



**AUSTRALIAN
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GEOSCIENTISTS**

Supporting Geoscientists



IAH Seven Wonders: Gins Leap Gap Hydrogeological Wonder

Inside this AIG News...

IAH Seven Wonders: Gins Leap Gap Hydrogeological Wonder: Upper Namoi Valley, NSW, Australia • Bursary Report: In Situ Fe isotope analyses by SIMS • The Spirit of Ecstasy replaced with a Workhorse • Upcoming events • Forensic down-the-hole geology in search of gold • Geological mapping procedures for Porphyry Cu-Au and Epithermal Exploration • INTRAW – International Raw Materials Observatory: A new international project on raw materials • Ethics Report: What sort of complaints does AIG deal with regarding members' conduct? • Yilgarn Retrospective • AIG Member Offer: AMIRA's Data Metallogenica • PACRIM 2015 in Hong Kong • And much more...



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25 May
3 August
9 November

PERTH

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understanding the key issues - how to optimise the frequency, size and the nature of the sample, and quantifying the errors associated with the sample. Practice of how the sample is taken, delimited, reduced, transported and prepared; and the theory of how to measure the errors associated with our sampling protocols, and to optimise those protocols.

26 May
4 August
10 November

PERTH

Getting The Most Out of QAQC Data

covers the QAQC life cycle: planning types and frequencies of QAQC data to be collected; mechanics of collecting, transporting and submitting samples; analyses for systematic and trending errors; what is and what isn't a failure; making changes in the resource database.

27-28 May
5-6 August
11-12 November

PERTH

Reconciliation - getting it right the first time

all aspects of reconciliation process, including key data to be collected, importance of unbiased measurement of volumes, tonnages and grades (among other metrics). How to map out the production data flow and discuss the important measures of performance – using real-life data.

29 May
7 August
13 November

PERTH

Resource Estimation and Evaluation

uses a real-life data set to cover the entire resource estimation and evaluation cycle and its requirements - from data collection and quality assurance through to classification. The 5th day of the course consolidates all that you have learned by taking you step-by-step through a check-list of the resource estimation and evaluation processes, and gives you the opportunity to bring your own data along to discuss and get advice on.

20-24 July
19-23 October
30 Nov-4 Dec

PERTH

Recoverable Resources: getting to the High Grade

demystifies and solves one of the great paradoxes of project evaluation – how to do more with less information. How to assess the recoverable resources for project valuation when the relative drill spacing does not provide sufficient coverage for the direct estimation into small blocks or selective mining units (SMU) required at the production stage.

27-28 July
26-27 October

PERTH

Report Writing for Geologists and Engineers

how to plan your document; write your summaries and conclusions; the essential grammar rules; styles and formatting; key features and time-saving tips in Word; how to review your document and review others' documents; how to write the references, abbreviations, acronyms, glossaries and the appendixes; and how to achieve your objective of writing an accurate report that grabs your readers' attention!

1 May
29 July
28 October
24 November

PERTH

Mining & Geology Fundamentals for Non-Miners

this course has been designed for non-miners working, investing, financing or associated with the mining industry – who need to understand the key fundamentals about the mine cycle, from exploration through to mine closure.

18 June
10 September
25 November

PERTH

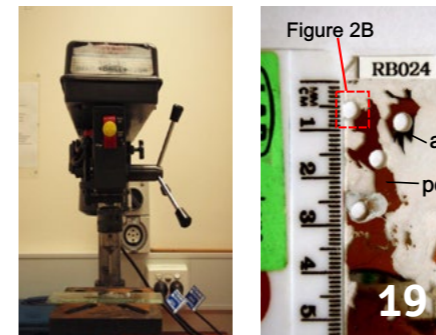
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Cover photo: Sunlight on The Gap. (Photo credit Ken Crawford 2008)

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From Your President



Wayne Spilsbury

On Professionalism

This card read "Have Hammer – Will Travel – Professional Geologist". There were no post-nominals after his name. I was sceptical. We were standing on a colluvium fan as he explained that gold was sourced from the nearby Searchlight District (an hour's drive south of Las Vegas) but could not be assayed yet his client's propriety recovery system was producing heaps of gold from the very gravel we were standing on! Of course it was a scam but what could I do? There was no professional association to complain to and the "Professional Geologist" had no Code of Ethics to abide by.

I have recently been involved in several discussions on what it means to be a Professional Geoscientist and how AIG goes about monitoring compliance of our codes by members.

The first discussion was in Hong Kong at the PACRIM 2015 conference (co-sponsored by the AIG) at an informal meeting with

AusIMM members about the apparent under-reporting of JORC Code breaches and how that may threaten external confidence in the Code. We all could recite recent cases of dodgy reporting but both AIG and AusIMM receive few complaints. Is this a case of Aussies don't do in their "mates" or is it a lack of confidence in our compliance systems? If it's the latter we need to better publicise the complaints/ethics review process and their outcomes. It was also suggested a portion (2-5%) of releases should be vetted by a review panel to provide a watchdog approach for industry and investor awareness. It is agreed that such a panel be instigated under the auspices of the JORC, funded by the parent bodies.

The idea that the JORC Committee should take on a watchdog role lead to another meeting this time between the AIG Executive and our representatives on the JORC Committee. This turned out to be the first time the AIG JORC representatives had met separately and the meeting was highly animated.

Some of the ideas thrown up included:

- Need for a focus on education and policing of the Code;
- Members need to be continually reminded that they have an ethical responsibility to report any breach of a code of practice binding on members, including JORC;
- Need for clarification of the term "competence" especially with regard to resources;
- Need for clarification of the roles of professional bodies and a system of sanctions for companies and individuals;
- Suggestion that JORC reports be in an on-line repository with public access which would expose CPs to more peer review;
- An agreement to complete a Green Paper addressing compliance and policing to be prepared by AIG's JORC Committee representatives.

I look forward to the Green Paper which will be published for comment in AIG News.

The idea that JORC takes on a watch dog role takes on more urgency with the recent news that ASIC will eliminate the position of Senior Specialist (Geology) – Emerging Mining & Resources due to budget cut-backs. The Senior Specialist (Geology) provided a critical liaison between ASIC and Competent Persons engaged in preparing reports for public companies for the protection of investors. In response to a letter to ASIC expressing our

concerns, ASIC replied "A meeting between AIG and other resource industry bodies to discuss poor conduct in the industry would assist ASIC with providing this protection."

My last meeting was with the Task Group on Global Geoscience Professionalism ("TG-GGP") which was formed by the International Union of Geological Sciences at the 34th International Geological Congress in Brisbane, in 2012. AIG is a member of TG-GGP whose purpose is to provide a single global forum for interchange on professional affairs in geoscience worldwide. An important part of TG-GGP's mission is to

foster a shared understanding of aspects of professionalism relevant to individual scientists and applied practitioners working in the geoscience profession. These may be summarised as competence, ethical practice, and professional, technical and scientific accountability. AIG is the sole Australian member in this Task Group.

A few last words on professionalism as it applies to AIG members. All AIG members are required to have a minimum of five years relevant professional experience, but is this enough? Should members demonstrate continuous improvement over their careers?

Should we, like many other professions have mandatory CPD through a log book system? This would demonstrate self-regulation and foster public confidence in our profession in my view. Going further should RPGeo status be required to act as a Competent Person? I'd like to hear your comments through letters to the Editor. 📧

Wayne Spilsbury
President

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AMC Specialist Technical Workshops

January – December 2015

AMC Consultants Pty Ltd (AMC) is a leading independent mining consultancy, providing services exclusively to the minerals sector. We are pleased to announce dates for our specialist technical career development workshops. Participants on all workshops will receive a bound, full-colour workshop manual. AMC can also run these workshops in-house and tailor them for your specific needs. Discounts are available for participants who attend several workshops in the same week (March, June, August, November).

JORC 2012—Complying with the Code in the Reporting Environment

Brisbane: 4 March, 24 June, 26 August, 18 November
Presenters: Peter Stoker and Mark Berry

This half-day workshop will present the fundamental requirements of the JORC Code, including new and changed provisions adopted in 2012. Examples of compliant and non-compliant reports will be reviewed, including case studies. This workshop is designed for existing and intending Competent Persons and management staff at all levels.

Lessons Learnt from Auditing Mineral Resource Estimates

Brisbane: 5 March, 25 June, 27 August, 19 November
Hong Kong: 21 March (in conjunction with PACRIM 2015)
Presenters: Peter Stoker and Mark Berry

This one-day workshop will present key learnings from AMC's extensive international audits of mineral resource estimates. It is designed to provide new and senior geological staff with insights into best practice and common problems. Topics covered will include drill programme design and drilling, surveying, sample preparation and analytical techniques, logging and related processes, geological interpretation and domaining, geostatistics, estimation, classification, reporting, QA/QC processes, and data management.

Preparing Appropriate Inputs for Robust Grade Estimation

Brisbane: 2 March, 22 June, 24 August, 16 November
Presenter: Alex Virisheff

This one-day workshop will present fundamental considerations and understandings in preparing information as inputs for completing a mineral resource estimate. It is designed to provide guidance on addressing issues associated with data inputs to grade estimates and grade estimation tasks.

Delivering High-quality Grade Estimates

Brisbane: 3 March, 23 June, 25 August, 17 November
Presenter: Alex Virisheff

This one-day workshop will present fundamental considerations and understandings in carrying out grade estimation in completing a mineral resource estimate. It is designed to provide guidance on setting grade estimation parameters, selecting grade estimation methods, and completing validation of grade estimates.

Assessment of Geological Uncertainty in Mining and Management of Risk

Brisbane: 6 March, 26 June, 28 August, 20 November
Presenter: Mark Berry

This one-day workshop will identify and assess the sources of geological uncertainty that feed into mineral resource and ore reserve estimates, with implications from pit to port. Case studies and a range of risk management strategies will be presented. This workshop is designed for geologists, engineers, metallurgists, and management staff at all levels.

Excellence in Mineral Resources Estimation

Brisbane: 4–8 May, 12–16 October
Presenters: Peter Stoker, Mark Berry, Alex Virisheff, Brian Hall, and other industry specialists

This five-day workshop provides geologists with a comprehensive review of all inputs into resource estimation, from data collection to reporting. Case studies are used extensively to illustrate and reinforce concepts. The workshop is presented by AMC principal consultants, supplemented by guest presentations covering topics such as sample preparation and analysis issues.

Register online at www.amcconsultants.com/training

For more information, contact: Alana Philips: (T) +61 7 3230 9000 (E) bristraining@amcconsultants.com

www.amcconsultants.com

AMC - the business of mining

Institute News Snippets

CoalLog v2.0



A seminar to launch CoalLog v2.0 was held in Brisbane 11th March 2015. If you were unable to attend the seminar, a video of the presentations is now available on the [AIG YouTube channel](#).

Presentations outline the features in CoalLog v2.0, discuss its application and provide information on the changes between v2.0 and previous releases of the standard.

Further information regarding CoalLog, including the [CoalLog training manual](#), is available from the [AusIMM web site](#). The development of CoalLog v2.0 was supported by ACARP Project C22017.



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Moral panic related to mineral development projects - Examples from Poland

Jaroslav Badera Pawel Kocon

Highlights

- Local elites create mining-related panic as a tool in political games.
- The panic is characterised by a feedback loop between the protesters and the media.
- Negative effects include blackmail, false beliefs, double intellectual standards.
- More effective pro-social solutions in the mining sector are still needed.

To read more:

September 2015, Vol.45:29-36, doi:10.1016/j.resourpol.2015.03.009

<http://www.sciencedirect.com/science/journal/03014207/45>

<http://www.sciencedirect.com/science/article/pii/S0301420715000343>



It's official: geology rocks

A total of 95% of geologists in a poll of 220,000 students said they were happy with their degree. Why?

Read more at www.theguardian.com/education/2008/sep/11/geology.students?CMP=share_btn_tw

Mankind grossly unprepared for catastrophic volcano

For the full article and video, visit

www.9news.com.au/world/2015/04/16/13/04/mankind-grossly-unprepared-for-catastrophic-volcano-blast



India drift

MIT researchers explain mystery of India's rapid move toward Eurasia 80 million years ago. Click here to read the full article www.newsoffice.mit.edu/2015/india-drift-eurasia-0504

\$1.43 million in collaborative drilling grants to support exploration projects

Sixteen exploration projects will share more than \$1.43 million in Queensland Government grants for targeted drilling projects to boost exploration throughout the state.

Minister for Natural Resources and Mines Dr Anthony Lynham said today the successful projects will target gold, copper-gold, base metals, graphite and phosphate in greenfield and brownfield areas of Queensland.

"The Palaszczuk Government supports the responsible and sustainable development of resource sector projects that will deliver jobs, regional development opportunities and ongoing economic benefits for Queensland," he said.

"Nine of the 16 projects will be in North West Queensland which is globally recognised as a strong and competitive mineral producing region with high-quality copper, silver, lead, zinc, gold and phosphate deposits.

"A further five projects are in north Queensland while the remaining two are in southern and south-west Queensland." (see map)

Dr Lynham said ongoing exploration is vital to unlock the resources that will support the mining projects and jobs of the future in the north-west and other areas of Queensland.

"That is why the government is providing funding to support the test drilling of new exploration targets through the Collaborative Drilling Initiative (CDI) of the \$30 million Future Resources Program.

"A total 38 applications were received and independently assessed for CDI Round 9 with the 16 successful projects to share a total \$1,431,275 in grants.

"The successful projects were chosen by the Geological Survey of Queensland and an independent panel for their innovative exploration proposals or location in under-explored areas of Queensland.

"Junior explorers in particular will benefit from these collaborative drilling grants which cover half the drilling costs (up to \$150,000) of a project.

"These drilling projects provide the resources sector access to new and valuable information about Queensland's mineral and energy potential to further stimulate ongoing exploration investment," he said.

Since the Collaborative Drilling Initiative started in 2006, more than \$5.99 million in government grants has been provided to 52 companies for 72 completed exploration projects.

More information about the Collaborative Drilling Initiative is available at www.business.qld.gov.au/invest/investing-queenslands-industries/mining/exploration-incentives-opportunities/exploration-grants

Education outreach UWA Woolnough Society Industry Night

WA Committee member

Sandy Moyle with Eunice

Makete, Sandy and Ruth

Mathenge.



Recognition of REFLEX expertise and quality with industry endorsement



REFLEX announced this week the endorsement of REFLEX's iGAS and Applied Geochemistry training courses by the Australian Institute of Geoscientists (AIG). The endorsement is the first under a new AIG initiative of recognising providers of continued professional development opportunities for geoscientists, willing to submit their courses for review by the Institute. Click here to read the full article www.aig.org.au/recognition-of-reflex-expertise-and-quality-with-industry-endorsement/



Geotourism NSW map

Only \$5 + postage just follow the link and order.

www.maps.com.au/Cart/LinkAdd.asp?ProductID=130

Classroom Resources from Geoscience Australia



Geoscience Australia has unveiled a beta version of its Classroom Resources web portal, designed to provide access to educational resources produced by the agency.

Geoscience Australia produces teaching resources for primary and secondary

levels. Resources include background information, student activities, full-colour cut-out 3D models and posters. For more information contact education@ga.gov.au or visit the classroom resources web page at www.ga.gov.au/education/classroom-resources

Brisbane History in Stone and Brick



The Geological Society of Australia Queensland Division, in conjunction with Global GBM has built a mobile app for a self-guided walking tour of the Brisbane CBD, highlighting a selection of significant buildings.



Click here to read the full article at

www.aig.org.au/brisbane-history-in-stone-and-brick



VALMIN Code Review

Comments on the exposure draft of the revised VALMIN Code close on Friday 17 July 2015. All interested individuals and companies are invited to make a submission.

The draft revised Code has been prepared in response to changes in market conditions and practices over the last decade since the publication of the VALMIN Code 2005. The look and feel of the VALMIN Code 2015 exposure draft is different to the VALMIN Code 2005, some of the terminology is different, while the methods and key principles are essentially the same.

To review the exposure draft, and for instructions on how to make a submission to the VALMIN Committee at www.valmin.org/draft_2015.asp. Enquiries can be directed by to contact@valmin.org.

Compliance with the VALMIN Code compliance by AIG members is mandatory. Interested members are urged to make a submission in order to help ensure that the code remains a practical and effective standard of best practice.



For the latest news, updates & events

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WA Branch Report

Suzy Urbaniak

The 2015 first quarter has indeed been busy providing value-adding opportunities for its members. In addition to the hugely successful MEGWA evenings, 2 seminars in collaboration with Geoscience Symposia were presented. Both Big Data and the much anticipated Yilgarn Retrospective were positively reviewed and enjoyed by its delegates. Contrastingly, the seminars delivered talks featuring future technologies and analytical practices as witnessed at Big Data compared to the Yilgarn Retrospective sessions which focussed and included strategies, processes and cognitive skills that were implemented to develop Western Australia's mineral's industry in the Yilgarn since the 1960's. Both abstract volumes are available on the AIG website.

Coming up, 2 one day seminars are scheduled for May and July. In a couple of weeks time, Proterozoic Terranes will be presented. Focusing on the development and mineralisation of Western Australia's Proterozoic regions, highlight talks include Degruusa and Tropicana. Our July seminar is tentatively titled "How do we sell exploration better? The value in exploration" and is in developmental phase. Thanks to Marcus and Matt respectively, for leading the organisation of these two events.

The WA NGG sub-committee have been busy developing its policies and format and excitingly we are awaiting its launch in July 2015. Sub-committee members, Heidi, Mike and Brett a cross section representation of our membership are aware of the educational needs of both mentees and mentors. Their collaboration and commitment to this much needed and important aspect will serve the continued development of Western Australian Members.

Education and community outreach is also evolving. Together with GSA, the annual Careers in Geoscience Evening is happening. Due to the current economic climate, there was a moment where the event was to be cancelled. However, it is during these countercyclical times where such events are most valued and required. A quick format rethink and new strategy implementations has seen a new look Careers in Geoscience scheduled to occur on May 5th for both secondary and university students.

Our commitments to our members remains strong and we welcome any new ideas to our value adding programs so that improved, professional learning opportunities are available for all to engage and learn from. 📢

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Kent Street - The Yilgarn Craton Field Trip and Kent Street 'Rocks the Land of Fire, Ice & Vikings - Iceland & Norway 2015



Yilgarn Craton Field Trip.

The beginning of 2015 has seen Kent Street Earth and Environmental Science students engaged in 2 remarkable field trips. In early March, the Year 12 group spent 6 days traveling the Yilgarn Craton visiting both the Evolution's Edna May Gold Mine and Western Areas Flying Fox and Spotted Quoll Mines understanding the relationships between the greenstone belts, mineralisation, their structures and the geochemical and geophysical techniques used to analyse and interpret the geology. A field trip based on deep earth processes, the Yilgarn granites were studied at Wave Rock and Mulka's Cave. Mulka's Cave and The Humps was a new addition this year and we were all taken by the +400 Aboriginal hand stencils and prints and drawings that occur here; one of Australia's largest Aboriginal Cave locations. The younger Albany Fraser Orogeny and its medium grade metamorphics at Fitzgerald River National Park - A World Biodiversity Hot Spot proved to be a highlight. To observe staurolite, garnet and kyanite in rock, the concept of 'facies' became clearer and relevant.

Four weeks later, a group of 16, including 3 Curtin University geology students (former students) experienced the geological wonders of Iceland and Norway. Just about 100% outcrop in both places and 'fresh,' even the ~1 billion year old Anorthosites in Rogaland, Norway. It is difficult to put into words the geological marvel that we studied. Each stop was better than the last, the geology was different at each



Iceland Spar Mine site - A lesson in Calcite Identification in -8C - The Outdoor Classroom.

location and consequently the landscape it supports was just as contrasting. We stood where the Mid Atlantic Ridge beaches onto land, we snorkeled through the rift, climbed its basaltic cliffs, chased dykes and sills, studied pillows and columns of all sizes and shapes, we examined ignimbrites, rhyolites, porphyritic and picritic basalts, there was Aa'aa and pahoehoe, marvelled at the infamous Laki Lava field and the world's largest pseudo crater site, not to forget the 'Dark City' near Myvatn. Some 10 different waterfall sites were examined, as was the Eyjafjalljokull Glacier and its outlet glacier, undertook glacier hiking and stood in awe as we understood the erosive power of these features and the landscape they produce. So many other aspects including zeolites, geothermal power and pools, Iceland Spar, norites, anorthosites, trocolites and 100% ilmenite sills near Norway's Titania Mine and my favourite the Krafla Fires and Crater Row.

The list is endless, the experience will never be forgotten, nor will the authentic learning. The only thing we missed was a volcanic eruption, we were also privileged to observe *Aurora Borealis*, otherwise known as 'The Northern Lights.' If you haven't been to Iceland or Norway as a geologist, I strongly recommend it as a bucket list item.

Thank you to AIG, Evolution, Western Areas, ESWA, Extreme Iceland and Magma Geopark, Norway for these extraordinary geoscience experiences. 📢

NSW Branch Report

Verity Borthwick

The NSW Branch of the AIG is active in organising events during the year. These include one day seminars, student information nights and the fabulous bi-annual Mines and Wines Conference, as well as joint events with other societies.

The NSW Branch hosted a student careers night on the 7th May at Wollongong University. Bret Ferris spoke about different career options open to students when they graduate, Katarina David spoke about what a career in hydrogeology is like and why it's important and Verity Borthwick gave a presentation about the path a career in minerals exploration might take and what the lifestyle is like. After the talks the students and speakers mingled over beer and pizza, with plenty of discussion and questions, and lots of sign-ups for student membership by the end.

The NSW branch has a number of workshops that are in the organising phase including: a two day Geochemistry course to be run by Dave Cohen and Neil Rutherford at the University of NSW; career support for Geoscientists looking for a job; and a core logging course that will be held at the core library in Londonderry.

We take a leading role in organising Mines and Wines every two years. The NSW branch is pleased to announce that registration has now opened for the 2015 conference, with the theme 'Uncorking the Tasmanides'. A fantastic program that will include technical presentations on exploration from the Eastern Australian Tasmanides is nearing finalisation and the field trip to the Lake George Mine at Captain's Flat and the Dargues Reef Gold Mine and local winery tours have been planned. The conference will be held in Queanbeyan from 2nd till 4th September, with the Mines and Wines Dinner at Old Parliament House in Canberra. Registration is \$600 (incl. GST), which covers the icebreaker, conference sessions with refreshments, and the conference dinner. The pre-conference field trip will be an additional \$66 (incl. GST). Get in now for the early-bird discount – the registration fee goes up on the 1st August.

The NSW branch is also pleased to announce that this year Mines and Wines will be hosting a student poster competition. Students are encouraged to submit a poster about their study area for display during the conference. The posters will be judged on content and presentation,



Students, speakers and university lecturers at the Wollongong University Careers night in May.

and winners will be presented with a prize. Student registration is also heavily discounted to \$150.

For more information about the Mines and Wines 2015 conference, go to www.minesandwines.com.au.

AIG NSW has a close association with SMEDG (Sydney Mineral Exploration Discussion Group). SMEDG meetings are held on the last Thursday of the month at the Rugby Club. Gatherings are very informal with a free bar at the beginning, an interesting speaker and often dinner afterwards. For more details visit the SMEDG site www.smedg.org.au and scroll down to "Join the SMEDG mailing list" to register for your free membership. You will then receive an email once a month reminding you of the meeting and the topic. If you're interested in giving a talk about mineral exploration please get in touch with the committee members (you can find their details on the SMEDG web site).

SMEDG also hosts harbour cruises twice a year, which are always great events and an excellent opportunity to catch up with old friends and network. The next one is coming up in July, so make sure to keep an eye on the SMEDG website for details on the date and registration.

NSW AIG provides funding support for young and for unemployed geoscientists. Limited funding is available to provide NSW-based AIG members with opportunities to participate in professionally organised geological field trips, conferences and courses (see the AIG web site under the Education tab, NSW AIG Support Fund).

The branch committee continues to assist in the assessment of applicants from NSW, seeking Registered Professional Geoscientist status with the AIG.

The NSW branch committee meets every two months in Sydney – visitors, guests, members and potential committee members are always welcome. 🍷



Education Report

Kaylene Camuti
Chair, AIG Education Committee

In the education report for last year's May issue of AIG News I wrote that we were going through a difficult period for geoscientists and for geoscience students. Little has changed in the last twelve months: unemployment and underemployment remain at high levels and students are graduating into a work environment that offers few job opportunities. Although this is disheartening for all involved, it did not deter bright and enthusiastic students from applying for an AIG bursary in 2014 and we hope for, and look forward to, an equally enthusiastic response from students in 2015. During times like these the contributions from sponsors and donors is critical – not only for the financial resources they provide, but also for the message of support and community they deliver to students and graduates.

This year the Bursary Program has again benefited from the support of long term sponsors. The list of current bursary sponsors is included on page 14 of this issue of AIG News and sponsors who have again committed to supporting the Bursary Program are mentioned below. A special thank you this year also to the many AIG members who have made generous donations to the AIG Education Foundation over the last few years. In the next few weeks we will be setting up a dedicated web page to acknowledge and thank these members for their support.

Many thanks to the Bursary Program Sponsors who have renewed their support in 2015:

Sydney Mineral Exploration Discussion Group (SMEDG)

DIAMOND SPONSOR

SMEDG is continuing its very generous support of the Bursary Program and we can now offer several major bursaries to NSW students working on mineral exploration-related research. SMEDG is a non-profit group and supports its activities and bursary sponsorship through the proceeds of symposia organised by volunteers, including the popular Mines and Wines Conference which will be run again this year in September.

Alexander Research Pty Ltd

PLATINUM SPONSOR

Alexander Research is again offering a bursary to students working on cross-disciplinary projects related to mineral economics and finance. The company is run by Jonathan Bell, a geologist who specialises in mineral asset valuations, and who also serves on the VALMIN Committee, the AIG WA Branch Committee, and is an AIG Federal Councillor. Alexander Research is Perth-based, and offers services to professional valuers in the extractive minerals industry through the provision of data, programmes, and innovative valuation techniques.

Terra Search Pty Ltd

GOLD SPONSOR

Terra Search has been a sponsor of the student bursary program for many years, and has renewed its sponsorship in 2015. The company offers a range of services to explorers and miners, including highly experienced geoscientific and field personnel, exploration database management, geophysical surveying, and vehicle and equipment hire. The company was founded by geoscientists in Townsville almost 30 years ago; it is still run by geoscientists, although operations have since expanded to include offices in Perth and Bathurst.

Gnomic Exploration Services Pty Ltd

GOLD SPONSOR

Gnomic Exploration Services has been a long-term supporter of the AIG Bursary Program. The company was established in Townsville around 30 years ago to provide geoscientific and geotechnical contractors and consultants to the minerals and energy industries. The company has been a long-term supporter of the AIG Bursary Program.

Cryptodome Pty Ltd

SILVER SPONSOR

Cryptodome is a Perth-based company run by Marcus Harris, with a focus on investing in Australia's future resources. Marcus is a member of AIG Council and past-Chair of the AIGWA Branch Committee. Marcus has committed a great deal of time to geoscience education and Cryptodome has been a long term contributor to the Bursary Program.

Doug Young
BRONZE SPONSOR

Last year Doug Young was the inaugural Bronze Sponsor of the AIG Bursary Program and, again in 2015, Doug is continuing his support. Doug is a member of the AIG Queensland state branch committee, a former AIG Federal Councillor, serves on the AIG Education Committee, and actively liaises with the AIG National Graduate Committee.

We are grateful, also, for the contributions from ongoing bursary sponsors:

- **Chris Bonwick**
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- **Geoff Davis**
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- **The Macquarie Arc Conference - GSNSW**
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- **The Department of State Development, South Australia**
PLATINUM SPONSOR

The support from these individuals and organisations has been long term, continues this year, and has been highly valued in providing security to the AIG Bursary Program.

Thank you, also, to the AIG state branches who regularly make substantial contributions to the AIG Bursary Program. As with SMEDG, the state branches are run by committees of volunteers who raise the funds to support the Bursary Program by organising symposia and other technical events. The effectiveness of the Bursary Program is significantly enhanced by the state branch financial support and by the efforts of the state branches in organising bursary presentations and student events.

The bursary application form for this year's program is being distributed to students and universities in May, and we invite applications from third year, honours and postgraduate geoscience students at Australian universities. 📞

PETER KOMYSHAN BSc (Hons), MAusIMM, MAIG

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For more information on the Student Bursary Programme visit www.aig.org.au/education-training/student-bursary-programme

Membership Update
We welcome all new members to the AIG

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SALEEM Ahmad • SAMBHAJI Mayur Jayant • SAWADOGO Francois Janvier • SMURTHWAITE Anthony John • STUFF Rob • TELFER Andrew • TISDALL Michael William • VARLEY Raymond John • WINTERBOTTOM Stephen John

NEW/UPGRADES MARCH 2015

STUDENTS PHILIPPA Elizabeth

GRADUATE BURLEY Lauren Louise • DAVIES Aaron Joshua • FULLELOVE Calum Andrew • MIKITUUK Doreen • TOPHAM Lieth Farally • WALL Thomas • WONG Christopher Charles

MEMBERS AMES Caleb • BAGGOTT Matthew Spencer • DE VRIES Peter John • DUGDALE James Samuel • EVANS Thomas Philip • HEALY Bryce • HO Tommy Njuk Kiong • LAMB Tyler Jay • MARYONO Adi • ROBERTS David Lloyd • TURNBULL Catherine Watson • TWINING Marc • XU Mingzuan • YANG Lijun

RPGeo Approvals and Applications

CANDIDATES APPROVED BY AIG COUNCIL IN MARCH 2015

MR MARTIN HAYLETT of Subiaco, WA, in Mining

NEW CANDIDATES PUBLISHED FOR PEER REVIEW BY THE MEMBERS OF THE AIG

MR SERGEY VOLKOV of Almaty, Kazakhstan, is seeking registration in Mining and Mineral Exploration

MR NEIL HANNAWAY of Bedford, WA, is seeking registration in Mineral Exploration

MR MARK PIRLO of Brisbane, QLD, is seeking registration in Geochemistry and Mineral Exploration

MR PETER CARISTO, The Gap, QLD, is seeking registration in Mineral Exploration

MR ROBERT SMILLIE of Dunedin, NZ, is seeking registration in Mineral Exploration



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7: Gins Leap Gap Hydrogeological Wonder: Upper Namoi Valley, NSW, Australia

Ken Crawford
Principal Consultant, KLC Environmental Pty Ltd

*Reproduced with thanks to the International Association of Hydrogeologists,
Australia National Chapter*

Seven Wonders of the Hydrogeological World (in Australia)

In an effort to raise the national profile of hydrogeology, the Australian branch of the International Association of Hydrogeologists (IAH Australia) launched a competition in 2010, challenging interested parties to nominate Seven Wonders of the Hydrogeological World (in Australia).

With a \$1000 cash prize on offer for the best submission, entries were impressive, varied and reflective of the diverse and abundant hydrogeological wonders Australia has to offer. Submissions were assessed on the basis of scientific merit, interest to scientific media, visual amenity, quality of submission and public interest. Of the wonders nominated, there were seven clear standouts.

Over coming issues of the AIG News, we will be featuring each of these wonders, starting with number 7 Gins Leap Gap.

Coming to Gunnedah as a young Soil Conservationist in the early seventies, I became fascinated with The Gap. I soon realised that surface water, at this narrow point in the valley, became dammed-up in flood times. There had been three floods by 1976 and I soon developed a passion to learn more about the hydrogeology of this place they call The Gap.

The Gins Leap Gap is located approximately 9 Km north of Boggabri on the Kamilaroi Highway in New South Wales. The major tributaries of the Namoi River, including Cox's Creek, the Mooki, Peel, Cockburn, Manilla and McDonald rivers all flow through The Gap as well as the groundwater associated with the unconsolidated sediments of the alluvial aquifer. The Gap also forms the major constriction in the Upper Namoi Valley and represents the northern extent of the Liverpool Plains (Plate 1).

Recent hydrogeological investigations at The Gap demonstrate how geological controls, such as faulting, fracturing and volcanic events, can constrict the alluvial aquifer and limit groundwater flow. A better understanding of major constrictions in

hidden valleys is strategically important to measure and monitor groundwater. The Namoi CMA Gins Leap Gap Project revealed some surprises and geological problems that make me wonder at the features of the underground landscape.

I marvel that so many geological controls of the bedrock topography exist in this one place. I often wonder about its geological history and stories the rocks could tell. Imagine: The Boggabri Thrust Fault predetermining the path of the Namoi River or even perhaps an earlier valley glacier. The paleochannel sides are very steep and the two ridges may have been pushed up as the valley glacier terminated at this point. This is could well be the toe of a Tertiary glacier.

Dr David Allen of Groundwater Imaging produced an image using Google Earth Professional (see Plate2). The polished rock on the eastern side looks like a glacial rock as if the rock face has been sheared off. Erratics, each side of The Gap were found where

rocks appear to have been carried along and dumped. These boulder rocks or drop stones are Permian conglomerates and are strikingly different to the volcanic bedrock ridges suggesting a glacial origin.

The longitudinal profile of the valley bedrock topography also suggests a stepping down feature along its length typical of a valley glacier. The infilling in later Tertiary times provided large boulders and cobbles from a high energy, fluvial environment. A Drillers nightmare! Jurassic and Tertiary intrusions also complicate the picture; however the geophysical survey discovered an inferred lava flow (see Plate 3). Drilling control

confirmed this. Notice that the lava flows over the earlier alluvial sediments post dating them. This is a recent lava flow, geologically speaking, and caused further damming of the Namoi River. The lava flow may have originated from the Mount Kaputar volcano.

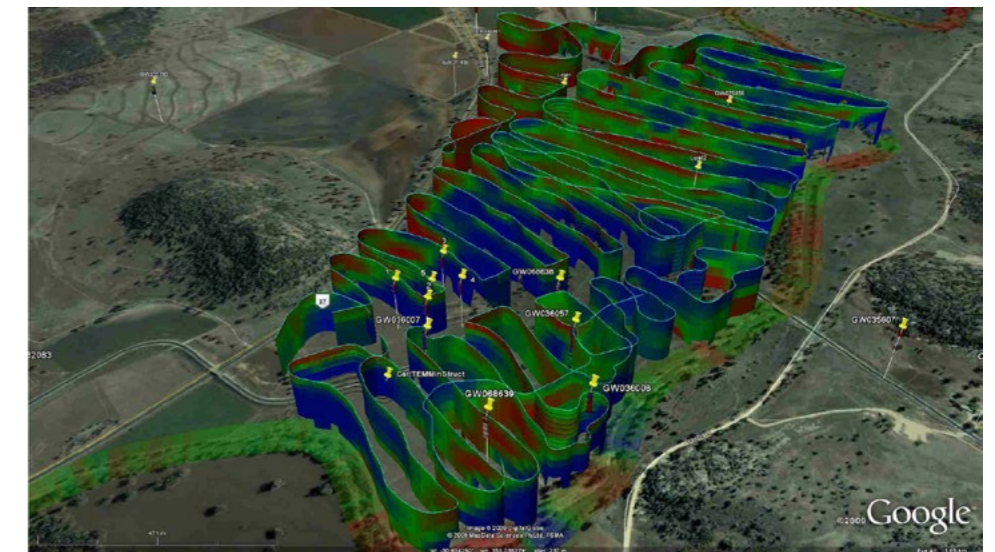
Think about it! Depth to bedrock is only 27 meters to 37 meters below ground level on the



Plate 1: Sunlight on The Gap. (Photo credit Ken Crawford 2008)

Plate 2: Groundwater Imaging using Transient Electromagnetic survey and Geo-electric Namoi River run superimposed on Google Earth Professional. Boreholes are shown with yellow markers and provide drilling control to the geophysics.

(Image credit: David Allen and Google Earth Professional 2009)





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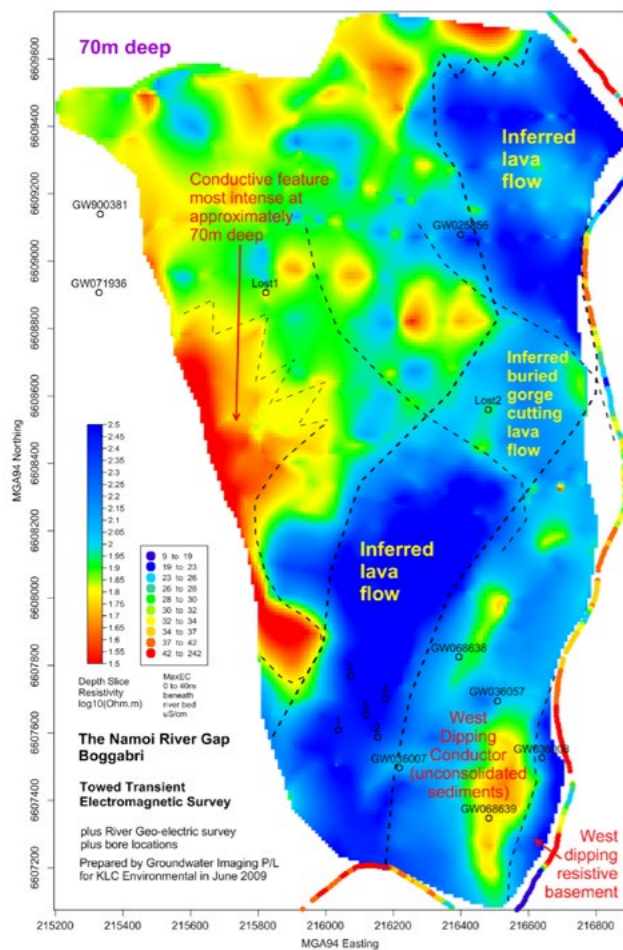


Plate 3: Towed Transient Electromagnetic Survey 70 m depth slice plus Namoi River Geo-electric survey Bore locations are included and interpretation by Groundwater Imaging Pty Ltd. (Image credit: David Allen 2009)

western side and 98 meters in a gorge to the east where the lava flow has been eroded by the Namoi River. The Gap with its geological history is an integral part of the formation of the Liverpool Plains and explains why the fertile black soils overly alluvial sediments containing precious groundwater. The underground dam is 160 metres deep in places.

The early explorers searched for an inland sea but couldn't find one. Ironically, the sea was just beneath their feet in the form of a hidden valley containing huge quantities of precious groundwater. It was covered by some of the best Black Earth soils in the world. There may be other scenarios of geological history than the one which I have proposed; however, the features of the underground landscape at The Gap certainly make you wonder. This area is unique. 🗺️

In Situ Fe isotope analyses by SIMS



Chris Wawryk
PhD candidate,
School of Physical Sciences at
University of Adelaide
2013 AIG Postgraduate
Bursary Winner

The project aims

I received a Student Bursary from the AIG to travel to Perth to work with Assistant Professor John Cliff at the Centre for Materials, Characterisation and Analysis at the University of Western Australia in October, 2014. John has developed internal sulphide standards for in-situ iron and sulphur isotope analysis via Secondary Ion Mass Spectrometry ('SIMS'), using a Cameca IMS 1280 ion probe. The aim of our work was two-fold:

- 1 to cross calibrate the instrumental mass fractionation of the ion probe by comparing the Fe-isotope measurements of the sulphide standards measured using SIMS, to measurements made using solution Multicollector Inductively Coupled Plasma Mass Spectrometry (MC-ICPMS) at the University of Adelaide.
- 2 to measure in-situ ^{53}S and ^{56}Fe of natural sulphide samples from the Renison tin deposit using SIMS, and compare the results to published data that had been measured by other methods.

How does SIMS work?

In general, SIMS instruments generate a primary beam of ions, which are directed to the sample, under vacuum. The interaction of the primary ion beam with the sample provides sufficient energy to ionize elements present in the sample. These are called the secondary ions. The secondary ions are then accelerated, focused, and analysed by a mass spectrometer. A more detailed explanation of how SIMS works can be found at www.serc.carleton.edu/research_education/geochemsheets/techniques/SIMS.html

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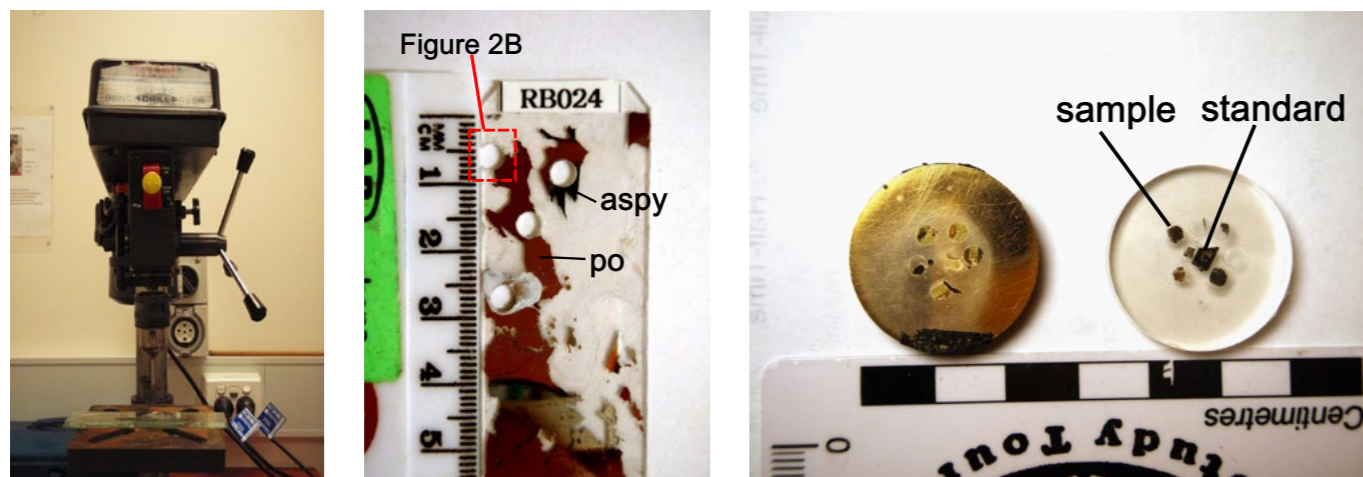


Figure 1. Photographs illustrating sample preparation stages for in-situ isotope analysis using the IMS1280 ion probe at CMCA. A: The drill was used to cut 3.5mm rounds from the thin sections. Different diameter diamond-tipped bits can be set in the drill. B: Sample RB024 with samples cut out. Slides were covered with water during cutting, so this slide is tarnished. C: Samples in resin mounts, uncoated (right) and gold-coated(left). Scale bar is divided into centimetres.

Sample preparation for the Neptune Multicollector Mass Spectrometer

To obtain sulphide separates for my research involves fine grinding, sieving and magnetic separation using a Franz magnetic separator, or by hand picking minerals under a binocular microscope. These methods cannot entirely separate minerals from any inclusions that may be present. Minerals are prepared for stable iron isotope analysis in solution via several steps of dissolution, evaporation and purification done in a "clean" laboratory, using hazardous chemicals such as hydrofluoric acid. It takes about 3 days to get a solution ready for the Neptune Multicollector.

Advantages of the ion probe

SIMS has two advantages over solution Multi-collector ICP_MS, one of which is that no corrosive acids are required in sample preparation, and the preparation is much quicker. We measured our samples directly as grain mounts drilled from thin sections (Fig. 1). Four mounts, with 5 samples and the standards on each mount, took about 6 hours to prepare. The grain mounts were set overnight in an epoxy resin, then highly polished and coated with gold (Fig 1). The gold coating is necessary to prevent a charge build-up on the sample surface.

A second advantage is the very high spatial resolution of samples; we used a primary ion beam of ~40µm width, so we were able to measure isotopes across alteration zones in pyrrhotites, and across mineral grain contacts (Figure 2), and avoid inclusions in the sulphides. This technique would have been extremely useful for the porphyry style samples I am working on; in one core sample an earlier chalcopyrite-bornite centreline assemblage in a quartz vein is cross cut by orthogonal tension cracks filled with chalcopyrite. I could not separate these 2 stages of chalcopyrite deposition using grinding, so that particular core sample could not be used.

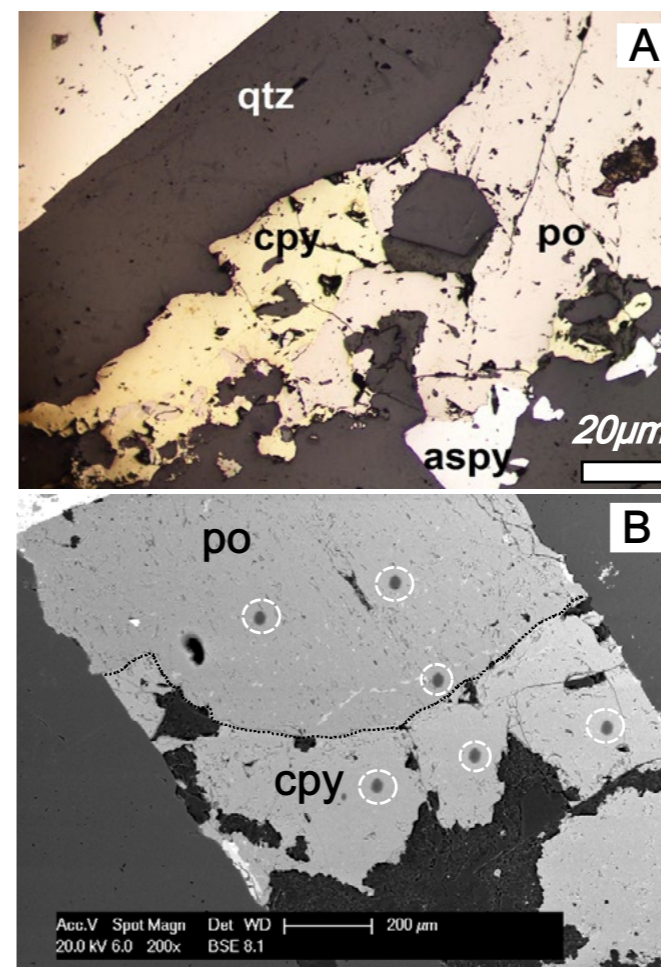



Figure 2. Photomicrograph and SEM image of sample RB024. A: chalcopyrite (cpy) and pyrrhotite (po) overprint an earlier quartz (qtz)-arsenopyrite (aspy) assemblage. There are abundant siderite inclusions in the cpy and po. B: A chalcopyrite-pyrrhotite grain boundary. White circles denote SIMS craters. The bright white mineral is a bismuth mineral. Scale bar is 200µm.

Limitations of the ion probe

A limitation of SIMS, apart from the high cost of the instrumentation, is that quantitative isotopic ratios must be calculated by comparing measurements of the samples to well characterized standards; but as instrumental mass fractionation is different for each mineral, there must be a separate standard for each mineral. Standards for some minerals cannot be made owing to crystallographic or matrix effects; solid solutions and non-ideal stoichiometries can also render it difficult to create standards for some minerals, for example bornite. So solution and laser ablation systems will be used for some time yet!



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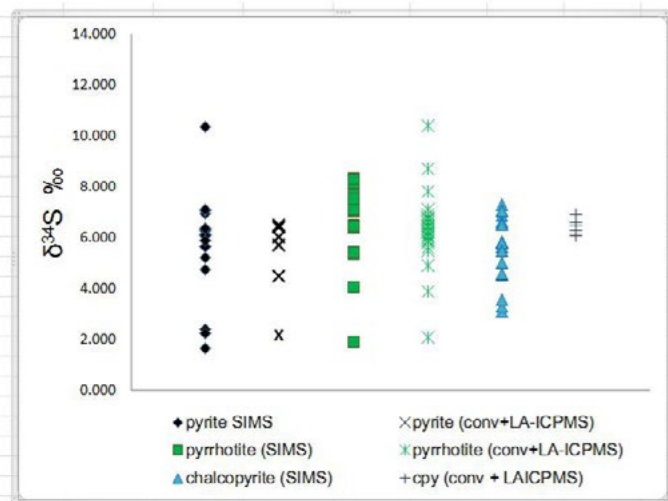


Figure 3. Comparison of $\delta^{34}\text{S}$ results for pyrite, pyrrhotite and chalcopyrite using the IMS1280 ion probe, with previously published data.

Results

The IMS 1280 ion probe at CMCA ran well during my visit, and we obtained $\delta^{34}\text{S}$ and $\delta^{56}\text{Fe}$ for pyrrhotite, pyrite, chalcopyrite and arsenopyrite from massive pyrrhotite replacement ore and quartz-vein hosted fault ore from the Renison tin mine. The preliminary $\delta^{34}\text{S}$ data matches published data (Patterson et al, 1981; Kitto, 1994) extremely well, as shown in Figure 3. The preliminary $\delta^{56}\text{Fe}$ data match the solution data very well (Wawryk and Foden 2014), and after final processing we will be writing up the results as a journal article.

The most exciting application for me, as an economic geology researcher, is how quickly samples can be prepared and data acquired for the common sulphides pyrite, pyrrhotite, chalcopyrite and pentlandite. For sulphides hosted in quartz veins, measurement for sulphur, iron and oxygen isotope data could be acquired from one sample, in one pass of sample preparation. 📢

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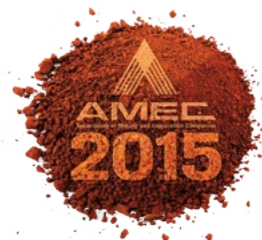
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Acknowledgments

I thank the AIG for awarding the student bursary which funded this project, and John Cliff for teaching me the sample preparation and running the Cameca IMS1280. The Bluestone Tin JV and the geologists at Renison Tin mine provided access to the core library to collect samples for my PhD research.



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The Spirit of Ecstasy replaced with a Workhorse

Diana Titren
Manager Training and Marketing Optiro

With the mining boom continuing its decline and commodity prices shrinking, no longer is it an issue of how much material we drive through our mine gates but rather how efficiently we drive it to the gates.

The mining industry has implemented all of the standard short-term and obvious cost saving measures of slashing staff, deferring projects, mothballing equipment, freezing budgets, placing declines on hold and sending drill rigs packing - while pushing for profits through increased productivity. So, with nothing left to trim, we now need to look at increasing the efficiency of our processes and people by putting that elusive best-practice, back into practice. But in these lean times we cannot afford the leather-seated Spirit of Ecstasy emblazoned Rolls Royce version of best-practice, but rather the less expensive, equally effective and reliable Workhorse that bears the emblem, The Spirit of Efficiency.

So, how do we drive the Workhorse? We need Strategies – to define what we want, plan where we are going and a programme to implement the strategies. We need to open the manual and read the Data - to accurately capture, analyse, review and document our data so we can identify and implement efficiencies. For a smooth efficient ride we need to open the bonnet and look at the Processes – we need to standardise, audit



and monitor our processes. To get peak performance from the Workhorse – we need to record, monitor and review the Equipment. And of course, the part most critical to the success of the Workhorse, is the driver. We need experienced, knowledgeable, skilful People – not only to steer the Workhorse efficiently and effectively over the bumpy road ahead, but to also pass on their knowledge and skills to the younger folk... to prepare them for the next inevitable downturn!

The Workhorse unfortunately can't liberate us from the current downturn, but The Spirit of Efficiency will boost our profit margins and have us working at peak performance, ready to put pedal to the metal at the first sound of the boom. 📢



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Australian Institute of Geoscientists,
Sydney Mineral Exploration Discussion Group,
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Joint AIG, AusIMM, GSA Technical Meeting: Aeromagnetics, Geology and Exploration



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- 22 May Roxby Downs SA | Roxby Downs Dunes Cafe
- 28 May Cobar NSW | Cobar Bowling and Golf Club
- 30 May Lachlan NSW | Parkview Hotel
- 4 June Illawarra NSW | University of Wollongong
- 6 June Sydney NSW | The Royal Exchange of Sydney

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IAH AUSTRALIA June 8 - 9 Water Management for Shale and Tight Gas Resources

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VALUE CREATION IN EXPLORATION

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www.aig.org.au/events/value-creation-in-exploration/

Friday 5th June New England Orogen: Geology, Tectonics, Economics

Saturday 6th June - Sunday 8th June New England Field Conference

The New England Orogen, the most eastern part of the continent is a fertile section of NSW and QLD for a variety of amineal deposits, varying from base and precious metals to building stones and industrial minerals. Significant advances in the understanding of the Orogen have been made in recent times and the seminar aims to present an up to date review of the knowledge. Speakers are drawn from a variety of industry, government, academic and consulting organisations to provide information exchange and raise awareness of geoscientists interested in the region. The seminar will be followed by a three day Field Conference to the southern Queensland and northern NSW parts of the New England Orogen, highlighting the metallic and industrial minerals occurrence in the area.
For more information visit www.aig.org.au/events

Applied Geochemistry REFLEX Geosciences June 23 - June 24, Balcatta, Perth

Geochemistry Essentials, Surficial Processes, QAQC, Geoanalysis, Introduction to Litho geochemistry, Portable XRF, Case Studies.
Further Information: www.reflexnow.com/events/applied-geochemistry-course/

ioGAS Advanced Techniques REFLEX Geosciences 10 June, Balcatta, Perth

Includes map based visualisation; multivariate plots; outlier detection; robust regression and residuals; clustering; principal components analysis; discriminant projection analysis and the 'new in version 6' M-distance auto classification functions.
Further information www.reflexnow.com/events/iogas-advanced-techniques/

Advanced Field Training

From 29 June 2015, Eight Day Course
Mt Isa – Cloncurry region, QLD

COURSE PRESENTERS:
Dr Thomas Blenkinsop & Dr Ioan Sanislav, Economic Geology Research Centre, James Cook University
Exploration-related field skills in complexly deformed and altered rocks

REGISTRATION FEES:
Full – \$4,600
AIG Members – \$3,800

FURTHER INFORMATION:
judith.botting@jcu.edu.au
www.aig.org.au/events/advanced-field-training

2015 Queensland Exploration Council Breakfast

June 16, Plaza Terrace Room, Brisbane Convention and Exhibition Centre, Grey Street, South Brisbane.

RSVP by Wednesday 10 June 2015
Book tickets via the QEC web site - www.qrc.org.au/02_cal/details.asp?ID=337
For more information contact Louise Stubblefield at louises@qrc.org.au

GPIC Victoria presents...

June 9, 2015
Redefining G.O.D. | Bill McCallum
July 2015
Seismic Reflection – Deep and Meaningful Data for Mineral Exploration, Hydrogeology and Geotech | Greg Turner, HiSeis P/L
For more information visit www.aig.org.au/events

Saying Goodbye to a 2D Earth 2-7 August, 2015

The CET and partner organisations (CSIRO, RWTH Aachen University, UWA and Geological Survey of WA) have come together to host the international conference, "Saying Goodbye to a 2D Earth". We invite you to download the FIRST CIRCULAR (www.cet.edu.au/docs/default-source/events/first-circular_v1.pdf?sfvrsn=2) for more information and contact details.

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Forensic down-the-hole geology in search of gold

Donald YATES
BAppSc BCommEng CertRenewEngy
CEO, Columbus Group R&D

The typical story so far

Defining a resource usually requires a close spacing drilling program to achieve results with reasonable confidence, particularly if the grade is variable within the deposit, a situation often experienced in underground gold prospects. And then the drilling data is trimmed to remove the extra high indications to produce what is regarded as a more realistic geological grade report of the anomalies.

As for the applied traditional drilling hardware, the choices are usually a balance of reliable data verses cost.

Diamond drilling does produce a lot of geological information with almost no contamination, but can be slow and expensive. It is often reserved for holes greater than 300m deep.

The usually more popular drilling system is reverse circulation, and what it gains in speed and lower cost, it loses in accuracy.

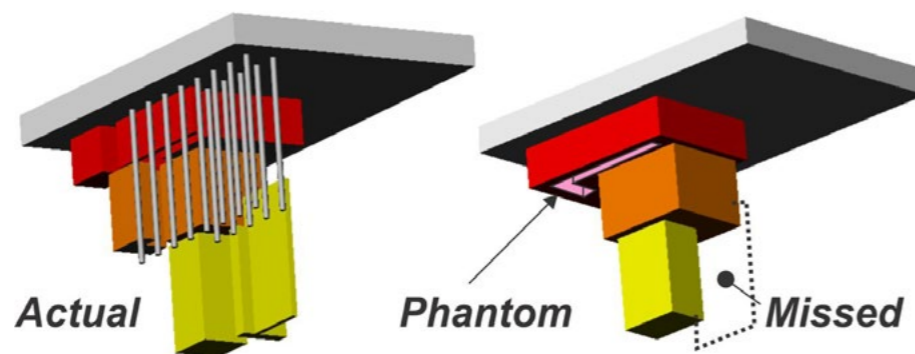
And the typical least cost is percussion rotary air blast drilling. It is good for drilling lots of holes up to 30m deep, quite fast, but cross contamination is a serious issue, as is groundwater if encountered where the produced fine dust can become a clogging mud very quickly.

In current practice with deep exploration holes, survey estimation with some down-the-hole navigational direction control have been combined to get an idea of where the test results are coming from. As far back as the

1970's neutron activation was used to obtain assaying information at depth with some success.

Bringing it all together when planning and conducting drilling programs, it has been the experienced operators who have developed the sought-after skills to read the surface signs, apply a range of drilling hardware and use simple but effective techniques like differently spaced and angled intersecting holes to discover more of what is to be found below.

In contrast, the regular spaced drilling programs with 3D 'join the dots' modelling, particularly in gold exploration, quite often can produce 'phantom' reserves that are not there because they are not continuous, and then miss other potentially profitable veins which are too narrow to be picked up and defined.



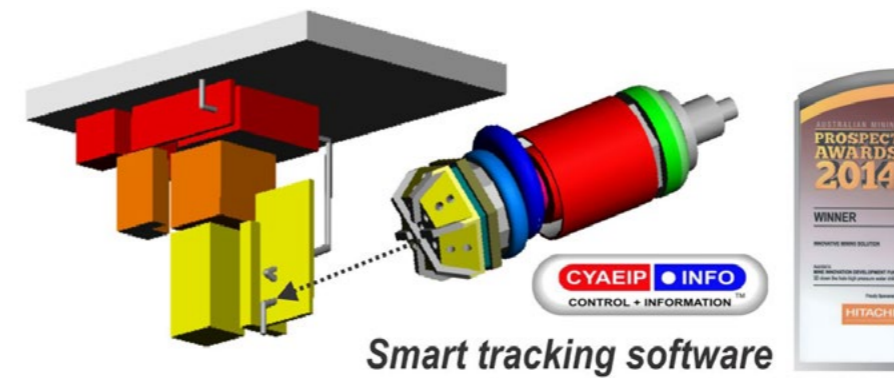
Traditional 'lots of holes' in a regular pattern can suggest continuous 'phantom' deposits that are not there and miss large narrow seams.

And what of the immediate future

In October 2014, the Australian Mining Prospect Awards for innovative mining solutions was won by the 3D down-the-hole high water pressure drilling system.

While designed to produce smart shaped holes for improved explosive effort, holes with cavities for safer rockbolting and even an environmentally better shale oil and gas alternative to fracking, the technology has been optimised for 3D forensic down-the-hole smart geology.

The 3D drilling hardware uses the delivered medium pressure water and separate grit supply to dramatically increase the pressure and composition of the cutting fluid delivery to the water hammer head package, so producing tetrahedral chip fragments in a slush, a good penetration rate and steerable direction control under the internal software



The award winning 3D down-the-hole high water pressure drilling system has been optimised to forensically assay deposits with built in optimised hyper spectral imaging and pseudolite guidance.

control in partnership with the surface overall monitoring management.

Before the drilling waste chip and slush are pumped up and away from the drilling head, an appropriate fraction is passed through an optimised hyper spectral image (HMI) analyser built into the drill housing for immediate assay determination of the cut away materials, together with the precise 3D underground positioning obtained from the

onboard pseudolite navigation system.

The instant position can also be physically scribed onto a sampling of the tetrahedral chips within the drill housing before being pumped to the surface through the tri-axial coax connection. This allows traditional assaying / observation to take place if wanted with known 3D referencing for cross comparison with the HMI data for extra results reliability.

In the world of Big Data, it is one thing to collect information, but another is the immediate and useful application of the assay results obtained. The inhouse CYAEIP software package in the drill has been focused to forensically chase and more clearly define underground discoveries, allowing twisting and turning, with vertical and horizontal drilling directions, automatically enhancing the skills of experienced drillers and doing the 'impossible'.

South Australia's door is open.



Unlocking SA's MINERAL WEALTH TECHNICAL FORUM



This year's technical forum at the South Australian Resources and Energy Investment Conference (SAREIC) highlighted the new deliverables derived from the PACE Frontiers initiative within the Geological Survey of South Australia (GSSA) and its collaborators. There were three types of presentations:

1. Staff from the GSSA reported on highlights from their recent project work and delivery of new results, interpretations, maps and reports. These were presented not only as oral presentations but also within posters.
2. Key collaborators with the GSSA research program, including staff from Geoscience Australia, CSIRO, universities, Deep Exploration Technologies Cooperative Research Centre (DET CRC) and service and research providers in private industry.
3. Drill core and sample display, highlighted the area of the southern margins of the Gawler Range Volcanics – northern Eyre Peninsula.

PACE FRONTIERS



Hear more of what South Australia has to offer @

Resources Investment Symposium

Broken Hill
24-27 May 2015

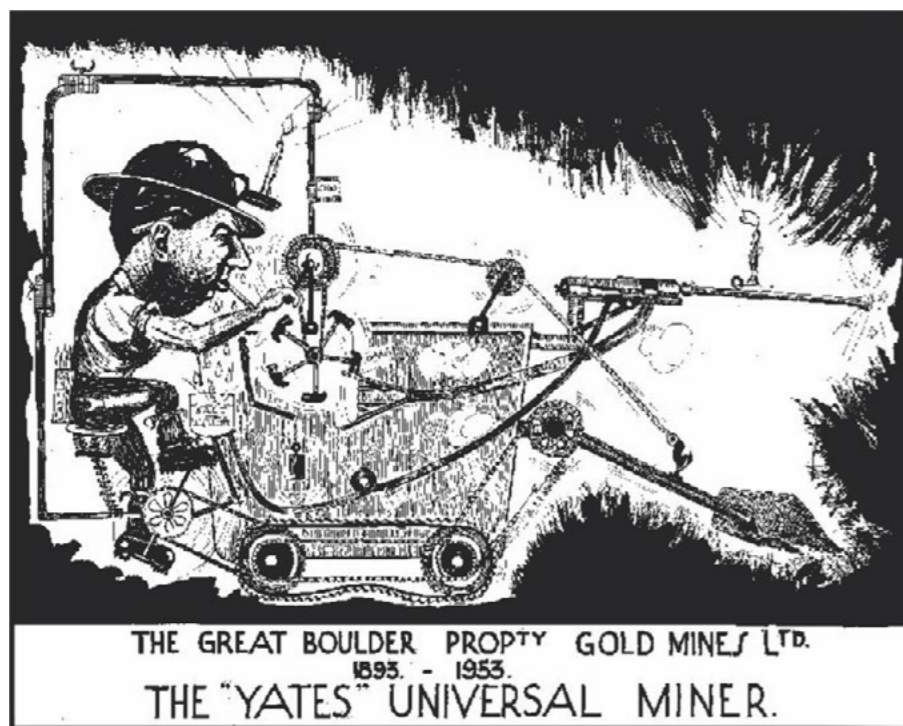
A one-day technical conference highlighting the latest data and research from the Geological Surveys of New South Wales and South Australia.

- Release of new Broken Hill metallogenic map
- New mineral system studies
- Uranium exploration opportunities
- SARIG updates
- Exploration highlights
- New geological maps
- Fieldtrip Thursday 28th May



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The above cartoon celebrated the first 60 years of the Superpit in Kalgoorlie. More than another 60 years on, there are many old workings with 'hidden' gold resources and could be very profitable to mine again, particularly when the 'infill assaying' can identify where the automated 'Universal Miner' hardware has a job to do.

At this time, testing continues to optimise the (a) directional drilling and (b) automated mining package, such as the connecting tri-axial tubing flexibility, so the systems can explore and exploit the secret and deeper potentially profitable ore reserves. 🗣️

(The big brother version of the software carries an Australian Defence Export Control Office restriction, number 122117 and cannot be exported without approval. Such is the power of the underlying management package).

Geological mapping procedures for Porphyry Cu-Au and Epithermal Exploration



Tape and compass mapping at Cargo pit.
Photo courtesy of Doug Menzies.

Short course held in Orange, 27th February-5th March, 2015 presented by Corbett, Menzies and Cunliffe (CMCGeos)

Mitch Dillon (Honours Student UNE)

I was fortunate enough to attend this course due to a bursary made available by the AIG (NSW branch), to whom I am most grateful for the opportunity to learn from a company that is highly regarded within the industry. The course was a wonderful opportunity for a student to experience working with globally experienced geologists, to gain new insights into porphyry exploration techniques.

The science surrounding porphyry genesis interpretation - and therefore exploration strategies, is continually

evolving, something that the presenters, Greg Corbett, Doug Menzies and Stuart Hayward, stress throughout the six-day course. As a consequence, while there are several extremely large, and also many smaller porphyry deposits globally, there is no single classic porphyry deposit style, or exploration paradigm with which to use as a guide to exploring for potential new deposits. In fact, complexity is the key to understanding porphyry mineralisation. Porphyry mineralisation is generally the

result of polyphasal retrograde and prograde alteration in hydrothermal regimes utilising both magmatic and meteoric waters in processes involving multiphase intrusions, typically involving uplift and erosion. In brief, building on the Terry Leach legacy, the CMC approach is to use rock textures, zones of alteration and stockwork (sheeted) vein style classification (A, M, B, C, D, breccia) as vectors for targeting mineral exploration.

Anything but a deposit tour, the course had a practical focus with a global perspective.



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Semper Sursum

“... by the end of the course I was reasonably confident I'd be able to play the 'pin the sample on the deposit' game.”

Lectures and talks continued in the evenings from guest speakers on deposits such as Oyu Tolgoi and Walfi-Golpu and locally, North Parkes. The evenings were also used to review the day's work and to prepare for the next day's activities. The days were spent onsite, either mapping in pits at Cargo and Copper Hill, or logging core at Copper Hill, Cadia or North Parkes.

Arriving on the first day and seeing 120 rock samples of many descriptions from various low-high sulphidation epithermal and porphyry deposits laid out on the tables at the back of the conference room was a little daunting, but by the end of the course I was reasonably confident I'd be able to play the 'pin the sample on the deposit' game. The idea is to locate the samples in time and space on the basis of texture, alteration and vein styles, on the Corbett diagram of staged porphyry Cu-Au evolution that is used as a basis from which to analyse a deposit. A lot of deposits were

also examined from a 3D perspective, which is an ideal format to display mineralisation occurring as 'shells' in a deposit space.

Orange was a convenient location for the course, as it affords access to several Macquarie Arc deposits - many of which CMC suggest, have a dilational genesis within a pull-apart basin resulting from oblique subduction in the Ordovician.

Day two saw us at the Cargo site with mapping-tape and compass, just to get the feel of using the abridged Anaconda technique, which dispenses with many formal geological mapping annotations, and uses thematic colours to indicate zones of alteration in terms of mineralogy, textures, vein style and direction. We did a similar exercise at Copper Hill the following day, also logging drill core in the afternoon.

Later during the week, we were fortunate to be allowed access to Cadia Valley and North



Parkes drill core, and while onsite at North Parkes, we were treated to a very professional overview by the Project Exploration Geologist - Jonathon Hoye.

From the perspective of a student about to graduate in a time when opportunities for postgraduates within the industry are scarce, the information gained from attending this course was insightful. Not just from the formal lectures and tasks, but also from gaining insights into the day-to-day complexities involved in carrying out exploration from workers employed in both small and large companies. It is courses such as this that go some way towards bridging the gap between traditional Geology/Geoscience degrees, and the industry environment. For various reasons, theory and practice sometimes fail to converge. For example, the mantra of 'digging early and digging deep' is fine if the budget allows for it. To a great extent, the market-or the purse strings define the exploration strategy. My sincere thanks once again, go to the AIG (NSW Branch) and to CMC Geos for the opportunity to participate in this invaluable course. Highly recommended. 📢

Participants in the CMCGeos Porphyry mapping course log core at CMOC North Parkes mine core shed. February-March, 2015.

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Current Major Collaborative Projects in 2014

In addition to our standard array of exploration services, Terra Search has a strong history of collaboration with Government agencies to provide pre-competitive exploration data sets.

PNG MINERAL RESOURCES AUTHORITY (MRA) PROJECT

As part of the World Bank sponsored 2nd Mining Sector Institutional Strengthening Technical Assistance Project (MSISTAP) in PNG, Terra Search has commenced a 12 month contract designed to add significant further historical Geological and Geochemical Data to the over 450,000 data points already captured by Terra Search during the 1st MSISTAP in 2002-2005.

With over 15 years of experience providing database services to government and industry, Terra Search is well placed to deliver the best possible outcome for the MRA.

All data compiled and validated during this project will be made available globally to exploration companies through the MRA.

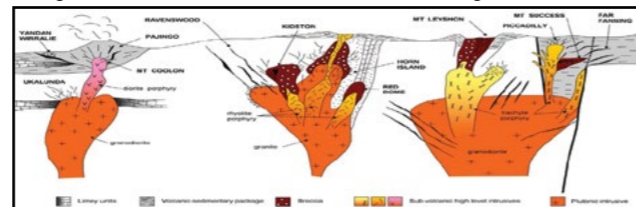


INTRUSION-RELATED MINERALIZATION SYSTEMS IN NE QLD

Terra Search and Klondike Exploration Services are undertaking a comprehensive study of the geology and metallogeny of gold-bearing magmatic hydrothermal systems incorporating:

- A new metallogenic database of the Charters Towers Region, GIS data package and map
- Metallogenic model documenting genetic types & spatial controls in Charters Towers region
- Revision and update of the geology of the Charters Towers District
- Templates of geophysical & geochemical signatures of deposit styles

This study is a part of a North QLD research initiative in collaboration with local Industry, EGRU (James Cook University) and the Geological Survey of QLD, funded through the Queensland Government Future Resources Program.



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INTRAW – International Raw Materials Observatory

A new international project on raw materials

www.intraw.eu

Kaylene Camuti

INTRAW is a three-year international research project on raw materials. The project is funded by the European Union (EU) and was launched in February this year. Australia is represented in the INTRAW project by the Australian Academy of Technological Sciences and Engineering (ATSE www.atse.org.au), which is a partner in the INTRAW consortium, and by the AIG, which is a third party partner in the project. In its role as a third party partner the AIG will assist in disseminating information so that AIG members and the wider geoscience and resources communities are aware of the project and its outcomes.

The INTRAW project aims to map best practices and develop new cooperation opportunities related to raw materials between the EU and technologically advanced countries. The project will address:

- Research and innovation;
- Raw materials policies and strategies;
- Joint educational and skills programmes;
- Licensing and permitting procedures, royalties and tax policies;
- Data reporting systems;
- Exploration, extraction, processing and recycling practices;
- Management and substitution of Critical Raw Materials.

The project is coordinated by the European Federation of Geologists (EFG) and brings together an international consortium of 15 partners with extensive experience in research, innovation, education, industry, trade and international networking across the entire raw materials value chain. The project partners will be actively supported by three Panels of Experts on "Research & Innovation", "Education & Outreach" and "Industry & Trade".


Through the EFG's third parties – who represent the members of professional geosciences organisations in 18 European countries, the USA, Australia, South Africa and Canada – a broad global network of geoscientists will further enhance the project.

In the first two years of the project activities will include mapping best practices and knowledge transfer. The outcomes of these activities will be used as a baseline to set up

and launch the European Union's International Observatory for Raw Materials as a knowledge management infrastructure. The Observatory will be a permanent international body that will remain operational after the end of the project, and will aim to establish and maintain strong long-term relationships with the world's key players in raw materials technology and scientific developments. 📡



Further information on the project is available from the INTRAW web site, and on the AIG web site at www.aig.org.au/intraw-a-new-international-project-on-raw-materials. The AIG will keep members informed as the project develops, via reports in AIG News and the AIG web site.



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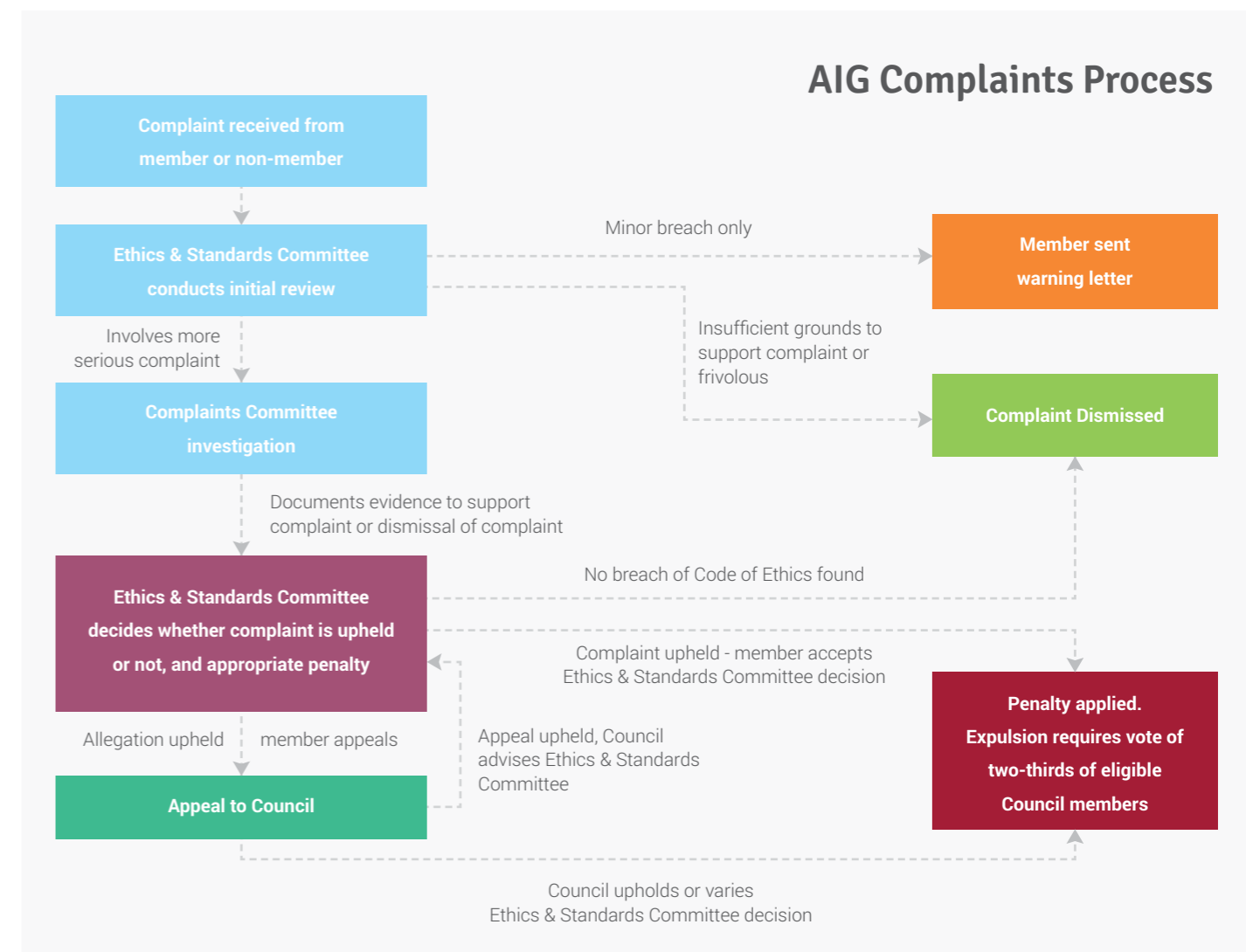
MINERAL EVALUATION & EXPLORATION

What sort of complaints does AIG deal with regarding members' conduct?

Andrew Waltho
 Chairman, AIG Complaints Committee

The types of complaints dealt with by AIG's Complaints, and Ethics & Standards Committees and the number of complaints dealt with are probably the two most frequent questions asked about the complaints and ethics and standards process.

It's worth pointing out that all complaints received by AIG are dealt with in accordance with the Institute's complaints process, the workflow for which is explained by the diagram below that is also published on the AIG web site.



“ There are typically between one and three complaints under investigation by the Complaints Committee at any point in time.”



Under this process, all complaints are investigated by the Complaints Committee which determines whether there are grounds for referring the complaint to the Ethics and Standards Committee for a ruling on the issue. The purpose of the two-committee process is to ensure procedural fairness for the subject of the complaint. The Complaints, and Ethics & Standards

Committees have completely separate membership. Members who do not agree with Ethics & Standards Committee findings have the option of appealing any decision to the Institute's Council, where any Councillors previously involved in the matter during the Complaints and Ethics & Standards processes do not participate in reaching any appeal decision.

Both the Complaints, and Ethics & Standards Committees attempt to deal with issues before them in a prompt manner, but the time required to complete processing of any complaint depends on the complexity and gravity of each case.

There are typically between one and three complaints under investigation by the Complaints Committee at any point in time. Many members I've told this are surprised by the number of complaints received by the committee and express surprise that there is not broader knowledge of this amongst members. This is actually a very positive sign that the committees are working effectively. To be fair to both complainants and those members against whom a complaint has been made, the processes need to be conducted in confidence. Where there is no case to answer, the subject of the complaint and the complainant are informed of the outcome. Where there is an adverse finding, however, the outcomes of the investigation and rulings are published. There hasn't been an adverse finding warranting publication for some time, hence the low profile of the Complaints, and Ethics & Standards Committees.

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What sort of issues are the subjects of complaints?

Complaints cover any aspect of professional practice. At their core, the subjects of complaints can be classified as:

- Professional Misconduct
- Incompetence; and,
- Negligence.

Professional misconduct is elegantly described by Andrews (2014) as "any conduct detrimental to the interests of the public", that "harms or tends to harm the standing of the profession generally" or "would reasonably be considered disgraceful, dishonourable or unprofessional". **AIG's Code of Ethics** (www.aig.org.au/about-aig/geoscience-news/code-of-ethics) provides more specific guidance that supports these very general principles.

In the past, AIG has dealt with complaints regarding alleged:

- unethical treatment of a member by another, which covers a range of issues including plagiarism and engaging in conduct that unfairly tarnishes a member's professional standing or reputation;
- unethical treatment of a member by an employer (who may or may not be a member of AIG);
- failure to comply with the JORC or VALMIN Codes (which is mandatory for all AIG members); and,
- poor professional practice, such as failing to complete work that a member has been contracted to undertake, or failure to deliver work of a standard commensurate with the member's experience or contract terms.



Who Can Make a Complaint?

Any individual or corporation can make a complaint regarding the actions of an AIG member. All written complaints, clearly outlining the basis for considering the conduct of a member to be unsatisfactory, initiate a complaints process.

Complaints associated with JORC compliance probably account for between one half and two thirds of the Complaints Committee's work and, in recent times, have been focussed on the ability of members to act as Competent Persons as defined by JORC; i.e. meeting the commodity experience requirements. The remaining third of complaints cover a diverse range of issues in which the treatment of members by employers feature. These are, possibly, the most complex issues dealt with by the Complaints, and Ethics & Standards Committees as there are frequently situations where laws and government regulations come into consideration. Legal advice may be needed, and is sought where required, to help resolve issues of this nature.



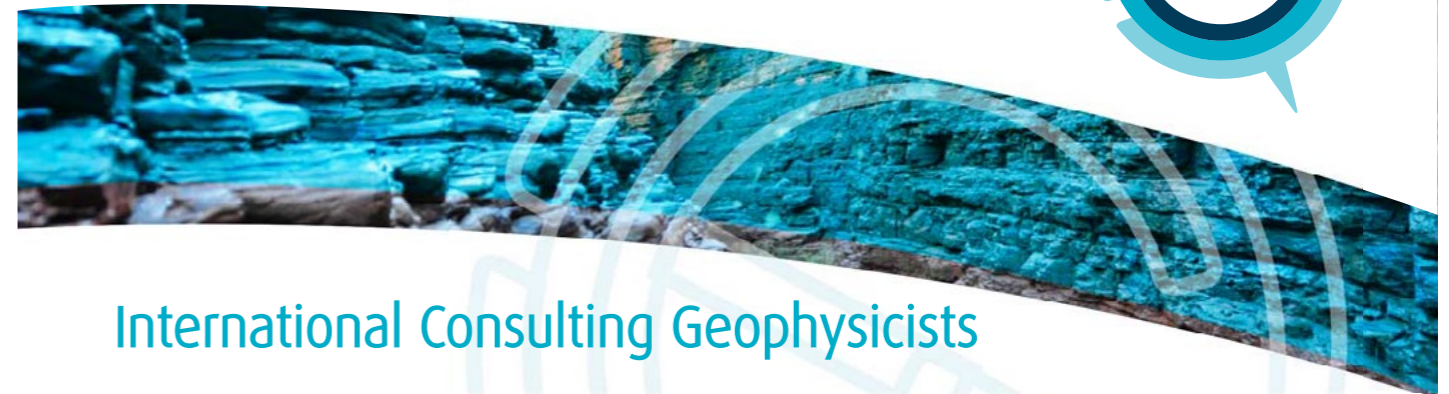
Does AIG monitor the conduct of members?

AIG expects members to comply with the Institute's Code of Ethics at all times. The Institute is not, generally, in a position to monitor the conduct of members and expects members to honour their obligation, set out in the Code of Ethics, to make the Institute aware of instances where the conduct of others may be in breach of the Code. The exception to this relates to JORC and VALMIN where there is a process of random review of announcements in which members are nominated as Competent Persons. This process at times reveals a

statement by a company that is considered not to comply with either code. The Complaints Committee, in these instances, may itself initiate a complaint against a member, or make a complaint on behalf of the Institute to another body. There have been several instances in the last year where AIG has referred the compliance of companies with the JORC Code to the Australian Securities Exchange (ASX) for investigation that have involved alleged inappropriate use of information provided by Competent Persons, or failure to nominate a Competent Person in

releases providing exploration results, mineral resource and ore reserve information. There have also been instances where AIG has referred an alleged issue with the conduct of a Competent Person to AusIMM, where the individual is not an AIG member but believes there are grounds for the conduct of the Competent Person to be investigated. AIG investigates all issues involving AIG members. There are situations, most frequently associated with JORC Code compliance, where AIG members who are also AusIMM members may be investigated independently by both Institutes (and vice-versa).

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Members' Obligations

Two obligations apply to all AIG members, irrespective of their grade of membership:

- 1 Members have an obligation to report conduct by another member that they believe may not comply with the Institute's Code of Ethics.
- 2 Members are required to fully cooperate with any Complaints or Ethics and Standards investigation in which they may become involved.

Non-compliance with the Code of Ethics has potential to undermine the standing and perception of our profession and this is at the core of our profession's ability to undertake meaningful self-regulation.



Need Advice?

Members are able to seek an opinion or advice on issues that they feel may represent non-compliance with AIG's Code of Ethics from the Complaints Committee, which is provided in confidence. 🗨️

REFERENCES

Andrews G.C., 2014. *Canadian Professional Engineering and Geoscience Practice and Ethics (Fifth Edition)*. Nelson Education Limited, Toronto (472 pp).

Yilgarn Retrospective

Wayne Spilsbury



Josh Pitt, discoverer of Golden Grove and Wayne Spilsbury.

Chris Manners, Wayne Spilsbury and Lachlan Coops.

The AIG along with Geoscientists Symposia (organisers) presented the Yilgarn Retrospective, on March 30-31 in Perth. The event celebrated the period 1950-1999 which saw WA transform from a small agrarian economy into a world leader in mineral exports, much of that mineral wealth sourced from the Yilgarn Craton.

The most common quip in the social sessions was "It's a bit of a WMC love-in". Fittingly, the first speaker was Roy Woodall, the legendary former exploration manager of Western Mining Corp., arguably the most successful explorer in the Yilgarn. While Roy stated that what really mattered was applied science and a Board who backed their scientists; I think Roy's relentless recruitment of the best geoscientists he could find was the real secret of WMC's success. Roy noted

he spent up to one third of his time visiting geoscience institutions, interviewing and hiring graduates in a time when WMC had no HR department. As testament to Roy's recruitment skills, at least half the speakers began their careers with WMC, contributing to the discovery of 3 major camps; Darling Range bauxite, Kambalda nickel, and Yeerlirrie uranium.

These commercial successes helped spawn research yielding new deposit models, a new appreciation of the regolith that blankets the Yilgarn and the tools to work beneath that regolith. Attendees were treated to 23

presentations by industry explorers, academia and government that documented this "golden" era. An extended abstracts volume is available through the member's portal on the AIG website. 🗨️

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AIG Member Offer: AMIRA's Data Metallogenica

Alan Goode
Director Data Metallogenica, AMIRA International

AMIRA International is building Data Metallogenica (www.dmgeode.com) as a web-based not-for-profit global encyclopaedia of ore deposits for the mining industry and associated institutions. While it is still growing at a rapid rate, DM already contains quality technical information on over 5,000 mineral deposits of all kinds from around the world. It has been supported by over 150 mining & exploration companies, many geological surveys and many professional societies/associations.

Some years ago, the Australian Institute of Geoscientists, through a one-off donation, became a Foundation Sponsor of DM to assist its continued growth.

As a member of AIG, you can therefore subscribe as an individual to DM for \$100 per year for unlimited access and downloads (this is a 50% discount compared to non-members). We hope you find DM of interest and can support us in our future growth. This can be done on-line on the website.

Some points of interest:

- You can do an Advanced Free Search from the Home Page which allows you see what is already in the database (without any commitment)
- Much of the information is unique or difficult (if not impossible) to find, making the website a major time saver for locating important technical information – all presentations are public (non-confidential) and vetted for quality before loading
- The website contains several different databases
 - Mineral Deposits – technical data on over 5,000 specific deposits around the world
 - Commodity Overviews – global overviews on specific commodities and deposit types by world experts, plus recommended individual deposits to further investigate
 - Regional Overviews – context overviews of major mineralised regions (not yet activated and in its early stages)
 - Technology Overviews – expert reviews of geoscience, exploration and other mining disciplines (not yet activated and in its early stages)
 - Geoscience Thesis Lists – lists of all Australian geoscience theses up to 2007 (soon to be updated, and with addition of all South African geoscience theses to 1999)



DM Deposits.

- The deposit database can be quickly searched by many different criteria eg name, country, commodity class, availability of high-quality sample photographs (70,000 representative samples of ore, alteration, host rocks) or spectral mineralogy, and many special categories such as geology, regolith, core photos, historical data etc
- Over 80 full geoscience theses for specific deposits are currently available on the website
- All deposits appear on a Google map which can be instantly zoomed to the maximum allowed
- Almost all information can be immediately translated to any of about 80 languages making DM extremely valuable for international reference, training and education (eg all European & Scandinavian languages, Arabic, Russian, most Asian languages including Mandarin, Japanese and Hindi, Swahili, Afrikaans etc etc)
- Previous sponsors of DM have given free access to many universities and geological surveys in developing countries, helping train the next generation of economic geologists
- It is hoped to add a wiki component soon so others can add their unique information and photos for specific deposits so that we preserve much fragile knowledge before it is too late.

If you like what we are doing or what you see, please tell others about DM. Remember the website is continually growing and improvements being added. 📢



For further information:

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PACRIM 2015 in Hong Kong

Wayne Spilsbury



Wayne Spilsbury, Steve Garwin (Consultant), unidentified geology student and Thomas Chan (geology student, Class of 2016, University of Hong Kong).

AIG co-branded AusIMM's PACRIM 2015 conference held in Hong Kong on 18 – 20 March and were granted a free Exhibitor's booth. As the name implies, the Conference focussed on the economic geology of the Pacific Rim. There were about 250 participants, including speakers, exhibitors and a contingent of eager students from the University of Hong Kong. Each day started with 2-3 keynote presentations from international experts (4 – USA, 2 – AUS, 2 - CAN and 1 - UK) and then separated into 2 streams of themed sessions.

In total there were 86 presentations and the organisers are commended for sourcing speakers from around the Pacific. The conference also hosted 4 workshops and organised 4 field trips to mining districts in China.

The AIG booth was well-frequented by members but more importantly potential new members. The booth also gave me a chance to try out my new "Selfie-stick" for these fine photos. 📷



Richard Schodde (Minex Consulting), Wayne Spilsbury and Anne Thompson (Petrascience Consultants).

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Events calendar

Keep up to date with upcoming AIG and Geological events at www.aig.org.au/events



June 2015

AIG, AusIMM, GSA: Aeromagnetism, Geology and Exploration: Sydney NSW

The Royal Exchange of Sydney, Sydney NSW
June 3, 2015 | 5:15pm - 7:30pm

AIG, AusIMM, GSA: Aeromagnetism, Geology and Exploration: Illawarra NSW

University of Wollongong, Wollongong NSW
June 4, 2015 | 6:00pm - 8:30pm

NEW ENGLAND OROGEN: Geology, Tectonics, Economics

The Theodore Club, Brisbane QLD
June 5, 2015 | 8:30am - 5:00pm

New England Field Conference

Brisbane Transit Centre, Brisbane QLD
June 6, 2015 - June 8, 2015

Water Management for Shale and Tight Gas Resources

Parmelia Hilton, Perth WA
June 8, 2015 - June 9, 2015

GPIC: Redefining G.O.D. | Bill McCallum

Basement on View, Bendigo VIC
June 9, 2015 | 6:30pm - 8:00pm

ioGAS Advanced Techniques

Reflex, Balcatta WA
June 10, 2015

2015 Queensland Exploration Council Breakfast

Brisbane Convention and Exhibition Centre, South Bank QLD
June 10, 2015 | From 7:15 am

Applied Geochemistry

Reflex, Balcatta WA
June 23, 2015 - June 24, 2015

Advanced Field Training

Mount Isa – Cloncurry, Mount Isa QLD
June 29, 2015 - July 6, 2015

July 2015

GPIC: Seismic Reflection – Deep and Meaningful Data for Mineral Exploration, Hydrogeology and Geotech

The Kelvin Club, Melbourne VIC
July 2015 (Date TBA)

Value Creation in Exploration

Burswood on Swan Convention Centre, Burswood WA
July 13, 2015

August 2015

Saying Goodbye to a 2D Earth

Quality Inn Margaret River, Margaret River WA
August 2, 2015 - August 7, 2015

Geoscience Australia Open Day

Geoscience Australia, Symonston ACT
August 23, 2015 | 10:00am - 3:00pm

September 2015

Joint SEG – Codes Conference: World Class

Ore Deposits: Discovery to Recovery
CODES (University of Tasmania), Sandy Bay TAS
September 27, 2015 - September 30, 2015

Mines & Wines 2015: Uncorking the Tasmanides

Queanbeyan Bicentennial Hall, Queanbeyan NSW
September 2, 2015 - September 4, 2015

October 2015

Bowen Basin Symposium 2015

Brisbane Convention and Exhibition Centre, South Bank QLD
October 7, 2015 - October 9, 2015

November 2015

Volcanic Processes, Products, Successions and Resources Short Course

Black Dolphin Resort, Motel and Apartments, Merimbula NSW
November 11, 2015 - November 21, 2015

Tectonics & Structural Geology Conference Caloundra Events Centre

Caloundra QLD
November 22, 2015 - November 27, 2015

2016

Business and Financial Management in the Minerals Industry

James Cook University, Townsville QLD
February 2, 2016 - February 12, 2016

Integrated Spatial Analysis and Remote Sensing of Mineral Exploration Targets

James Cook University, Townsville QLD
April 21, 2016 - May 5, 2016

35th International Geological Congress

Cape Town International Convention Centre, Cape Town, SOUTH AFRICA
August 27, 2016 - September 4, 2016

AIG Council for 2014–2015

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AIG NEWS



AUSTRALIAN
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AIG News is published quarterly as per the following table.

Avoid disappointment by contacting the Editor at least several days beforehand to advise submission of items for the newsletter.

Issue Date	Contribution deadline
February	January 31st
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Please submit all articles, letters and advertisements to the above email address.

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Text: Word Files (Please DO NOT EMBED pictures in Word, supply as separate files.) Pictures, Logos, Maps, Diagrams: Resolution 300dpi. Photoshop EPS, Tiff, Jpeg or press-optimized PDF files. Please provide images of all pictures separate to text. Please EMBED ALL FONTS in EPS and PDF files.

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Note: All advertisements; no bleed or trim marks.. Prices are inclusive of GST Per Issue.

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Third page	90 mm (h) x 188 mm (w) \$273
Quarter page	75 mm (h) x 188 mm (w) or 130 mm (h) x 90 mm (w) \$198
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