Living the dream

Inside this AIG News...

From Your President • Institute News • Membership Updates • Registered Professional Geoscientists Applications • Text Book Review: Exploring Earth & Environmental Science • Welcome Improvement in Australian Geoscientist Employment • Bentonite Tephrostratigraphy and Geochronology of Richly Fossiliferous Upper Cretaceous Continental Strata in the Western Interior Basin, North America • The geology and genesis of the Two-Thirty prospect Northparkes district, NSW • John Forrest Geotrail – Geotourist Route next to the Darling Fault, Swan View, WA • Reporting industrial mineral Exploration Results according to the JORC Code • Professional Issues Subcommittee Survey of Members • Gold17@Rotorua Conference • AIG Edumine Campus • AIG Council & AIG News • Events Calendar • And much more...
Welcome to the winter edition of AIG News. This is the traditional exploration field season in with cooler and drier climes in northern Australia and same could be said for southern Australia. The latest AIG Employment Survey suggests unemployment and underemployment continues to improve. I’ll talk about Andrew’s analysis shortly.

The AIG held its annual general meeting in Perth recently. As well as the usual governance requirements, the meeting ratified the appointment of two new Federal Councillors. Welcome aboard to Brendan Howard and James Llorca. It is pleasing to see we continue to have members keen to volunteer in the running of your organisation.

I would also like to thank the two members who have stepped down after many years of distinguished service. Anne Tomlinson served up until recently as the Chair of the Membership Committee. Anne has decided to focus on her new family and we wish her all the best. Martin Robinson has served for many years as Federal Councillor and served as President. Martin will continue to be active in the Victoria Branch. Many thanks to both of you for all your contributions over the years.

The results of the latest AIG Employment Survey continue to be encouraging and confirm the ongoing improvement in employment prospects of geoscientists in Australia. Andrew Waltho’s analysis makes interesting reading. The “real” unemployment rate (unemployed geoscientists unable to achieve more than 25% of their desired workload) was 21.7%, down from 24.5% in the final quarter of 2016. The improvement has now been evident in three of the past four surveys. This supports anecdotal evidence I have received from drilling companies and assay laboratories that business has certainly picked up this year. Andrew’s final comment that this improvement hopefully provides some encouragement for students who may be contemplating joining the geoscience industry over the next few years is particularly insightful.

This does not mean we can be complacent. The “real” unemployment rate of 21.7% still means one geoscientist in five is underemployed. This fact is behind the AIG raising the question as to why geologists remain on the list of professions for which temporary work visa applications should be considered. The AIG has written to the Minister for Immigration and Border Protection criticising the issuing of 457 visas to overseas geoscientists at a time of high unemployment in the profession in Australia. These representations have met with the response that all visas were issued only following labour marketing testing by employers. The AIG intends to pursue the Department on how it intends to apply labour market testing.

In mid-June the Federal Council met for its annual face-to-face Strategy Meeting in Hobart, hosted by the Tasmanian Branch. First and foremost the face-to-face meeting is exactly that – it’s the only opportunity for your 14 Federal Councillors from across Australia to meet in person. The future direction of your organisation was the main item on the agenda and I will report on outcomes in the next AIG News.

We organised the Association of Company Directors (AICD) to spend a morning updating us on compliance and governance issues and directors’ roles and responsibilities in running a not-for-profit organisation like the AIG.

The Tasmanian Branch was re-established in 2015, so I encourage local members in that state and geoscientists interested in becoming involved to register for Tas E-News (on homepage of AIG website) and get along to their social events. Whilst on the topic of re-establishing state branches, we have been encouraged by the interest in re-establishing the South Australian Branch. Anyone interested in getting involved is encouraged to contact me in the first instance.

For those who have not, I would encourage you to subscribe to AIG’s weekly E-magazine, AIGeoscope (aigeoscope.aig.org.au), which contains many of the geoscience-related articles from the AIG website and social media updated weekly. You may be interested in a recent article on The World Stress Map – 2016 release. The World Stress Map started in 1986 to map out the state of tectonic stress in the Earth’s lithosphere. One of the things about the project is that it is completely free and public. All data, as well as maps, software and interpretation guidelines are freely and publically available. A must for those interested in global tectonics.

Whilst on the theme of free and public software, AIG has set up its OGIS interest group. OGIS is a free and publicly available GIS software package. AIG has many users and several members provide training. I encourage you to visit the site at www.qgis.aig.org.au. The site is currently live online but still needing content. Anyone interested in submitting please contact myself or Fiona Makin at fiona@makinitezy.com.au.

And finally, next year is the 50th anniversary of the discovery of the Ok Tedi mine in PNG. Many Australian geologists have been involved and continue to be involved in the mine. I am involved in plans to celebrate the event and in the first instance I am interested in making contact with as many geologists as possible who have had a link with the mine. Contact me at president@aig.org.au.

From Your President

Mike Erceg

President
Sophisticated Excel skills: You must be a confident Excel user, able to use the software to its full potential when completing the training course. You must know your way” round formulas, be able to create functions, make your own macros and be confident with a range of other skills.

Mineralogy Fundamentals

This course is designed for people working in the mining and exploration industries who need to understand the key characteristics of rocks, minerals and their uses. The course covers the classification of rocks, the world of minerals, industrial minerals, and their uses in industry. It also introduces the use of mineralogical data and mineral processing.

Resource Estimation and Evaluation

This course is designed for geologists and explorationists who need to work with resource estimates in a professional manner. It covers the principles of resource estimation, the use of data and the identification of errors, as well as the evaluation and reporting of resource estimates.

Surpac Geology Fundamentals

This course is designed for people who need to learn how to use Surpac, a leading software for geology and mining. The course covers the basics of Surpac, including data import and export, data preparation, and the use of Surpac for geological and mining purposes.

Resource Estimation and Evaluation with Surpac

This course is designed for people who need to use Surpac for resource estimation and evaluation. It covers the use of Surpac for estimating mineral resources, including the use of databases, the estimation of grades and volumes, and the validation of estimates.

Corporate Compliance in Resource and Reserve Reporting

This course is designed for people who need to understand the standards and guidelines for resource and reserve reporting. It covers the ASX Listing Rules, JORC Code and NI-43-101, and how to ensure compliance with these standards.

Lithogeochemistry of Pegmatites in the Broken Hill District, New South Wales: Vectors to Mineralisation?

At Broken Hill pegmatites are generally considered to be a poor in the area. They have insidiously eaten away at the stratigraphy, disrupting and consuming the nicely ordered layer-cake sequences. They surreptitiously conform with local layering and then they enjoy the benefits of folding and deformation that the Olarian Orogeny really reserved for ordinary rocks. Their greatest sin however lies in the fact that they are scurrilous ore dilutors. The folks at Silver City Minerals however took a less condescending view than some on these problematic and much maligned rocks. This presentation outlines a bit of good old fashioned science, observation and innovation for explorers.
At the time of writing there are only 8 months until the conference and still a lot to do. Abstracts are being lodged, workshops are being finalised and sponsors are being sort. Early bird registration is now open. It will close on 31 October 2017, so get in quickly! The exhibition hall is filling up fast so if your company would like a booth, please get in contact with us ASAP. The prospectus is available for download on the conference website: (http://www.aegc2018.com.au/). The Conference Organising Committee has endeavoured to contact as many companies as possible - if your company hasn't been contacted please let us know ASAP! There are still sponsorship opportunities available if your company is looking for exciting promotion opportunities. Again, please do not hesitate to contact us if you are interested and would like further information.

We will have reviewed all initial abstracts by mid-June and the programme subcommittee will be in the middle of deciding on the draft programme. Extended abstracts will need to be submitted by the end of August.

The programme subcommittee have invited several more keynote speakers. All keynote speakers are listed below and the conference website contains photos and a short biography.

Confirmed Keynote Speakers are:
- Katarina David, University of New South Wales
- Natasha Hendrick, Santos
- Kevin Hill, Citigearch
- Jen Macnair, RMIT
- Graham Heinson, University of Adelaide
- Richard Flook, Private Consultant in Industrial Minerals
- Ryan Noble, CSIRO
- John McGaughey, MIRA Geoscience
- Kevin Ruming, Geological Survey of NSW
- Ross Large, University of Tasmania
- Steve Macintosh, RioTinto

Please stay tuned to the website for any updates to this programme. We are also constructing an exciting schools programme. Local high schools will be invited to participate in an information day to learn about the geophysical industries, and be given the opportunity to visit the trade exhibition. We are also finalising a couple of excursions to visit some key geological sites in the region.

Any geoscientist working in mineral exploration in Australia over the past few years will tell you that the sector has been doing it tough. Junior explorers have experienced difficulties raising capital. There appears to have been not a lot of mid-tier to major company interest in exploration in recent years, with a few notable exceptions. The industry as a whole has faced a growing burden associated with gaining access to land in the form of long lead times between applying for exploration licences and having them granted, and a mountain of red tape associated with permitting for even very low-impact exploration activities.

Australian Bureau of Statistics (ABS) mineral exploration expenditure statistics, released quarterly, and Australian geoscientist employment survey results, compiled by AIG since 2009, have recorded evidence of declining investment in mineral exploration in Australia, with consequences for discovery, development and retention of geoscientists with essential specialised skills, and the economic benefits experienced by the broader community especially in rural and remote areas.

The finger of blame is frequently pointed at the Federal Government as the ultimate steward of Australia’s economy. Land and natural resource management, however, are state responsibilities. Evidence suggests that different states are discharging these responsibilities with varying effect and success.

The declining state of exploration in Australia

Read the full article at https://www.aig.org.au/blog/2017/04/12/the-declining-state-of-exploration-in-australia/
THE DEVELOPMENT OF BIG ISSUES AND IDEAS FOR AGCC 2018

An outline of the technical program for our inaugural Australian Geoscience Council Convention (AGCC 2018) was provided in the last issue of TAG (March 2017), when geoscientists were invited to engage directly with planning the program. The technical program will provide the opportunity for all geoscientists to communicate their work to a wide audience, and to hear about relevant developments presented by other geoscientists in multiple fields. Essentially, this broad program will provide the ‘bedrock’ of AGCC 2018 in a format familiar to regular attendees of the AESG, IGC and other large events. As is always the case, these sessions will be predominantly self-organising mini-symposia, strongly influenced by the actual papers that you submit as speakers, with guidance from our member organisations (eg, the International Association of Hydrogeologists) and overall direction by the Scientific and Technical Committee.

A proposed new approach

AGCC 2018 will provide opportunities to examine and consider some of the emerging issues that affect us all in geoscience. We anticipate these will be topics that attract attention from industry, government and academia, while also creating opportunities for non-geoscientists to engage and participate in our deliberations in Adelaide.

This interaction will be a significant differentiator of this convention and will help us achieve our vision to ‘raise the profile of geoscience to be pre-eminent in Australia’. We also hope to expose delegates to ideas they would not normally engage with in routine technical talks, and to attract those people who don’t normally attend our various member organisation conferences.

To do this, we plan to have several focused discussions that raise the Big Issues, explore the Big Ideas (hopefully some including new approaches and directions for some of the Big Issues!) and reach consensus about providing commitment and support for ways to take geoscience forward. We are aware of the value of strategic planning and believe that exciting times are ahead for geoscience. Some of these have become apparent to many of us during the current formulation of a new Decadal Plan for Earth Science, sponsored by the Australian Academy of Science.

An example of one topic we favour will be built around the early commitment to attend by Iain Stewart, Director of the Sustainable Earth Institute in Plymouth, UK. Iain is a riveting speaker who is passionate about geoscience communication and education. We will hold a plenary session on this topic with additional key thinkers, an interactive question and answer session, the opportunity during the day to formulate an agreed convention position and a summing up statement (press release) that will be issued. We look forward to your thoughts on the merits of this approach and your likely level of commitment and engagement.

What are the big issues and ideas in geoscience?

We are seeking ideas about the Big Issues (and Big Ideas) that you want to explore, and about possible champions of these that will attract widespread community interest, support from major sponsors and the attention of policy makers.

At this stage, we have a think-tank subcommittee that has formulated the following possible topics from a much larger field of possible candidates:

1. The future of the nuclear cycle in Australia
2. Unconventional gas and energy security
3. Resource-driven development of regional and northern Australia
4. Reducing the impact of the boom-and-bust commodity cycle on Australian geoscience
5. Geoscience education and communication

Other possibilities could be the ever-increasing role of automation (robotics), improved drilling technologies, innovative geological models and the search for novel or unusual commodities, although these might be addressed comprehensively in the broad technical program. We are seeking your input on:

- possible world-class thinkers to help us develop these or other topics
- your own possible contributions eg, five-minute spoken position statements framing the issues and ideas
- your interest in participation
- your thoughts on our proposed approach (eg, whether these should be spread across the four days of the convention or all addressed on a single day)
- whether these are the topics most important to you as geoscientists.

In conclusion

To reiterate, the broad technical basis of AGCC 2018 will allow us to present papers on our specific technical interests (subject to acceptance by the Scientific and Technical Committee), which are of course very wide ranging and inclusive. There will no doubt also be embedded mini-symposia sessions covering the collective interests of many diverse groups and of our member organisations (eg, UNCOVER, JORC, Valmin).

We are now seeking your thoughts on the BIG ISSUES and BIG IDEAS component of AGCC 2018. To let us know your views, please get in touch with any member of the Organising Committee at our website: https://www.agcc.org.au/committee.
Retracing the Systematic Steps in a Voyage of Scientific Discovery

John Elliston has been involved in mineral exploration and research for over 50 years. After early experience as a chemist and consulting geologist he joined a successful mining company in 1956. Studies with the support of leading academic consultants and a talented exploration team led to developing an understanding of the nature and origin of the source rocks and mineral deposits.

The most interesting conclusion from the research is that liquefaction of wet sediments allows the high-energy colloidal particles to reduce surface energy by re-arranging themselves. The essential mechanism is the collapse of flocculated and randomly precipitated natural particles to form separate denser aggregates (‘clots’ or accretions) in the shear regime. This gives rise to the observed metamorphic, porphyroidal and granitoid textures.

John Elliston’s work presents an alternative, some would say controversial, interpretation of the science and knowledge of how mineral deposits are formed and how to more effectively find new ones.

Statement by QEC Chairman on EDI funding

The Queensland Exploration Council (QEC) is disappointed that there is no future funding allocated in the Commonwealth Budget for the Exploration Development Incentive (EDI).

The EDI has operated since 2014-15 and encouraged shareholder investment in small exploration companies undertaking greenfield mineral exploration. A government review into the effectiveness of the EDI has been conducted over the past year but the final report has not yet been delivered. The government appears to have withdrawn funding before adequately considering the findings of the review.

A number of QEC member organisations have utilised the EDI since the scheme was introduced in 2014-15. The incentive was modelled around elements of a similar scheme that operates in Canada. Such a scheme requires a longer term commitment from government to maximise the value to the exploration industry. The flow-through share scheme in Canada has been operating for about 40 years and the Canadian Government has recently extended the scheme. In addition, many Canadian provinces provide additional incentives for individuals to invest in exploration projects.

Exploration is the lifeblood of the minerals industry, and funding has been scarce during the recent mining industry downturn. Removing future funding for the EDI will lessen Australia’s attractiveness from an exploration investment standpoint, particularly compared to the likes of Canada.

Text Book review

Exploring Earth & Environmental Science


Edited by Dianne E. Tompkins and Joanne M. Watkins

Review by Wayne Spilsbury

I don’t normally equate reading textbooks with pleasure but I spent the Easter long weekend thoroughly entertained (and educated) by the contents of the revised Exploring Earth and Environmental Science for Year 11 and 12 Australian Curriculum.

The two volumes are not ‘Rocks for Jocks’ textbooks for those students looking for science credits less challenging than biology, chemistry and physics. In fact a good understanding of basic science is required from the first chapter, “The Beginning” which takes the reader through the Big Bang Theory up to the formation of our Solar System as explained by the principles of light and nuclear fusion. From there it’s on to Age-dating, Palaeontology and Stratigraphy in chapter two culminating in the Principles of superposition and Cross-cutting relationships. The next chapter on the Rock Cycle leads into chapters on Minerals and Sedimentary and Igneous rocks and then logically to Weathering and Soils. Next the disciplines of Meteorology and Ecology are covered and Volume one concludes with Plate Tectonics beautifully illustrated by graphic designer, Angelo Antesi from CSIRO.

The Year 12 volume tends to more applied science beginning with Non-Renewable Resources. For mineral resources topics covered include deposit genesis and types, exploration techniques and mining and beneficiation. Oil and gas formation and extraction round out the chapter. I was a bit disappointed that two of the case studies described argonitic gold mines, omitting the chance to highlight iron mining in the Pilbara which is the state’s largest employer. Renewable Resources get their turn in the next chapter with local examples including the Perth Wave Energy Project and the solar-assisted Degussa copper mine.

For some reason Metamorphic rocks ended up in the Year 12 volume, possibly the PT graphs and metamorphic isograds are more difficult concepts. Structural geology follows with simple mapping and cross section exercises. Plate Tectonic theory is revisited but expanded through a study of the associated hazards which brings in volcanology and wave mechanics applied to earthquakes and tsunamis.

Hydrogeology is next, neatly illustrated by the challenge of supplying water to Perth through its aquifers, desalination plants and sewage water re-cycling. Volume two concludes with an examination of climate change through geologic time into the modern era. While the authors are unequivocal on their support for anthropogenic global warming, they take the high road in just presenting the data and don’t get mired in a discussion of how Australia can mitigate global warming.

Beyond an excellent reference text for students, I can recommend Exploring Earth and Environmental Science for anyone, young and old seeking a thorough overview of these subjects. While the texts are certainly WA-centric I’m sure they will be of great use to Earth Science teachers in other states.

Exploring Earth and Environmental Science is the product of the determination of the founders and the current CEO of Earth Science WA, along with volunteer authors to raise the level of awareness and teaching of Earth Science in WA schools. Why it fell to a not-for-profit organisation financially supported by industry to create these texts rather than the Ministry of Education is beyond me but here it is.
MINERAL EXPLORATION 2017: FUNDING • POLICY • PRACTICE • TECHNOLOGY

5th and 6th August 2017
Kalgoorlie, Western Australia

SYMPOSIUM OVERVIEW
Saturday 5th and Sunday 6th August

Welcome to Mineral Exploration 2017 that will take place in Kalgoorlie, Western Australia, from 5th and 6th August 2017. Mineral Exploration 2017 will focus on funding exploration, government policy, exploration practice and developments in exploration technologies, opportunities and methods. There will be a technical programme with a series of invited keynote speakers, an advertorial session and social functions that will provide a comprehensive programme and significant networking opportunities.

The Symposium is organised with support from professionals in the minerals industry and research and government organisations. The symposium committee are working with relevant Australian societies and organisations.

Contact us if interested in sponsorship or exhibiting:
training@geosymposia.com.au

FURTHER INFORMATION AND REGISTRATION:

**COMMITTEE**
- Julian Vearncombe (SJS Resource Management)
- Joe Dwyer (HiSeis)
- Matthew Greentree (SRK Perth)
- Lora Madriaga (geosymposia.com.au)

To be held the weekend before ‘DIGGERS & DEALERS’
The meeting continues the semi-regular series of events organised by the Australian Institute of Geoscientists and Geosymposia. This event is time-tabled in the weekend before the prestigious Diggers and Dealers event in Kalgoorlie. This is the second time we have an event held immediately prior to Diggers and Dealers. This year’s event is planned to be larger and over two days.

**DELEGATE FEES**
(including Field Trip and GST)
- MEMBERS: AIG, AusIMM and sponsor organisation members – $350
- NON-MEMBERS – $510
- DISCOUNT MEMBERS: AIG, AusIMM and sponsor organisations (student, unemployed or retired) – $275

**SHORT FIELD EXCURSION**
Sunday 6th August – Morning Only
Short field excursion with drill core led by David Nixon and Gerard Tripp to overview the geological stratigraphy and structure at Kalgoorlie. Pleas wear field boots.

We anticipate this being mostly self-drive – please let us know if you have spaces in your vehicle or need a lift.

The Dos and Don’ts in Raising Equity Finance for Exploration and Mining Companies
Warwick Grigor
Chairman, Far East Capital Limited

Raising equity funding for exploration and mining companies is a condition precedent to a company starting business, and it is equally essential in keeping these companies alive. Nothing happens without funding. Given probably 95% of all companies on the mining bourse never make it to production and positive cash flow from operations on a sustainable basis, it could be said that skill in raising high risk equity funding is the most important talent for the modern CEO. Yet, very few CEOs excel at this task. Why is that, and what can be done about it? What are the ten commandments in raising equity that CEOs and CFOs need to know?

Engineers, and less so geologists, are used to working in environments of science and certainty in which the rules are known and understood. Dealing with equity capital market is the complete opposite. You need to master the chaos of markets driven by the psychology of fear, greed and incompetence all rolled into one. You need to consider constantly changing regulations from ASIC and the ASX rules. You need to deal with market participants and seasonal factors.

You need to consider not just what your company is doing but you have to place its actions and appetite for capital in the perspective of broader markets and raise money when the funds are available even if your budget or your representations to shareholders suggest otherwise.

In this paper you will be presented with guidelines of what to consider and how to act. You will be advised as to who can best help you raise capital if you seek external help. Different capital raising methods will be assessed. General principles and their exceptions will be listed. Examples will be offered for your observation. By following the guidelines you should then be better equipped to handle the challenges in the battlefield we call equity markets.

Warwick Grigor will be a keynote speaker at the upcoming MINERAL EXPLORATION 2017, in Kalgoorlie WA, August 5th & 6th August, 2017.

Institute News

The Dos and Don’ts in Raising Equity Finance for Exploration and Mining Companies

**Warwick Grigor**
Chairman, Far East Capital Limited

Raising equity funding for exploration and mining companies is a condition precedent to a company starting business, and it is equally essential in keeping these companies alive. Nothing happens without funding. Given probably 95% of all companies on the mining bourse never make it to production and positive cash flow from operations on a sustainable basis, it could be said that skill in raising high risk equity funding is the most important talent for the modern CEO. Yet, very few CEOs excel at this task. Why is that, and what can be done about it? What are the ten commandments in raising equity that CEOs and CFOs need to know?

Engineers, and less so geologists, are used to working in environments of science and certainty in which the rules are known and understood. Dealing with equity capital market is the complete opposite. You need to master the chaos of markets driven by the psychology of fear, greed and incompetence all rolled into one. You need to consider constantly changing regulations from ASIC and the ASX rules. You need to deal with market participants and seasonal factors.

You need to consider not just what your company is doing but you have to place its actions and appetite for capital in the perspective of broader markets and raise money when the funds are available even if your budget or your representations to shareholders suggest otherwise.

In this paper you will be presented with guidelines of what to consider and how to act. You will be advised as to who can best help you raise capital if you seek external help. Different capital raising methods will be assessed. General principles and their exceptions will be listed. Examples will be offered for your observation. By following the guidelines you should then be better equipped to handle the challenges in the battlefield we call equity markets.

Warwick Grigor will be a keynote speaker at the upcoming MINERAL EXPLORATION 2017, in Kalgoorlie WA, August 5th & 6th August, 2017.

Institute News

The Dos and Don’ts in Raising Equity Finance for Exploration and Mining Companies

**Warwick Grigor**
Chairman, Far East Capital Limited

Raising equity funding for exploration and mining companies is a condition precedent to a company starting business, and it is equally essential in keeping these companies alive. Nothing happens without funding. Given probably 95% of all companies on the mining bourse never make it to production and positive cash flow from operations on a sustainable basis, it could be said that skill in raising high risk equity funding is the most important talent for the modern CEO. Yet, very few CEOs excel at this task. Why is that, and what can be done about it? What are the ten commandments in raising equity that CEOs and CFOs need to know?

Engineers, and less so geologists, are used to working in environments of science and certainty in which the rules are known and understood. Dealing with equity capital market is the complete opposite. You need to master the chaos of markets driven by the psychology of fear, greed and incompetence all rolled into one. You need to consider constantly changing regulations from ASIC and the ASX rules. You need to deal with market participants and seasonal factors.

You need to consider not just what your company is doing but you have to place its actions and appetite for capital in the perspective of broader markets and raise money when the funds are available even if your budget or your representations to shareholders suggest otherwise.

In this paper you will be presented with guidelines of what to consider and how to act. You will be advised as to who can best help you raise capital if you seek external help. Different capital raising methods will be assessed. General principles and their exceptions will be listed. Examples will be offered for your observation. By following the guidelines you should then be better equipped to handle the challenges in the battlefield we call equity markets.

Warwick Grigor will be a keynote speaker at the upcoming MINERAL EXPLORATION 2017, in Kalgoorlie WA, August 5th & 6th August, 2017.
Changes to 457 Visas Announced

On the 18th of April 2017, the Australian government announced an overhaul of the 457 temporary work visa scheme. The announcement of the proposed changes lacked detail but in essence:

- The new working visa scheme announced will have two- and four-year categories, and workers will be required to have two years’ relevant experience in the field that they are applying for a visa in, and criminal record checks will also be required.
- Employers will need to do labour market testing in Australia before applying to sponsor overseas workers.
- The four-year category will require applicants to demonstrate English language proficiency.
- More than 216 occupations have been removed from the list of eligible occupations for temporary work visas.

The list of occupations for which foreign worker visas may be applied for still includes geologists, but now excludes hydrogeologists and geophysicists. Drillers have also been removed from the list of eligible professions.

There were 95,788 foreign workers on 457 visas as of September 2016, according to the Department of Immigration. The majority of visa holders were from India (26.6 per cent), followed by the United Kingdom (16.9 per cent) and China (6.1 per cent).

Some 190 457 visas were issued for geologists, geophysicists and hydrogeologists since 2014 based on an analysis of available data by SBS. A further 117 visas were issued for other natural and physical scientists and professionals and 79 for environmental scientists.

The number of 457 visas issued for geoscientists is estimated to represent about 6% of the number of unemployed geoscientists in Australia today based on there being 8,000 geoscientists in Australia according to the 2011 Census, but not all of whom would be working or seeking work in geosciences, making the 6% estimate likely to be much higher. The prospect that there are more than 1,100 unemployed geoscientists in Australia questions the need for geologists to remain on the list of occupations for which temporary work visa applications should be considered. A continued requirement for labour market testing could reasonably be expected to prevent issuing visas to workers to fill roles for which suitable, Australian candidates exist. The application of labour market testing has, however, been a target for criticism in the past. In the past few years there has been a marked shift towards employment opportunities being filled through companies identifying candidates through profile searches on LinkedIn and other on-line employment services, or companies’ own databases containing approaches from potential candidates.

2017 Bursary Awards & Victorian Student Travel Grants applications now open

In 2017 the AIG is again offering bursaries to Honours, Postgraduate and Third Year geoscience students.

The 2017 Bursary awards, which have values between AS$1000 and AS$4000, are funded by the AIG, by the generous sponsorship of individuals and organisations, and by donations from AIG members to the AIG Geoscience Education Foundation. Further information on bursary applications is available at www.aig.org.au/bursary-applications.

The AIG Victorian Student Branch is also offering Student Travel Grants in 2017. More information is available at www.aig.org.au/2017-vic-travel-grant-app.

The 2017 Travel Grants have a value of AS$1000 and are funded by the volunteer efforts of the Victorian Student Branch Committee.

NSW Branch Report

Verity Borthwick
NSW Committee member

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

The NSW branch also has a number of other workshops in the pipeline, including career support for geoscientists, a valuation seminar, JORC update seminar, geological mapping and field skills workshop, as well as another core logging workshop, this time to be extended to 3 days after the success of the first.

We also take a leading role in organising the Mines and Wines Conference every two years. Registration is now open for the next Conference, to be held from the 6-8th September, 2017, in Orange, with the technical program full of presentations on exploration in the Tasmanides. You can visit the website to register: www.minesandwines.com.au.

The AIG is also involved in organising the 26th AEGIC (Australian Exploration Geoscience Conference) conference, with planning and sponsorship going well. The conference is planned for the 18 – 21st February 2018. A call for papers for the conference has gone out if you would like to submit a paper please register.

AIG NSW has a close association with SMEDG (Sydney Mineral Exploration Discussion Group). SMEDG meetings are held on the last Thursday of the month. With the closing down of the Sydney Rugby Club building, the monthly meetings of the Sydney Minerals Exploration Group (SMEDG) will now be held at the venue known as Club99 on York Street in the city. This venue is very close to Town Hall Station, and can also provide low cost parking. Gatherings are very informal with a free bar at the beginning, an interesting speaker and often dinner afterwards. For more details go to the SMEDG web 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).

For those living and working in the Central West of NSW CVEDG (Central West Exploration Discussion Group) has restarted regular informal meetings, with speakers from a variety of companies who operate within the Central West. If anyone is interested in helping organise these catch ups, please contact the NSW AIG.

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. If anyone is interested in joining the committee, or helping in any capacity they should contact any NSW branch committee member or email nsw@aig.org.au.

In particular we are looking for young professionals and graduates who might be interested in coming on board.

Optiro
Fresh thinking, fresh growth

Specialist resources advisory and consulting services group

Our expertise and fresh thinking enables strong sustainable relationships with our clients

TALK TO CONFIDENCE TO OPTIRO TODAY WE LOOK FORWARD TO TALKING WITH YOU

Ian Gucken – Director of Geology
julian@optiro.com
Level 1, 16 Olid St, West Perth 6005
T: +61 8 9215 0000
www.optiro.com

Institute News
Education Report

Kaylene Camuti
Chair, AIG Education Committee

It's that time of year again, when we invite geoscience students around Australia to apply for an AIG Geoscience Student Bursary. Over the last few years, as we've launched the program each autumn, the employment outlook for geoscience graduates (and for experienced geoscientists) has been consistently grim. Despite this, each year we have received an enthusiastic response to the bursary program, with numerous high quality applications. This year we're hoping for a similar response, but against a background of a slightly more optimistic job outlook (see employment article on page 21 of this issue).

During the down times in employment, as we've been experiencing for several years now, contributions to the bursary program from sponsors and donors have been critical. These contributions have provided valuable funds to the bursary program, and also demonstrated a commitment to supporting geoscience education and students.

This year the Bursary Program has again benefited from the support of long-term sponsors. The list of current bursary sponsors is included opposite of this issue.

Many thanks to the Bursary Program Sponsors who have renewed their support in 2017:

Sydney Mineral Exploration Discussion Group (SMEDG)
DIAMOND SPONSOR
SMEDG is continuing its very generous support of the Bursary Program and of 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 increasingly popular Mines and Wines Conference which will be run again this year in Orange in September (see the web site for this year’s exciting conference program www.minesandwines.com.au).

Alexander Research Pty Ltd (Jonathan Bell)
PLATINUM SPONSOR
Alexander Research is again offering a bursary to students working on cross-disciplinary projects related to mineral economics and finance. 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. The Managing Director, Jonathan Bell, is a geologist who specialises in mineral asset valuations; Jonathan also serves on the VALMIN Committee, the AIG WA Branch Committee, and is an AIG Federal Councillor.

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 over 30 years ago to provide geoscientific and geotechnical contractors and consultants to the minerals and energy industries.

Doug Young
BRONZE SPONSOR
Doug Young was the inaugural Bursary Sponsor of the AIG Bursary Program in 2015 and, since then, has continued to support the program. Doug is a member of the AIG Queensland state branch committee, a former AIG Federal Councillor, serves on the AIG Education Committee, actively liaises with the AIG National Graduate Committee, and has led the way with the AIG Mentoring Program in Queensland and remote areas.

We are grateful, also, for the contributions from long-term Diamond bursary sponsors:

Chris Bonwick
DIAMOND SPONSOR

Geoff Davis
DIAMOND SPONSOR

The Macquarie Arc Conference
GSNSW - DIAMOND SPONSOR

Thank you, also, to the AIG state branches who frequently make substantial contributions to the AIG Bursary Program. The state branches are run by committees of volunteers who raise funds by organising symposia and other technical events for the benefit of local members. The value of the Bursary Program is markedly enhanced by state branch financial support and by on-the-ground activities of the state branches in organising bursary presentations and student events.

The bursary application form for this year’s program has been distributed to students and universities and is also available from the AIG web site (www.aig.org.au/bursary-applications). We invite applications from third year, honours and postgraduate geoscience students at Australian universities.

AIG Bursary Sponsors – June 2017

The AIG wishes to thank the following individuals and organisations for their support of the Geoscience Student Bursary Program.

Geoscience Student Bursary Program

DIAMOND
- CHRIST BONWICK
  Sponsoring the Bonwick – AIG Geoscience Student Bursaries
- GEOFF DAVIS
  Sponsoring the Davis – AIG Geoscience Student Bursaries
- MACQUAIRE ARC CONFERENCE - GSNSW
  Sponsoring the Macquarie Arc Conference – AIG Geoscience Student Bursaries
- SYDNEY MINERAL EXPLORATION DISCUSSION GROUP (SMEDG)
  Sponsoring the SMEDG – AIG Geoscience Student Bursaries

PLATINUM
- AIG STATE BRANCHES
  Sponsoring AIG Geoscience Student Bursaries
- JONATHAN BELL
  Sponsoring the Jonathan Bell-AIG Geoscience Student Bursary

GOLD
- GNOMIC EXPLORATION SERVICES PTY LTD

BRONZE
- DOUG YOUNG
- EXPLOREGEO

For more information on the Student Bursary Programme visit www.aig.org.au/education-training/student-bursary-programme
Welcome Improvement in Australian Geoscientist Employment

Andrew Waltho and Wayne Spilsbury
AIG Councillors

Employment prospects for Australia’s embattled geoscientists improved during the first quarter of 2017 according to the latest Australian Geoscientist Employment Survey conducted by the Australian Institute of Geoscientists during April.

Unemployment amongst geoscientists during the survey period was 12.1%, down from 14.4% in the fourth quarter of 2016. Underemployment (geoscientists unable to secure their desired level of self-employment) was 18.3%, down from 19.5% in the previous quarter.

The ‘real’ unemployment rate (unemployed geoscientists and underemployed geoscientists able to achieve less than 25% of their desired workload was 21.7%, down from 24.5% in the final quarter of 2016.

The proportion of geoscientists seeking to leave their profession to seek work fell from 11.4% in the final quarter of 2016 to 7.9% in the most recent quarter.

AIG Councillors Andrew Waltho and Wayne Spilsbury

An improvement in both unemployment and underemployment has now been evident in three of the past four surveys, supporting anecdotal evidence of a modest upturn in industry activity evident over the past year. The unemployment rate in the first quarter of 2016 was 19.5% and the corresponding underemployment rate was 23.4%.

On a state by state basis, the unemployment rate ranged from 6.9% in New South Wales and the ACT to 14.8% in Queensland. The underemployment rate was lowest in Victoria at 10.7% and highest in South Australia at 28.6%. The unemployment rate fell in every state except Queensland, where it increased by almost 2% during the first quarter of 2017. Underemployment fell in every state.

Too few responses were received from geoscientists working in the Northern Territory and Tasmania to report state results.

Full-time, part-time and self-employment rates remained similar to those observed in the previous survey, at 77%, 5% and 18% respectively. Some 59% of survey respondents work or seek work in mineral exploration, 16% in metamorphic mining and 7% in energy resource (coal, oil and gas) exploration and production.
Long-term unemployment remains a real concern. Almost 62% of unemployed and underemployed geoscientists reported that they had been out of work for 12 months or more. More than 16% of unemployed and underemployed geoscientists had lost their jobs during the quarter. More than 53% were not confident of regaining employment in the next 12 months.

Just over half of the survey respondents currently in employment were confident of retaining their jobs for at least the next 12 months.

The survey attracted a total of 736 responses—more than one in ten geoscientists in Australia.

“After such a prolonged period of bad news on geoscientist employment in Australia, it’s good to have something clearly positive to report,” spokesperson for the Institute, Andrew Waltho said. “The decline in unemployment and underemployment that we first saw some signs of in the latter part of 2016 appears to be continuing, reflecting a pick-up in exploration for minerals.”

“This good news, however, is no cause for complacency,” Mr Waltho said.

“Geoscientist unemployment in Australia is still roughly three-times that of the Australian workforce in general, which is not good news for both the profession and the exploration and mining industry which accounts for the bulk of geoscientist jobs in Australia.” They work in an industry which drives a very large piece of Australia’s economy and provides both direct and indirect employment for tens of thousands of Australians,” Mr Waltho said.

“Current levels of geoscientist employment are better than they were 12 months ago but are only back to mid-2013 levels,” Mr Waltho said.

“More than two thirds of Australian geoscientists work in minerals exploration and mining.” The Institute asked geoscientists what they thought were the biggest barriers to greater employment in Australia, to which the overwhelming response was access to land for exploration,” Mr Waltho said. “Recent research, published on AIG’s website, shows that the area of each state in Australia under exploration licence has fallen consistently over the past decade.”

The most recent global survey of exploration and mining company managers undertaken by Canada’s Fraser Institute paints a varied picture of the attractiveness of policies and regulations governing mining and exploration in each Australian state. “Western Australia and South Australia were identified as providing desirable conditions for exploration and mining”. At the same time, one state was ranked lower than Russia as a destination for exploration and mining investment which is simply not good enough” Mr Waltho said. Australia needs to compete globally for investment in new projects”. “We have the skills and expertise to conduct world-leading exploration and mining geoscience but we need to ensure that Australia is seen to be an attractive place to invest, in which equitable access to land for responsibly conducted fieldwork is key.”

“Long term unemployment amongst Australian geoscientists is a real concern”. A majority of unemployed and underemployed geoscientists are striking to secure new employment that still isn’t there, resulting in significant numbers of highly skilled and experienced professionals seeking work outside their chosen field,” Mr Waltho said.

The improvement in this survey hopefully provides some encouragement for students who will be entering the geoscience profession over the next few years”. “We are seeing some companies reinvigorate graduate recruitment and development programmes that have been a missing feature in the geoscience arena for a number of years which is also really encouraging” Mr Waltho said. “We need more, both financial and intellectual, investment in Australia’s future to maximize the value of our mineral and human resources” Mr Waltho said.
Bentonite Tephrostratigraphy and Geochronology of Richly Fossiliferous Upper Cretaceous Continental Strata in the Western Interior Basin, North America

This study is part of a broader project focused on redating (via ultra high precision U-Pb geochronology) and correlating volcanic ash beds throughout this important fossil-rich interval. Specifically, this project aims to develop and test a new approach for correlating or “fingerprinting” ash beds from different formations across the Western Interior Basin (WIB) to determine whether it is possible to: 1) correlate the same ash bed within a single formation and even across formations; 2) determine if identical aged ash beds can be linked to a single source or whether they represent multiple volcanic sources with similar eruption histories; and, 3) to constrain the source(s) of volcanic ash preserved within the basin. To do this, major element geochemical analysis was conducted using an electron microprobe on glass melt inclusions found in microscopic zircons that formed at the instant of volcanic eruption before being deposited as tephra in the fossiliferous sedimentary sequences. This new technique was applied in combination with hafnium isotope data thus suggesting at least three active volcanic centres were contributing to tephra deposits in the Cretaceous Western Interior Basin. Two of these were operating synchronously, while a third source appears to be temporally distinct and to have initiated after the previous sources. This study provides an exciting proof of concept test of this new approach to studying tephrostratigraphy, and it is believed that these techniques could be applied to a variety of analogous circumstances globally.

Formation in southern Utah and coevally deposited sedimentary sequences (Oldman, Dinosaur Park and Bearpaw formations) in Dinosaur Provincial Park in Alberta. This innovative technique proves to be not only an effective means of measuring major element geochemistry of devitrified volcanic ash but also potentially provides a far more accurate proxy for parent magma composition than previous methods. The contemporaneous bentonites from Alberta and Utah were identified with a high degree of certainty to originate from different eruptions and most likely from different volcanic sources altogether. Three geochemically distinct zircon populations were recognised by the major element geochemistry and hafnium isotope data thus suggesting at least three active volcanic centres were contributing to tephra deposits in the Cretaceous Western Interior Basin. Two of these were operating synchronously, while a third source appears to be temporally distinct and to have initiated after the previous sources. This study provides an exciting proof of concept test of this new approach to studying tephrostratigraphy, and it is believed that these techniques could be applied to a variety of analogous circumstances globally.

The geology and genesis of the Two-Thirty prospect Northparks district, NSW

Tristan Wells
University of Tasmania, 2016 Macquarie Arc Conference-GSNSW – AIG Honours Bursary

The Two-Thirty Cu–Mo (Au) prospect is located ~25 km northwest of Parkes, NSW. It is hosted by the Late-Ordovician, shoshonitic Goonumbla Volcanics within the Northparks porphyry district of the Early-Ordovician to Early-Silurian Macquarie Arc. The Goonumbla Volcanics have undergone pervasive potassic alteration where intruded by medium- to high-K calc-alkaline porphyries and minor mafic and aplite dykes that comprise the Late Ordovician (450 to 439 Ma) Two-Thirty intrusive complex. Three of the porphyry phases at the Two-Thirty prospect have been correlated texturally and mineralogically with porphyryic intrusions from the Northparks porphyry deposits. The feldspar-phyllic monzonite zero porphyry, the youngest intrusion at the Two-Thirty prospect, returned two calculated zircon crystallisation ages (439 ± 4 Ma and 455 ± 4 Ma). The older of these two ages (ca. 455 Ma) is interpreted to be inheritance of detrital zircons from the basal Goonumbla Volcanics. The younger age is within error of zero porphyry dated at the Northparks porphyry deposits. The porphyry most pertinent to this study is the Two-Thirty porphyry, a 448 ± 4.5 Ma feldspar-phyllic monzonite. The Two-Thirty porphyry is interpreted to be the progenitor to the magmatic-hydrothermal breccia complex that is the dominant feature of, and host to, high-grade mineralisation at the Two-Thirty prospect. The Two-Thirty intrusive complex has the potential to produce economically viable porphyry-style mineralisation, based on favourable geological features, including elevated zircon U/Pb+ recoil signature in both, the magmatic-hydrothermal breccia and its progenitor, the Two-Thirty porphyry. Geochemical data also indicates positive relationships between tungsten and molybdenum in the breccia complex, an association that potentially provides a useful tool for future exploration.

The age of the porphyries at the Two-Thirty prospect has implications for exploration in both the Northparks district and the Macquarie Arc. It is older other mineralised porphyry deposits at Northparks and Cadia, and younger than the deposits at Cowal, Copper Hill, Marsden and Ridgeway. In addition, the Two-Thirty prospect is unique to the Northparks district and the older Macquarie Arc, being the only occurrence of significant high-grade, magmatic-hydrothermal breccia hosted mineralisation discovered to date. Deeper drilling at the prospect is required to fully delineate the mineralised breccia complex, as well as to determine if stockwork porphyry mineralisation is located at depth.
An auspicious day for the John Forrest geotrail along the former main train line that crossed the continent - the AIG visit to trial the route. The day arrived, promising a maximum temperature of 29°C and a cloudless sky. And the forecast was spot on. Perhaps just a little warm, but the warmth of the attendees was the same with 20 members and friends arriving at the start. A few, who had previously been familiar with the site were a little bushed when they went to the old park and did not find any fellow-geo. But the new Council-built carpark makes the start so much more civilised.

Mike Freeman, Walk leader

The 20, after a brief introduction then headed along the route with the first stop to look at a highly sheared contact between the 2.6 Ga Darling Range granite and a 1.2 Ga dolerite dyke. Two more dykes in the first cutting and then across the first embankment into the second cutting. Discussion about the granite, jointing, fracture filling and slickenside and then two more dykes. Lots of debate and discussions ensued especially over a curious silicified granite outcrop. The problem of rock stability and of rocks falling onto the former railway line was focussed upon. Continuing along to elephant rock and finally to a dyke with a highly stepped contact with the last dolerite with the contact exposed in a 1 to 2 metre high wall of granite. Turning back the group went through the former railway tunnel, on to the western side, more dolerite and granite and then back to the start.

My thanks to John Bunting who gave his excellent knowledge of the geology along the route.

What else can one say – granite and dolerite, dolerite and granite, then more granite, and then more dolerite. But the old railway cuttings do have excellent outcrops and show the huge variety of contacts along an east-west transect. No injuries, no snakes crossing the track, no rock falls but a few interested bystanders wondering about the fascination a few rocks had for a mob of walkers along the 3.5 km walk.

Top: The mob at the eastern portal of the Swan View former railway tunnel dug in 1895.
Standing in front of one of the 1.2 Ga dolerite dykes (Photo courtesy: Paul Askins)

Left: John Bunting, Bill Shaw (AGC president) and Mike Freeman (Photo courtesy: Paul Askins)
Introduction

Industrial minerals such as graphite and lithium minerals, have become the focus of attention for listed exploration and mining companies. This is mainly due to developments in rechargeable battery technologies, driven by growing demand from the emerging electric vehicle market and solar technologies, and driven by growing demand from developments in rechargeable battery technologies, driven by growing demand from the emerging electric vehicle market and solar technologies.

Consequently, the race has been on to acquire tenure, report larger exploration results, and there are very clear guidelines in the JORC Code Clause 19, which highlight that “The JORC Code Clause 19, which highlights that “Public Reports of Exploration Results must contain sufficient information to allow a considered and balanced judgement of their significance.” and “Public Reports of Exploration Results must not be presented so as to unreasonably imply that potential economic mineralisation has been discovered.” (JORC, 2012).

“Where assay and analytical results are reported, they must be reported using one of the following methods, selected as the most appropriate by the Competent Person:
• Either by listing all results, along with sample intervals (or size, in the case of bulk samples), or;
• By reporting weighted average grades of mineralised zones, indicating clearly how the grades were calculated.”

Also, it is very important to support a clear understanding of the exploration results:
“Clear diagrams and maps designed to represent the geological context must be included in the report. These must include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views”. Please note that the underlying raw data and the CP should provide opinions that answer the questions in Table 1, not merely descriptions of the work done.

The value-add provided by the Competent Person derives from the quality of the opinion provided: an adequately completed JORC Table 1 presents sufficient material information to allow the reader to form their opinion; a good JORC Table 1 presents information as an opinion, bearing in mind Clauses 4 and 5 of the JORC Code, which provide the scope for why the Code exists at all, which is to inform investors. Please note that the underlying raw data is added by the authors to highlight the key aspects of Clauses 4 and 5, and not part of the JORC Code. JORC Code Clause 4 “In particular, the Competent Person must consider that the benchmark of Materiality is that which includes all aspects relating to the Exploration Results, Mineral Resources or Ore Reserves that an investor or their advisers would reasonably expect to see explicit comment on from the Competent Person. The Competent Person must not remain silent on any material aspect for which the presence or absence of comment could affect the public perception or value of the mineral occurrence.”

<table>
<thead>
<tr>
<th>Market</th>
<th>CSC (meq/100g)</th>
<th>Free swell (%</th>
<th>Fluid loss (mL/100g)</th>
<th>Water absorption (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundry</td>
<td>&gt; 80</td>
<td>&gt; 20</td>
<td>&lt; 15</td>
<td>30</td>
</tr>
<tr>
<td>Drilling mud</td>
<td>&gt; 80</td>
<td>&gt; 20</td>
<td>&lt; 16</td>
<td>30</td>
</tr>
<tr>
<td>General synthetic clay</td>
<td>&gt; 80</td>
<td>&gt; 24</td>
<td>&lt; 18</td>
<td>30</td>
</tr>
<tr>
<td>Iron ore / chrome</td>
<td>&gt; 80</td>
<td>&gt; 24</td>
<td>&lt; 18</td>
<td>30</td>
</tr>
</tbody>
</table>

Note: CSC: Carbonation Exchange Capacity. – A higher CSC usually indicates a lower carbonation capacity. The rates of exchangeable calcium are performance (e.g., swelling, viscosity fluid loss and water absorption). Calcium or magnesium bentonites do not swell significantly, but sodium bentonites generally have a high swelling capacity. The purity of the clay does not necessarily indicate potential markets; that the examples in Table 1 all have similar CSC values.

Industrial mineral Exploration Results according to the JORC Code

Andrew Scogings
PhD (Geology) MAIG, MAusIMM, RP Geo. (Industrial Minerals). CSA Global Pty Ltd

Ivy Chen
PhD (Geology) MAIG, MAusIMM, RP Geo. Member of JORC. CSA Global Pty Ltd

Graham Jeffress
BSc (Hons), FAIG, RPGeo, FSEG, CIA. Non-exec. Member of the VALMIN Committee. CSA Global Pty Ltd.

Table 1: Some generalised bentonite market specifications and quality guidelines
We note that metallurgical testing associated with process design testing or process optimisation, may not necessarily be considered material to Exploration Results, and naturally there will be commercially confidential information that cannot be disclosed to the market. The key considerations under these circumstances should be:
- whether the results of the metallurgical or beneficiation analysis material to providing context for Exploration Results;
- and
- if these results impact the project’s prospects for eventual economic extraction.

If the results are material but commercially confidential, then the market needs to be informed accordingly, in consultation with the company’s legal advisers.

Are Exploration Result announcements meeting JORC Clause 18 and 19 requirements?

Public Reports of Exploration Results must contain sufficient information to allow a considered and balanced judgement of their significance. Reports must include relevant information such as exploration context, type and method of sampling, relevant sample intervals and locations, distribution, dimensions and relative location of all relevant assay data, methods of analysis, data aggregation methods, land tenure status plus information on any of the other criteria listed in Table 1 that are material to an assessment.

Clear diagrams and maps designed to represent the geological context must be included in the report. These must include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views (Figures 1 and 2).

It is apparent that industrial mineral Exploration Result announcements have not all been treated equally and, in the authors’ opinion:
- Analytical result announcements are generally the best reported and have appropriate maps, cross sections and Table 1 in addition to a CP statement.
- Geophysical survey announcements generally have maps (and cross sections when applicable but can sometimes fail to include units and legends), in addition to JORC Code Table 1. However, the Table 1 is often ‘borrowed’ from previous assay results announcements and may not always be appropriate for geophysical surveys. In addition, a CP statement is not always included and if there is a CP statement this may not be from a geophysicist.
- Metallurgical, beneficiation or product performance reports are often not considered to be true Exploration Results. They frequently don’t have maps or sections, Table 1 or a CP statement and are weakly presented, without sufficient context to demonstrate the material impact of these metallurgical results on the project.

Reporting of analyses (assays)

Taking graphite as an example, graphite or carbon content may be reported in several ways and it must be made clear which is being used. For example, analytical laboratories may report Total Carbon ("TC"), Total Graphitic Carbon ("TGC") or Loss on Ignition ("LOI") for graphite concentrates, whereas Exploration Results Mineral Resources are usually reported as TGC. The CP should comment on the analytical method being used and its suitability for the commodity being reported.

The nature and concentration of potentially deleterious components such as sulphides also need to be discussed.

Reporting of visual estimates

In those instances where a company determines that continuous disclosure obligations require the publication of drilling results prior to receipt of the laboratory analytical results, it is essential that the CP disclose information on the identity and quantity of the minerals of interest (graphite flakes, or spodumene, petalite, feldspar, vermiculite, etc.), in addition to the gangue minerals present (Scogings, et al., 2016). It is not sufficient to simply quote intervals of interest, metres of pegmatite or graphite schist, without providing an estimate of what is in those intervals – is it a speck, half the rock, or 5-10%? Such information should be provided as ranges of percentage estimates, and include cautionary language about the uncertainty of visual estimates and the importance of laboratory confirmation (Walloth, 2015).

Reporting of geophysical results

Geophysical techniques are an indirect way of tracing geological and/or mineralisation trends across an exploration project. Using graphite as an example, various electromagnetic (EM) methods can be highly effective exploration tools for graphite mineralisation and provide supporting evidence for mineralisation continuity along strike and down dip. As such, geophysical survey results are generally material to graphite projects and should be considered as Exploration Results.

The question may be asked “where does the CP comment on geophysical results in Table 1?" It is recommended that these results be commented on under Section 2 “Other substantive exploration data” which includes “Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.”

A geophysicist is the appropriate Competent Person to be responsible for the public release of geophysical results. Adherence to the JORC Code would require that the CP statement includes the geophysicist.

Reporting on an ‘if not, why not’ basis is to ensure that it is clear to an investor whether items have been considered and deemed of low consequence or are not yet addressed or resolved.”

What constitutes industrial mineral Exploration Results?

We may ask what constitutes Exploration Results for industrial minerals? In the authors’ opinion, industrial mineral Exploration Results may be grouped into three main categories (Scogings, 2017):
- Analytical ("assay") results including geochemistry, outcrop, drill sample, trench or bulk samples; visual estimates of drill hole intersections; or petrographic examination.
- Geophysical surveys and geology observations/mapping, often reported early on in a project.
- Metallurgical or beneficiation testing, including product performance tests on concentrates (e.g. graphite), or rocks and minerals (e.g. bentonite, vermiculite, kaolin, etc.).
Reporting of metallurgical, beneficiation and product performance results

Metallurgical, beneficiation or product performance results are classified as Exploration Results if these are material to the project and include data that may be useful to investors (which is almost always the case with industrial minerals such as graphite) – as is clearly shown by their inclusion in Section 2 of Table 1. Metallurgical results should be reported with supporting maps and sections in the same way that analytical Exploration Results are announced.

Clause 49 of the JORC Code (2012), which requires that: “For minerals that are defined by a specification, the Mineral Resource or Ore Reserve estimation must be reported in terms of the mineral or minerals on which the project is to be based and must include the specification of those minerals.”

In other words, to comply with the JORC Code, any announcement of industrial mineral metallurgical, beneficiation and/or product performance testing results should include the common market requirements for the product in question.

Examples of test results include liberated flake size, purity, density and peak oxidation temperature (graphite); flake size distribution and expansion rate (vermiculite); concentrate grade and iron content (spodumene), and viscosity, mechanical strength, and dehydroxylation temperature (bentonite clay).

These test results would only have meaning if there is suitable context provided by providing quantitative information. For example, the dehydroxylation (loss of structural water) temperature of a highly durable bentonite for foundry markets could be expected to be in the range 670°C to 700°C, whereas many bentonites may be well below 600°C; hence this type of aspect needs to be discussed quantitatively.

The reason that performance test results are material in public announcements is because they define likely markets for industrial mineral products. For example, a high peak oxidation temperature for graphite indicates suitability for use in high-temperature refractory products. Expanded vermiculite contains trapped air and is used in lightweight building products and for thermal and acoustic insulation; therefore, higher expansion = better performance. Low iron content in spodumene and other lithium minerals renders them suitable for use as fluxes in specialist ceramics and clear glass.

The viscosity of bentonite slurry is important when used as drilling mud; swelling index is important for some civil engineering applications, while mechanical strength and high thermal durability are important parameters when bentonite is used as a binder in sand moulds for metal casting. It may well be the case that bentonite from one part of a deposit may be suitable for drilling mud, but not of any use for metal casting; this highlights the materiality of performance tests in public reporting of industrial minerals (see Table 1 for generalised examples of bentonite specifications and Figure 3 for examples of different swelling performance).

The question may be asked “where does the CP comment on metallurgical results in Table 1?” It is recommended that metallurgical results be commented on under Section 2 “Other substantive exploration data” which includes “Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characterisation; potential deleterious or contaminating substances.”

Metallurgical, beneficiation or product performance tests results can be affected by the type of drilling and/or sampling method used. It is therefore required to comment in Table 1 on the drilling method used which may have a material impact on the industrial mineral being reported.

When drilling for minerals such as graphite or vermiculite, drilling methods could affect intrinsic properties such as flake size. For example, drilling methods such as RC or Air Core (“AC”) are likely to shred the mineral flakes and reduce their size relative to flakes in diamond drill (“DD”) core samples. Such size reduction would have a material impact on the economics of a vermiculite project, as coarse flakes typically attract a higher price than finer flakes.

Drilling with an auger may increase the viscosity of bentonite due to the shearing action of the auger flights, and the CP should be aware of such artefacts of drilling methods when reporting.

As with geophysical results, either the metallurgist and/or the “product specialist”, is the appropriate Competent Person responsible for the public release of this type of information, and should be included in the CP statement as required by the JORC Code (and by their membership of the AusIMM, for example).

Concluding Remarks and Observations

In the authors’ experience, analyses are sometimes commissioned from highly specialised service providers, who may or may not be members of either the AIS, AusIMM or a RCP. If the public announcement is by an entity listed on the ASX, a CP sign-off may still be required to demonstrate that the information has been reviewed and accepted as material and relevant to the project.

In these circumstances, either an internal CP (e.g. the Company’s Technical Director), or an external CP (e.g. a consultant) may be an appropriate CP. What is critical is that the investing public has the confidence that a CP has reviewed the information being released and is prepared to stand by it.

When publicly reporting industrial mineral Exploration Results in compliance with the JORC Code (JORC, 2012), the authors recommend that the following points should be considered:

- Exploration Results for industrial mineral projects include: analyses (assays), geophysical surveys and the results of metallurgical/beneficiation and product performance tests that may be useful to investors.
- If you need to report visual estimates prior to receiving laboratory results, then you must identify the minerals of interest (e.g. graphite or spodumene) and include estimates of abundance (as ranges) – identity and quantity.
- There is rarely an excuse for not having a map of sample locations, drill holes, and geological sections of the drill holes when reporting Exploration Results.
- Don’t ‘cherry pick’ results. Present all material results and use pictures (e.g. sections) to illustrate the context.
- Include units and legends in maps and sections, especially when reporting geophysical results.
- Include Table 1 and ensure that the commentary is applicable to the type of Exploration Results being reported. It’s not just a case of ‘copy and paste’ commentary from previous announcements.
- CP statements must be included. This includes geophysicist and metallurgist CPs in addition to geologists, if those are the results being reported.
- Context is king: it is essential that the reader appreciates the risk inherent in uncertainty that is invariably present in the early stages of any potential project development.
- Refresh your memory on clauses 4 (materiality), 5 (Table 1), 9 –11 (CP), 18 – 19 (ER), Clause 49 (MV) and Table 1 of JORC (2012) before preparing a public report.

In conclusion

BIBLIOGRAPHY


Definitions

Competent - Having the necessary ability, knowledge, or skill to do something successfully. Efficient and capable.
https://en.oxforddictionaries.com/definition/competent

Professionalism comprises the personally held beliefs about one’s own conduct as a professional. It’s often linked to the upholding of the principles, laws, ethics and conventions of a profession as a way of practice.
http://www.psc.gov.au/what-is-a-profession

A professional is a member of a profession. Professionals are governed by codes of ethics, and profess commitment to competence, integrity and morality, altruism, and the promotion of the public good within their expert domain. Professionals are accountable to those served and to society.
http://www.psc.gov.au/what-is-a-profession

A profession is a disciplined group of individuals who adhere to ethical standards. This group positions itself as possessing special knowledge and skills in a widely recognised body of learning derived from research, education and training at a high level, and is recognised by the public as such. A profession is also prepared to apply this knowledge and exercise these skills in the interest of others.
http://www.psc.gov.au/what-is-a-profession

Task Group on Global Geoscience Professionalism (TGGGP)
Geoscientists providing services and opinions at a professional level incorporate:
• Sound geoscience knowledge and application of theory;
• Exceptional ethics; and
• Good judgement; providing services and opinions only in the areas of geoscience in which they are competent.
http://tg-ggp.org/professionalism-in-geoscience

AIG's Vision Statement is "The AIG will strive to be the pre-eminent Australian professional institute in advocacy for, and public promotion of, all Australian geoscientists." This is not a static statement, it is also one that goes beyond mineral deposits and JORC. As the practice of geoscience evolves with changes in technology and changes in society's expectations of professional practice, so must AIG change to preserve its pre-eminent status.

Professional Issues Sub-Committee Charter

OBJECTIVES
In supporting the Board, the role of the Professional Issues Sub-Committee concentrates into three main areas:
• to road map a plan to improve competency and increase professionalism (and the perception of professionalism) of AIG members
• review existing and proposed standards and guidelines that may affect professional geoscience practice in Australia, and recommend their updating, revision or acceptance to the Board
• determine whether new standards and guidelines are required to ensure professional geoscience practice is protective of human health and the environment, and, as appropriate, recommend their development to the Board

Desired outcomes from achieved objectives
• Encourage confidence and trust in geoscientist's services
• Prevent/reduce any unnecessary regulation and supervision by government
• Improve employment and career longevity
• Provide geoscientists with community purpose and empowerment
• Enhanced awareness of obligations, responsibilities and accountability
• Assuring expertise and its currentness
• Promoting consumer protection
• Recognition and respect for geoscience as profession
• E.g. Mentoring, knowledge requirements

Mandatory CPD
Improved Competence
Increased Professionalism
Ethics examination

Professional Issues Subcommittee
Wayne Spilsbury MAIG. FAusIMM (CP). PGeo.
Julian Vearncombe BSc. PhD. FGS. FSEG. FAIG. RPGeo.
Kaylene Camuti MAIG. RPGeo.
Josh Leigh MAIG.
Robert Findlay BA Hons. MA, PhD. MAIG.
The survey will seek your input on the following issues:

1. Membership Requirements – Education and Communication Skills

The current minimum requirements for AIG Membership are a three-year Bachelor’s degree in the geological sciences and five years relevant professional experience, including two years in which the applicant has been required to exercise professional judgement and is supported by at least two AIG members with personal knowledge of the applicant’s professional experience.

For industry employers, an Honours degree is the desired minimum qualification for graduate employment. This is because, under the modern degree system, most students are not exposed to working requiring problem-solving and the exercise of technical and professional judgement until their Honours year. That is, until students complete Honours, they have had little to no experience in the acquisition, assessment, compilation and interpretation of data, and little experience in technical writing and professional reporting.

In many comparable jurisdictions (Canada, USA, South Africa and Europe), the minimum education requirement for admission to professional institute is a 4-year Bachelor’s degree.

The AIG is currently not at risk of losing its Recognised Overseas Professional Organisations (ROPO) status which allows our Members to identify as Qualified Persons or Competent (ROPO) status which allows our Members to identify as Qualified Persons or Competent Persons or Competent Persons in foreign jurisdictions. However the AIG’s lower educational requirements for entry could place its ROPO status at risk.

Some professional organisations require applicants to submit a recent report, written in English and take a personal interview to demonstrate their professional literacy and communication skills.

Therefore, should the educational requirement be changed to an Honours degree or equivalent professional experience and should new applicants be interviewed and required to submit a recent report written in English?

2. Membership Requirements – Law and Ethics Exam

Some professional organisations require applicants to take a Law and Ethics course and pass an examination. The courses are designed to increase knowledge of Corporate Law, Stock Exchange rules and other relevant legislation, and teach the obligations and responsibilities that come with adherence to a Code of Ethics. Should AIG develop a Law and Ethics course with an exam as a prerequisite for membership?

3. Membership Requirements – Continuous Professional Development (CPD)

The AIG promotes the benefits of CPD to all members and requires Registered Professional Geoscientists (RPGeo) to complete and document a minimum of 50 hours of CPD, on average, annually over a three-year period. CPD activities typically include attendance at conferences, undertaking relevant postgraduate education including extension courses, in-house courses, distance learning, on-the-job training and private reading of learned publications. CPD is not a guarantee of competence.

The community at large, however, sees a commitment to CPD as being at the core of an individual being able to describe themselves as a “professional” (Walsh, 2012). Should the AIG follow the practice of most professional organisations which make undertaking and recording CPD activities a requirement of membership?

4. Authoring Reports

Because geoscience is largely unregulated in Australia, essentially anyone can submit a geoscience report to an employer, client, the public at large, or a government authority. This arguably undermines the practice of professional geoscientists and exposes the public to risks inherent in the misrepresentation and misinterpretation of geoscience data and observations, including but not limited to exploration results and mineral resource reporting. Should Members be encouraged to sign and seal all formal public documents that have been created by them in their professional capacity to employers, clients and the public? Should the AIG promote the benefits of only accepting geoscience reports prepared by members of a professional institute including the AIG and AusIMM in Australia, or a Recognised Overseas Professional Organisation?

5. JORC Competent Person

The JORC Code defines a Competent Person as “…a minerals industry professional who is a Member or Fellow of The Australasian Institute of Mining and Metallurgy, or of the Australian Institute of Geoscientists, or of a Recognised Overseas Professional Organisation (ROPO)… and … must have a minimum of five years relevant experience in the style of mineralisation or type of deposit under consideration and in the activity which that person is undertaking.” (JORC 2012).

The key qualifier in the definition of a Competent Person are the words ‘relevant experience’. What constitutes relevant experience is left to the judgement of the Competent Person (CP) (who must be confident of being able to demonstrate competence to a panel of his or her peers if called on to do so (convened by the AIG or AusIMM Ethics and Standards committee)).

Several reviews of JORC reports (Coombes, 2012, 2016) have identified frequent shortcomings in Competent Person reports issued, purportedly in compliance with the JORC Code that range from:

- Procedural breaches (e.g. omitting a consent statement by the CP);
- Provision of inadequate technical information of substance (e.g. cut-off grades and maximum internal dilution in a drill intersection or physical characteristics of industrial minerals); and, less frequently,
- A lack of market-sensitive technical information (e.g. inadequate, opaque description of mineralisation in “intersections of massive sulphides” without describing the sulphide minerals observed or their respective abundances) which represent a failure to comply with the underlying transparency and materiality provisions of the JORC Code.

A change for Australian geoscientists would bring them into alignment with Canadian geoscientists who already need to be registered with the relevant provincial registration authority (PGeo).”
Professional Issues Subcommittee


draft of legislation for public comment and

licensing of an organisation and its members,
and ensures that organisational self-regulation
meets the current Australian standards
applicable to other comparable professional
organisations (such as Engineers Australia).
Accreditation of the AIG by the PSC will require
the AIG to undertake the following
(some of which are already within the scope
of current activities):

1. Both provide and track Continued
   Professional Development by members
2. Maintain an effective complaints
   handling and disciplinary process for
   members
3. Use of the PSC disclosure statement
4. Undertake an annual risk management
   program review
5. Improvements and changes to
   professional standards
6. Insurance cover, claims and business
   asset monitoring
7. Annual audit of members and the
   provision of an independent certificate

Additionally, there is a cost for PSC
membership including a one-time fee of about
$550 and an annual levy equivalent to $50 per AIG member.

Should AIG investigate accreditation by the
Professional Standards Council?

REFERENCES
   The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves,


JORC (2012). The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves,
   from http://www.jorc.org/jorc_code.asp

Waltho, A. W. (2012) It’s Time to Think About Professional Registration,

The AIG acknowledges the generous assistance of its sponsors and supporters

Gold Sponsors

Silver Sponsors

Bronze Sponsors

Industry Supporters

Exhibitors and General Sponsors

We look forward to talking with you.

Optiro
Specialist resources advisory and consulting services group

Our expertise and fresh thinking ensures
strong sustainable relationships with our clients.

TALK WITH CONFIDENCE TO OPTIRO TODAY
WE LOOK FORWARD TO TALKING WITH YOU
Paul Blackley: paulblackley@optiro.com
Christine Standing: cstanding@optiro.com
Level 1, 16 Ord St, West Perth 6005
Tel: +61 8 9215 0000
www.optiro.com

Optiro
Fresh thinking, fresh growth

AIG NEWS Issue 128 · June 2017

REGISTRATION OPEN – LIMITED SPACES REMAINING

The third day of the conference is dedicated to offering delegates drilling-related workshops. Nine half-day, full-day and three-day professional development workshops are available.

The AIG acknowledges the generous assistance of its sponsors and supporters

Gold Sponsors

Silver Sponsors

Bronze Sponsors

Industry Supporters

Exhibitors and General Sponsors

The dramatic growth in sophisticated data and geological information could pave the way for an explorer unearthing a major new gold find in New Zealand.

The head of regional geology for GNS Science, Rob Smillie, told the Gold17 Conference in Rotorua that the country only has two significant gold mining centres – Macraes in Otago and Waihi in the North Island’s Hauraki Goldfield.

There has not, said Smillie, been a major greenfields gold discovery in 150 years because both Macraes and Waihi had developments in or earlier to that period. Brownfields exploration has shown up extensions or new deposits in existing mining areas but there has not been a find in a previously untested area.

Smillie said there were exciting new developments for discoveries and not only was there sophisticated new data but a greater understanding of NZ’s geology and mine-finding techniques.

There had been an “explosion” of new airborne data linked to advances with radiometric data. Recently enhanced 3D mapping was helping not only with exploration but with work and understanding of earthquake damage and volcanoes with seismic activity and lava flow. GNS Science was now completing new soil surveys in Otago and Southland and this Smillie said would be a valuable new tool for industry. Survey and mapping teams were now completing a survey in northern and west Otago and another in the Nelson region.

Smillie said GNS Science has looked at what other countries were doing with new data. Australia was a good example and for the vast Yilgarn Craton of Western Australia there have been enhancements with a holistic approach which has helped identify new and deeper mineral deposits.

New maps of the Yilgarn are showing the whole of the lithosphere, and this mapping aid was starting to be used in New Zealand, starting on the West Coast where work to date has shown scope for polymetallic targets.

Looking under cover has identified scope for tungsten and other deposits on the West Coast. In Otago, recent work has shown two terranes of schists in the region have some differences and Smillie said this could lead to some changes in thinking by explorers.
Hauraki retains allure for new treasures

The Hauraki goldfield on the North Island has produced a recorded 12 million ounces of gold and 50 million ounces of silver and is considered to have enormous scope for new targets.

Proof today is development of Correnso as the new breadwinner for Waihi and the potential to find a commercial deposit in the large WKP target.

In his presentation at the Gold17 Conference in Rotorua prominent GNS Science presenter Dr Tony Christie pointed out that the Hauraki Goldfield was 200 kilometres long and 40 km wide, representing 2% of New Zealand's land mass.

Deposits were volcanic-related and there were Adularia-sericite type of systems and it contained the world class Martha deposit at Waihi which so far has produced 7 million ounces of gold.

The trend of exploration in the Hauraki goldfield has moved from the reconnaissance stream sediment sampling of the 1970s to a focus since 2000 on brownfields and drilling.

Between 2000 and 2010 a total of 50 prospects were tested by drilling and 900 drill holes were undertaken by 30 companies. Exploration successes in this period have included ongoing prospecting at Waihi, Neavesville, WKP, Waitekauri Valley, Rahu and Muirs.

He said most modern drilling has been diamond drilling and the epithermal gold targets have really been hydrothermal-driven.

Dr Christie said targeting today in the Hauraki has evolved from looking for bullseye anomalies in geochemical and aeromagnetic survey data from the 1970s.

What has helped has been mineral deposit models have evolved with increasing knowledge of architecture, geological and structural settings, age and genesis of the deposits.

Assisting this was comparisons to active geothermal systems of the nearby Taupo Volcanic Zone.

This increased understanding, he said, was reflected in use of XRD, SWIR and pXRF analyses in addition to conventional assays to vector to mineralisation.

He said there are large areas of unexplored ground in the goldfield for prospecting under cover, particularly under young rhyolitic rocks.

"The success of recent exploration suggests that there is plenty of exploration potential in the Hauraki Goldfield."

Zealandia’s news value surprises key author

No one was perhaps more surprised than Nick Mortimer about the global coverage given to revelations about Zealandia, the mostly submerged continent sitting east of Australia, up into the Pacific and under and south of New Zealand’s South Island.

One speaker at the Gold17 Conference in Rotorua yesterday said tens of millions of readers and viewers saw or read news about Zealandia as it went viral on websites, newspapers and other media and social media outlets.

Dr Mortimer, based in GNS Science’s office in Dunedin, was lead author in the study on Zealandia that involved scientists from GNS Science and Victoria University in Wellington.

You know you've made it when the satirists get into it," he said.

Dr Mortimer said there was nothing new in the concept, New Zealand geoscientists have known about it for 10 years.

He told delegates that Zealandia has a diverse geology, a continental basement containing granite-diorite-gabbro, rhyolite-dacite and grewacke and schist.

With its plate boundaries the question was did Zealandia have enough high elevation, diverse geology and crust to call it a continent and “not just continental.” It contains three large islands and several small islands and is 94% submerged.

It covers a total of 4.9 million square kilometres, while Australia is 7.7 M sq km.

Dr Mortimer also talked about the Otago Schist and asked whether its genesis saw it formed on the Gondwana margin, near Queensland, elsewhere in NZ or near Antarctica.

Did it develop as a burial metamorphic pile, collisional orogeny, accretionary wedge or a metamorphic core complex?

Dr Mortimer, based in GNS Science’s office in Dunedin, was lead author in the study on Zealandia that involved scientists from GNS Science and Victoria University in Wellington.

You know you’ve made it when the satirists get into it," he said.

Dr Mortimer said there was nothing new in the concept, New Zealand geoscientists have known about it for 10 years.

He told delegates that Zealandia has a diverse geology, a continental basement containing granite-diorite-gabbro, rhyolite-dacite and grewacke and schist.

With its plate boundaries the question was did Zealandia have enough high elevation, diverse geology and crust to call it a continent and “not just continental.” It contains three large islands and several small islands and is 94% submerged.

It covers a total of 4.9 million square kilometres, while Australia is 7.7 M sq km.

Dr Mortimer also talked about the Otago Schist and asked whether its genesis saw it formed on the Gondwana margin, near Queensland, elsewhere in NZ or near Antarctica.

Did it develop as a burial metamorphic pile, collisional orogeny, accretionary wedge or a metamorphic core complex?
Industry should remember its exploration success

A well-known mining consultant said at the conclusion of the Gold17 Conference in Rotorua that contrary to many views in Government and industry observers gold exploration has been a successful business. Julian Vearncombe of Perth-based SJS Resource Management, who was a principal organiser of the conference, gave the final presentation yesterday and pointed to some of the negatives that explorers have faced.

This included the decreasing probability of mineral discoveries with costs increasing, companies needed to make world-class finds, and a need to replace explorers with digital technology.

Gold was being found at times when the gold price was low, and there was great success at brownfields exploration in NZ, Australia and Nevada. Companies were finding gold in half-million ounce parcels and these can grow through brownfields exploration into world-class deposits.

In recent years Australia has moved ahead of the once-dominant South Africa, the United States and Canada in production but more recently in terms of the gold price. Since the 1980s Australia’s gold production has soared, helped by technological advances with oxide and refractory ore treatment. The national output peaked above 300 tonnes per annum in the early 2000s, dipped to about 220t but was now above 250t pa. From the growth in production, the role of the gold price and its relation to the $A price against the $US, was shown in a graph, with dominant phases being in the 1979-83 period when the gold price peaked around $A1,600/oz and again between 2007-09 when it was in the $A1,700/oz range.


He said that contrary to these perceptions New Zealand and Australia through successful gold exploration had paradigm-changing growth in the 1980s and this was followed by consistent production. Early drilling, he told delegates, was essential in all exploration.
Otago Province was a strong theme in the last two days of the Gold17 Conference that ended in Rotorua yesterday. While many of the papers were highly technical they indicated scope for new deposits of size outside of Macraes. Leading the presentations was Professor Dave Craw of University of Otago who gave two papers, one of his own making, the other for two senior OceanaGold Corporation geologists from Macraes who were unable to present. Noted for his knowledge of geological origins Prof Craw pointed to the breakup of Gondwana eons ago where parts of New Zealand were fused to parts of Antarctica and the coastline of Queensland – which shows a correlation between the geology of the rich Gympie goldfield of north Queensland and Reefton on the West Coast.

Linked to the same sequences are the Brook Street Terrane below Reefton and the Longwood Range that has platinum group metals and old gold shows, though a relatively ignored region by prospectors today. The Blackwater mine at Waiaua in the southern Reefton field was probably New Zealand’s richest-grade mine and in recent years there has been deep drilling to 1.5 kilometres to identify the reef system underneath the old mine workings that closed in the 1950s. It is owned by OceanaGold though it is not a priority in its current reporting. Another major deposit is Sams Creek, which Perth-based MOD Resources Ltd (ASX: MOD) has upgraded to a resource of more than one million ounces, but the 80% owner has placed it on the market.

Prof Craw said despite all the tough times the Macraes mining centre has been a success story and is working on a resource and production of 10 million oz. Most of it is disseminated ore of low grade. The Macraes mine was producing about 200,000 oz per annum, with the Frasers open pit and Coronation mine, with the Coronation North mine now gaining resource consents. The Frasers Underground produces about 50,000 oz pa at a grade of +2 grams/tonne gold, helped by some high grade reefs at depth. Prof Craw said the first 10 years at Macraes were challenging with the complex refractory ore causing erratic recoveries, sometimes in the 60% range, but introduction of an autoclave changed that with gold recoveries lifting into the 88% range. (The autoclave was also a catalyst for developing the Globe-Progress mine at Reefton and sending a concentrate to the Macraes process plant).

Prof Craw told delegates that thanks to Macraes Orogenic ore hard rock mining in Otago has passed 10 M oz to eclipse the largely historic alluvial gold mining which has produced about 8 M oz. He cited gold in several sequences and now, thanks to warmer climate gold mineralisation in the Southern Alps previously masked by ice and snow were now evident. They appear to be small but field studies have indicated visible gold. He told NZ Resources that while gold in graphitic schists were profound the commercial potential for graphite in the region was unlikely because it was minute in size and very low grade, compared to graphite deposits being pursued in Australia and elsewhere overseas.

OceanaGold has been studying the recovery of tungsten at Macraes and Prof Craw commented that recent data shows the scheelite deposits were larger than the gold. “It’s been a 30 year technical challenge (at Macraes) but I think it’s a success story,” he said.

An earlier presentation by Otago Universities Doug Mackenzie also covered the Otago gold geology and he pointed to the growing exploration focus away from Macraes in the Otago Schists. A new Otago explorer is New Age Exploration Ltd (ASX: NAQ) which is currently undertaking field work including mapping, and shallow sampling. Dr Mackenzie is a consultant to New Age Exploration on its two permits in the southern Otago Schists on generally greenfield targets.

Dave Craw and Doug McKenzie.

Automation was also a priority in its current reporting. Another major deposit is Sams Creek, which Perth-based MOD Resources Ltd (ASX: MOD) has upgraded to a resource of more than one million ounces, but the 80% owner has placed it on the market. Prof Craw said despite all the tough times the Macraes mining centre has been a success story and is working on a resource and production of 10 million oz. Most of it is disseminated ore of low grade. The Macraes mine was producing about 200,000 oz per annum, with the Frasers open pit and Coronation mine, with the Coronation North mine now gaining resource consents. The Frasers Underground produces about 50,000 oz pa at a grade of +2 grams/tonne gold, helped by some high grade reefs at depth. Prof Craw said the first 10 years at Macraes were challenging with the complex refractory ore causing erratic recoveries, sometimes in the 60% range, but introduction of an autoclave changed that with gold recoveries lifting into the 88% range. (The autoclave was also a catalyst for developing the Globe-Progress mine at Reefton and sending a concentrate to the Macraes process plant).

Prof Craw told delegates that thanks to Macraes Orogenic ore hard rock mining in Otago has passed 10 M oz to eclipse the largely historic alluvial gold mining which has produced about 8 M oz. He cited gold in several sequences and now, thanks to warmer climate gold mineralisation in the Southern Alps previously masked by ice and snow were now evident. They appear to be small but field studies have indicated visible gold. He told NZ Resources that while gold in graphitic schists were profound the commercial potential for graphite in the region was unlikely because it was minute in size and very low grade, compared to graphite deposits being pursued in Australia and elsewhere overseas.

OceanaGold has been studying the recovery of tungsten at Macraes and Prof Craw commented that recent data shows the scheelite deposits were larger than the gold. “It’s been a 30 year technical challenge (at Macraes) but I think it’s a success story,” he said.

An earlier presentation by Otago Universities Doug Mackenzie also covered the Otago gold geology and he pointed to the growing exploration focus away from Macraes in the Otago Schists. A new Otago explorer is New Age Exploration Ltd (ASX: NAQ) which is currently undertaking field work including mapping, and shallow sampling. Dr Mackenzie is a consultant to New Age Exploration on its two permits in the southern Otago Schists on generally greenfield targets.

Dave Craw and Doug McKenzie.

Geoscientists warm to Otago gold

Looking out for Waihi’s dogs and cats

The mining and exploration quest in and around Waihi involves a high degree of social licence. A consultant to OceanaGold Corporation (TSX & ASX: OGC) working on the Waihi operations, Rick Streiff, told yesterday’s opening day of the Gold17 Conference that in Waihi the big Martha open cut mine has operated in the town and that the latest underground operations go underneath some housing. Streiff, who also undertook work for previous owner Newmont Mining, said it was clear from the outset that the mining companies needed to listen to the concerns of Waihi’s townsfolk and he believes this has been a successful operation.

There were some challenges for exploration including when operating teams needed to undertake CSAMT work to enhance underground targets that the mining near houses did not create any problems. This took in looking out for dogs and cats.

There were noise issues that needed to be covered, including encasing drill rigs in containers to mute the noise and to ensure at night functions such as not using hammers on drill steels or rods. Modern gold mining at Waihi began in late 1980s with a pit at Martha over the original underground mines and this was originally operated by a joint venture of US and Australian companies, then taken over by Normandy Mining before that big Australian

Rick Streiff.
company was taken over by Newmont, which in turn sold Waihi to OceanaGold in 2016. Rick Streiff said that following on Martha’s development, underground discoveries to follow included Moonlight-Favona, Trio and the 2009 discovery of Correnso, now the current mining focus. Discovery of Correnso came about when exploration near the Reptile Vein came across an intersection that appeared to be “something else.” Ongoing exploration outlined Correnso as a significant target and there was excitement with an intercept of 11.5 metres grading 17 grams/tonne gold.

Major Faults/Faults

Interval dominated by major, continuous BIF units
Variant of Bd that contains strong linear magnetic
mag units that may be minor BIFs, cherts or basaltic layers

BANDED IRON FORMATION - quartz-magnetite with silicate-sericite schists
ACID VOLCANICS - undifferentiated, including some quartz

OUTCROP GEOLOGY

0-50ppb Au
50-100ppb Au
25-50ppb Au
0-25ppb Au

Smart use of smart technology and data

The AIG Victoria branch will hold their annual conference on Friday 13 October 2017 on the smart and successful use of innovative technology and data.

This conference provides the opportunity for geoscientists who have made smart discoveries using smart technology to showcase their results.

The conference additionally provides the opportunity for innovative companies to showcase their smart products.

For further information and to register your interest please contact:
Rodney Boucher
Phone: 0417 506 051
Email: rodney@linex.com.au

Download review the full abstract at https://tinyurl.com/aignews128-streiff
Make the most of your AIG Member Benefits

Your AIG Member Advantage program, provides you and your family with unlimited use on an extensive range of financial and lifestyle benefits, allowing you to save on everyday items, including:

**Dining**
Enjoy great savings on dining at selected restaurants. Offers include 2-for-1 dining or a discount off the total bill.

**Entertainment**
Choose from hundreds of entertainment providers offering discounts across Australia and New Zealand.

**Hotels & Accommodation**
Access over 100,000 promotional deals and competitive rates on accommodation options worldwide.

**Car Hire**
Obtain either reduced car hire rates or excess in Australia and New Zealand with leading car rental companies.

For more information, visit www.memberadvantage.com.au/aig or call AIG Member Advantage on 1300 853 352

---

AIG Edumine Campus

AIG’s dedicated Edumine Campus provides members with world leading Continued Professional Development opportunities

The Australian Institute of Geoscientists (AIG) has reached agreement with EduMine to establish an AIG Edumine Campus that will provide members with access to an extensive range of continued professional development (CPD) resources in the form of structured learning programs, able to be undertaken by members on-line, anywhere, at any time, and seminars streamed live from several locations around the world that provide participants with the opportunity to interact, in real time, with other participants and the course leader.

The establishment of the campus is an important development in AIG’s provision of CPD opportunities that complements traditional offerings in the form of highly accessible and affordable conferences, seminars and informal lectures and talks regularly presented by AIG state branches throughout Australia.

In working with EduMine to establish the campus, AIG joins a small, select group of leading professional institutes who have taken this step for the benefit of members.

Who are EduMine?
EduMine is a division of Infomine Inc, a global leader in the provision of geoscience and mining information services. EduMine is Infomine’s professional education division established specifically to provide specialised CPD opportunities to geoscience and mining professionals and allied mining industry personnel. EduMine offers a wide range of structured courses covering a wide range of topics relevant to geoscientists working in all sectors of the profession. A unique aspect of many of EduMine’s courses is that they can be used as credit towards the award of formal postgraduate qualifications in mining by selected universities, in conjunction with lectures and research assignments. AIG has agreed that EduMine short courses nominated by AIG may be used as credit towards satisfying CPD requirements of the Registered Professional Geoscientist (RPGeo) programme.

AIG has had an affiliate agreement with EduMine for several years, whereby members have been entitled to a 10 percent discount on enrolment and course certification fees. EduMine are not covered by the Campus agreement. Access to these will continue to be available to all AIG members at 10% discount of the normal seminar registration fee. In working with EduMine to establish the campus, AIG joins a small, select group of leading professional institutes who have taken this step for the benefit of members.

Subjects covered by EduMine courses
There are currently more than 150 short courses, accessible on-line, 24 hours per day, seven days per week, enabling members to undertake CPD when they want, whenever they happen to be. Courses provided by EduMine also cater for a range of levels of experience, from new graduates launching their careers to seasoned professionals seeking to expand their existing knowledge. Topics covered range from technical subjects spanning a variety of geoscientific fields, to issues becoming increasingly important to geoscientists particularly in the exploration sector such as building relationships with community stakeholders and earning a social licence to operate. There are also a range of courses covering geotechnical and mining engineering, and coal and minerals processing, that enable geoscientists to expand their knowledge of these fields and better equip themselves to work with professionals from other disciplines. New courses are being added to the catalogue constantly.

Lectures and courses are streamed live from several leading universities, in conjunction with conferences and seminars, and are available to all AIG members at a 10% discount of the normal seminar registration fee.

EduMine also assists members interested in developing and presenting courses commercially to do so using the EduMine platform, assisted by EduMine staff, with the dual aims of increasing the course content with an Australian flavour, and providing members with the ability to both share and commercialise their skills and experience with a global audience.

---

For more information, visit www.memberadvantage.com.au/aig or call AIG Member Advantage on 1300 853 352

---

© istockphoto.com
Enrolment

Members who wish to access the campus will be required to enrol, and will be provided with a student ID that provides access to all EduMine content.

Enrolment is not available to Student or Associate Members.

There will be an enrolment fee of, initially, A$100 per year, paid to AIG, which represents a discount of more than 75 percent on standard enrolment fees offered to individuals by EduMine. The enrolment fee is intended to help ensure the long term financial viability of the campus program.

Members must enrol through their member portal. This will take you to this screen. (Fig. 2)

Click on Apply/Resubscribe EduMine now. That will take you to a payment portal. Once payment is confirmed, the EduMine campus is notified and they send an email with your login details.

Accessing the campus

The AIG EduMine campus will be accessed through www.edumine.com/campuses/aig. Members who complete a course are also requested to pay a nominal fee for assessment of course outcomes and certification of course completion. Certification is required if CPD hours are to be claimed as credit towards maintaining registration, and is recommended by AIG to all members who complete CPD work through the campus as a means of demonstrating completion of voluntary, self initiated CPD activities.

The Perth Secretariat office will coordinate enrolment for members and communication between AIG and EduMine. EduMine staff will also be available to help with any issues that may arise with course access and completion. Training covering how to both access and maximise the benefits of on-line courses offered through the campus will also be provided.

Enrolment applications may be lodged on-line through the AIG web site. Enrolment details will be provided by email when applications are processed and personal access to the AIG campus has been established.

Supporting Geoscientists

The AIG Council believes that establishment of AIG’s EduMine campus is an important initiative that delivers additional benefits to members and adds to the high quality, relevant range of CPD resources provided to members. The initiative directly targets CPD, which is at the core of being a professional. The campus also tangibly supports members who have elected to have their personal CPD efforts independently verified through AIG’s Registered Professional Geoscientist (RPGeo) programme with affordable, accessible resources needed to meet their CPD commitments, and will ideally, provide more members with the incentive to take up registration.

Enrolment is not available to Student or Associate Members.

There will be an enrolment fee of, initially, A$100 per year, paid to AIG, which represents a discount of more than 75 percent on standard enrolment fees offered to individuals by EduMine. The enrolment fee is intended to help ensure the long term financial viability of the campus program.

Members must enrol through their member portal. This will take you to this screen. (Fig. 2)

Click on Apply/Resubscribe EduMine now. That will take you to a payment portal. Once payment is confirmed, the EduMine campus is notified and they send an email with your login details.

Accessing the campus

The AIG EduMine campus will be accessed through www.edumine.com/campuses/aig. Members who complete a course are also requested to pay a nominal fee for assessment of course outcomes and certification of course completion. Certification is required if CPD hours are to be claimed as credit towards maintaining registration, and is recommended by AIG to all members who complete CPD work through the campus as a means of demonstrating completion of voluntary, self initiated CPD activities.

The Perth Secretariat office will coordinate enrolment for members and communication between AIG and EduMine. EduMine staff will also be available to help with any issues that may arise with course access and completion. Training covering how to both access and maximise the benefits of on-line courses offered through the campus will also be provided.

Enrolment applications may be lodged on-line through the AIG web site. Enrolment details will be provided by email when applications are processed and personal access to the AIG campus has been established.

Supporting Geoscientists

The AIG Council believes that establishment of AIG’s EduMine campus is an important initiative that delivers additional benefits to members and adds to the high quality, relevant range of CPD resources provided to members. The initiative directly targets CPD, which is at the core of being a professional. The campus also tangibly supports members who have elected to have their personal CPD efforts independently verified through AIG’s Registered Professional Geoscientist (RPGeo) programme with affordable, accessible resources needed to meet their CPD commitments, and will ideally, provide more members with the incentive to take up registration.

The online course Geostatistics 101 - A Practical Introduction, by Simon Houlding, has been recently revised.

Geostatistics 101 provides an introduction to the topic for anyone who needs to understand the basic principles, advantages and practical application of semivariograms and geostatistical estimation. The course is illustrated by numerous examples from mineral exploration and environmental characterization.

Please visit https://tinyurl.com/aignews128-edumine-geostats for a more detailed course description. If you are already enrolled, simply enter the course, or register for certification to gain access to the full content.
Keep up to date with upcoming AIG and Geological events at www.aig.org.au/events

**July 2017**
- **AIG-SMEDG Mining Industry Mid Year Cruise 2017**
  - July 7, 2017
  - McMahon’s Point Wharf, Sydney NSW
- **Australasian Groundwater Conference 2017**
  - July 11-13, 2017
  - University of New South Wales, Kensington NSW
- **GPIC Bendigo July 2017: Costerfield Au-Sb Narrow Vein Mine**
  - July 11, 2017
  - Basement on View, Bendigo VIC
- **GeoPub Melbourne - July 2017**
  - July 14, 2017
  - Little Mule Café, Melbourne VIC
- **Iron Ore 2017**
  - July 24-26, 2017
  - Perth Convention and Exhibition Centre, Perth WA

**August 2017**
- **Mineral Exploration 2017**
  - August 9-11, 2017
  - WMC Conference Centre, Kalgoorlie WA
- **GeoPub Melbourne - August 2017**
  - August 11, 2017
  - Little Mule Café, Melbourne VIC

**September 2017**
- **Epithermal Au-Ag and Porphyry Cu-Au Exploration - Greg Corbett Short Course**
  - September 4-6, 2017
  - Orange Ex-Services Club, Orange NSW
- **GeoPub Melbourne - 8th September 2017**
  - September 8, 2017
  - Little Mule Café, Melbourne VIC
- **An introduction to porphyry Cu-Au exploration, Orange District - Field Training Course**
  - September 9-14, 2017
  - Orange Ex-Services Club, Orange NSW
- **Tenth International Mining Geology Conference 2017 - a joint AusIMM/AIG event**
  - September 20-22, 2017
  - Hotel Grand Chancellor – Hobart, Hobart TAS
- **Fractionated Granites and Mineralisation**
  - September 24, 2017
  - Benalla Performing Arts and Conference Centre (BPACC), Benalla VIC

**October 2017**
- **Earth Science Week 2017**
  - October 8-14, 2017
  - American Geosciences Institute, VA, USA
- **Smart use of smart technology and data - One day conference**
  - October 13, 2017
  - Macedon Ranges Hotel & Spa, Macedon VIC
- **GeoPub Melbourne - 13th October 2017**
  - October 13, 2017
  - Little Mule Café, Melbourne VIC
- **13th AusIMM Underground Operators’ Conference 2017**
  - October 16-18, 2017
  - Jupiters Gold Coast, Broadbeach QLD

**November 2017**
- **Structural Geology and Tectonics Conference in Western Australia: SGTSG Denmark 2017**
  - November 8-12, 2017
  - Denmark Riverside Club, Denmark WA
- **GeoPub Melbourne - November 2017**
  - November 10, 2017
  - Little Mule Café, Melbourne VIC

**December 2017**
- **Digging Deeper**
  - December 6, 2017
  - Brisbane Convention and Exhibition Centre, South Bank QLD
AIG Council for 2017

EXECUTIVE

President: Mike Erceg  
0458 051 400, president@aig.org.au

Vice President  
vicepresident@aig.org.au

Treasurer: Peter Lewis  
treasurer@aig.org.au

Secretary: Andy Wilde  
secretary@aig.org.au

Executive Officer: Lynn Vigar  
0400 323 067, exec@aig.org.au

COUNCILLORS

Andrew Waltho  0412 426 764, andrew.waltho@aig.org.au

Brendan Howard  brendan.howard@aig.org.au

James Llorca  james.llorca@aig.org.au

Jonathan Bell  VALMIN, 0427 621 322, jonathan.bell@aig.org.au

Katarina David  0412 080 360, katarina.david@aig.org.au

Kaylene Camuti  (07) 4772 5296, education@aig.org.au

Patrick Maher  patrick.maher@aig.org.au

Tim Craske  tim.craske@aig.org.au

Timothy Pippett  timothy.pippett@aig.org.au

Robert Findlay  robert.findlay@aig.org.au

Wayne Spilsbury  0418 957 089, wayne.spilsbury@aig.org.au

REGISTRATION BOARD

Sam Lees  0412 252 518, rpgeo@aig.org.au

COMPLAINTS COMMITTEE

Tim Craske, complaints@aig.org.au

ETHICS & STANDARDS COMMITTEE

Michael Edwards  0419 997 778, ethicsandstandards@aig.org.au

EDUCATION COMMITTEE

Kaylene Camuti  (07) 4772 5296, education@aig.org.au

MEMBERSHIP COMMITTEE

Patrick Maher  membership@aig.org.au

LEGAL COMMITTEE

Andrew Waltho  0412 426 764, andrew.waltho@aig.org.au