Dear Members and Friends of the CET,

Welcome to the fall/winter 2019 CET newsletter. The CET entered the New Year with significant momentum following the start of several new projects and an improved global outlook for commodity prices in 2019. This issue captures
some of the new activity with updates on the MRIWA Yilgarn 2020 project and the AMIRA South American Exploration Initiative (SAXI). Both of these CET-led projects are large, multi-year, collaborative research efforts involving industry professionals and geoscientists and students from multiple universities, geological surveys, and government research agencies. These collaborations are necessary to address the difficult problems that we face in exploring undercover with limited geological knowledge and incomplete data sets. I think they are good examples of how CET-affiliated researchers are able to work across institutional silos and build long-lasting relationships with exploration and mining companies operating around the globe.

The newsletter also profiles some new faces working on CET projects and reports on local conferences where members were represented. Updates on training courses delivered in Papua New Guinea and Suriname highlight our ongoing commitment to provide training to industry professionals in regions where such training opportunities are limited. Finally, mark your calendar's that the annual CET Members’ Day is on Wednesday November 27th at the Wesfarmers lecture theatre at the UWA Business School.

Best regards,

Steve Rowins
Professor of Mineral Geoscience and CET Director

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**CAREERS OVER BEERS**

On Thursday 23rd May the CET hosted a Careers over Beers event, giving our UWA Geology students the opportunity to hear about career opportunities and advice from four industry experts. Our four presenters provided a unique insight into their own careers, in relation to their workplace, the careers on offer in the industry, career transitions and development, hints and tips when travelling, the 'Grit and the Glory', and all the benefits of working in the mineral exploration space.

Feedback on the event has been extremely positive so we will look at doing similar events in the future. Some comments from our attendees:

"Absolutely the best networking/student event I've ever attended!!!!"
"This event was an excellent eye-opener for future geologist as well as PhD students and post docs. The insight provided was excellent and I was really happy with the talks. I truly believe this event should be repeated."

"I liked the small and almost intimate format of the event. I hope you can keep organising such events."

A special thankyou to our four presenters for giving their time and for their interesting and informative presentations:

- John Vann, Group Head of Discovery & Geosciences at Anglo American
- Jen Roskowski, Exploration Geologist at First Quantum Minerals
- Paul Polito, Exploration Manager at Independence Group (IGO)
- Lisa Vella, Principal Geophysicist at Rock Solid Geophysics

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CET MEMBERS' DAY

The 2019 CET Members' Day Symposium will be held on Wednesday 27th of November in the Wesfarmers Lecture Theatre at the UWA Business School.

All of our Corporate and Individual Members are invited to attend this exclusive symposium to see and hear about the innovative work of the CET, and to interact with the dynamic CET team of research staff and postgraduates.

Further information will be available closer to the date.

To enquire about CET Membership, please use this link or email info-cet@uwa.edu.au

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CET UPDATE

Welcome to new PhD student Polyanna Moro who joined the CET in March, after completing her Masters at the University of Brasilia. Polyanna is working with Mark Jessell, Sandi Occhipinti and
Matthew Rowe and Tony Kemp from the CET-UWA recently presented collaborative work with the Geological Survey of Western Australia at the GSWA Open-Day 2019.

The project, titled ‘Origin of the Eoarchaean Manfred Complex: Geochronology and Petrology’, reports U-Pb zircon geochronology and olivine, pyroxene, and spinel mineral chemistry from leucogabbroic and ultramafic cumulates associated with the Klaus Gessner as part of the Paterson Basins project, looking at the Geodynamics and basin evolution of the Paterson Orogen from Paleoproterozoic to Neoproterozoic based on 3D geophysical modelling and data inversion.

Welcome to CET Visitor Ashwani Prabhakar who is completing an internship with Mark Jessell’s group at CET over the next few months. Ashwani is working on geophysical integration. Besides testing new functionalities and techniques to integrate geology and geophysics, he will be busy making the geophysical inversion platform Tomofast usable and will document the algorithm.

**EVENTS**

**Geological Society of Australia - WA Division**

Talk + Monthly Meeting
First Wednesday of each month (except Dec & Jan)
5:30pm | Irish Club of WA, Subiaco

**2019 Copper to the World Conference**
17 – 18 Jun, 2019 | Location: Adelaide,
oldest anorthosite complex on Earth, located in the Narryer Terrane, Yilgarn Craton.

Results are consistent with parental magma generation from shallow mantle peridotite and emplacement within an intra-plate Early Archaean oceanic plateau as a layered mafic intrusion c. 3725 Ma. This has implications for the generation of coeval Early Archaean continental crust and tectonic settings operating during the Eoarchaean in the Narryer Terrane.

This research reflects ongoing collaborative work between the CET-UWA and the GSWA, with additional projects focusing on Archaean crustal evolution in the Narryer Terrane, northwestern Yilgarn Craton, presently being undertaken by Tony Kemp and Matthew Rowe.

WORLD BANK COMMISSIONS THE CET TO COMPILE BOOK ON AFRICAN MINERAL RESOURCES

Pietro Guj has joined forces with Richard Schodde of MinEx Consulting to produce a comprehensive book on “Mineral resources of Africa” for the World Bank (WB). The study will be an important source of factual information in support of the preparation by the WB’s Office of the Chief Economist for the Africa region of a new regional flagship report on Africa’s Resource Future.

The CET’s significant knowledge and experience of the economic geology of Africa will be combined with the power of a comprehensive database of mineral deposits around the World compiled by MinEx Consulting and with Richard’s artistry in extracting relevant tabular and graphic information from it. MinEx’s database contains over 58,000 mineral deposits of which around 11,300 deposits are of significant size (ie containing >100 koz Au, >100 kt Cu or its equivalent for other metals), including 1500 located in Africa.

Pietro’s association with the WB, for which he has directed a number of important studies in the area of mining governance and taxation, started in the early 2000s, but his interest in Africa dates back to the late 1960’s when as a young geologist he mapped and explored virgin terranes in the northern part of Namibia.

Richard has had an illustrious career in the mining industry including 15 years in a range of project evaluation, business development and strategic planning roles with WMC Resources followed by four years with BHPBilliton in Melbourne as a minerals economist, before founding MinEx Consulting in 2008 of which he is the current Managing Director.
One of the indirect benefits of the WB/CET’s proposed publication of Mineral Resources of Africa is that it is also likely to stimulate additional academic research on the role and impact of mining on the economy of developing countries around the World.

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**TRAINING UPDATE**


CET has joined force with the University of Queensland (UQ) to develop and deliver a two-week course on ‘Mineral policy and economics’ to officers of the Treasury, Mines and other departments of the Government of Papua and New Guinea. The course to be run in Port Moresby in May is sponsored by the Australian Department of Foreign Affairs and Trade. The primary objective of the program is to provide participants with an understanding of the fundamental principles and concepts of minerals policy and economics that underpin sound investment and regulatory frameworks in the resource sector. Academics from both UQ and CET, including Pietro Guj and Bryan Maybee (CET Curtin) will develop and deliver the program. CTE’s contribution will focus primarily on financial modelling and evaluation of resources projects and how to manage their risk and on the fundamental elements of how to formulate and manage a fair and effective mining fiscal regime in the context of mineral-rich developing countries.

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**CONGRATULATIONS**

Fariba Kohanpour was awarded the 2018 David Groves Prize for Postgraduate Research in Geoscience. This prize is awarded to the student who, among those completing a Doctor of Philosophy (PhD) at least partly in the year of award, is judged by the Head of the School of Earth Sciences, to have made a significant contribution to research and other core activities in the School.

All Faculty of Science prizes are generously donated by individual and corporate donors, and the Faculty’s schools.

Fariba also successfully defended her thesis on Friday, May 31st. She has accepted a postdoc position to work on the “Geodynamics through time” project funded by MRIWA, Fortescue Minerals, First Quantum and the GSWA.

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**UK**

Iron Ore 2019: Optimising Value
22 – 24 Jul, 2019 | Location: Perth, Australia

Uncover Curnamona 2019
23 – 25 Jul, 2019 | Broken Hill, Australia

GOLDSCHMIDT2019
18 – 23 Aug, 2019 | Barcelona, Spain

AIMEX: Asia-Pacific’s International Mining Exhibition
27 – 29 Aug, 2019 | Sydney, Australia

15th Biennial Meeting of the Society for Geology Applied to Mineral Deposits
27 – 30 Aug, 2019 | Location: Glasgow, UK

AEGC 2019 - Data to Discovery
02 – 05 Sep, 2019 | Perth, Australia

13th International Conference on Mine Closure
03 – 05 Sep, 2019 |
Polyanna Moro obtained both bachelor and master degrees in geophysics at the University of Brasilia, Brazil. During her undergraduate degree, she acted as a Seismic Signal Analyst for the Seismological Observatory of the University of Brasília, with expertise in seismographic monitoring and reporting on the reservoir triggered seismicity observed in Brazilian hydroelectric plants. This work provided her with the chance to participate in the Geophysical and Tectonic Research Group of the Brazilian research network of the National Institute of Science and Technology for Tectonic Studies (INCT-ET), working mainly with Applied Geophysics, Geophysics of the Solid Earth, Integration of Geophysical and Geological Methods and Seismotectonics.

She has been awarded a CAPES Scholarship for her master's in 2015, provided by the Brazilian Government. Her master thesis concerned the structural characterization and geophysical modelling of a Paleo/Mesoproterozoic rift-sag basin located in the north-eastern part of the Brasilia Fold Belt from gravity and magnetic data. After the completion of her master’s degree, she developed great interested in studies related to geotectonics and basin evolution along Proterozoic orogenic belts, while exploring this geological context in her thesis.

CET Memberships expire 30th June, 2019.

We would like to take this opportunity to thank you for your support over the past year. We value all contributions to The Centre for Exploration Targeting and your involvement is extremely important to us and very much appreciated.

Invoices will be sent to all of our Corporate Members in June 2019. Individual Members will receive an email reminder.
with payment details.

You can also renew your CET Membership by clicking on the RENEW NOW button below.

**CET Membership Benefits**

[RENEW NOW]

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**PUBLICATIONS**

**Protracted evolution of the Marañón Valley Au Belt magmatic complex in the Peruvian Andes using zircon oxygen isotopes, Lu-Hf and U-Pb analyses**

**Comparing different real option valuation approaches as applied to a copper mine**

**Grade-cost relationships within Australian underground gold mines – A 2014–2017 empirical study and potential value implications**

**The spatial-temporal patterns of land cover changes due to mining activities in the Darling Range, Western Australia: A Visual Analytics Approach**

**A new 3.59 Ga magmatic suite and a chondritic source to the east Pilbara Craton**

**Paleoproterozoic volcano-sedimentary series in the ca. 2.27–1.96 Ga Birimian Orogen of the southeastern West African Craton**
Incorporating conceptual and interpretation uncertainty to mineral prospectivity modelling

The Horto-Baratinha itabirite-hosted iron ore: A basal fragment of the Espinhaco basin in the eastern Sao Francisco Craton

Geochemical characterisation of rock hydration processes using t-SNE

Thermal, rheological and kinematic conditions for channelized lower crustal flow in a threshold example

Episodic collisional orogenesis and lower crust exhumation during the Palaeoproterozoic Eburnean Orogeny: Evidence from the Sefwi Greenstone Belt, West African Craton

A geodynamic model for the Paleoproterozoic (ca. 2.27–1.96 Ga) Birimian Orogen of the southern West African Craton – Insights into an evolving accretionary-collisional orogenic system

Evidence for dyke-parallel shear during syn-intrusion fracturing

Microstructural constraints on magma emplacement and sulfide transport mechanisms

Inversion of geological knowledge for fold geometry

Integration of geoscientific uncertainty into geophysical inversion by means of local gradient regularization
Giraud, J., Lindsay, M., Ogarko, V., Jessell, M., Martin, R., Pakyuz-Charrier, E., (24 January 2019) Solid Earth, 10 (1), pp. 193-
PROJECT UPDATE:

South American eXploration Initiative (SAXI) moves into preparation for Stage 2

Stage 1 of SAXI brought together a diverse group of stakeholders (industry, government and research organisations) in a collaborative effort to improve our understanding of the fundamental nature of North-East South America, including the Amazonian Craton and the Borborema Province. This region covers all or part of Brazil, French Guiana, Suriname, Guyana and Venezuela. Key motivations for undertaking this initiative are to assist exploration companies in focusing their activities in areas of maximum prospectivity and to help the Geological Surveys in the region to build capacity and enhance their capability in their role of providing pre-competitive data and information. An additional aim of the project is to build a matching knowledge base that can be combined with the West African eXploration Initiative (WAXI) database to produce a seamless coverage for the two regions. There is no publically available equivalent database for the Guiana Shield region.

Stage 1 was well supported by AMIRA International's global members and saw the delivery of a gap analysis to understand what data and information is available for the region and SAXI Exploration GIS, plus a structural analysis of regional geophysical data and targeted geochronological sampling and analysis was possible as a result of the project being oversubscribed.

The significant and diverse attendance at the 11th Inter Guiana geology conference in Paramaribo, Suriname in February 2019 suggests there is renewed interest in collaboration between institutions in the different countries, which a SAXI Stage 2 should be able to draw upon to undertake new industry-focused research.

On Thursday 16th May, a breakfast event with industry was held at the Mercure, Perth, where SAXI lead researcher Mark Jessell (CET-UWA) expanded on plans for Stage 2 and spoke about the potential for
involvement and the benefits from joining the growing consortium. [photos below]

Keep up to date with the SAXI Project:

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PROJECT UPDATE:

THE YILGARN 2020 KICK-OFF MEETING

The “Yilgarn 2020” kick-off meeting was held on May 30th in the Oceans Institute at UWA. The overall aim of the MRIWA Yilgarn 2020 project is to enhance our ability to predict the distribution of mineralised camps across the Yilgarn Craton at all scales. The meeting was well attended, with over 25 geoscientists representing the 7 sponsor companies and senior members of the research team. This included staff from the CET in the School of Earth Sciences, geoscientists from the Geological Survey of Western Australia (GSWA) and Dr. Pat Hayman from the Queensland University of Technology. After introductions, Dr. Nico Thebaud (Project Leader) lead the discussion on project management and reporting protocols. The project will have biannual (6 month) progress reports and a 2-day annual meeting with a field trip (the first will be in Kalgoorlie). A Project Advisory Committee consisting of Nico and Prof. Steve Rowins (Science Integrator and Deputy Project Leader), a representative from each sponsor company, Dr. Hugh Smithies
from the GSWA and Dr. Anil Subramanya from MRIWA will be tasked with keeping the project on-track and ensuring that results from the 3 modules comprising the Yilgarn 2020 project are well integrated.

Prof. Alan Aitken led the discussion of Module 1 (Composition and evolution of the Yilgarn Craton lithosphere) and outlined the work to be completed in Year 1. This was followed by Dr. Nico Thebaud’s review of Module 2a (Lithostratigraphic record and camp-scale architecture) and Prof. Mike Dentith who is leading Module 2b (Geophysical studies of camp-scale 3D architecture). Prof. Tony Kemp provided an outline of Module 3 (Mapping of fertility and development of a fertility index) and discussed the analytical work to be completed by the post-doctoral research fellow and associated Ph.D. project.

The GSWA has three programs feeding into Yilgarn 2020. Dr. Hugh Smithies discussed the Greenstone Geochemical Barcoding Project, which is an initiative aimed at geochemically characterizing greenstone stratigraphy throughout the Eastern Goldfields (stratigraphic DNA). Dr. Ruth Murdie followed with a discussion on geophysical data acquisition and geophysical signatures in the mineral systems in the southern Kalgoorlie Terrane. The meeting wound up with a presentation by Dr. Yongjun Lu on how zircon compositions can be used as a metallogenic fertility indicator of Archean granites. It is an exciting time for exploration in the Yilgarn Craton and the kick-off meeting achieved its goals of informing participants of project objectives and deliverables. The next researchers meeting will be held in September in Perth.

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**BECOME A CET MEMBER**

The CET is built on a foundation of active and direct engagement with the exploration and mining industries, with Corporate and Individual Membership representing a gateway for interested organisations and individuals into our dynamic portfolio of research activities and knowledge.

As a CET Corporate or Individual member, you are supporting research excellence, innovation and education for a more successful and dynamic mineral exploration industry. As a CET Member you will also have the opportunity to access a variety of member-exclusive resources and benefits.

Visit our [www.cet.edu.au](http://www.cet.edu.au) to learn more about the benefits of membership and to find out about payment options.

Contact the CET for more information about Corporate or Individual Membership.