consults to mining and exploration companies around the globe for a range of mineral commodities and deposit types. He specialises in structural geology and stratigraphy and their application to exploration discovery and development.

Jamie Price

Jamie formerly at Cardiff University, is a resource geologist at SRK Consulting based in Cardiff, UK. He specialises in 3D geological modelling and Archean geology and has studied the geochemistry and structure of lode-gold deposits in the western Yilgarn Craton.

STRUCTURAL GEOLOGY AND RESOURCES 2022

As with the 2002 and 2012 events a science journal will be hosting a Special Issue consequent on the symposium. Content does not need to match that given at the meeting. The special issue editors are

Tom Blenkinsop, Bert De Waele & Julian Vearncombe.

Contact us if you intend to submit for this volume. Submission dates for final manuscripts is November 2022.

STRUCTURAL GEOLOGY AND RESOURCES 2022

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SYMPOSIUM COMMITTEE:

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- **Julian Vearncombe**
Consultant
- **Lora Madriaga**
AIG WA Secretariat Officer

TRAVEL TO KALGOORLIE

At the time of writing both Qantas and Virgin Australia fly to Kalgoorlie from Perth. (But, the airline industry is in flux.) Flights are in high demand with FIFO workers and never cheap. We suggest you book well in advance.

Taxis are widely available in Kalgoorlie.

HOTELS IN KALGOORLIE

Everyone including keynotes and committee are responsible for their own accommodation.

Hotels in walking distance are:

The Plaza (hotel) <https://www.plazakalgoorlie.com.au/>

The Palace Hotel (character hotel with mining history) <https://palacehotelkalgoorlie.com/>

Quality Inn Railway (standard motel-type) <https://www.railwaymotel.com.au/rooms.html>

Quest Yelverton (posh hotel) <https://www.guestreservations.com/about/mybooking>

There are many other hotels and caravan parks with cabins a long walk / short drive away. Australia, many hotels show as full if trying to book using online booking sites more than 3 months out. They want you to contact them directly! It is possible to get discount deals with the hotels by email/ phoning them directly.

For Further Information Contact: sgrkal2022@aig.org.au

There is no accompanying member's programme. But, we can put anyone interested in contact with the tourist operators in Kalgoorlie.

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