Australian Institute of Geoscientists

# AIG NEWS

Quarterly Newsletter No 92 May 2008

# LARGEST MINERALS CONFERENCE COMES TO PERTH IN JULY 2008

## Resources — Foundation for our Future

## Australian Earth Sciences Convention 2008

**Perth Convention Exhibition Centre**

**(easy walking distance from Perth's major hotels and transport facilities)**

As part of a full program on New Generation Advances in Geoscience. 450 papers and 60 posters will be presented over four days from 21 to 24 July 2008. Presentations come from Australasian university students, researchers, Australasian government organisations including Geoscience Australia, CSIRO, and leading industry explorers, miners and their service companies.

### Major Resources Themes are:

- **Precompetitve geoscience information — a window into the future**
- **Being smarter with our data**
- **Mineral exploration strategies and technologies**
- **Ore systems and metallogenesis**
- **Mineral commodities**

### Fieldtrips

#### Pre-convention Trips

- Paleozoic Geology of the Canning Basin
- Archean Crustal Evolution and Mineralisation of the Northern Pilbara Craton
- Eastern Goldfields Superterrane, Yilgarn Craton

#### Post-convention Trips

- Geology of the Halls Creek Orogen
- Kalgoorlie, Youanmi and Narryer Terranes of the Yilgarn Craton
- Kalbarri — A Ramble Through the Red-Beds, and more
- Mines and Wines of South-west Western Australia

#### Day Trips

- Geology and Landforms of the Perth Region: Pre-convention
- Geology and Landforms of the Perth Region: Post-convention
- Meckering Fault Scarp
- Of Cores — WA in a Day

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## INSIDE THIS AIG NEWS:



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# Resources — Foundation for our Future
# Australian Earth Sciences Convention 2008

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## Workshops

- *Workshop 1:* Drafting Public Reports that Conform to the JORC Code
- *Workshop 2:* Crustal History and Tectonics of the Northern Tasman Orogenic Zone
- *Workshop 3:* The Precambrian Timescale: Issues and Possible Changes
- *Workshop 4:* Core Logging — Observing, Measuring and Interpreting Structural Elements
- *Workshop 5:* Earth Caching: Combining geoscience, learning and outdoor fun with the Global Positioning System and the Internet

## Registration

Online Registration: www.iceaustralia.com/aesc2008

Manual Registration: download registration forms from: http://www.iceaustralia.com/aesc2008/register.html and fax to +61 8 9381 9560, or mail to AESC

| | ONLINE REGISTRATION | MANUAL REGISTRATION |
|---|---|---|
| Standard Member | AU$850 | AU$870 |
| Standard Non-Member | AU$990 | AU$1,010 |
| Student Registration (full time students) OR Retiree Registration | AU$325 | AU$345 |
| Day Registration Member (One day only - Mon, Tue, Wed, Thur) | AU$295 | AU$315 |
| Day Registration Non-member (One day only - Mon, Tue, Wed, Thur) | AU$350 | AU$370 |

NB: All prices include GST

## Papers of Interest

Some of the papers which might be of interest to AIG members are:

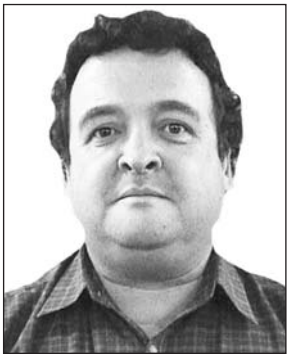
- Advances in magmatic Ni-Cu-PGE exploration geoscience: challenging dogma and developing new ideas for an evolving search space by Dr. Steve Beresford, University of Western Australia
- Gold lode deposits in Orogenic Belts of Russian Segment of the Pacific Rim, by Prof. Nikolay Goryachev
- The Tolukuma mine, PNG; the structural anatomy of a classic intra-volcanic epithermal gold system by Dr. Robert Findlay, Montagu Minerals Mapping Pty Ltd
- A new view of hypogene and supergene gold: Clues for ore paragenesis and exploration by Dr. Robert Hough, CSIRO Exploration and Mining
- Subsurface alteration associated with actively forming seafloor massive sulfide mineralisation in the Brothers Caldera, Kermadec Arc, New Zealand by Dr. Christopher Yeats, CSIRO Exploration and Mining
- The Neves Corvo (Portugal) massive sulphide deposit: depositional instability in the Lombador lens, and the origin of the sulphur by Dr. Mike Solomon, CODES
- Uranium mineralising systems: a continuum of deposit styles? By Roger Skirrow, Geoscience Australia
- Exploration for Sandstone-Type Uranium Deposits in Tertiary Palaeochannels in the South of Western Australia by Prof. Mike Dentith, University of Western Australia
- The concealed 2 Lens high-grade (>63 wt % Fe) iron ore body: product of hypogene fluids and hydrothermal fluid processes by Warren Thorne, University of Western Australia
- The giant Carajas jaspilite-hosted iron deposits: geological setting, fluid geochemistry and genetic model by Steffen Hageman, Centre for Exploration Targeting, School of Earth and Geographical Sciences, University of Western Australia. ▲▲

## If yuo cna raed tihs, yuo hvae a sgtrane mind too

Cna yuo raed tihs? Olny 55 plepoe out of 100 can.

I cdnuolt blveiee taht I cluod aulaclty uesdnatnrd waht I was rdanieg. Teh phaonmneal pweor of the hmaun mnid, aoccdrnig to a rscheearch at Cmabrigde Uinervtisy, it dseno't mtaetr in waht oerdr the ltteres in a word are, the olny iproamtnt thing is taht the frsit and lsat ltteer be in the rghit pclae. The rset can be a taotl mses and you can sitll raed it whotuit a pboerlm. Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef , but the wrod as a wlohe. Azanmig huh? Yaeh and I awlyas tghuhot slpeling was ipmorantt!

# From Your President



**THIS ISSUE OF AIG News is arriving in your letterbox at about the same time as the Annual General Meeting is being held in Perth.**

That makes this an appropriate time to look back on the year's events and discuss what challenges may be on the horizon for the geoscience profession in Australia in the coming year. Before doing so, however, I would like to express my sincere thanks to the members of the Council and State Branches, all volunteers, who as a team have made an outstanding contribution to their profession and peers throughout the year, at a time when few geoscientists generally have had much time to spare.

## AESC is the biggest ever minerals conference in Australia

Why not attend the Australian Earth Sciences Convention (AESC 2008) being held in Perth during late July?. This is the first time that AIG has partnered with the Geological Society of Australia to organise and present the convention. It is being held at the Perth Convention Centre and the resources theme alone features around 160 papers dealing with applied exploration and mining geology, making this portion of the convention in itself the most important exploration and mining geology conference being held in Australia for some time. If you haven't attended a convention before, or haven't been to one for some time, then attend this one. It will certainly be a great opportunity to get up to speed with some of the latest developments in geoscience and a superb networking opportunity. A dedicated web site www.iceaustralia.com/aesc2008/ for the convention can be accessed via a link on the home page of the AIG and GSA web sites that will be updated continuously with programme details and registration information. Opportunities remain for both exhibitors and sponsors at this major event on our geoscience calendar.

Another conference, "Drilling for Geology" is being held in Brisbane during October. This conference will cover a broad range of topics spanning the subject of collecting geological, geophysical and geotechnical data for use in exploration, mining and all fields of Earth engineering, making it a significant opportunity to gain an insight into how drilling is used in industry sectors outside our own, which may form the seed for innovation and improvements in our own, day to day work. Information about this event will appear on the AIG web site and in upcoming issues of AIG News.

## AIG does its bit to improve public announcements of exploration results

Continuing education efforts supporting effective compliance with the JORC Code by Competent Persons continued throughout the past year, with AIG either conducting, or being involved with workshops dealing with JORC code compliance in the reporting of exploration results, mineral resources and ore reserves in conjunction with the ASX. Companies updates issued by ASX that relate to issues associated with reporting have also been published in AIG News regularly to ensure that members acting as Competent Persons have access to this information. Further workshops are planned next year in both Perth and Brisbane.

A major reform of AIG's complaints and disciplinary processes was completed which resulted in a fairer and more transparent process for dealing with complaints against members on professional ethics matters, or issues associated with Competent Person compliance with both JORC and VALMIN.

## Geoscience education makes our profession sustainable

It is probably fair to say that geoscience education has been the single biggest issue on which the Institute has been focussed this year. Several major developments have resulted from this work.

A foundation has been established to fund AIG's student bursary scheme. The scheme has been running for a number of years now and has supported both undergraduate and postgraduate students completing their studies at universities across Australia. Funds to support the scheme have been sourced from both generous sponsorship by individuals, companies and government, and by AIG members generally through the Institute's operating funds. The scheme has meant that postgraduate students in particular have had the resources to enhance their studies by being able to undertake work, present the results of their work at conferences where it was subjected to peer review of communicated to a wide section of the geoscience community, or gain experience that would not have been possible otherwise. From the beginning of May, support for the bursary scheme, through the foundation, will be tax deductible, which will hopefully contribute to the scheme's support base and help to ensure its sustainability and value to the geoscience community generally.

AIG played a major role in the development of a programme to ensure that teachers in Western Australia have curriculum resources and other forms of support to ensure that geoscience has a prominent place in the school science curriculum. AIG's support for and participation in this initiative has been led by the WA State Branch. AIG's involvement in a national initiative with similar objectives, in which a number of geoscience societies including PESA and GSA will also be involved along with other supporters, is currently being negotiated.

The Australian Geoscience Council, of which AIG is a member, has also been active in the geoscience education field throughout the year, focussing on how to improve the resourcing and sustainability of geoscience departments at Australian universities. This process was catalysed by a forum held in Canberra, with the support of Geoscience Australia during September, that I was fortunate to attend and gain a much clearer understanding of the complexity of issues affecting tertiary geoscience education in Australia. The forum made a number of significant issues very clear, including:

- Government support and funding of Tertiary geoscience education in Australia is woefully inadequate. Geoscience, partly because it needs to be a field based form of education and requires specialised resources if it is to be taught meaningfully, and the current funding model does not adequately account for this.
- Most geoscience departments survive due to the personal support of enlightened Heads of School or Vice Chancellors who divert funds from other strands of teaching because they

*Cont. on Page 5*

# From Your Editor

Another AIG News issue and this issue's emphasis is the Australian Earth Sciences Convention in Perth during late July 2008 with a summary of the main events features on the front page, and a large flyer insert for the Resources Sector. Registration forms can be downloaded from the ICE website as well.

The second paper of the Stratigraphic controls on Structures and Mineralisation in Central Victoria deals with Ballarat East. Seems we have found another impact crater in Western Australia from Googling, though we wonder how much Googling is actually of a productive nature rather than being a diversion.

A letter to the Editor spells out fairly plainly what the problem in geoscience education is about and there is a general interest story about a novel exploration sampling method involving sniffer-rats?

The UK is pretty well known as the home of climate alarmism and now they have elected a climate-change sceptic, Boris Johnson, as Mayor of London. Still on climate and Bioscientist Walter Starck comments on an interesting set of graphs concerning climate data and fish stocks. As my email in-folder is getting some discussion about these graphs from a group of climate-chnage sceptical geologists, the main thread being the source of energy for the observed periodicity in the data, it does seem we have but only started to scratch the surface, and anthropogenic glocal warming is quickly unravelling as do all pseudoscientific theories with time. Dr Walter Starck has a PhD in marine science including post-graduate training and professional experience in fisheries biology.

The next AIG News will be after the AESC 2008 event, when we will report on proceedings. ▲▲

# From Your President

*Cont. from Page 3*

recognise the need for and value of geoscience education generally.

- Most students entering university have no exposure to geoscience at high school or even primary school level. The inherent uncertainty that results from this in the minds of prospective students is no encouragement to even take a glimpse of what geosciences have to offer.
- Tertiary students in Australia, on the whole, will not travel to undertake study. We need to maintain a solid geoscience capability at as many universities as possible.

There is no doubt that increasing student numbers undertaking geoscience studies would help. We have probably been promoting geoscience in a way that has turned many prospective students away by not appealing to their aspirations. Neil Williams of Geoscience Australia made the point at the AGC forum that young people today aspire to make a difference. They want to make a positive contribution to their world by making it a better place.

Trevor Powell, the current AGC President, has devoted many hours of work to ensuring that developing strategies to address this issue retain traction on a number of fronts.

Geoscience education, first and foremost, is about developing a thorough understanding of Earth systems, interactions and processes. These core skills are valued by the exploration and mining industry because mineral deposits and energy resources are the products of these interactions in their most complex form. These skills are just those needed, however, to understand the processes that shape our environment, climate and utilisation of resources beyond minerals, coal and oil to groundwater and soil. Most importantly, at least in my opinion, is that geoscientists understand the scale and time frames in which Earth interactions occur. The temporal aspect of these processes is something that many scientists trained and experienced in other disciplines have no concept of and do not adequately take account of in interpreting observations and other data.

Put bluntly, if we don't continue to develop and sustain the pool of geoscientific knowledge and skills available to the community as a whole, we're stuffed. It's about time both State and Federal governments got this message. I find it particularly frustrating that politicians of all persuasions, in government or in opposition, don't seem to be able to get this.

## AIG needs your input

Initial implementation of the new AIG web site was also completed during the year. Content will be added progressively over coming months and feedback from members on the features that would be of value on the web site are being actively sought. A number of requests have been received for re-instatement of the AIG Journal web site, which was originally developed to provide members with a means of rapidly publishing applied geoscience papers and technical notes, have been received, and this is currently being looked at.

Merger discussions between AIG and GSA also continued, albeit at a relatively slow pace, throughout the year. The next step in this process would involve preparation of a detailed model of how a merged entity could be constituted, in order to develop a concept that could be considered by both GSA and AIG members.

Clearly there's a lot happening. We all benefit from the work AIG does being timely and relevant. No small part of AIG's success is its ability to represent members interests strongly and effectively. If there's something you think that AIG should be doing and isn't, or if you have any suggestions relating to AIG activities then don't hesitate to phone the Secretariat office in Perth, talk to your local state branch or contact a Councillor. For example, are there aspects of how JORC is being applied that you're not comfortable with, is there a policy issue that you feel isn't being addressed, is there something that you'd like to see on the web site, a seminar or conference suggestion, or is there a need for more communication with members to supplement AIG News? You have the floor.

Andrew Waltho

For the latest in Geoscientist news, views, codes, events, employment and education visit the AIG website:
**www.aig.org.au**

# Stratigraphic Controls on Structures and Mineralisation in Central Victoria 2: Ballarat East

**R. K. Boucher, Linex Pty Ltd & La Trobe University**
**D. J. Osborne, LGL* Ballarat Goldfields**
**P. B. d'Auvergne, LGL* Ballarat Goldfields**
* Lihir Gold Limited

## Abstract

This is the second in a series of papers discussing the stratigraphic controls on structures and gold mineralisation in Victoria. Ballarat East does not have the thick shales and very coarse-grained sandstones that occur at Bendigo. Ballarat East has different structural styles as well. Although factors such as depth of burial and the number and magnitude of deformation events must be taken into account, stratigraphic contrasts between the two areas can help explain the differences in structural style.

## Introduction

Central Victoria is a world class orogenic gold province. Faults and folds within Ordovician turbidites host gold and associated mineralisation. Turbidites occur across most of Victoria and in the field comprise monotonously interbedded sandstones and shales, although facies variations and lateral discontinuity of individual beds are characteristic at a local scale. At Ballarat nuggety gold is hosted by quartz veins within fault-related structures. Ballarat is one of the largest goldfields in Victoria, with a recorded production of 12 million ounces of gold, from Ballarat East, Ballarat West and Nerrina (Little Bendigo). LGL Ballarat Goldfields operation is continuing efforts to reopen the Ballarat East goldfield after merging with Ballarat Goldfields NL in 2007. This paper discusses the geology of the southern end of the Ballarat East goldfield. The Nerrina goldfield will be considered in a later publication in this series.

This study of the Ballarat East goldfield (Fig. 1) follows a review of the Bendigo goldfield by Boucher et al., (2008). Linex Pty Ltd was engaged by Ballarat Goldfields to review its logging and interpretation systems in 2004. The sedimentological core logging system established at Fosterville and Bendigo was adopted and correlation and interpretation roles were added as integral parts of the geologists' duties. In doing this, a career path was created for core logging geologists, enabling them to graduate from core logging to interpretation. The primary author assisted in setting up these roles and much of the data and concepts used in this paper are drawn from the ongoing work of LGL staff.


*Figure 1. Location map showing the turbidite-hosted deposits discussed in this series of papers.*

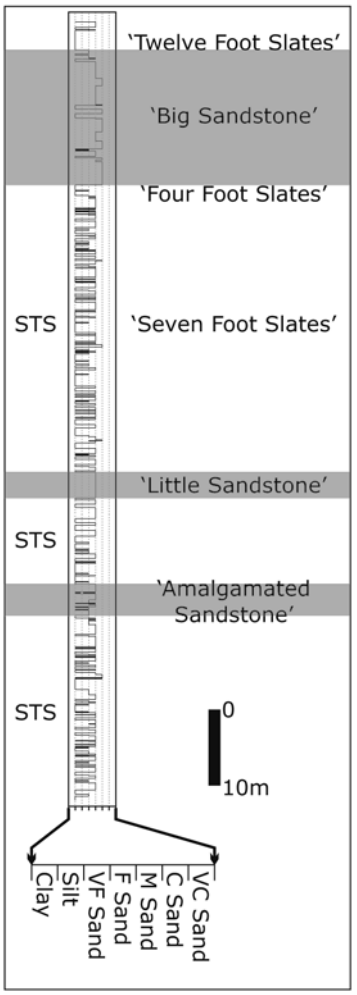



*Figure 2. Composite stratigraphy from 200m north of the Woolshed Gully Decline portal. The rocks are mostly monotonous 'shale-topped sands' (STS) with the notable exception of the 'Big Sandstone' which hosts quartz veins, particularly where cut by west-dipping faults. Smaller sandstone units have been defined and mapped because they host quartz veining and gold mineralisation.*

## Ballarat East stratigraphy

The mine stratigraphy at Ballarat East (Fig. 2) is a monotonous succession of 'shale topped sands' (STS). Unlike Bendigo (Boucher et al., 2008) and elsewhere in Victoria, thick shales are rare and there are no very coarse grained sands.

The most notable unit within the stratigraphy is the 'Big Sandstone' which provides an important stratigraphic marker and as discussed later, is economically important also. The 'Big Sandstone' is interpreted to have been deposited in a channel environment and, like channel sands elsewhere in Victoria, is up to 10m thick. The 'Big Sandstone' thins towards the north and is not seen in the northerly drill sections. In contrast to channel sands elsewhere in central Victoria, there are no very coarse-grained sands in the 'Big Sandstone'. Instead, it is mostly medium-grained with occasional coarse-grained sandstone which distinguishes it from the fine- and very fine-grained sands elsewhere. The grain size of these channel sands is thought to be related to the provenance of the sediments.

As well as the 'Big Sandstone', two additional sand packages have been recognised (Figs 2 & 3). While the 'Little Sandstone' and the 'Amalgamated Sandstone' are not true channel sands, they are sufficiently thick and characteristic to be correlated. Additionally, they are good hosts for veining and associated gold mineralisation and as a result, effort is made to predict their location for drill targeting.

Thick shales are notably rare at Ballarat East. At Bendigo (Boucher et al., 2008) and elsewhere in Victoria it is common for shale successions to exceed 10 m. The thickest shale that occurs at Ballarat East is the 'Big Slate' which is up to 15 m thick in the northern section of the goldfield but is absent from the southern part (Fig. 2). Elsewhere in Victoria, including the adjacent Ballarat West goldfield, thick shales are good hosts to bedding parallel, laminated quartz veins. As there are no thick shales, Ballarat East does not have significant laminated quartz veins. Historically the 'Twelve Foot Slates', the 'Four Foot Slates' and the 'Seven Foot Slates' (Fig. 2) have been recognised

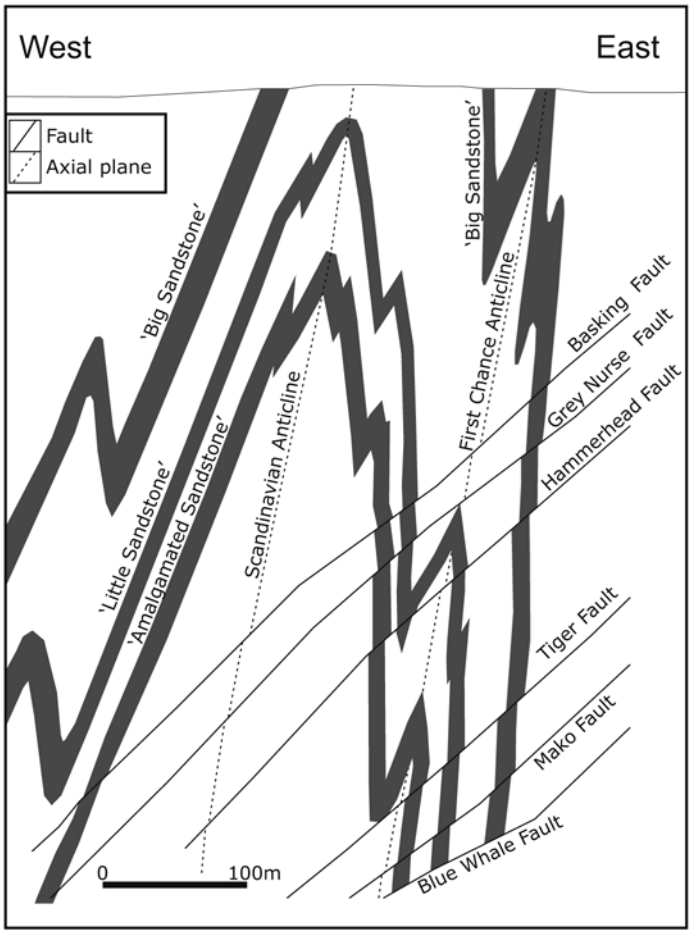



*Figure 3. Cross-section showing correlatable sand packages that provide the best host for tension veins where cut by west-dipping faults. These faults commonly have displacements less than 5 m. The notable exception is the Blue Whale Fault which has more than 100 m displacement.*

as mappable units to assist geological interpretations. However, these units are significantly thinner than shales elsewhere and commonly have thin sands within them.

'Indicators' are significant gold hosts at Ballarat East and were historically important. The general consensus is that they are thin (<1cm), bedding parallel faults. Reconstruction of the stratigraphic position of several indicators described by Lidgey (1894) shows that they occur within STS successions. The primary author suggests that indicators are thinner analogues of laminated quartz veins that occur in environments where there are no thick shales and where some bedding-parallel slip occurred during folding.

## Stratigraphic controls on the development of veins, faults and folds

The vein types at Ballarat East are shown in Figure 4. Most quartz is related to west-dipping faults, often referred to as 'leatherjackets' in the historic literature. Quartz occurs on fault planes but more commonly as tension vein arrays. Tension veins also occur on faulted bedding contacts especially on the boundaries of thick sandstones. Cleavage is strongly developed and axial planar in shaly beds and fine sandstones, but only weakly developed in medium- to coarse-grained sandstones, where it is usually convergent (west-dipping).

At Bendigo, thick shales host laminated quartz veins that often culminate at anticlines to produce a variety of reefs (Boucher et al., 2008). Thick shales and prominent laminated quartz veins are absent from the southern portion of the Ballarat East goldfield and reef development within anticlines is rare (Fig. 3). However, the 'Big Slate' develops further north and more work is being done to establish the nature of the veins within this unit. Without multiple thick shales, the opportunity for numerous laminated/bedded veins like these at Bendigo (Boucher et al., 2008) is low at Ballarat East.

Thick, amalgamated channel sands are favourable sites for vein development. Brittle failure occurs in the thick sands and accompanying vein development is common, especially near faults. The 'Big Sandstone' was extensively stoped historically where intersected by west-dipping faults and along its margins. Similarly, the 'Little Sandstone' and 'Amalgamated Sandstone' are favourable sites for brittle deformation and vein formation that develops where high competency contrasts occur around thick sand beds. Interestingly, it was only the east limb of the folds that were worked and only where they remained dipping to the east and not overturned. Early stratigraphic/structural targeting success intersected a location where folded sandstones were intersected by a west-dipping fault and intersected 30 metres @ 24 g/t gold (Ballarat Goldfields, 2005).

## Folding and fault styles at Ballarat East

Folds at Ballarat East are upright to overturned chevron folds with axial surfaces dipping steeply to the west. Folds are asymmetrical and possess parasitic folds that locally develop and separate into large individual folds. Hinge lines plunge gently to the north or south and adjacent anticlines sometimes plunge in opposite directions. Folds are generally tight with an interlimb angle of 20°. A notable feature of the Ballarat East goldfield is the presence of steeply dipping, conjugate, bedding oblique faults (crosscourse faults) that show strike-slip and dip-slip displacement of up to 100 m.

Bedding parallel fault styles at Ballarat East are different to Bendigo. Bendigo faults are linked systems of laminated quartz veins and thrusts that propagate from fold hinges and truncate fold limbs. They dip both to the west and east and have moderate displacement, likely exceeding 40 m (Boucher et al., 2008). Ballarat faults do not appear to track fold hinges, are dominantly west-dipping and have offsets that rarely exceed 20 m (Fig. 3). Brittle failure at Bendigo occurs incipiently from slip within thick shales and hinge dilations. However, without thick shales and coarse sands at Ballarat East, there is less opportunity for this type of strain accommodation and the folds are consequently tighter. Additional factors such as depth of burial and the number and magnitude of deformation events also probably exerted some influence.

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# Stratigraphic Controls on Structures and Mineralisation in Central Victoria 2: Ballarat East

*Cont. from Page 7*

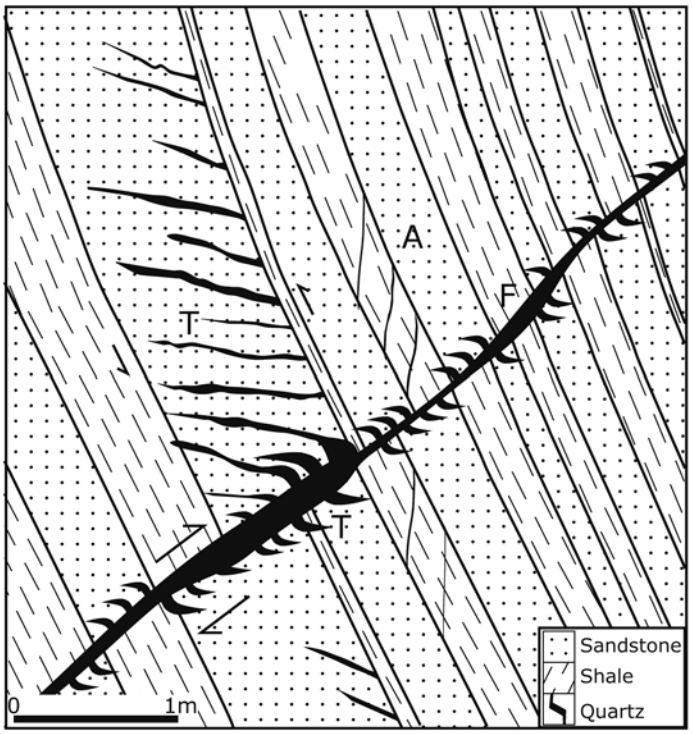


*Figure 4. Lithological and structural controls on quartz veins at Ballarat. Veins occur on faults (F), as tension vein arrays (T) and aligned with axial planar (A) cleavage.*

## Conclusions

The southern portion of the Ballarat East goldfield is a thick succession of shale-topped sands containing a single channel sand (the 'Big Sandstone') and no thick shales. To the north, the 'Big Slate' thickens to 15m. The simplest conclusion is that with more uniform facies, the folds at Ballarat East continued to yield homogeneously and have tighter interlimb angles. Subsequent brittle failure was initiated by west-dipping faults, minor bedding parallel shearing and crosscourse faults. As a result, gold is concentrated in different structural positions at Ballarat; namely in west-dipping faults and vein arrays associated with bedding parallel shears. Whereas, at Bendigo, the gold is commonly found near fold hinges. ▲▲

## Acknowledgments

Steve Olsen is gratefully acknowledged for establishing the logging and interpretation work at Ballarat Goldfields in 2003 and for providing the support and enthusiasm that allowed it to be developed. Numerous staff geologists diligently compiled detailed stratigraphic logs for analysis. Hamish Forgan, Tim Fogarty and Angela Steenhuis were instrumental in developing the interpretations. Rod McKenzie, Craig Stevens, Brad Cox and Charles Carnie provided fruitful discussions on geology, data collection and interpretation. Thanks to Allan Rossiter for assisting with the final editing.

## References

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Boucher, R. K., Fraser, R. M. & Hill, R. L., 2008. Stratigraphic controls on structures and mineralisation in central Victoria 1: Bendigo. AIG News 74:21-23.

Lidgey, E., 1894. Report on the Ballarat East Gold-field. Geological Survey of Victoria. Special Report. 16pp.

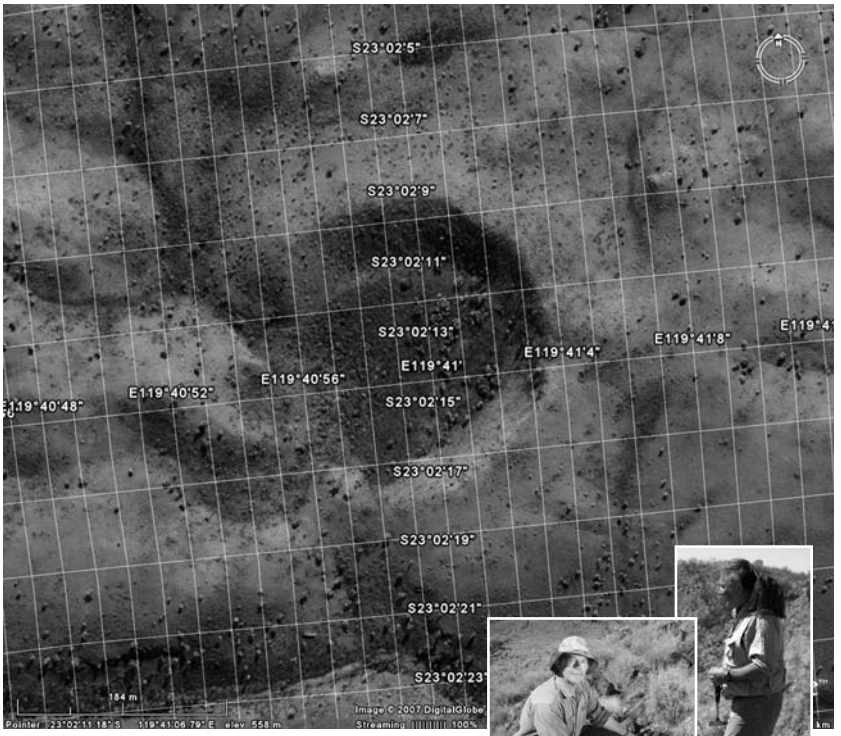
# Crater-Googling

**IT SEEMS GOOGLE-EARTH played a part in the discovery of a crater in the Pilbara region by intrepid geoscientist, Arthur Hickman.**

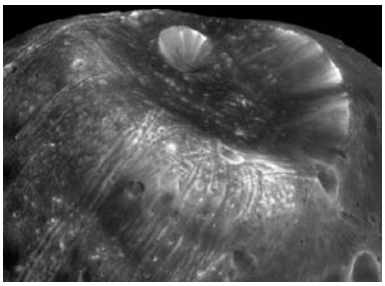
He and fellow geoscientists Andrew Glikson and John Vickers have jointly submitted a paper about it to the Australian Journal of Earth Sciences.

This new crater is interpreted as a meteorite impact crater and assumed similar to the famous Barringer Crater in Arizona, USA. However no meteoric fragments have been found so further field work is planned for the 2008 dry season to find evidence; Geological dating the crater is also a priority.

Others craters are Wolfe Creek Crater in the Kimberley region and the Stickney crater on Phobos, a satellite of Mars, below. The last one is a little odd as it is half the size of Phobos itself. ▲▲




*Right: Arthur Hickman*
*Far Right: Andrew Glikson at Crater 2*



*Stickney Crater on Phobos*

*Wolfe Crater, Kimberley*

*Panorama shot of the new crater*

# Climate Change and the Commercial Fishery: A Note from Walter Starck

**Walter Starck PhD., Bioscientist, Townsville, Australia**

**Copied from the Jennifer Marohasy blog)**

I have never seen a more succinct and telling argument to refute carbon dioxide-governed climate change than the following graph from a study by L.B. Klyashtorin published as a technical paper by the United Nation's Food and Agricultural Organisation.

The study entitled '*Climate change and long term fluctuations of commercial catches: possibilities of forecasting*' concludes that 60-year climate oscillations correspond to the regular fluctuations of the populations and catches of the main commercial fish species.

"Analysing roughly 30-year alternation of the so-called "climatic epochs" characterised by the variation in the Atmospheric Circulation Index (ACI), the study revealed two ACI-dependent groups of major commercial species correlated positively with either "meridional" or "zonal" air mass transport on the hemispheric scale.

"Climate periodicity serves as a basis for a predictive model of the population and catches of major commercial fish species. The model has two basic limitations.

(1) It is applicable to the abundant fish species only (commercial catch > 1.0 – 1.5 million tons) yielded over large areas, such as the North Pacific or North Atlantic as a whole;

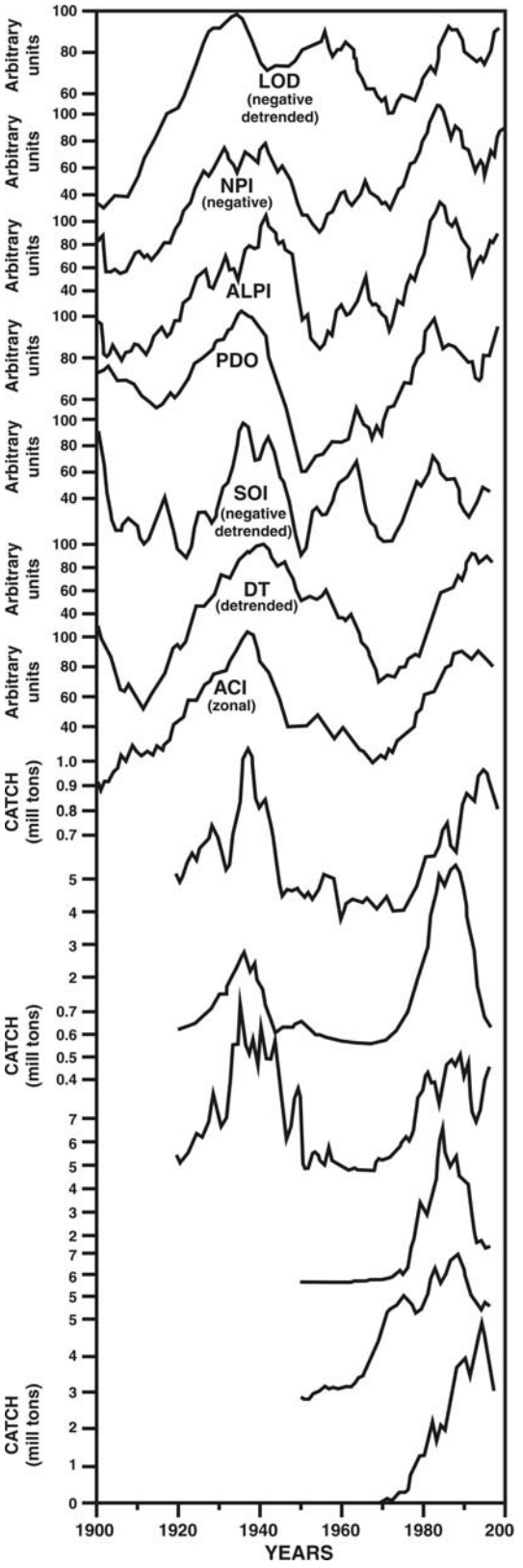
(2) The model is intended to analyse and forecast the long-term trends in the population of major commercial species with the assumption that the general intensity of commercial fisheries will stay at its average level over the last 20 – 25 years.

"The concept of generating forecasts of anthropogenic climate change and consequent changes in fish production is beyond the scope of this study. However, there is a clear link between fish production and climate, so projecting future climate changes is of importance. Not only can climate be used to forecast commercial fish yields, but also it may be possible to estimate general changes in biological production on the global scale. It is therefore important to maintain databases on routine fisheries data and climate indices in the long term, in order to track these critical processes."

This study trashes most of the classic examples of fishery collapse due to overfishing. Incidentally, the Pacific Decadal Oscillation (PDO) has this year switched into its cooler phase.

Anthropogenic global warming (AGW) catastrophists are now belatedly accepting natural influences on global temperature to explain the current cooling. If natural cooling is possible then warming must be also and a similar amount of natural influence to that now being attributed to cooling would reduce the greenhouse contribution to the previously observed warming to little or nothing. AGW is beginning to look like the more and more convoluted epicycles invented to maintain the geocentric theory before it finally had to be abandoned. ▲▲

(from http://www.fao.org/DOCREP/005/Y2787E/y2787e1l.gif)




LOD - Length of Day - index of changes in the Earth's rotational velocity

NPI - North Pacific Index - averaged sea level atmospheric pressure over the North Pacific (smoothed by 13-years averaging)

ALPI - Aleutan Low Pressure Index - area (in sq.miles) bordered by isobar 100.5 kPa over the North Pacific (smoothed by 13-years averaging)

PDO - Pacific Decadal Oscillation - long tern change of sea surface temperature for the North Pacific (smoothed by 13-years averaging)

SOI - Southern Oscillation Index- East-West atmospheric pressure difference along the equator, measured between Darwin and Tahiti (smoothed by 13-years averaging)

dT - Global air surface temperature anomaly (smoothed by 13-years averaging)

ACI - Atmospheric Circulation Index - long term dynamics of "zonal" atmospheric circulation

## References

Klyashtorin L.B. 2001. Climate change and long term fluctuations of commercial catches: the possibility of forecasting. FAO Fisheries Technical Paper 410, 98p. FAO (Food Agriculture Organization) of the United Nations, Rome.

# Stratospheric Compensation Model of Climate Change

David R.B. Stockwell
April 22, 2008

**CURRENT ATMOSPHERIC general circulation models (GCMs) do not explain well the measured asymmetries in decadal trends of atmospheric temperature.**

While surface temperatures are increasing by 0.2C/decade, temperatures 2-12km above the surface are increasing at only 0.1C/decade, and strongly decreasing in the stratosphere. Current GCMs do not show such strong altitudinal asymmetry, predicting up to 0.4C/decade from 0-14km [1]. The asymmetry in hemispherical rate of warming (UAH +0.21 vs +0.07 K/decade) is also not seen in major atmospheric models [2].

Possible explanations of these and other global warming asymmetries can be found in simple equations from the new atmospheric model of Miskolczi [3]. This semi-transparent model of the atmosphere (STA) includes an expression coupling surface and stratospheric temperatures, called stratospheric compensation (SC). In SC, stratospheric temperature varies inversely with surface temperatures. Thus, SC provides a mechanism for exotic solar effects on the stratosphere, through effects on ozone formation and depletion.

The effect has opposite polarity to radiative forcing by ozone. While this is a controversial explanation for warming, it is not inconsistent with the IPCC view — a likely discernible human influence on global climate.

### 1. Constant GE ( $\tau = 1.87$, [3] Fig. 13)

"The system has an optimal infrared optical thickness ( $\tau \simeq 1.87$) which is assuring the most effective cooling of the system. If you put $CO_2$ into the atmosphere, the system will remove $H_2O$ or other greenhouse gas from the atmosphere to keep this 1.87 optical thickness. This means that the global average surface temperature can not change. The only way to increase or decrease the surface temperature is via the $F_0 + P_0$ (Insolation + Geothermal flux) term. In other words, to change the surface temperature either the solar constant, or the system albedo must change - (we neglect $P_0$)." Dr Miskolczi, Heartland Institute New York Climate Change Conference, 4th March 2008.

Unlike the conventional infinitely-thick atmospheric model (ITA) that predicts increasing temperatures with increasing $CO_2$, the STA model has an almost constant troposphere temperature and constant greenhouse effect (GE). Miskolczi believes the classical Eddington ITA model of stars [4] has been erroneously applied to Earth. While most predictions of the STA model are in excellent agreement with the observed atmosphere [3], compared with the IPCC range of +2K to +5K [5], the STA predicts a very low sensitivity of +0.24K to CO2 doubling. This insensitivity appears inconsistent with recent temperature changes and asymmetries.

### 2. Altitude asymmetry ($\Delta OLR = -f\Delta S_u$, [3] Eqn. 30)

Could SC permit changes in stratospheric chemistry that change temperatures, such as ozone depletion or residual effects of large volcanic eruptions, to be propagated to the surface? The differential SC equation above relates changes in outgoing longwave radiation *OLR* at

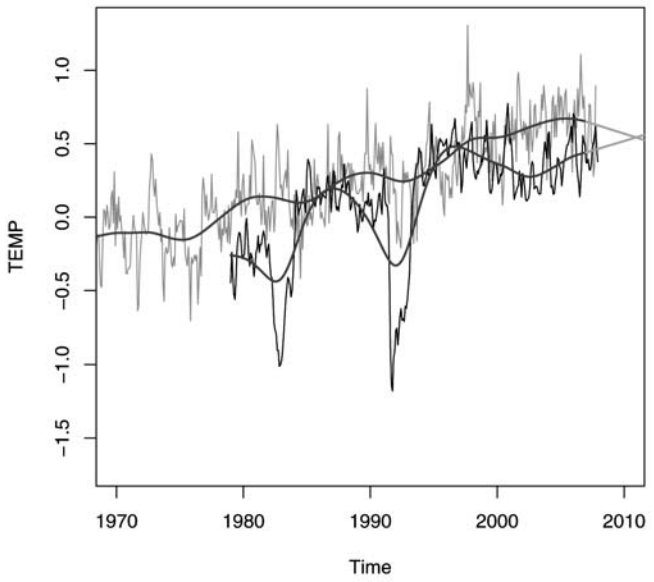



*Figure 1: Monthly global surface (HadCRU in gray) and inverted stratosphere (-0.9*TLS in black) temperatures. Smoothed temperatures illustrate the correlation and potential stratospheric cause of recent surface temperature changes.*

the atmosphere skin to changes in upward radiation at the surface $S_u$via a greenhouse constant *f*. Intuitively, the surface must warm in order to compensate for the loss of radiation from the cooling stratosphere.

Clear sky radiosonde measurements confirm $f = 0.68$ (Fig 9 of [3] and *pers. comm.*) is a constant and in agreement with the theoretical value of $f = 0.666$. Eqn. 28 [3] predicts atmospheric skin temperature (estimated using the Stephan-Boltzmann law to give *f* as a ratio of temperatures $f^{0.25} = 0.90$) of 259K (288*0.9) which realized at two places — 6km and at the stratopause. Could the ratio of 30 year increase of surface (HadCRU) and stratospheric temperatures (TLS from RSS) (+0.6K/+0.7K = 0.9) also be manifestation of the *f* relationship?

Visual evidence of a strong inverse effect of stratospheric temperature on surface temperatures is shown in Fig 1, a plot of inverse stratospheric temperatures (-0.9*TLS) and surface temperatures (HadCRU).

## 3. Hemispheric asymmetry ($S = \varepsilon\sigma t4$)

The relationship of temperatures *t* to radiation flux *S* for a given surface emissivity ε can also explain asymmetric NH and SH temperature trends. Land is warming at twice the rate of oceans (UAH +0.09 vs +0.04K/decade).

By the Stephan-Boltzmann equation the lower emissivity of land requires a higher temperature to maintain identical surface flux as the more IR emissive oceans. A 0.5 difference in rate of warming would require a 6.25% (0.54) difference in emissivity between land and ocean as observed.

## 4. Glacial-interglacials ($S_u(1 - T) = E_D$, [3] Eqn. 4)

Glacial-interglacial asymmetry is potentially explained by the increase in transmittance (*T*) of radiation through a semi-transparent atmosphere reducing both upward ($S_U$) and downward ($E_D$) IR fluxes. An increase in transmittance due to lower albedo of ice and snow may enable considerably lower surface temperatures than at present with little or no change in solar insolation. To lower global temperatures by 10K or 0.965 of present, and reduce surface IR and hence albedo by 0.867 ($0.956^4$), then at 50% global ice cover, albedo of ice must be 0.75 ((1-0.867)*2) of land and water, consistent with observed albedos (http://en.wikipedia.org/wiki/Albedo). A stratosphere temperature increase of 11K (10/0.9) could cause an ice age in the STA model without $CO_2$ or solar variation.

## 5. Conclusions and Predictions

These calculations show the STA model can potentially explain asymmetric temperature variations over spatial and temporal scales despite constant greenhouse effect. The STA model also supports a novel explanation for recent global warming, and opens the door to phenomena such as solar storms influencing surface temperatures via stratospheric temperatures. The STA is an elegant non-GH explanation for AGW that does not have the troubling runaway temperature problems of GCMs.

Under the STA model, the stability of stratospheric temperatures for the last 15 years suggests the atmosphere is presently very close to equilibrium (Fig. 1) after compensating for the ozone depletion of two major eruptions and a CFC injection. At current rates of $CO_2$ increase, only a small component its STA estimated doubling sensitivity of +0.24C will be felt by 2100. Barring major eruptions that produce immediate (~2yr) cooling and longer term warming, surface temperatures will gradually return to pre-CFC 1970 levels (-0.6K) depending on the pace of recovery of the ozone layer. ▲▲

## References

[1] Benjamin D. Pearson S. Fred Singer David H. Douglass, John R. Christy. A comparison of tropical temperature trends with model predictions. *nt. J. Climatol*., DOI: 10.1002/joc.1651, 2007.

[2] D. H. Douglass, B. D. Pearson, and S. F. Singer. Altitude dependence of atmospheric temperature trends: Climate models vs observation. *Geophysical Research Letters, 2004.*

[3] Ferenc Miskolczi. Greenhouse effect in semi-transparent planetry atmospheres. *IDOJARAS*, 111(1):1–40, 2006.

[4] Eddington A.S. On the radiative equilibrium of the stars. *Monthly Notices of the Royal Astronomical Society*, LXXVII(I):16–35, 1916.

[5] Intergovernmental Panel on Climate Change. Climate change 2007: Synthesis report. summary for policymakers. Technical report, 2007.

# African Exploration and Mining Conference - Monday 21st April 2008

*The Audience*

## African Exploration and Mining

- a one day conference held at the Burswood on Swan in Perth on 21 April 2008.

Companies presenting included Equinox Resources, Jigsaw Geoscience, Resolute Mining Ltd, CSA, Ampella Mining Ltd, and John Stockley.

*Bill Hewitt Chris Robinson, Bob Walker & Jurriaan Felith*

*Bill Peters and Ray Cary*


*Consolidated Minerals*


*John Flynn & Deon de Bruin*

*Steve Mudge, Michael Lees and Kirsty Begelhole*

# ASX Seminar on Continuous Disclosure, Corporate Governance and the JORC Code

**Perth 26 March 2008**

This seminar, attended by over 400 company representatives, advisors, Competent Persons, and representatives of JORC parent bodies, was divided into two parts. During the morning session, the Australian Securities Exchange (ASX) and the Australian Securities and Investments Commission (ASIC) provided updates on recent developments in continuous disclosure and corporate governance and the particular challenges facing listed small- to medium-sized enterprises in relation to these matters.

In the afternoon, representatives of the ASX, ASIC, JORC and JORC parent bodies conducted a panel session, chaired by Rick Rogerson (AIG). The session consisted of audience questions to the panel members and a few short presentations by Peter Stoker on behalf of JORC, James Rowe on behalf of the ASX and John Price on behalf of ASIC. James' talk focussed on an analysis of deficiencies in public reports and the March 2008 Companies Update (see Complaints, Complaints, Complaints column elsewhere in this issue of the AIG News for more information). Peter Stoker gave an overview of the relationship between JORC and the ASX and a rundown on recent developments on reporting uranium exploration and resources, reporting historical estimates, and international developments in relation to reporting codes and attempts to map between principles-based codes (e.g. JORC Code) and the prescriptive reporting codes used by the United Nations, China and Russia.

The hour of audience questions to the panel members formed the last part of the day. Points and issues arising out of the questions included:

- The JORC Code has got it about right but needs to be supported by additional guidelines such as those contained in ASX Companies Updates
- ASX Company updates need to be easier to locate on the ASX website or they should be available via the JORC website
- The processes for obtaining a waiver from the ASX to use historical resource estimates in IPOs and announcements needs to be more transparent
- More definition needs to be put around what constitutes a "summary report" and their reporting requirements under the JORC Code
- If used widely, the "Competent Person Consent Form" will assist in ensuring reporting integrity
- Close cooperation is occurring between the JORC parent bodies in relation to improving public announcements and the AIG and AusIMM have disciplinary processes that deal with competent persons who fail to adhere to the JORC Code

The whole day was considered a great success and the ASX intends to run a similar event in Brisbane shortly. Funding for these information days is provided by the fines paid by companies who breach the ASX listing rules. ▲▲

# AIG Service Award Call for Nominations

The AIG has instigated a new award for outstanding service by a member to the AIG

We are looking for your nominations

The selection criteria are as follows:

- Nominees must be a current member (any membership category) of the AIG.
- Nominees can be proposed by any AIG member but otherwise the names of nominees will remain confidential.
- The judgement of outstanding service will be left to the discretion of Council after consideration of a recommendation from the Service Award Committee using the following guidelines:
  - Service should have been through a Permanent Committee (Branches are permanent committees) or Council for a sustained period or periods amounting to 10 years or more.
  - The service must have resulted in an outstanding contribution to the AIG's objectives. Outstanding in this context means a measurable improvement in the reputation or profile of AIG and/or the geoscience profession.
  - The Council decision to make the award must be unanimous. Such a decision may be made out of session but must be confirmed at the following Council meeting.
- Entries will be made on the award form which is available on the AIG website at www.aig.org.au/. These entries will be sent to the Councillor selected to head the Service Award committee. The committee will consist of a minimum of three members consisting of one councillor and two AIG members, preferably from different states, as it is envisaged that the person receiving the award will be well known nationally.
- The award will consist of a certificate and a medal. It is planned to present this award at an AIG-sponsored or related function at which the nominee would normally attend.
- The award will feature in the AIG News and on the AIG website.
- The award does not have to be made on a regular basis and a maximum of one Service Award per year can be made.
- All nominations for this year need to be received by 30 June 2008.

new generation advances in geoscience

AUSTRALIAN earth sciences 2008 CONVENTION

HOSTED BY AIG & GSA
PERTH, WESTERN AUSTRALIA

# Australian Earth Sciences Convention

The overarching theme of the conference is **New Generation Advances in Geoscience** with five particular areas of thematic focus that are most relevant to cutting-edge geoscience in the early 21st Century.

## Perth, 20th to 24th July 2008

### "Geoscience in the Service of Society"

is a theme which focuses on the increasing number of ways that Geoscience is becoming integral to the effective functioning of our communities. This theme includes geohazards, environmental management, land-use planning, education and geoscience information provision.

### "Resources – Foundation for our Future"

is a theme which recognises the central role that the resource industry plays in the Australian economy and how innovative geoscience is making a critical contribution to maintaining its international competitiveness. Resources are broadly defined to include petroleum, coal and groundwater together with minerals. Important sub-themes will include a focus on exploration targeting and prospectivity analysis, and a mineral systems approach to economic geology.

### "The Evolution of Life and the Solar System"

theme seeks to synthesize the recent exciting scientific developments relating to the geological record of early life on the earth and the explosion of geological data from other planets, particularly Mars. An important objective of this theme is to put the evolution of the earth and its life-forms into a broader comparative perspective.

### "Earth's Environments – Past, Present and Future"

seeks to draw together a geological perspective on what is perhaps the most important global issue of our time – Climate change. This objective of this theme is to integrate the "deep time" perspective on earth's environmental changes and its drivers, particularly those of a geological nature, with the current explosion of knowledge in this field. The role that geoscience fulfills in providing proxies for paleoclimate will be a significant focus of this theme.

### "The Dynamic Earth – From Crust to Core"

theme emphasizes our emerging understanding, driven by critical new data sets such as global seismic tomography, of the earth as a single, linked dynamic system that has evolved over geological time in a systematic way. Some areas of focus for this theme will include: mantle processes and the generation of mantle melts; plate tectonic processes and the dynamic mantle; the supercontinent cycle; time, tectonics and the evolving landscape; orogens and basins: indicators of continental processes; formation and evolution of crust and crustal Melts; and regolith and landscape evolution.

In addition to the above themes, the Plenary sessions at the convention will recognise that 2008 is the International Year of Planet Earth through a series of invited key-notes that address major themes of the IYPE.

For more information about the program, contact aesc2008@iceaustralia.com

## The Conference will have dynamic Pre-Conference and Post-Conference field trips

### Pre-Conference from July 13th

**Canning Basin Paleozoic**

World famous Devonian reefs as well as other interesting Ordovician to Permian successions. Of interest to sedimentologists, petroleum geologists and mineral explorers. Maximum 14

**Hammersley Basin Iron Ore Province**

One of the of the worlds great iron ore provinces examined from outcrop to mine site. TBA

**Archean crustal evolution and mineralization of the northern Pilbara Craton**

Contrasting tectonic styles and mineralization during the Paleo- and Meso-Archean history of our planet, and the development of early life upon it. Maximum 30

**Eastern Goldfields Superterrane, Yilgarn Craton**

New insights into brownfields gold exploration in the Yilgarn Craton with a structural geology bias. Maximum 14

### Post Conference trips from July 26th.

**Geology and history of the Shark Bay region**

Shark Bay, famous for it's stromatolites. Looks at its geology, neotectonics and history in the context of the Quaternary of Western Australia. Maximum 14

**Geology of the Halls Creek Orogen**

Tectonics and mineral systems of the North Australian Craton, and the applicability of plate tectonics to the assembly of Proterozoic Australia. Maximum 14

**Kalgoorlie, Youanmi and Narryer Terranes of the Yilgarn Craton**

Geology and mineral systems of classic, highly mineralised Archean granite-greenstones and gneisses. Maximum 14

**Mines and Wines from Perth to Margaret River**

World class mines and vines for wine lovers, young and old! Maximum 30

**Geology and landforms of the Perth region**

Climate change revealed as sea level changes in eolian and marine units from Swan River to Cape Peron. Maximum 30

**Geology and landforms of the Perth Hills**

Yilgarn Craton and Proterozoic geology exposures on the Darling Ranges. Maximum 30

**Geology and landforms of the Meckering Fault Scarp**

Meckering is the biggest and best preserved intraplate surface rupture in WA and only one of 12 recorded worldwide. Maximum 30

GEOLOGICAL SOCIETY OF AUSTRALIA Incorporated

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Register your interest **aesc2008@iceaustralia.com**

Australian Earth Sciences Conference,
Perth 20th to 24th July 2008.

**www.iceaustralia.com/aesc2008**

# Geoscientist Salaries on the Rise

**SALARIES PAID TO Geoscientists grew by an average of 6.9% over the twelve months to March 2007 according to the results of a survey of Australian science professionals.**

Members of the Australian Institute of Geoscientists were invited to participate in a broad-based scientist employment and remuneration survey in February/March 2007. The survey was conducted amongst member organisations of the Federation of Australian Scientific and Technological Societies (FASTS).

Analysis of responses returned by members of the AIG and others with Geology/Geoscience qualifications showed similar average percentage increases in salary achieved across most job functions.

The mean and median increases in salary of 6.9% and 6.1% respectively were above the rate of inflation as measured by the Consumer Price Index (CPI). The Australian Bureau of Statistics (ABS) reported an average increase in the CPI of 2.4% for the year ending 31March 2007.

Movements in Geoscientist salaries rises were generally higher than movements recorded by major indicators of wage and salary growth in the economy; the ABS Wage Price Index rose by 4.1% to the end of March 2007, whilst the increase in Average Weekly Ordinary Time Earnings (AWOTE) as measured by the ABS was reported as 3.4% to the end of February 2007.

GRAPH 1 - REPORTED ANNUAL BASE SALARY INCREASE V ECONOMIC INDICATORS

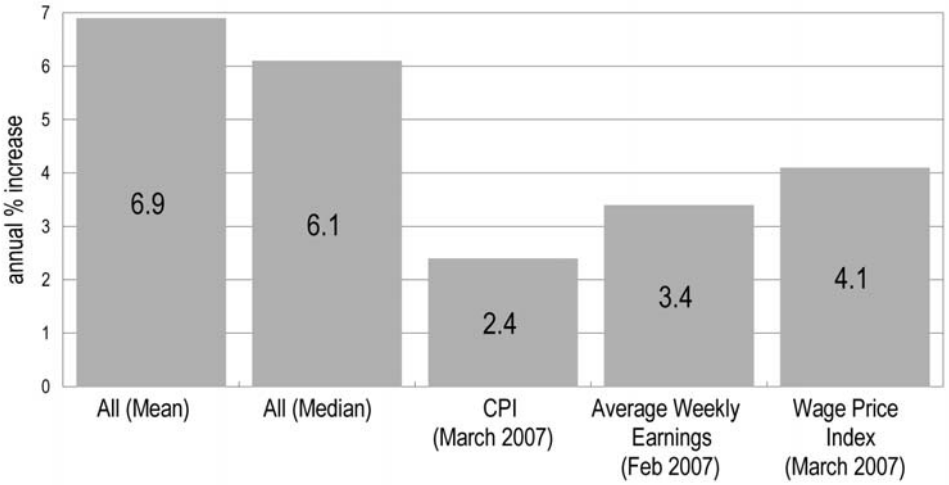


TABLE 1 - ALL FULL-TIME RESPONDENTS - RESPONSIBILITY LEVEL 1

| n=9 | Lower Quartile | Median | Upper Quartile | Mean | Response % |
|---|---|---|---|---|---|
| Age | 22.0 | 25.0 | 28.0 | 25.7 | 100.0% |
| Years of Professional Experience | .3 | .4 | 1.0 | .8 | 100.0% |
| Tenure in Current Position | .2 | .5 | .8 | .5 | 88.9% |
| Hours of Work | 38.00 | 40.00 | 45.00 | 41.94 | 100.0% |
| BASE SALARY | 51,790 | 52,500 | 71,000 | 59,232 | 100.0% |
| Annual % movement in base salary | . | . | . | . | . |
| Annual Leave Loading | 603 | 707 | 1,003 | 771 | 33.3% |
| Award Allowance | 3,000 | 4,750 | 6,500 | 4,750 | 22.2% |
| Overtime | 281 | 281 | 281 | 281 | 11.1% |
| TOTAL CASH | 51,790 | 53,207 | 74,000 | 60,576 | 100.0% |
| Cost of Car | 30,000 | 30,000 | 30,000 | 30,000 | 22.2% |
| Car Allowance | . | . | . | . | . |
| Entertainment Allowance | . | . | . | . | . |
| Parking | . | . | . | . | . |
| Other FBT Benefits | 8,000 | 8,000 | 8,000 | 8,000 | 11.1% |
| Other Non-FBT Benefits | . | . | . | . | . |
| Employer Superannuation Contribution | 4,680 | 5,179 | 6,390 | 5,720 | 100.0% |
| TOTAL REMUNERATION | 56,969 | 70,850 | 80,660 | 71,020 | 100.0% |
| Fringe Benefits Tax | 5,761 | 5,761 | 5,761 | 5,761 | 22.2% |
| TOTAL EMPLOYMENT COST | 56,969 | 70,850 | 80,660 | 72,300 | 100.0% |
| Performance Bonus | 6,500 | 6,500 | 6,500 | 6,500 | 11.1% |
| TOTAL PACKAGE | 56,969 | 77,350 | 80,660 | 73,022 | 100.0% |

GRAPH 2 - COMPOSITION OF TOTAL PACKAGE - RESPONSIBILITY LEVEL 1

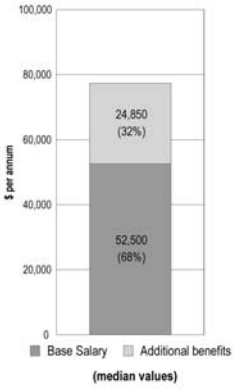



TABLE 2 - ALL FULL-TIME RESPONDENTS - RESPONSIBILITY LEVEL 2

| n=29 | Lower Quartile | Median | Upper Quartile | Mean | Response % |
|---|---|---|---|---|---|
| Age | 28.0 | 30.0 | 35.0 | 34.3 | 100.0% |
| Years of Professional Experience | 2.5 | 5.0 | 11.0 | 9.3 | 100.0% |
| Tenure in Current Position | 1.3 | 2.0 | 3.0 | 2.9 | 100.0% |
| Hours of Work | 40.00 | 45.00 | 50.00 | 50.74 | 100.0% |
| BASE SALARY | 65,000 | 74,000 | 93,000 | 77,096 | 100.0% |
| Annual % movement in base salary | 3.7 | 7.8 | 12.3 | 8.1 | 44.8% |
| Annual Leave Loading | 666 | 677 | 816 | 720 | 10.3% |
| Award Allowance | . | . | . | . | . |
| Overtime | . | . | . | . | . |
| TOTAL CASH | 65,000 | 74,000 | 93,000 | 77,170 | 100.0% |
| Cost of Car | 80,000 | 80,000 | 80,000 | 80,000 | 3.4% |
| Car Allowance | . | . | . | . | . |
| Entertainment Allowance | . | . | . | . | . |
| Parking | . | . | . | . | . |
| Other FBT Benefits | 3,000 | 3,000 | 3,000 | 3,000 | 3.4% |
| Other Non-FBT Benefits | 300 | 352 | 1,000 | 551 | 10.3% |
| Employer Superannuation Contribution | 5,886 | 7,020 | 9,000 | 7,292 | 100.0% |
| TOTAL REMUNERATION | 70,850 | 82,140 | 102,824 | 85,936 | 100.0% |
| Fringe Benefits Tax | 2,880 | 4,128 | 5,376 | 4,128 | 6.9% |
| TOTAL EMPLOYMENT COST | 70,850 | 82,140 | 102,824 | 86,221 | 100.0% |
| Performance Bonus | 1,700 | 6,468 | 7,500 | 6,376 | 17.2% |
| TOTAL PACKAGE | 70,850 | 82,140 | 102,824 | 87,320 | 100.0% |

GRAPH 3 - COMPOSITION OF TOTAL PACKAGE - RESPONSIBILITY LEVEL 2

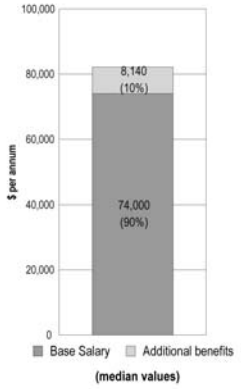
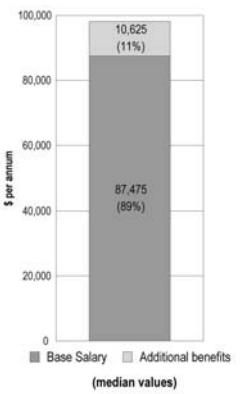



TABLE 3 - ALL FULL-TIME RESPONDENTS - RESPONSIBILITY LEVEL 3

| n=53 | Lower Quartile | Median | Upper Quartile | Mean | Response % |
|---|---|---|---|---|---|
| Age | 32.0 | 35.0 | 45.0 | 38.2 | 100.0% |
| Years of Professional Experience | 8.0 | 12.0 | 19.0 | 13.6 | 100.0% |
| Tenure in Current Position | 1.0 | 2.0 | 3.0 | 3.2 | 100.0% |
| Hours of Work | 40.00 | 45.00 | 50.00 | 46.69 | 100.0% |
| BASE SALARY | 73,000 | 87,475 | 105,000 | 87,797 | 100.0% |
| Annual % movement in base salary | 3.8 | 4.9 | 7.4 | 5.7 | 49.1% |
| Annual Leave Loading | 828 | 1,052 | 1,144 | 1,010 | 24.5% |
| Award Allowance | 2,000 | 5,000 | 7,000 | 4,667 | 5.7% |
| Overtime | 5,000 | 5,000 | 5,000 | 5,000 | 1.9% |
| TOTAL CASH | 73,000 | 87,700 | 105,459 | 88,603 | 100.0% |
| Cost of Car | 30,000 | 32,500 | 42,500 | 36,250 | 7.5% |
| Car Allowance | 7,500 | 7,500 | 7,500 | 7,500 | 1.9% |
| Entertainment Allowance | 3,100 | 3,100 | 3,100 | 3,100 | 1.9% |
| Parking | 1,000 | 1,000 | 1,000 | 1,000 | 1.9% |
| Other FBT Benefits | 5,000 | 12,700 | 20,400 | 12,700 | 3.8% |
| Other Non-FBT Benefits | 145 | 175 | 700 | 423 | 7.5% |
| Employer Superannuation Contribution | 6,800 | 8,280 | 10,300 | 8,757 | 100.0% |
| TOTAL REMUNERATION | 82,500 | 96,470 | 118,810 | 99,405 | 100.0% |
| Fringe Benefits Tax | 4,800 | 5,761 | 5,761 | 5,280 | 9.4% |
| TOTAL EMPLOYMENT COST | 82,500 | 98,100 | 118,810 | 99,903 | 100.0% |
| Performance Bonus | 5,600 | 6,499 | 7,210 | 10,043 | 11.3% |
| TOTAL PACKAGE | 82,856 | 98,100 | 119,599 | 101,040 | 100.0% |

GRAPH 4 - COMPOSITION OF TOTAL PACKAGE - RESPONSIBILITY LEVEL 3




## Additional Results

- 12.1% of employee respondents had received no increase in salary in the preceding 12 months.
- 23.4% of employee respondents had received an increase of 10% or more in the preceding 12 months.
- 21.6% of employee respondents indicated they were working more hours this year compared to the previous year.
- The average number of hours worked by full-time employee respondents was 49. 47.4% of all full-time respondents were working 50 hours per week or more whilst 24.7% were working 40 hours per week or less.
- The average amount of overtime worked by employee full-time respondents was 8.6 hours per week.
- 55.2% of full-time employee respondents reported receiving no additional compensation for any work beyond normal working hours.
- 5.2% of full-time respondents received additional payment for overtime worked, whilst 17.7% received an amount within annual salary as compensation. The remainder accessed time off in lieu of payment.
- 18.4% of employee respondents indicated their employment contracts were governed by enterprise agreements, 66.9% were not , and the remainder of respondents did not know whether an enterprise agreement governed their conditions of employment.
- 8.6% of employee respondents had their employment contracts governed by Australian Workplace Agreements.
- 73.7% of full-time employee respondents were employed in the private sector whilst the remainder were engaged directly by a State Government or by a State Government Instrumentality or GBE, by the Federal Government or by research agencies.
- 75.9% of employed respondents were engaged in full-time positions, whilst 18.1% were self-employed.
- 75.3% of male employed respondents were engaged on a full-time basis compared to 80.4% of females. 20.1% of males were self - employed compared to 7.1% of females.
- 84% of all respondents were male, 16% were female.
- 31.1% of respondents held a qualification in a field other than science.
- 24.7% of employee respondents had received a promotion in the last twelve months.
- 15.7% of employee respondents had changed employers during the preceding twelve months.
- 14.6% of all respondents were undertaking further study.

*Cont. on Page 21*

# GEOCONFERENCES (WA) INC.

Geoconferences (WA) Inc. is a non-profit organisation of volunteers from the Western Australian geoscientific community dedicated to the promotion of geoscience, particularly Precambrian geology and/or economic geology.

Geoconferences arranges conferences, symposia and other meetings and excess funds are used to support geoscience education at both secondary and tertiary level.

The International Archaean Symposia are the "flagship" meetings organised by Geoconferences, and the 5th International Archaean Symposium will be held in Perth in 2010.

**Geoconferences (WA) Inc is a**

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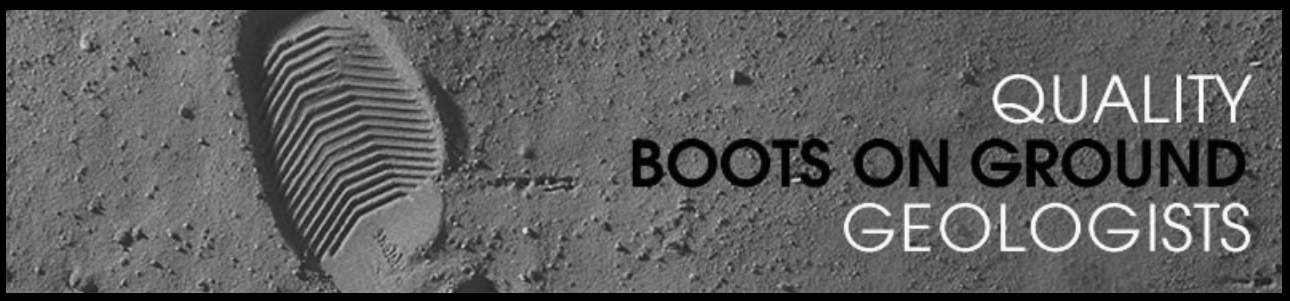
The Geoconferences-AIG bursary is offered to students at Australian universities working on projects related to platinum and/or nickel in magmatic rocks. The project must have significant relevance to Western Australian economic geology, and should include a travel or field component.

For further information on Geoconferences, the J H Lord Travel Grants for young geoscientists, and the 5th International Archaean Symposium in Perth in 2010, please visit www.geoconferences.org

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# Geoscientist Salaries on the Rise

Cont. from Page 19

TABLE 4 - ALL FULL-TIME RESPONDENTS - RESPONSIBILITY LEVEL 4

| n=87 | Lower Quartile | Median | Upper Quartile | Mean | Response % |
|---|---|---|---|---|---|
| Age | 35.0 | 42.0 | 54.0 | 43.5 | 100.0% |
| Years of Professional Experience | 11.0 | 18.0 | 26.0 | 19.1 | 100.0% |
| Tenure in Current Position | 1.0 | 3.0 | 8.0 | 5.6 | 100.0% |
| Hours of Work | 42.00 | 48.00 | 50.00 | 48.36 | 100.0% |
| BASE SALARY | 86,735 | 110,000 | 123,000 | 108,530 | 100.0% |
| Annual % movement in base salary | 3.6 | 6.3 | 9.1 | 6.5 | 50.6% |
| Annual Leave Loading | 977 | 1,147 | 1,346 | 1,259 | 20.7% |
| Award Allowance | . | . | . | . | . |
| Overtime | 10,400 | 12,700 | 15,000 | 12,700 | 2.3% |
| TOTAL CASH | 89,184 | 110,000 | 123,000 | 109,947 | 100.0% |
| Cost of Car | 30,000 | 30,000 | 45,000 | 38,333 | 20.7% |
| Car Allowance | 9,000 | 12,000 | 15,000 | 10,743 | 8.0% |
| Entertainment Allowance | . | . | . | . | . |
| Parking | 1,150 | 1,950 | 4,300 | 2,725 | 4.6% |
| Other FBT Benefits | 2,000 | 3,400 | 11,000 | 6,680 | 5.7% |
| Other Non-FBT Benefits | 330 | 750 | 10,000 | 4,765 | 11.5% |
| Employer Superannuation Contribution | 8,370 | 10,000 | 12,305 | 10,616 | 100.0% |
| TOTAL REMUNERATION | 98,100 | 126,441 | 146,400 | 125,120 | 100.0% |
| Fringe Benefits Tax | 4,680 | 5,761 | 7,057 | 6,094 | 23.0% |
| TOTAL EMPLOYMENT COST | 98,100 | 127,530 | 151,800 | 126,521 | 100.0% |
| Performance Bonus | 7,938 | 11,700 | 15,750 | 13,482 | 26.4% |
| TOTAL PACKAGE | 99,953 | 130,800 | 152,600 | 130,085 | 100.0% |

GRAPH 5 - COMPOSITION OF TOTAL PACKAGE - RESPONSIBILITY LEVEL 4

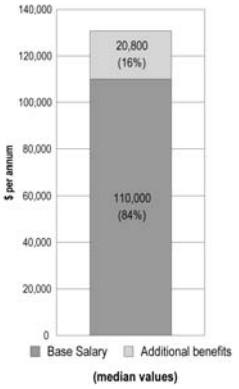



TABLE 5 - ALL FULL-TIME RESPONDENTS - RESPONSIBILITY LEVEL 5

| n=58 | Lower Quartile | Median | Upper Quartile | Mean | Response % |
|---|---|---|---|---|---|
| Age | 40.0 | 45.5 | 54.0 | 46.5 | 100.0% |
| Years of Professional Experience | 16.0 | 21.5 | 30.0 | 23.2 | 100.0% |
| Tenure in Current Position | 1.0 | 3.0 | 6.0 | 5.4 | 100.0% |
| Hours of Work | 45.00 | 50.00 | 55.00 | 51.30 | 100.0% |
| BASE SALARY | 108,000 | 132,500 | 150,000 | 136,214 | 100.0% |
| Annual % movement in base salary | 4.7 | 6.6 | 10.1 | 7.7 | 58.6% |
| Annual Leave Loading | 1,010 | 1,198 | 1,618 | 1,277 | 19.0% |
| Award Allowance | . | . | . | . | . |
| Overtime | . | . | . | . | . |
| TOTAL CASH | 109,454 | 140,000 | 162,000 | 139,751 | 100.0% |
| Cost of Car | 30,000 | 35,000 | 50,000 | 37,429 | 24.1% |
| Car Allowance | 10,000 | 15,000 | 20,000 | 13,700 | 22.4% |
| Entertainment Allowance | 1,000 | 2,000 | 10,000 | 4,333 | 5.2% |
| Parking | 1,150 | 2,000 | 4,660 | 3,324 | 20.7% |
| Other FBT Benefits | 2,000 | 3,500 | 6,760 | 5,781 | 10.3% |
| Other Non-FBT Benefits | 500 | 750 | 5,000 | 4,425 | 17.2% |
| Employer Superannuation Contribution | 10,350 | 12,700 | 15,750 | 13,546 | 100.0% |
| TOTAL REMUNERATION | 122,203 | 159,380 | 185,581 | 158,077 | 100.0% |
| Fringe Benefits Tax | 1,920 | 5,520 | 6,337 | 4,850 | 31.0% |
| TOTAL EMPLOYMENT COST | 124,080 | 161,527 | 190,750 | 159,582 | 100.0% |
| Performance Bonus | 7,703 | 15,650 | 22,500 | 16,789 | 31.0% |
| TOTAL PACKAGE | 128,230 | 164,961 | 193,261 | 164,792 | 100.0% |

GRAPH 6 - COMPOSITION OF TOTAL PACKAGE - RESPONSIBILITY LEVEL 5

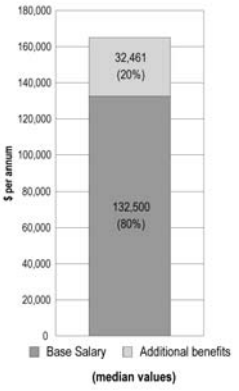
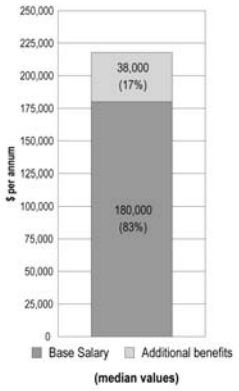



TABLE 6 - ALL FULL-TIME RESPONDENTS - BEYOND RESPONSIBILITY LEVEL 5

| n=9 | Lower Quartile | Median | Upper Quartile | Mean | Response % |
|---|---|---|---|---|---|
| Age | 47.0 | 52.0 | 54.0 | 49.7 | 100.0% |
| Years of Professional Experience | 17.0 | 30.0 | 32.0 | 26.6 | 100.0% |
| Tenure in Current Position | 3.0 | 4.0 | 6.0 | 4.4 | 100.0% |
| Hours of Work | 50.00 | 55.00 | 60.00 | 55.00 | 100.0% |
| BASE SALARY | 160,000 | 180,000 | 207,000 | 192,889 | 100.0% |
| Annual % movement in base salary | .0 | 4.2 | 18.5 | 7.4 | 77.8% |
| Annual Leave Loading | 1,683 | 2,234 | 2,786 | 2,234 | 22.2% |
| Award Allowance | . | . | . | . | . |
| Overtime | . | . | . | . | . |
| TOTAL CASH | 165,000 | 180,000 | 211,786 | 195,497 | 100.0% |
| Cost of Car | 15,700 | 30,000 | 35,000 | 26,900 | 33.3% |
| Car Allowance | 16,000 | 16,000 | 16,000 | 16,000 | 11.1% |
| Entertainment Allowance | 1,000 | 1,500 | 2,000 | 1,500 | 22.2% |
| Parking | 800 | 2,200 | 3,600 | 2,200 | 22.2% |
| Other FBT Benefits | 2,500 | 16,250 | 30,000 | 16,250 | 22.2% |
| Other Non-FBT Benefits | 500 | 5,250 | 10,000 | 5,250 | 22.2% |
| Employer Superannuation Contribution | 15,500 | 16,200 | 18,630 | 17,849 | 100.0% |
| TOTAL REMUNERATION | 187,300 | 218,000 | 238,427 | 220,745 | 100.0% |
| Fringe Benefits Tax | 3,919 | 4,474 | 5,761 | 9,071 | 55.6% |
| TOTAL EMPLOYMENT COST | 191,219 | 218,000 | 248,653 | 225,784 | 100.0% |
| Performance Bonus | 23,250 | 41,400 | 89,600 | 51,417 | 33.3% |
| TOTAL PACKAGE | 196,200 | 218,000 | 285,587 | 242,923 | 100.0% |

GRAPH 7 - COMPOSITION OF TOTAL PACKAGE - BEYOND RESPONSIBILITY LEVEL 5




## Responsibility Level Definitions

**LEVEL 1 - PROFESSIONAL SCIENTIST**

The graduate scientist commencement level. The scientist undertakes initial professional scientific tasks of limited scope and complexity, such as minor phases of broader assignments, in office, plant, field or laboratory work.

Classification Level definition

Under supervision from higher-level professional scientists as to method of approach and requirements, the professional scientist performs normal professional scientific work and exercises individual judgment and initiative in the application of scientific principles, techniques and methods. In assisting more senior professional scientists by carrying out tasks requiring accuracy and adherence to prescribed methods of scientific analysis, design or computation, the scientist draws upon advanced techniques and methods learned during and after the undergraduate course. Training, development and experience using a variety of standard scientific methods and procedures enable the professional scientist to develop increasing professional judgment and apply it progressively to more difficult tasks at Level 2. Decisions are related to tasks performed, relying upon precedent or defined procedures for guidance. Recommendations are related to solution of problems in connection to the tasks performed. Work is reviewed by higher-level professional scientists for validity, adequacy, methods and procedures. With professional development and experience, work receives less review, and the professional scientist progressively exercises more individual judgment until the level of competence at Level 2 is achieved. The professional scientist may assign and check work of technical staff assigned to work on a common project.

**LEVEL 2 - PROFESSIONAL SCIENTIST** - Classification Level definition

Following development through Level 1 he/she is an experienced scientist (as defined) who plans and conducts professional scientific work without detailed supervision, but with guidance on unusual features and who is usually engaged on more responsible scientific assignments requiring substantial professional experience.

**LEVEL 3 - PROFESSIONAL SCIENTIST** - Classification Level definition

A professional scientist performing duties requiring the application of mature professional scientific knowledge. With scope for individual accomplishment and coordination of more difficult assignments, the professional deals with problems for which it is necessary to modify established guides and devise new approaches. The professional scientist may make some original contribution or apply new professional scientific approaches and techniques to the design or development of equipment or special aspects of products, facilities and buildings. Recommendations may be reviewed for soundness of judgment but are usually regarded as technically accurate and feasible. The professional scientist makes responsible decisions on matters assigned, including the establishment of professional scientific standards and procedures; consults, recommends and advises in speciality scientific areas. Work is carried out within broad guidelines requiring conformity with overall objectives, relative priorities and necessary cooperation with other units. Informed professional scientific guidance may be available. The professional scientist outlines and assigns work, reviews it for technical accuracy and adequacy, and may plan, direct, co-ordinate and supervise the work of other professional and technical staff.

**LEVEL 4 - PROFESSIONAL SCIENTIST** - Classification Level definition

A professional scientist required to perform professional scientific work involving considerable independence in approach, demanding a considerable degree of originality, ingenuity and judgment, and knowledge of more than one field of, or expertise (for example, acts as his/her organisation's technical reference authority) in a particular field of professional science. The professional scientist: initiates or participates in short-range or long-range planning and makes independent decisions on scientific policies and procedures within an overall program; gives technical advice to management and operating departments; may take detailed technical responsibility for product development and provision of specialised scientific systems, facilities and functions; coordinates work programs; and directs or advises on use of equipment and material. The professional scientist makes responsible decisions not usually subject to technical review, decides courses of action necessary to expedite the successful accomplishment of assigned projects, and may make recommendations involving large sums of money or long-range objectives. Duties are assigned only in terms of broad objectives and are reviewed for policy, soundness of approach, accomplishment and general effectiveness. The professional scientist supervises a group or groups including professional scientists and other staff, or exercises authority and technical control over a group of professional staff, in both instances engaged in complex scientific applications.

**LEVEL 5 - PROFESSIONAL SCIENTIST** - Classification Level definition

A professional scientist usually responsible for an scientific administrative function, directing several professional and other groups engaged in interrelated scientific responsibilities, or as an scientific consultant. Achieving recognition as an authority in an scientific field of major importance to the organisation. The professional scientist independently conceives programs and problems to be investigated and participates in discussions determining basic operating policies, devising ways of reaching program objectives in the most economical manner and of meeting any unusual conditions affecting work progress. The professional scientist makes responsible decisions on all matters, including the establishment of policies and expenditures of large sums of money and/or implementation of major programs, subject only to overall policy and financial controls. The professional scientist receives administrative direction based on organisation policies and objectives. Work is reviewed to ensure conformity with policy and co-ordination with other functions. The professional scientist reviews and evaluates technical work; selects, schedules, and co-ordinates to attain program objectives; and/or as administrator, makes decisions.

# Micro-Seisms Origin Located — Scientists Solve 50-Year-Old Mystery Of Oceans' Seismic 'Buzz' from Noisy Waves

**AIG Editorial Staff**

**THE LATEST BUZZ in Earth science literally comes from out of the blue-the deep blue seas. For the first time, scientists have pinpointed a specific area in the North Atlantic where micro-seisms, small Earth tremors created when ocean waves travelling in opposite directions merge together, are emitted from the depths of the ocean.**

Scientists have long known about micro seisms, but no one could figure out where they came from - until now. They were first recorded as a strange, continuous buzz on the earliest seismometers, devices that measure Earth vibrations over periods from one to several seconds long. Scientists use seismometers to "hear" everything from earthquake tremors to these tiny microseismic vibrations of the ocean floor. Every year, the cumulative energy of these small vibrations equals the combined annual energy release from earthquakes. Finding out where ocean microseisms originate could help scientists monitor stress in Earth's crust with a technique called "noise tomography." The technique uses seismic waves to image sections of the crust.

Records of microseismic activity give us a history of wave interaction in Earth's oceans since the early 20th century. They are also used to examine the history of storms over the ocean, according to Frank Webb, a geophysicist at NASA's Jet Propulsion Laboratory, Pasadena, Calif. Webb has studied this phenomenon extensively and is co-author of a new study on microseisms appearing in the March 8 issue of the Proceedings of the Royal Society, Series A. JPL's Sharon Kedar led the interdisciplinary science team, which included researchers from JPL; University of California, San Diego; the California Institute of Technology, Pasadena; and the Hydrologic Research Center in San Diego.

"It's been an interesting project, because people from very different fields were working together to address this problem," Webb said, adding that the team included both oceanographers and seismologists. "That's something that has rarely been done since we first started to look for areas where microseisms originate."

The theory of the origin of microseisms was first introduced in 1950 by Michael Longuet-Higgins from the University of Cambridge in England, who also worked on this recent project. Longuet-Higgins suggested that the vibrations originated in places where ocean waves were traveling at the same frequency opposite to each other at a certain ocean depth. According to his theory, the interacting waves combine to form stationary waves over large areas of the ocean. These waves create tall, pulsing columns of pressure that repeatedly beat down on the ocean floor, causing it to vibrate at double the frequency of the wave. The vibrations generate seismic surface waves, which propagate thousands of miles and are detected by seismometers as noise.

Longuet-Higgin's theory was used to predict regions of the ocean where microseisms could originate. Webb said that actually finding an area of the ocean with the right conditions to generate microseisms was difficult.

Using ocean wave models that determine the states of the ocean in different areas, the team located a region of the ocean that matches the criteria from Longuet-Higgin's theory in a region of the North Atlantic that extends from the Labrador Sea (between Greenland and the northeast coast of Canada) to the south of Iceland. The team found the region by comparing opposing wave interactions to seismic data recorded at the same area. While this region is not the only one to produce micro-seisms, it is the first region in which the source of micro-seisms has been located. ▲▲

# Developments In Geological Sampling — Harnessing Nature's Little Diggers

**AIG Editorial Writers and our own ABC**

**THERE'S NO DOUBT that one of Australia's greatest economic resources is mineral ores. However, finding ore bodies is an expensive and sometimes environmentally disruptive process but, as Paul Willis finds out, scientists are now learning a lot about what lies beneath, by studying what thrives above — trees; termites, even kangaroo poo as well as discovering the acute smelling abilities of some faunal species, according to a memo leaked to the editor some time ago.**

Hidden under the surface of our vast continent lie some of the biggest mineral deposits in the world - nickel, copper, lead, zinc, uranium and gold which have helped generate great wealth, but before the nation can profit from them, they need to be found. It is generally estimated that outcrop per-se represents about 10% of Australia's land surface, the rest hidden under "cover" whether transported to in-situ. While Olympic Dam is the case-book study of the discovery a mineral deposit hidden under 300 metres of cover using esoteric structural and geophysical techniques, little has been done to harness the sub-surface sampling abilities of termites, vegetation, let alone animal sensitivity to subsurface geochemistry. And nothing seems to be known about any geophysical responses which the earth's surficial biosphere possesses.

Vegetation surveys, for example, might class trees according to age, older trees having deeper tap roots and potentially absorbing any subsurface hydrological geochemical signatures.

Termite mounds are another source of biotic deep sampling. The highly visible termite mounds are actually the termite equivalent of air-conditioners, while the termites live below the mound in relative coolness. Termite mound sampling has its risks though, as King Brown snakes prefer the air-conditioned comfort of the larger mounds.

A slightly more risky sampling technique is coprolite sampling, or roo-poo for the more earthly among us, which assumes that the coprolites are derived from the neighbourhood and not from visiting relatives.

What next one wonders — using rats to locate geochemical anomalies like a rodent version of a police sniffer dog? Seems that has been tried by one of the diamond majors: "As consultant to the DRC Research and Technical Services, (RATS), one of my tasks is to bring new technologies and/or ideas to the attention of the other DRC section members so that we can decide if DRC should support research into new exploration ideas. One of the latest which may seem a bit strange is to use rats to detect kimberlites and lamproites.

However this is not as bizarre as it seems as rats have proved their worth in detecting landmines in various parts of Africa as shown by the follow news story:

> Maryann Mott for National Geographic News - February 10, 2004. In Mozambique, an African country littered with land mines from decades of civil war, 20 rats were recently used to search for explosives. So far, they've been successful. In November, the animals found nine mines in one day along the Limpopo Railway, says Bart Weetjens, director of APOPO, the Belgian research company that trains the animals. The Mozambique National Demining Institute accredited the technology in late September, allowing for the work to take place. Weetjens notes this is the first time the African giant pouch rats have been deployed in real mine fields. The rats combed three minefields along a rail line that connects the port city of Maputo with neighboring Zimbabwe.
>
> Despite the railway's economic importance, few trains travel this dangerous stretch. People fear vibrations caused by trains will trigger the instable explosives. APOPO came up with the idea of using rats while searching for a cheap and efficient way to detect mines. A trained rat costs about U.S. $2,000-about $10,000 less than a mine-sniffing dog. Other advantages include the rats' relatively small size (15 inches/40 centimeters), which make them easy to maintain and transport; their resistance to most tropical diseases; and their highly developed sense of smell.
>
> "Rats are able to detect most types of mines," said Weetjens. "In principle they could detect all mines because of the explosive content, if it weren't that some devices have been manufactured with accurate sealing, which leaves no escape for explosive trace vapors. But these can easily be found with a metal detector." Rats conditioned to TNT odors are trained to walk on a leash, which is attached to a bar that moves forward into a suspected field. When the animals smell explosive material they scratch or bite at the location. The rat's light weight-one-and-a-half to three pounds (0.7 to 1.5 kilograms)-does not trigger the mine. A rat and handler can search 180 square yards (150 square meters) in about half an hour. "After that, reliability of concentration for rats as well as trainers goes down," Weetjens said. This isn't a problem, he notes, since well-rested, replacement rats are available. Currently the company has more than 100 rats in different stages of training at its facility in Tanzania, north of Mozambique.
>
> Rats begin training at the age of five weeks when juveniles are weaned from their mothers. A positive reinforcement method known as clicker training is used. When the animal does something right, the trainer clicks a small, handheld noisemaker before giving the rat a piece of banana or peanut as a reward. (The same method is often used in America to train dogs in obedience schools.) The company says the rats learn the desired task relatively quickly-between six to ten months.
>
> "We now have some fourth-generation domestic animals. And generation after generation, the animals learn faster," said Weetjens. "It is too early, though, to conclude if this is due to selective breeding or to a more established training method and [increased] skills of the trainers." After an animal has been fully trained, a series of blind tests are conducted during a six-week period. If the rat passes, it is then licensed for de-mining operations. APOPO plans to use its trained rats elsewhere, including Angola, Cambodia, and Bosnia." ▲▲

*(Ed: A quick scan of the AESC 2008 agenda shows this novel diamond exploration technique must still be in the development stage).*

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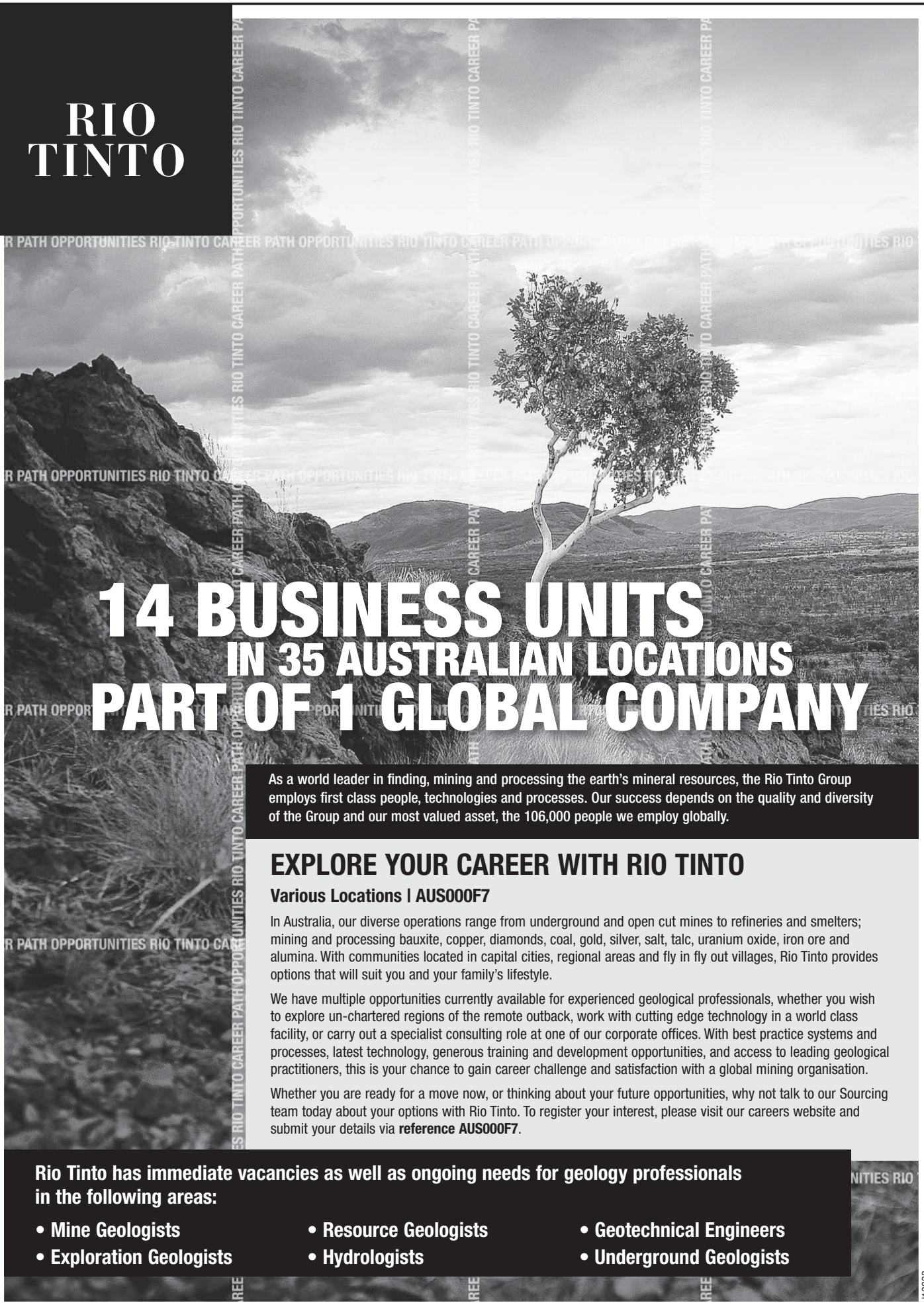

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# Education Report

**Kaylene Camuti**
**(Chair, Education Committee)**

## 2008 AIG Geoscience Student Bursaries

The 2008 bursary application form will be sent to universities and students in the next few weeks, and will also be available on the AIG web site. Applications for the bursaries are invited from Honours and Postgraduate students and applications will close around the end of June. Last year ten Honours and Postgraduate students received AIG bursaries and, since the bursary program began in 2001, the AIG has awarded 46 bursaries to Australian geoscience students.

The AIG recognises the vital support the program has received from sponsors over the years and this year we are expanding our education program with the development of the AIG Education Foundation, mentioned by Andrew Waltho in this issue's President's Report, which will allow members and others to make tax deductible contributions to the AIG education program.

## Our Bursary Sponsors

Once again, in 2008, the AIG Bursary Program has received continuing support from previous bursary sponsors and the welcome addition of new sponsors - Geoconferences (WA) Inc., and Digirock Pty Ltd.

**Geoconferences (WA) Inc.** was founded in 1987. This non-profit organisation comprises volunteers from the Western Australian geoscientific community dedicated to the promotion of geoscience, particularly Precambrian geology and/or economic geology, by arranging conferences, symposia and other meetings.

Excess funds are used to develop the careers of young geoscientists through the provision of J H Lord Travel Grants and bursaries, and to support geoscience education at both secondary and tertiary undergraduate level.The Geoconferences-AIG Geoscience Student Bursary uses excess funds from 6th International Platinum Symposium held in Perth in 1991, and donated to Geoconferences by the organising committee of that symposium.

**Digirock Pty Ltd** is a geological contracting and consulting company specializing in the provision of high quality exploration geologists to the minerals industry. The company, established in 1998, is based in Perth and comprises 18 geologists, ranging from recent graduates to highly experienced exploration managers.

Operating on the principles of good people doing good science, Digirock geologists are predominantly field geologists with a genuine passion for the bush and for exploration in remote areas. The company also provides all aspects of geological support, from complete project management and consulting services, to the provision of contract geological labour.

*Continued Overleaf*

# Education Report

Cont. from Page 25

We are grateful to our new sponsors for their contributions to the AIG bursary program, and would also like to acknowledge our continuing sponsors:

**Chris Bonwick, MD of the Independence Group**

Five Bonwick-AIG bursaries have been awarded since 2003.

**The Minerals & Energy Division of the Department of Primary Industries & Resources South Australia (PIRSA)**

Four PIRSA-AIG bursaries have been awarded to South Australian students.

**Sydney Mineral Exploration Discussion Group (SMEDG)**

Two SMEDG-AIG bursaries have been awarded to students carrying out mineral exploration-related research.

**Terra Search Pty Ltd**

Two Terra Search-AIG bursaries have been awarded to Honours & PhD students.

**Kagara Limited**

The first Kagara-AIG bursary was awarded in 2007 and a Kagara bursary will be offered again in 2008.

**Consolidated Minerals Limited**

Consolidated Minerals became Platinum bursary sponsors in late 2007, and the first Consolidated Minerals-AIG bursary will be offered to students in 2008.

**Cryptodome Pty Ltd**

Three Cryptodome-AIG bursaries have been awarded to Honours & PhD students.

**Gnomic Exploration Services Pty Ltd**

Gnomic has been a supporter of the bursary program for many years and is continuing its support in 2008.

**ActivEX Pty Ltd**

ActivEX has also been a continuous supporter of the AIG bursaries and again, in 2008, is continuing as a bursary sponsor.

**AIG State Branches**

The AIG state branches were critical to the development of the AIG bursary program and continue to provide support.

## The Hellman & Schofield Terry Leach PhD Scholarship

In the May 2007 issue of AIG News we included a notice about the Hellman & Schofield Terry Leach PhD scholarship. Hellman and Schofield were offering a scholarship to the value of A$20,000 to honour the life and work of Terry Leach, who passed away in February 2007. In this issue of AIG News we would like to announce that the Terry Leach PhD scholarship has been awarded to Zarah Heyworth, a PhD student at the University of Queensland. Zarah has previously been awarded a Cryptodome-AIG Honours bursary and a Terra Search-AIG postgraduate bursary, and we wish Zarah continuing success with her research. ▲▲

SMEDG and AIG

## TERRY LEACH SYMPOSIUM 2008

SMEDG and AIG are organising a one day symposium, to be held at the Kirribilli Club, Milsons Point, Sydney, Australia, on Friday, 17th October 2008, to honour Terry Leach's contribution to mineral exploration.

**The Application of Petrology to ~Geological Models in Mineral Exploration~**

Terry's clients and colleagues will present exploration case histories reflecting on the contributions he made to specific exploration and mining projects.

For more information and proposed speakers see **www.smedg.org.au**

*There will be opportunities to mount Trade Displays and to sponsor the Symposium at various levels. Contact details on the SMEDG website*

## THE TERRY LEACH SCHOLARSHIP for Postgraduate Research in Petrology & Geochemistry

*Awarded to*

MS ZARAH HEYWORTH

BSC (HONS 1)

PHD STUDENT (UQ)

Hellman & Schofield Pty Ltd is pleased to announce that a scholarship to honour the life and work of Terry Leach BSc (Carleton University), MSc (Hons 1, Auckland University), M.Soc.Econ.Geol has been awarded to Zarah Heyworth . Terry passed away on 28 February, 2007.

Zarah's research is primarily focused on understanding the chemical fluxes and dynamics of volcanic and hydrothermal systems within the Australian-Pacific margin. She was also awarded the AIG-Terra Search postgraduate bursary to do an oxygen isotope study at the ANU on sea-floor samples from the Vanuatu backarc basin.

*The Terry Leach Symposium will be held on 17 October 2007 at the Kirribilli Club, Milsons Pt, Sydney (see http://www.smedg.org.au/ for details).*



## SPONSORS of the AIG GEOSCIENCE BURSARIES

*The AIG wishes to thank the following individuals and organisations for their support of the*

GEOSCIENCE STUDENT BURSARIES

### Diamond Sponsor

**CHRIS BONWICK**

*sponsoring the*

**Bonwick-AIG Geoscience Student Bursaries**

### Platinum Sponsors

**CONSOLIDATED MINERALS LIMITED**

*sponsoring the*

**Consolidated Minerals-AIG Geoscience Student Bursary**

**DIGIROCK PTY LTD**

*sponsoring the*

**Digirock-AIG Geoscience Student Bursary**

**GEOCONFERENCES (WA) INC**

*sponsoring the*

**Geoconferences-AIG Geoscience Student Bursary**

**KAGARA LIMITED**

*sponsoring the*

**Kagara Zinc-AIG Geoscience Student Bursary**

**OFFICE OF MINERALS & ENERGY PIRSA**

*sponsoring the*

**Office of Minerals & Energy PIRSA-AIG Geoscience Student Bursary**

These bursaries are offered to geoscience students at South Australian Universities.
(General eligibility criteria and guidelines also apply.)

**SYDNEY MINERAL EXPLORATION DISCUSSION GROUP**

*sponsoring the*

**SMEDG-AIG Geoscience Student Bursary**

This bursary is offered to geoscience students working on projects related to mineral exploration. The successful applicant must give a presentation on her/his research project to SMEDG at a Sydney meeting within 12 months of being awarded the bursary.
(General eligibility criteria and guidelines also apply.)

**TERRA SEARCH PTY LTD**

*sponsoring the*

**Terra Search-AIG Geoscience Student Bursary**

### Gold Sponsors

**AIG NSW State Branch**
**AIG QLD State Branch**
**AIG VIC State Branch**
**AIG WA State Branch**
**Cryptodome Pty Ltd**
**Gnomic Exploration Services Pty Ltd**

### Silver Sponsors

**ActivEx Limited**
**Lantana Exploration Pty Ltd**

# Complaints, Complaints, Complaints

## Is a picture worth 1000 words?

While the above statement applies in many circumstances, its applicability to the public reporting of exploration results needs careful thought. I'm not talking about maps, sections or diagrams here - I'm referring to photographs of outcrops, core, isolated boulders etc that are used to illustrate some public announcements signed-off by Competent Persons and usually more common in reports of early exploration results. Most tend to have an indication of scale and appear to invariably be of high grade material, but their captions often lack other information such as mineralogy, assay results or how representative such specimens are of the area of mineralization.

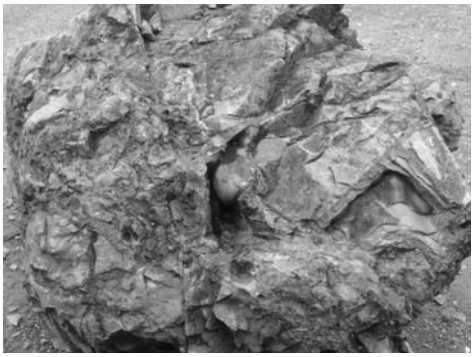
Let's assess the use of photographs against the JORC principles of Materiality and Transparency.

Without a fulsome caption or description within the text, photographs may lack Materiality (they are just pretty pictures). If photographs of only high grade material are included or that there is no statement concerning how representative the photographed sample is compared to the mineralized area, there may be a breach of Transparency as well as Materiality. If photographs of outcrops, core etc. are used without other textual information and maps concerning sample locations, grade, mineralogy etc of samples, then Materiality and Transparency are lacking.

In the circumstances, photographs of a range of sample grades, with appropriate captions, are best used as an adjunct to maps and sections, and textual information - not as a substitute.

Great picture !!! but what does it mean on its own?

*(Ed: It's supposed to be vivid green copper ore!)*



## ASX Companies Update 03/08 released

This update contains useful guidelines for Competent Persons on the following issues:

- Reporting of in situ values
- Reporting historical or non-JORC resource estimates
- Competent Person statement
- Reporting Exploration Targets
- Lack of drillhole information
- Combining categories of resources and reserves
- Incorrect use of reserves and resources to describe results

Link: www.asx.com.au/resources/newsletters/companies_update/archive/CompaniesUpdate_20080318_0308_HTML.htm

## Current complaints

A complaint involving repeated minor breaches of the JORC Code is currently working its way through the "JORC infringement notice" disciplinary process. This process is designed to deal with minor breaches such as sloppy use of nomenclature for resources, lack of material documentation, or failure to include a Competent Person statement. ▲▲

# Letter to the Editor

**Dear Editor,**

AIG President Andrew Waltho comments in the latest edition of AIG News (Issue 91) about a shortage of geologists, and he discusses some of the reasons for it. Apart from our industry being horribly cyclical and deterring students during times of downturn, the other factors identified are the closure of university departments and the lack of geoscience being taught in schools.

First I want to address the schools issue. There is a lack of geoscience taught in schools because there are very few science teachers with a geoscience background. Why? Because they're all out there being employed in industry. Why? Because they're paid at least double what they can get as teachers. Pure and simple maths (and science). There is no doubt that the classroom teacher is the single most important factor in a student's interest in a subject. A good enthusiastic teacher will have eager and interested students. Teachers with no geoscience background trying to teach geoscience will never impart the same level of expertise or enthusiasm to students. If we want more geoscience taught in schools we need to entice more graduates with geoscience backgrounds into teaching. How? Pay them more. Pay them a lot more.

All this stuff and nonsense about "productivity trade-offs" etc. that the Government Education departments go on with, is just that. Stuff and nonsense. The simple economic driver is salary. If you want high quality teachers (no matter what the discipline actually) pay them more. Forget all the other claptrap about "trade-offs", that's just window dressing and excuses not to pay teachers what they're worth.

I also read recently a comment that a survey of university geoscience graduates revealed that less than 50% of them wanted to go into industry, and most were looking towards an academic career. Ask yourself why? Because everyone who has any level of interest in working in industry is out there right now - working in industry. That leaves the committed academics in the universities instilling their love of academia into our students. Now don't get me wrong, I am not criticising academics. They have an incredibly important role to play, but we need balance. We need more people with industry backgrounds teaching at our universities. But how? Again the answer is pure and simple. Pay them more.

If there was the opportunity to pursue a teaching career at either secondary or tertiary level for our geoscience graduates with a commensurate level of pay as industry, then we would be enticing more people into this noble profession than we are currently. The first output would be more secondary students with exposure to geoscience, and interest in pursuing careers in the area, with a more balanced view of the place of earth science in the global setting. Secondly, industry balance in tertiary teaching offers students a broader and more balanced view of the opportunities in geoscience, and the importance of mining in the economy.

But here's the problem. Funding. No-one wants to pay teachers more. Governments spend millions finding excuses not to pay them more. Universities and schools continue to suffer funding cuts. So is the industry willing to do anything about it? Maybe each state branch of AIG and AusIMM needs to jointly fund an industry sponsored tertiary teaching position at each of the geoscience departments in their states to give more industry perspective to university courses. Maybe the funding group needs to involve other agencies as well (e.g. AMEC, MCA). If we don't take this sort of action nothing will change.

Regards, **Ian Mulholland, FAIG, FAusIMM, FSEG**

# Membership FAQs

**THE AIG COUNCIL recognises that members may from time to time slip up on making their annual membership renewal payments. The task of chasing up lapsed members is an added cost to the AIG and because we do not charge penalties for late payments, this cost is ultimately carried by those members who do pay on time.**

Council recently revisited its rules for members who fail to meet the annual membership renewal deadline. In doing so, Council recognised that some members may have valid reasons for missing their payments and it has therefore adopted certain exemptions to the provisions for lapsed members.

The FAQs below outlines important membership related information.

***What's the timing on membership renewals?***

Renewal Notices are posted to your nominated address in May - June of each year. Renewals should be paid within 30 days of receipt of your Renewal Notice.

***What happens if I don't pay within the specified period?***

If you do not pay your renewal within 30 days of receipt of your Renewal Notice you will automatically become a Non-financial Member.

If you do not pay your renewal within 90 days of receipt of your Renewal Notice you will immediately cease to be a member of the AIG and will stop receiving any benefits of membership, including the right to claim AIG membership in press releases, market announcements and resource calculations.

***What if my address has changed and I haven't received a Renewal Notice?***

If your address has changed since you submitted your original application for membership you can send an e-mail to The Secretary at aig@aig.org.au and a Renewal Notice will be forwarded to your new address.

***What happens if my membership has lapsed?***

If your membership has lapsed you may, at the sole discretion of Council, be reinstated at the grade of membership you previously held by (i) paying pro-rata back dues and (ii) providing a signed declaration that you have complied with the AIG Code of Ethics during your lapsed period. There is no time limitation on reinstatement and you do not need to provide any supporting documentation. To find out what back dues you owe, contact The Secretary at aig@aig.org.au.

If you do not want to pay back dues you will need to submit a new application which will be evaluated on its merits by Council. Your application will need to include the appropriate fee, provide a Proposer and Seconder who can vouch for your experience since your earlier application and include any supporting documentation, with the exception of copies of qualifications you previously submitted with an application for membership. An Application Form which details the requisite supporting documentation for each grade of membership can be downloaded from the AIG Website at aig@aig.org.au.

***What if I want to re-apply at a higher grade of membership than I previously held?***

You will need to submit a new application together with the appropriate supporting documentation.

***What if I will be unable to pay my dues?***

You can apply to Council for exemption from cancellation of your membership under the following circumstance:

- If you take maternity/paternity leave
- If you suffer a seriously debilitating illness or injury
- If you experience serious financial impairment

Any application for exemption will be considered on its merits and any exemption provided at the sole discretion of Council.

***What if I've gained additional qualifications or changed my name or address, etc?***

If any of your details change at any time you should advise us by sending an e-mail to The Secretary at aig@aig.org.au so that your records can be updated accordingly.

***If my membership has lapsed and I rejoin, is my RPGeo status automatically reinstated?***

No. Registered Professional Geoscientist (RPGeo) status contains an explicit commitment to continued professional development (CPD). This commitment is auditable and a cross-section of RPGeo members' CPD records is audited annually by the Registration Board.

If your membership has lapsed but you have continued your professional development during the lapsed period you can apply to have your RPGeo status reinstated by submitting to the Registration Board (i) your CPD record for review and (ii) a signed declaration that you have complied with the AIG Code of Ethics during your lapsed period. Following a satisfactory review of the above by the Registration Board your RPGeo status will be reinstated. If the Registration Board is of the opinion that the information you have provided is inadequate, you will be advised.

If you cannot present a satisfactory CPD record to the Registration Board you will need to submit a new application for RPGeo.Your submission will need to include the application fee, all the necessary

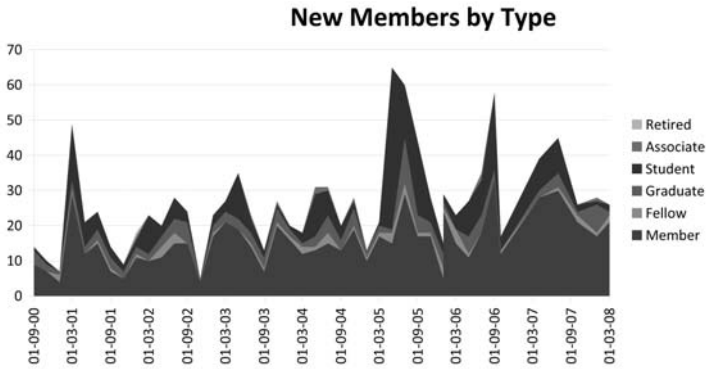
supporting documentation and will be evaluated entirely on its merits. An application form for RPGeo is available on the AIG website at aig@aig.org.au.

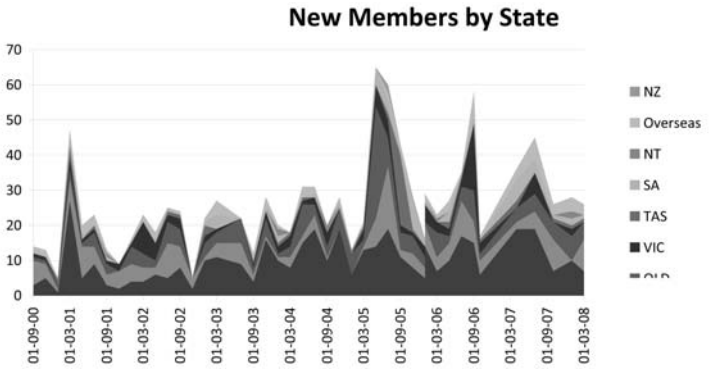
***If I'm an AIG member am I automatically a Competent Person under the JORC Code?***

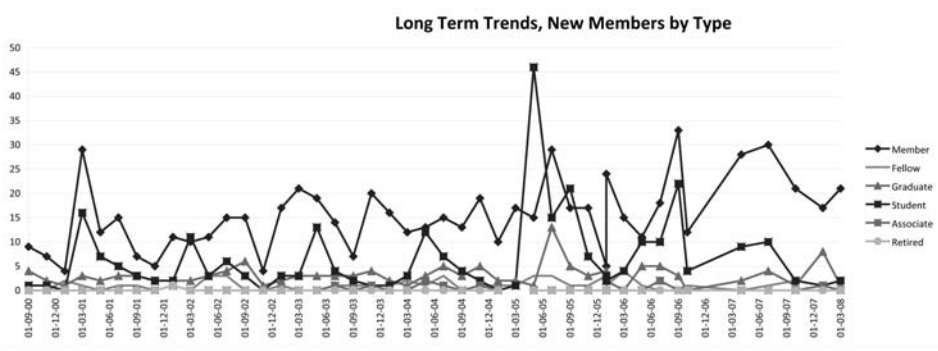
No. A Competent Person under JORC must be a member of a professional institution (e.g. AIG); however under the Code a Competent Person must also be able to demonstrate a minimum of five years experience relevant to (i) the style of mineralisation, (ii) the type of deposit under consideration and (iii) the stage of project development being undertaken. In other words, if a Competent Person is preparing a report on gold exploration results, the relevant experience must be in gold exploration.

**If you have any questions about you membership, please don't hesitate to contact the Secretary at aig@aig.org.au or your local AIG Committee. ▲▲**

# Membership Statistics




# Membership Update

***New Members and Upgrades at the March Council Meeting 2008***

**FELLOWS**

| | | |
|---|---|---|
| HOWARD | Robert | Winston |
| MACDONALD | Alasdair | James |

**MEMBERS**

| | | |
|---|---|---|
| ALLMARK | David | Norman |
| BAUDRY | Philippe | Andre |
| BENHURA | Clive | Tonderai |
| BLAKE | Michael | Dean |
| BUCKLEY | Peter | Maurice |
| CANISIUS | Millicent | |
| CULLEN | DAMIEN | James |
| ELLIOTT | Roy | Graham |
| GHASEMI | Abbas | |
| HUTTON | Murray | John |
| KLOPPER | Jay | Stuart |
| MCLEAN | Wendy | |
| MORRISON | Christopher | Stedman |
| MURRAY | David | Edward |
| NITSCHKE | NICHOLAS | |
| PATERSON | Thomas | Alexander |
| RANKIN | Leigh | Ronald |
| SMALLEY | Jonathan | Francis |
| STRATE | Tanya | |
| WAUGH | Robert | Scott |
| YOUNG | Barry | John |

**GRADUATES**

| | | |
|---|---|---|
| HANSEN | Alan | Peter |

**STUDENTS**

| | | |
|---|---|---|
| GRIMMER | Suzette | Louise |
| POSKUS | Danielle | Amelia-Marie |

***We welcome all new members to the AIG.***

# RPGeo Approval and Applicants

## CANDIDATES APPROVED BY AIG COUNCIL IN MARCH 2008

**Mr. Richard Philpott,** of Greenslopes, Queensland, in Geotechnical and Engineering

**Mr. Peter Gringinger,** of Burwood, Victoria, in Environmental Geoscience

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

**Julie Evans** ***of Kirrawee, NSW, reinstatement in the field of Environmental Geoscience***

# AIG FEDERAL COUNCIL FOR 2007-2008



# AIG NEWS

## CONTRIBUTION DEADLINES

AIG News is published quarterly, in February, May, August and November.All items for inclusion in the newsletter for a particular issue should reach the Editor by the end of the preceding month. Avoid disappointment by contacting the Editor at least several days beforehand to advise submission of items for the newsletter.

*AIG News is published by the Australian Institute of Geoscientists to provide information for its members and a forum for the expression of their professional interests and opinions. Observations, interpretations and opinions published in AIG News are the responsibility of the contributors and are not necessarily supported by the Australian Institute of Geoscientists or the Editor of AIG News.*

*While the Editor and the Australian Institute of Geoscientists have taken all reasonable precautions and made all reasonable effort to ensure the accuracy of material contained in this newsletter, they make no warranties, express or implied, with respect to any of the material published in AIG News.*

### The BUSINESS ADDRESS of AIG News is:

**PO Box 8463, Perth Business Centre, Perth WA 6849**
**Tel: (08) 9427 0820**
**Fax: (08) 9427 0821**
**Email: aignews@fgservices.biz**
**Web: http://www.aig.org.au**

*Please use these contacts for all matters relating to advertising accounts, changes of address, AIG News distribution, or membership.*

### The EDITORIAL ADDRESS is:

**Editor: Louis Hissink**
**Email: aignews@fgservices.biz**
**Tel: (08) 9427 0820**

*Please submit all articles, letters and advertisements to the above email address.*

## SUBMISSION FORMATS

**Text:** Word Files (Please DO NOT EMBED pictures in Word, supply as separate files.)

**Pictures, Logos, Maps, Diagrams:** Resolution 300dpi. Photoshop EPS, Tiff, Jpeg or press-optimized PDF files in Grayscale/Bitmap. Please provide images of all pictures separate to text. Please EMBED ALL FONTS in EPS and PDF files.

## ADVERTISEMENTS

AIG News provides an ideal opportunity to advertise your company and services to the AIG membership throughout Australia (and some overseas), There are about 1,300 members who receive the newsletter four times per year. Please contact the Editor for further details or to book advertising.

*Prices are inclusive of GST*

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|---|---|
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| Pre-printed (3 or more pages) | By negotiation and weight |
| Including printing | By negotiation |

Supporting Geoscientists

The **AIG Website** in currently undergoing a major update. Comments on content suggestions or new features should be directed to Andrew Waltho (andrew.waltho@bigpond.com