

## Exploration Value and Predicting "Undiscovered" Gold Endowment in a Mature Gold Camp

- Case Study of the Plutonic Marymia  
Greenstone Belt, Western Australia

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### Abstract

The Plutonic Marymia Greenstone Belt (PMGB) is the 6th largest gold camp in Western Australia. An earlier attempt to estimate the residual gold endowment in the PMGB (Guj and Fallon, 2009) predicted additional undiscovered resources in the belt. A GIS-based prospectivity modelling approach was used to assist identifying areas of high potential for gold mineralisation where these yet-be-discovered deposits could be spatially located. The modelling provided an estimate of the relative probability of discovering gold mineralisation in each unit cell of the area. This knowledge will be critical in guiding future exploration programs in the PMGB.

### 1. Introduction

The Plutonic Marymia Greenstone Belt (PMGB), an elongated NE-trending belt within the Marymia Inlier, is located 1000 km north of Perth, Western Australia (Figure 1). The Marymia Inlier is an area of exposed Achaean basement within the Proterozoic Capricorn Orogen. The PMGB consists of a mafic and ultramafic volcanic rock sequence in the northern part of the belt, a central conglomerate unit, and a sedimentary and mafic rock sequence in the south. All units are surrounded by granite. The mafic and ultramafic rock sequence has been metamorphosed to amphibolite facies grade. Concordant dolerites and gabbros have intruded the stratigraphy in the central and northern parts of the belt. Proterozoic dolerite dykes cut both the greenstones and the surrounding granites. Most units within the PMGB dip to the northwest, parallel to the granite-greenstone contacts, and are cut by east-west faults. Three major structural events have been identified; 1) D1, north-directed, low-angle thrusting emplacing the older mafic and ultramafic units on top of sediments, 2) followed by granite thrusting along the western portion of the belt during D2, 3) D3 with high-angle thrusting towards the southeast and open folding of earlier structures as well as reactivation of D2 thrusts.

Mineralisation in the PMGB is subdivided into five distinct styles: replacement "Brown" - or "Plutonic" - type lodes that contain the bulk of the gold, replacement -type "Green lodes", "invisible" lodes, dilational high angle quartz veins, and shear related mineralisation close to lithological rock contacts. The Brown and Green lode mineralisation events are thought to be associated with the earliest structural event (D1) within regional-scale thrust duplexes controlled by deep-seated east-west trending lineaments (Vickery et al., 1998).

The PMGB remained largely unexplored until 1987 when gold was first discovered. Production commenced in 1990, and by 2007 a total of 4.2 Moz of gold had been produced. Plutonic is the 6th largest gold camp in Western Australia with an estimated total gold endowment of 12.2 Moz.

The Lord et. al., 2000 technique to measure exploration success in a mineral field was applied for the PMGB. The probability a prospect would advance through the various exploration stages to

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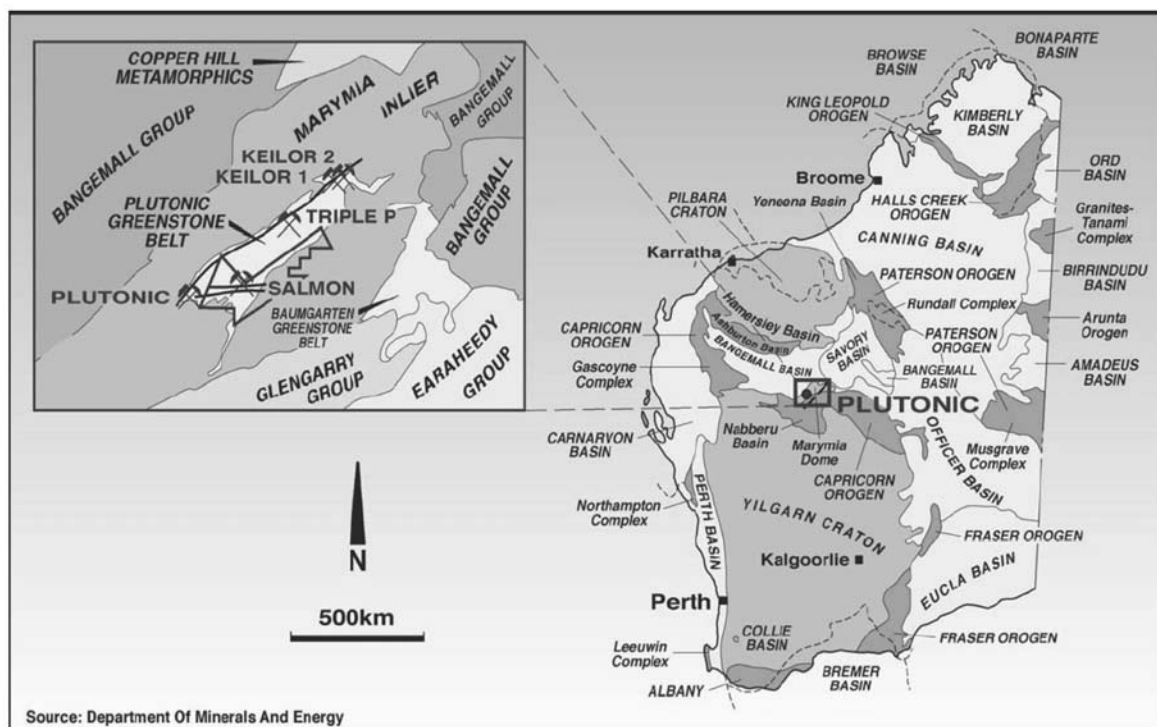


Figure 1 Location of PMGB

mining was calculated at 0.18. The average life of mine discovery historical costs for the total gold endowment was A\$ 16.31 / oz and A\$23.39 / oz in 2007 constant dollars. For reserves the discovery cost was calculated at A\$ 30.51 and A\$ 43.75 respectively. These costs equate to significant multipliers in terms of the annual in-situ value of gold discovered relative to the corresponding annual exploration expenditure.

### 2. Predicting residual gold endowment in PMGB

The traditional techniques used to predict the undiscovered or residual metal endowment in a mature mineral field relies on the application of subjective criteria to genetic, structural and economic models by the geologist. Over the last decade the mineral industry's performance using this technique has tended towards most geologists being over-optimistic in their predictions of size of the mineral endowment, resulting in low probabilities of success whilst executing their exploration programs.

From 1980 to 1995 the petroleum industry shared a similar experience, terming this the prospector's myth (Rose and Citron, 2000) resulting in low discovery rates and the destruction of value to the shareholder and the company. This invoked the petroleum industry's application of statistical and probabilistic techniques to evaluate and predict the residual endowment in hydrocarbon plays. By analysing the number and size of deposits in hydrocarbon plays across the globe, it was recognised that the size of petroleum accumulations in any basin followed a lognormal distribution. This recognition was quickly followed by the adoption of a range of useful statistical techniques to estimate the expected size of a deposit and the associated uncertainty or probability of that discovery being successful. Zipf's Law was one such geostatistical techniques applied. In 1949, George Zipf, a professor of linguistics at Harvard University, attempted to describe the use and frequency of the most used word and words in a language. The relationship was identified to be proportional to  $1/n$ .

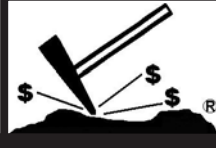
Zipf's Law is an expression of the Pareto distribution or power law and describes the relationship between size and rank of discrete phenomena. It involves the ranking of data with the largest value at rank 1, the second largest at rank 2, etc. tending towards zero. Simply, the largest rank 1 member is twice number 2 and three times number 3 in a series tending towards zero. Its application in the petroleum industry has been described by (Howarth et al. 1980; Schuenemeyer and Drew, 1983; Merriam et al., 2004) and for mineral deposits by

(Folinsbee, 1977; Rowlands and Sampey, 1977; Tapp and Moniuszko, 1978; Paliwal et al. 1986; Houghton et al., 1993; Fagan, 2006; Guj et al., 2007, Guj and Fallon, 2009).

Guj and Fallon, (2009) attempted to use Zipf's Law to estimate the potential size and number of undiscovered gold deposits remaining in the PMGB. All of the discovered gold prospects and deposits > 100 ounces were compiled into a database and were ranked according to their size or mineral endowment. Guj and Fallon, (2009) found the deposit data best fitted a lognormal distribution, hence plotting as a straight line on a probability log graph. The database confirmed the presence a very large number of small gold accumulations and few very large deposits.

Using this technique the residual or undiscovered gold endowment in the PMGB was predicted to be between 5.5 and 5.9 Moz, including 6 undiscovered deposits ranging in size from 0.70 to 0.40 Moz and another 6 undiscovered deposits ranging between 0.30 to 0.20 Moz. As used in the petroleum industry, an attempt was made to confirm the

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## From Your President

**WELCOME TO 2010! I hope that the coming year is a happy and satisfying one for everyone, after the trials experienced by many geoscientists, colleagues and friends during the past year.**

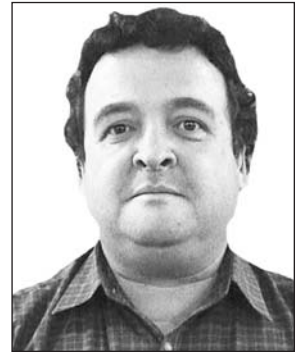
I'm filling in for Martin Robinson this issue, who is just back on deck from what I'm sure was a well earned break during January (and paying for it by trying to sort through the accumulated backlog of work on his desk!).

2010 has to be better than 2009. All of the signs are there that economies, globally, are recovering from the global economic, albeit at different rates, but that there still may be some hurdles to cross before we return to a more normal situation. At least in Australia, the outlook for resource industries, and exploration in particular, seems to have improved markedly. The most recent update to the AIG employment survey, results for which appear in this issue or on the web site, clearly showed that the employment outlook for geoscientists is improving, although it is still well short of ideal. The latest survey attracted considerable media attention when results were released in early January which helped to raise the profile of the problems affecting investment in exploration and resource development projects, attracting talented students to geoscience careers and retention of skilled professionals. These surveys will be repeated quarterly during 2010, to track the recovery in employment terms, and in what may be a first, attempt to establish a relationship between industry activity and geoscientist employment generally. Sincere thanks to all members who contributed to these surveys, by answering the survey questionnaire and encouraging their colleagues to also contribute.

The initial survey and each update received a great response that helped to establish the credibility of the results and humbly request your continued support during the coming year. Election years are times when Governments (and their alternatives) are more likely to take heed of information and ideas presented to them. Whether they actually follow through, let alone honour election promises such as the introduction of Flow Through Shares as a measure to stimulate employment and reduce Cyclicity in exploration investment is another thing entirely, which says a lot about ethical standards in my view.

The big news story since the end of last year is the failure of the Copenhagen summit to live up to expectations for the introduction of legally binding targets for greenhouse gas emission reduction and, just prior to the summit, rejection of the Commonwealth Government's emission trading scheme for the second time in the Senate.

The AIG Secretariat office, state branch committee members and Councillors have received many requests for AIG to state a position on climate change. AIG has a diverse membership with correspondingly diverse views on this complex subject. Consequently, AIG does not have a position either for, or against the proposition that human activity is inducing a change in Earth's climate, through warming of the atmosphere. What we do have is a commitment to promote and facilitate vigorous, robust and appropriately informed discussion of arguments for and against the proposal to allow members to reach their own views on this issue, and to express their views to their peers. It's clear, contrary to Al Gore's claims, that the science is far from settled. Further, the debate has become highly emotive at times, and that the ethical conduct of the debate has suffered.



Our political "leaders" (and I use the term leader with some uncertainty), with a few notable exceptions where politicians have demonstrated a commitment to seeking out facts and developing a balanced and informed opinion on the climate change issue, have not helped through their conduct in relation to this issue, especially through what I believe to be thoroughly demeaning conduct in the form of branding opponents as "heretics" or "climate change deniers". I was, at first, frankly shocked to hear Dr Bob Brown on radio last year pleading for people to listen to the scientists. It took me a while to realise that Dr Brown and I had very different definitions of what a scientist is, stemming from the application of scientific principles:

- Objectively assessing data and information gained through relevant observations;
- Collecting data with the aid of well designed, unbiased and unambiguous experiments;
- Analysing results both favouring the hypothesis being tested and potential alternative interpretations;
- Presenting results in a clear and objective manner; and,
- Proposing actions to address the implications of results, which themselves must be assessed, developed and presented in a clear and objective manner.

These criteria don't appear to have been met in many instances by scientists on both sides of the debate.

This lack of scientific rigour, in my view at least, is unethical and has potential to damage the reputation of science and scientists in the broader community. This sort of conduct in one sector of what is a very broad and diverse profession has enormous potential to damage the reputation and credibility of the profession generally. Geoscientists and geosciences, in Australia, partly due to the profession's record of taking decisive action to address shortcomings, such as the JORC and VALMIN codes for public reporting of information with potentially significant commercial consequences, and Australia's two professional institutes covering geoscientific practice (AIG and AusIMM) having open, fair, strong and enforceable codes of ethics.

New Scientist magazine has been one of the strongest proponents of anthropogenic global warming in recent times, through both articles published in the magazine and editorial content. Since Copenhagen, there has been a noticeable change in the tone of editorial comment in the magazine, culminating recently in strident criticism of Dr Syed Hasnain's claims that Himalayan glaciers could melt by 2035, claims that would not have become widely publicised and included in the IPCC report if New Scientist had not published them in the first instance. Dr Hasnain has himself described the claim as "speculation", not supported by any formal research. Jean-Pascal van Ypersele, the IPCC's vice chairman, has described inclusion of Dr Hasnain's claims in the IPCC report as "one mistake in a 3,000-page report" but it surely places the criteria and processes used to test and validate evidence followed by the IPCC in

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confidence of these predictions through the use of geographical and statistical reality checks. Figure 2.

A review of all drilling data at a depth of 200 metres below the surface showed that most of the PMGB has been poorly tested and sufficient room existed for the number and size as predicted number by Zipf's Law.

The statistical reality checks included the P10/P90 ratio and the Swanson mean. Guj et al., (2007) stated if a maturing greenstone belt can be viewed as equivalent to an established oil play or trend (Rose, 2001, p. 26), then the P10/P90 ratio should calculate at between 10 and 120 and the Swanson mean should plot between the P17 and P33. For the PMGB, Guj and Fallon, (2009) calculated the P10/P90 ratio at 84.5 and the Swanson mean at P24. Hence the predicted size of the gold endowment in the PMGB passed both statistical reality checks.

In predicting potential of hydrocarbon basins, the petroleum industry tends to report a range of deposit sizes and the associated uncertainty of their occurrence. Hence the deposits size is typically quoted as ranging between P1 (largest), P10, P50 to P99 (smallest). Guj and Fallon, (2009) plotted the existing and residual deposit data for the PMGB onto a log probability plot. The residual endowment distribution was generated by drawing a straight line between the largest P1(0.70 Moz) deposit and smallest P99 (284oz) deposit size as predicted by Zipf's Law (Figure 3). This allowed predictions of the expected or mean size of all possible future discoveries to be 0.39 Moz. There is a 1% probability of a possible discovery exceeding 0.70 Moz, 10% probability of it exceeding 0.11 Moz and 50% probability of it exceeding 0.01 Moz (Figure 3).

Although probabilistic techniques were used to predict the number, size and confidence limits for residual deposits in the PMGB, it did not provide any localities or spatial constraints for the predicted undiscovered gold endowment. This question led to an analysis in the GIS environment, which attempted to link the probabilistic predictions of the "residual" deposits to the prospectivity map.

### 3. GIS-based prospectivity mapping

The approach involved spatial-mathematical-model based integration of multiple layers of geoscientific information associated with known gold occurrences, prospects and deposits in the belt.

A consistent GIS database of the PGMB was compiled from the available exploration datasets which included mineral deposits, lithology, structures, geochemistry, drilling data, and geophysics. Based on past exploration experience and conceptual models of gold metallogeny, the following were identified as the key mappable exploration criteria for gold deposits in the PGMB: (1) proximity to

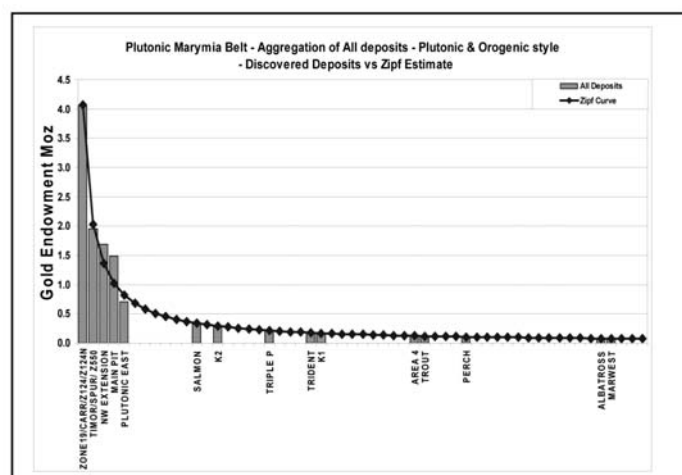


Figure 2 Prediction of residual endowment in PMGB

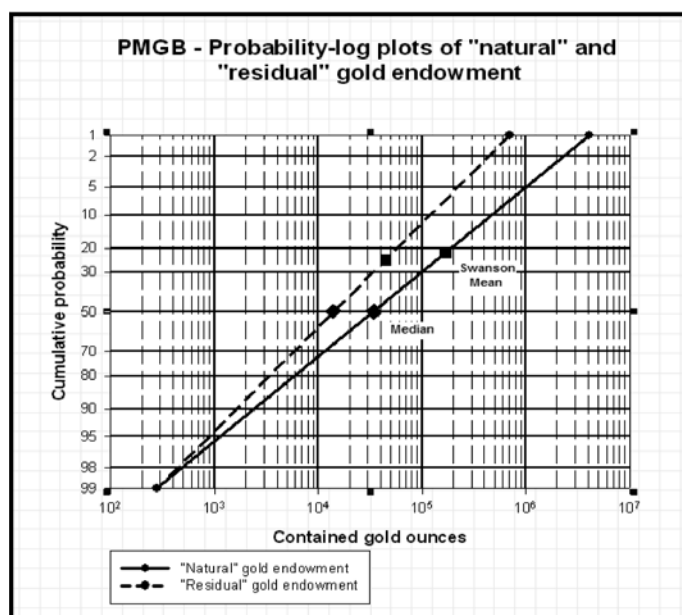


Figure 3 Log probability of existing and predicted residual endowment in PMGB

faults, (2) structural complexity, (3) favourable host rocks, (4) geochemistry, and (5) alteration. The mappable exploration criteria were input to the spatial mathematical models in the form of GIS proxies (or derivative predictor maps) that were derived by processing the GIS database (Table 1). Prospectivity analysis was performed using a unit cell size of 100 m by 100 m. Three models were implemented, namely, a knowledge-driven fuzzy model (Porwal et al., 2003), a data-driven Bayesian probabilistic (or weights-of-evidence) model (Agterberg et al., 1990), and a data-driven logistic regression model (Chung and Agterberg, 1980; Carranza and Hale, 2003).

The parameters of the fuzzy model including the fuzzy membership values of each input predictor map, were based on the expert knowledge, and were subsequently integrated using various fuzzy mathematical operators in a multi-stage inference engine (Porwal et al., 2003). The output of the fuzzy model is a prospectivity map of the study area (Figure 4) in which each unit cell is represented by a combined fuzzy favourability value that ranges between 0 (minimum prospectivity) and 0.37 (maximum prospectivity). The combined fuzzy membership value is a measure of the favourability of the unit cell to host gold mineralization.

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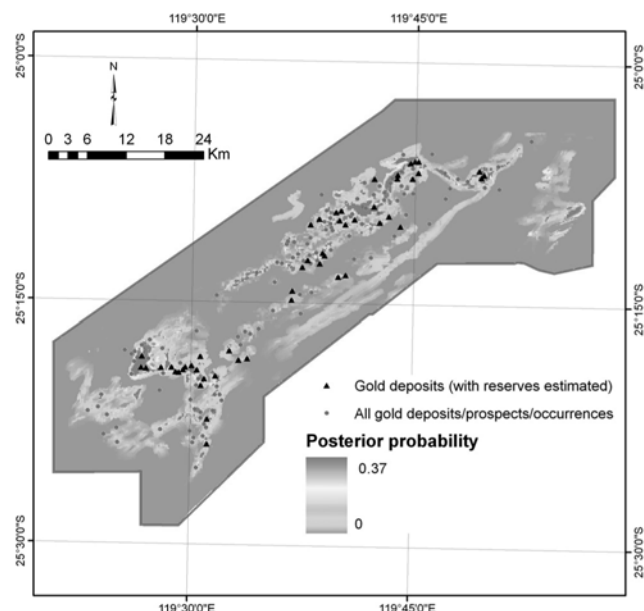


Figure 4: Gold prospectivity map of the PGMB derived using fuzzy model.

S. No.	Mappable exploration criteria	GIS proxy
1	Proximity to faults	Distance to 4th Generation faults
		Distance to 3rd Generation faults
		Distance to 2nd Generation faults
		Distance to 1st generation thrusts
		Distance to fault intersections
2	Structural complexity	Fault density
		Geological contact density
3	Favourable host rocks	Proximity to geological contacts
		Host rock Lithology
4	Geochemistry	Anomalous gold values
5	Alteration	Alteration type

Table 1: Mappable exploration criteria and GIS proxies

The positive and negative weights of evidence parameters of the predictor maps were estimated empirically from the spatial associations of known gold deposits and were combined using Bayes' equation in a log-linear form under the assumption of conditional independence (Bonham-Carter, 1994). Although there are a total of 170 gold occurrences in the belt, we used only 52 deposits with estimated gold resources to determine the model parameters. The output of the weights-of-evidence model is a prospectivity map (Figure 5) in which each unit cell is represented by a posterior probability value for hosting a gold deposit. It should be noted that the output posterior probability values of the weights-of-evidence model are significantly biased upwards by the correlations amongst the input predictor maps, and hence should be interpreted as measures of relative favourability rather than the posterior probabilities of gold deposits in an absolute sense.

The logistic regression model, on the other hand, does not require the assumption of conditional independence and hence its output is possibly not affected by the correlations amongst the input predictor maps (Agterberg et al., 1993). The regression coefficients were estimated empirically from the spatial association of the 52 gold deposits (see above) with the predictor maps. In the logistic regression model (Figure 6), each unit cell is represented by a posterior probability value. A comparison of Figures 4 and 6 shows that the logistic-regression-derived posterior probabilities are much lower (maximum value - 0.20) than the weights-of-evidence-derived posterior probabilities (maximum value - 0.98), and are more realistic.

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## From Your President

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question. It's just not good enough to blithely attempt to justify conduct of this nature on such an important and hotly debated issue.

Dr Hasnian made his comments in a telephone interview in 1999 after publication of his comments in an Indian newspaper. He wasn't referencing a scientific paper in a learned journal and, personally, I don't think he's done anything wrong. Anyone is entitled to an opinion and to throw up hypotheticals in conversation. New Scientist's editor's however, have a responsibility to be more prudent in their reporting, and certainly don't appear to have any basis for Dr Hasnian's recent treatment in their magazine, which may itself be an illustration of the difference between popular media and learned publications and the need to treat the information provided by different forms of publication more appropriately.

A geoscientist working in resource exploration or mining cannot make a public statement of exploration results, coal or mineral resources without agreeing to be bound by these standards for ethical conduct. Too many of our peers, however, are able to make statements on climate change, that may also have considerable commercial significance, if not immediately then certainly in the long term, without being bound by any comparable standards of professional conduct or sound scientific practice. This is not helping to ensure the quality of the debate, both within scientific forums and the community at large who look to scientists for guidance on an issue with the potential to affect every single person on Earth.

One thing is certain: the science is far from settled. Sorry Mr Gore. As a profession, we need to raise the bar in terms of what constitutes appropriate and ethical practice on this issue.

An apparently unrelated issue has a similar theme at its core. There is a perception by Government in Australia that we are a nation literally sitting on an enormous inventory of strategic resources, just waiting to be extracted and utilised for the good of the economy. While there may be a substantial resource inventory, there appears to have been very little examination of what is and isn't economic, and therefore able to be considered to be a resource. Broad assertions of resource inventory by government agencies are not subject to compliance with the JORC Code. Under the JORC Code, "a 'Mineral Resource' is a concentration or occurrence of material of intrinsic economic interest in or on the Earth's crust in such form, quality and quantity that there are reasonable prospects for eventual economic extraction".

The words reasonable prospects for eventual economic extraction are critical in this definition. What do they really mean and how should they be interpreted? Perhaps there should be a requirement for these criteria to be explicitly stated in resource statements, in the interests of transparency and materiality, and to allow informed analysts to develop their own, informed assessment of the veracity of resource statements? There certainly appears to be a case for statement of criteria used to estimate resource inventories by government agencies in order to develop rational and realistic of Australia's mineral resource project pipeline.

I suspect that the outcome would be increased focus on how to improve the base on which an industry we, as a nation, are clearly relying on to underpin national prosperity, economic security and standards of living into the future is itself dependent.

Any thoughts on these issues?

Andrew Waltho





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## 4. Results

All prospectivity maps show a similar pattern that captures the majority of known significant gold deposits in high prospectivity areas (Figures 4, 5 and 6). Thus the concept-driven and data-driven models cross-validate each other. The highest prospectivity is confined to the south-western and northern parts of the greenstone sequences along the contacts with granite. However, the weights-of-evidence model (Figure 5) results in seemingly excessive areas of high prospectivity which is an effect of possible conditional dependencies in the datasets. The fuzzy (Figure 4) and logistic regression (Figure 6) models outline better-defined areas of prospectivity, and therefore identify target areas more efficiently.

## 5. Discussion and Summary

A prospectivity map depicts prospectivity of a terrane with the benefit of "hind sight". Prospectivity is relative to the "original natural endowment" of the terrane and not in terms of its yet-to-be-discovered "residual endowment".

Hence cells containing known mineralisation display very high probabilities, close to certainty as depicted in the weights-of-evidence model of Figure 5, which in effect is telling us that if we had originally drilled the related cell we could have expected to make a mineral discovery with a high level of confidence. This outcome, of course, would have depended on the size/footprint and depth of the mineralised body relative to that of the cell. In the analysis, however, the location of each mineral occurrence is dimensionless as it is captured in the GIS as a single point and not in terms of its size/footprint. In other words the area of influence of individual mineralised bodies is unrelated to the size or importance of a deposit even though the footprint of a large deposit may be larger than a single map cell and encroach on some of the adjacent ones. This weakness may be overcome by (1) weighting deposit influences as a function of their size, or (2) producing separate maps based on the influence of deposits above increasing size thresholds with consequent loss of resolution, or alternatively (3) attempting to locate not only the centre but also the extremities of deposits on the map. Such approaches would allow better screening between "original" and "residual" fields of prospectivity. In the current case study, it was predicted using rank statistics (Guj and Fallon, 2009) that the "residual" endowment contains around 5.9 Moz of gold in 14 as-yet-undiscovered deposits ranging in size between 0.2 and 0.7 Moz, and a number of smaller ones. The next challenge is to link the distribution of these "residual" deposits to the prospectivity map. Ideally this should allow us to attribute an order of magnitude, risk-adjusted dollar value to each of the cells featuring prospectivity above a given threshold. If successful, this would represent the first attempt to map not just the geological merit but also the expected financial value of an exploration terrane. ▲▲

## Acknowledgements

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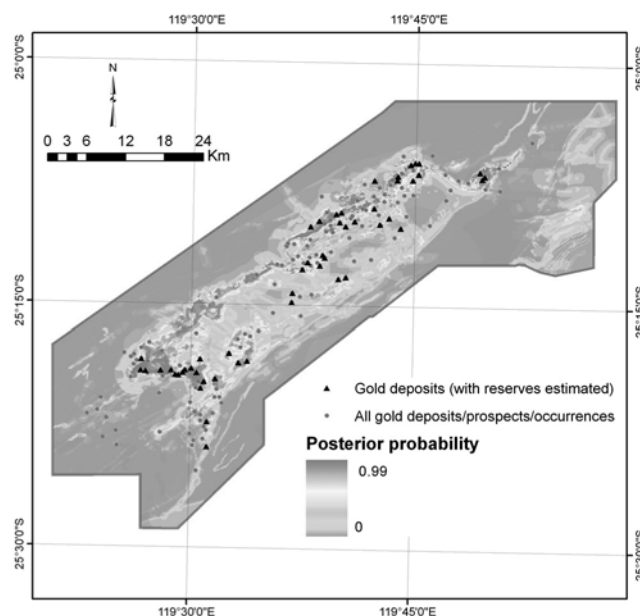


Figure 5: Gold prospectivity map of the PGMB derived using weights-of-evidence model

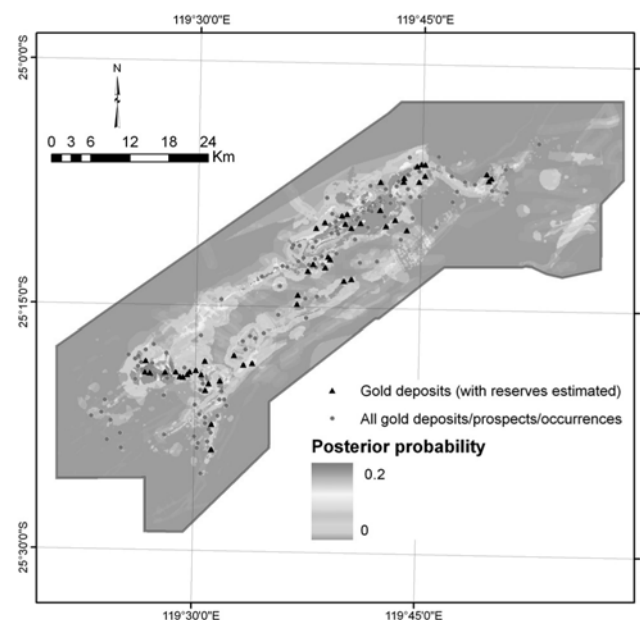


Figure 6: Gold prospectivity map of the PGMB derived using logistic regression model

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## Exploration Value and Predicting "Undiscovered" Gold Endowment in a Mature Gold Camp

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# Doomed Planet – The IPCC's Flawed Data

by Des Moore

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## Climategate – IPCC's Flawed Temperature Picture Revealed

Since Copenhagen there have been revelations overseas of important flaws in the science used in reports by the IPCC. Believers in the dangerously rising temperature thesis have brushed these aside as “unfortunate” mistakes but as not affecting the alleged scientific consensus that continually rising temperatures result from the emissions of CO<sub>2</sub> and usage of fossil fuels. Hence, it is argued, government action is still needed to prevent dangerous increases in temperatures in the future.

Now, however, we have a major new analysis by two Australian scientists showing that the temperature data published by the IPCC and other organisations has been manipulated to give the appearance of a warming trend – but not one that has actually occurred. In essence this analysis severely, probably fatally, damages the basis on which the IPCC and its supporters rely for their call for government intervention to reduce emissions. Needless to say, this has major international implications in regard to the policies to be adopted by countries on emissions reductions.

This analysis, undertaken by William Kininmonth (former Deputy Head of the Bureau of Meteorology and head of that body's Climate Centre) – and physicist Dr Tom Quirk, shows that temperatures published for both Australia and the world by the IPCC, whose main

source has been the Climate Research Unit at East Anglia University, derive from an averaging over ten years intervals. As shown below in graphed form, this method of presentation gives the appearance of a steady upward trend. However, the presentation of temperatures based on annual averages by Messrs Kininmonth and Quirk give no such appearance and highlight the irregularities.

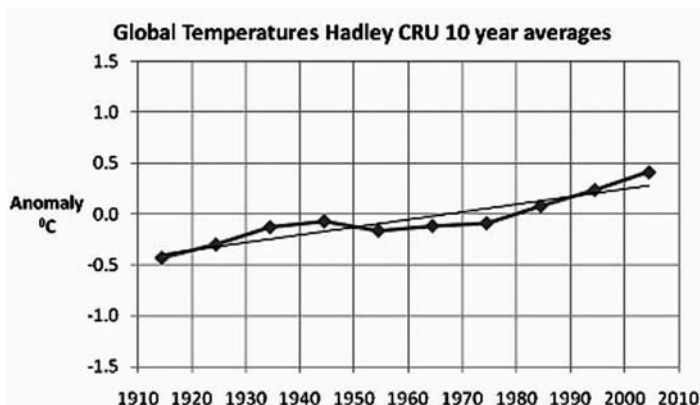
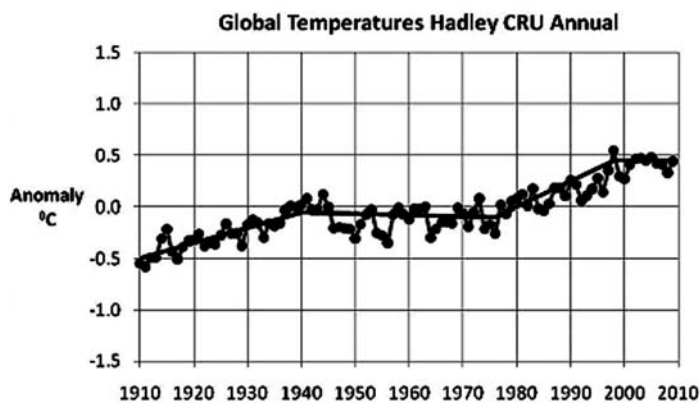
This analysis has been drawn to the attention of the Prime Minister and Leader of the Opposition and it has been suggested that it confirms the need for a major independent inquiry before any government action is taken to reduce emissions of CO<sub>2</sub>. One might add that it suggests the need for the two major parties to revise their existing global warming policies.

For the global data, the graphs showing the annual and ten year average temperatures presentations both give a similar picture up to the mid 1970s. It is important, however, to recognise that the increase in temperature between 1910 and the mid 1940s occurred at a time when CO<sub>2</sub> concentrations in the atmosphere were increasing at a relatively slow rate whereas the flat period of temperatures from the mid 1940s to the mid 1970s occurred during the period of rapid post World War II growth in world economic activity and CO<sub>2</sub> concentrations. The annual averages for the world also show a smaller increase than for Australia in the mid-late 1970s when the Great Pacific Climate Shift occurred, possibly because the effect of that shift would have taken some time to be reflected outside the Pacific region. The big difference between the ten year and annual presentations of the global data over the last ten years is that the ten year averaging process masks the return to relatively steady temperatures over the past decade.

The graphs showing average temperatures for Australia bring out more clearly the differences between the annual and ten year averages presentations. While neither show a statistically significant upward trend between 1910 and the mid 1940s, the ten year averages then show a quite different picture. In particular, the annual averages for Australia shows the one-off jump of about 0.6C in the mid 1970s when the Great Pacific Climate Shift occurred due to a major change in the Pacific Ocean circulation that is accepted as having had nothing to do with CO<sub>2</sub> emissions. In the ten year averages presentation, however, the averaging process makes this appear as little more than a component of an upward trend.

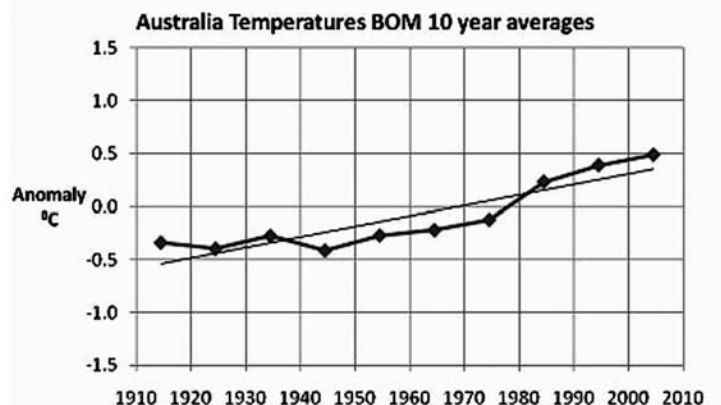
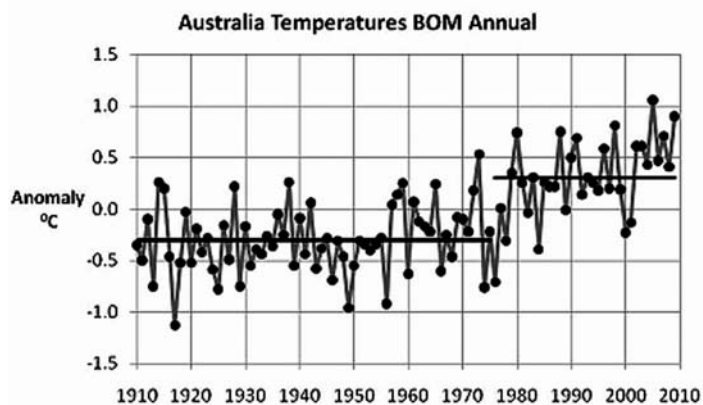
Assuming that the annual average data has not been manipulated (on which see further below), temperatures are admittedly now higher than they were a century ago. But that increase has not occurred in line with emissions of CO<sub>2</sub> and a substantial proportion of the increase reflects a one-off event which had nothing to do with emissions. Moreover, it is now widely acknowledged (even by some believers) that there is strong evidence that temperatures were as high if not higher in the Medieval Warming Period (800 - 1,100) and the Greco-Roman warm period (600 BC - 200 AD). This means of course that there is no policy significance in the persistent claims made by the Government that we have the highest ever recorded temperatures. Hence, there is also little or no substance in the arguments that there is a cause and effect relationship between emissions and temperature increases justifying government intervention to restrict emissions and/or that the world faces a unique situation demanding Canute-like responses.

It might be added that the revelations about the flaws in IPCC science (sic) since Copenhagen make it extraordinary that the Government



## Doomed Planet - The IPCC's Flawed Data

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has announced that, regardless of what other countries do, it will adopt a 5 per cent reduction target for greenhouse gas emissions by 2020 as well as starting an emissions trading scheme in July 2012. These flaws included the totally unjustified claims about early (2035) meltings of Himalayan glaciers, which forced IPCC head Pachauri to apologise publicly for the error but left unexplained that an employee of his who had been responsible for the prediction remained as an employee. This was followed by the revelation that the IPCC has greatly exaggerated claims about likely increases in extreme weather as (if) temperatures rise and the warning by Britain's Chief Scientist (endorsed by his

Australian counterpart) that too great a degree of certainty is being attached to predictions (or is it the use of "projections" as, absurdly, attempts are made to pretend there are no predictions) and outcomes of modelling, as well as too little transparency being given regarding data use. On top of that submissions have been invited to an inquiry (Australians are eligible to submit) announced by the Science and Technology Committee of the UK Parliament into (inter alia) the adequacy of the terms of reference and scope of the independent review by East Anglia University of the CRU. It is little wonder that audiences for visiting lecturer and expert on the issue, Lord Monckton, are very high.

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Of course, these flaws have produced a spate of responses from the “expert” scientists who are believers in the dangerous temperature thesis and who have been lead authors of IPCC reports. According to these experts, a couple of mistakes maketh not a wrong report. This of course is total nonsense given the many other earlier IPCC mistakes, such as the (now discredited) hockey stick analysis purporting to show that temperatures were lower pre-industrialisation. It also conveniently overlooks the fact that the hacked email exchanges between leading researchers and advisers to the IPCC (including the inventor of the hockey stick) suggest not only an exclusive “club” of scientists who “peer review” their own work or don’t even resort to peer review but one where all stops are pulled out to show a warming trend in temperatures over the past century or so.

As indicated, the graphs are constructed by using data compiled by the CRU. This data is obtained from meteorological authorities in various countries, including of course Australia’s Bureau of Meteorology.

Preliminary examination by Messrs Kininmonth and Quirk of the “high quality” data published for Australia by the Bureau of Meteorology and used in its online climate trends suggests that further questions arise regarding manipulation to that data. In the case of Darwin, for example, where the CRU has made no adjustment to the original data, the BOM temperatures recorded

between 1910 and 1940 were “adjusted” downwards by about 1.5 degrees, perhaps to take account of when the weather station was shifted from the Post Office to the airport. While some downwards adjustment appears to have been justified in order to obtain homogeneity, there is no basis for such a large adjustment, which was made in concert with an Australian lead author of the IPCC. The outcome is that a distinct warming trend is produced in the “high quality” data when no such trend would occur with a consistent adjustment. If Australia’s published data reflects unjustified manipulations by the BOM it is very likely that weather authorities overseas have also engaged in manipulations.

The foregoing suggests that the temperature data as analysed and presented by the IPCC and associated international research organisations do not provide a sound basis for the alarmist conclusions that have been reached and presented to governments. There is also a question about the validity of adjustments to Australia’s temperatures by our Bureau of Meteorology in compiling the so-called “high quality” data set. The temperature analyses, along with other similar alarmist claims, certainly justify a major independent inquiry before any government action is taken to reduce emissions of CO<sub>2</sub>. Such an inquiry would provide an opportunity for Rudd to change his extremist policy pending the inquiry’s outcome. ▲▲

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## Dr Miles Worsley 1950 - 2009

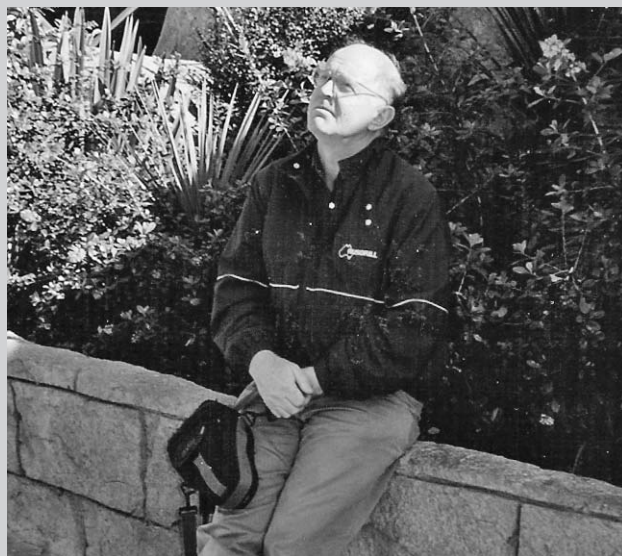
Well regarded exploration geologist, Miles Worsley, passed away on the 11th of September, 2009.

Miles started his life in Australia as a jackaroo. But a love for geology saw him working as a field hand with North Broken Hill from 1966. He obtained several university degrees, in geophysics from the University of Witwatersrand and from the Bendigo School of Mines. Later in life he completed a PhD at James Cook University following several years unraveling the epithermal gold deposits at Cracow in Queensland.

Miles' career in the mining industry was diverse. He has worked with several of the major miners, including RTZ, Aberfoyle, Indochina Goldfields and Ivanhoe Mines. He held senior positions with Indochina Goldfields (Exploration Manager, Indonesia) and was Chief Geologist at Ivanhoe. He was involved with regional exploration in Mongolia with Ivanhoe at the time of the Oyo Tolgoi discovery. Subsequently he became Director of Ivanhoe Hereward Ventures (in Bulgaria) and General Manager of Ivanhoe Ventures Mining (in Serbia).

Miles worked with numerous smaller companies, in Australia and New Zealand, South East Asia, West Africa and Latin America. He ability to rapidly evaluate the potential of prospects was well regarded by industry.

From a personal perspective, Miles' attention to detail was evident from the work completed at the Cracow project in Queensland. This work not only assisted in bringing the Cracow mine back into production, but also added significantly to the resource base during the



mine's life. Former colleague, Tim Hopwood, in commenting on Miles' past work said: "Between 1982 and 1983 Miles in his inimitable style compiled detailed sketch geological field maps giving details, together with sample assay data for some 320 prospects in the Broken Hill District which were compiled into the Broken Hill Field file for the Aberfoyle/Concept Joint Venture .....These volumes still remain the most detailed and definitive studies of mineral prospects in the Broken Hill District."

Miles was a member of the Society of Exploration Geologists and of the AIG.

He leaves a wife, Phuong, and two sons, Mark and John.

**Chris Baker, December, 2009**



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## Know Your Councillor - Wendy Corbett

**I ENTERED THE UNIVERSITY OF SYDNEY** in the dim dark ages determined somehow to combine geography and chemistry in a career. There really was no deliberation in choosing a fourth science subject - it had to be geology. After the first week of geology lectures I was hooked - and it did tie in beautifully with geography.

No one was prepared to hire female geologists in 1972, so rather than take an honours year in coal (the only course offered!!) I completed a Dip. Ed. The highlights of that year were learning how to pot (on a wheel) and play volley ball. There were no jobs for female geos in 1973- I was often told "we don't have facilities for ladies in the field"....I haven't seen that many for men either....ladies to the left and men to the right of the vehicle has always worked pretty well. I'm a loud whistler.

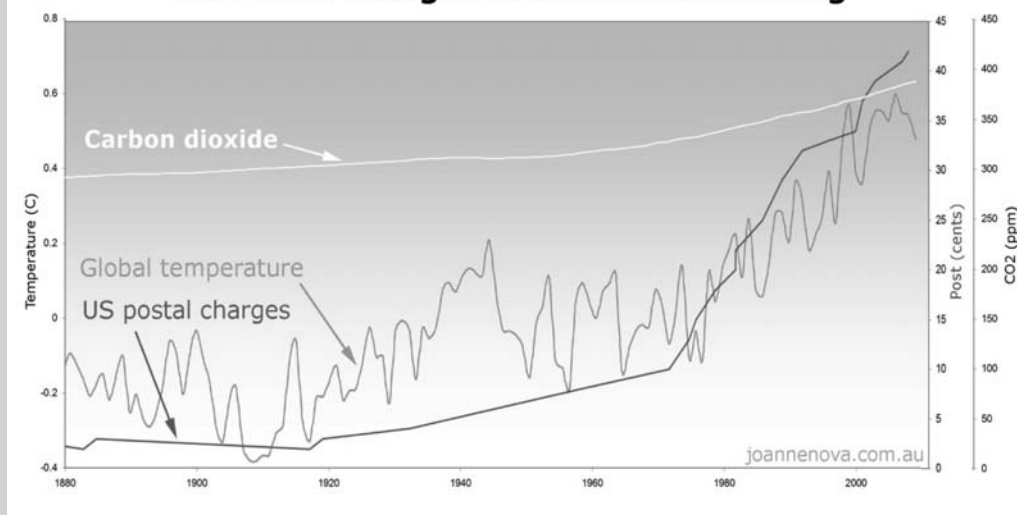
An advertisement in the AusIMM bulletin won me three office-based job offers so I took one as a pa with the Chairman of Geopeko, John Elliston. John was unstinting in his support of professional development and honesty in science. Yes! I believe that colloidal chemistry simply and elegantly explains the genesis of so many of the textures and associations that we see in rocks. My three-finger-peck typing had to improve and I'm sure that over the years when times have been lean for geos that my typing skills have kept me in a job because I was able to write and present my own reports. This sounds so corny nowadays when everyone can use a keyboard from primary school. Over my 37 years in the industry I have mainly worked in helping to organise exploration programs, setting up and maintaining databases, writing reports, ordering paper clips and liasing with government and jv partners. I have worked for Geopeko, Getty, Kennecott, Lachlan Resources, CRAE, Delta Gold and PlatSearch. I am currently a non-exec director of Eastern



Iron, managing geologist for PlatSearch and a member of the NSW Geological Survey Advisory Committee to the Minister.

My favourite activity is bush walking and camping followed closely by swimming, gardening, pilates and reading. My most treasured belonging is probably my Macpac pack or is it my new self inflating camping pillow (luxury)? Best views ever - from the top of Mt Anne in south western Tasmania. Worst moment ever - sliding ever so slowly into mud that was deeper than I am tall on the South Coast Track - on second thoughts it was being helicoptered out from the walk to Federation Peak with a damaged knee and not being able to finish the walk! Moral - always carry a sat phone or epirb. ▲▲

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## Impressed

Dear Editor,

Julian Vearncombe (AIGNews No 98, November 2009) in calling for a JORC-like Code to apply to all scientific communications, I believe, voicing concerns held by many scientists who are fed up or generally annoyed at any report of poor quality, having unsubstantiated statements, or even simply lacking an audit trail of data that can be checked for validity by an interested reader.

But what can the AIG do? While serving on the AIG Council, I became aware of the poor quality of reporting in certain sectors of the geosciences. The quality of reporting was similar to that of the minerals industry in past years where little of value was being reported covering expenditure in the hundreds of thousands of dollars. While this practice still continues, most State mines departments are now insisting on improved presentation of reports, supported by verifiable data and logical interpretations and conclusions.

I have been in the unfortunate position of having to read reports on hydrogeology and environmental sciences - while some are clear and concise, overall I note that the issues raised by Julian (completeness of report, materiality, and even competency?) are valid indeed. And the authors are generally members of some professional institute such as the AIG.

AIG members must comply with the JORC Code when reporting on Exploration Results, Mineral Resources and Ore Reserves. There is no equivalent code for reporting on hydrogeology, environmental geology, engineering geology or other geoscience by members of the AIG. Members are not bound, except under the provisions of Clauses 2, 5, 6 and 7 of the Code of Ethics to report with clarity, fidelity or materiality in the private domain.

While on Council, I contacted the Australian Chapter of the International Association of Hydrogeologists with the proposition to develop a code for reporting in this sector - after a little discussion, the idea was abandoned due to lack of interest. Now, with the increase in membership in this and related sectors, there is the need to outline the main principals of reporting on geoscientific issues, expressed in a broad code of reporting that is binding on all AIG members.

I propose that the AIG develop a code of reporting, that is binding on all members of the AIG. The code need not be (indeed, must not be) prescriptive, and could easily borrow from the three pillars of the JORC Code - these are Materiality, Transparency & Competency. Perhaps the fourth pillar of reporting, Impartiality, should also be adopted, as with the Pan-European Code for Reporting of Exploration Results, etc.

How to proceed? For a start, the AIG needs to gauge the level of enthusiasm for such a code. Then develop one in consultation with members representing the broad range of geoscientific endeavours. It may not be feasible to develop a single, over-arching code, and perhaps a collection of codes each applying to specific sectors would be a more useful result. I suggest that the AIG, through its State Branches, hold a series of Workshops throughout 2010 and 2011 to work through the issues.

But first, we need more discussion in the pages of AIGNews.

**Geoff Turner**

**Exploration Management Services Pty Ltd**



# Superstition, Science and Pseudoscience

I would like to first to commend the Editor of the AIG News for publishing the diverse arguments he does, without fear or favour. It is good to see the various insides and some of the outsides of the boxes in which lives science. In this spirit I wish to address the notion of pseudoscience, as defined by the Editor.

As defined by the Editor, "Pseudoscience.....uses the scientific method to deduce hypotheses from an untested assumption but agreed to be true by a consensus". How do we arrive at the untested assumption? Assumptions do not come out of thin air; they are a result of observing something, such as the sun rising in the east and setting in the west and therefore circling around the planet Earth. The assumption implicit in this is that the sun must move because we see it move.

Now to turn to a real-life experience. A few years ago I was consulting at a prospect in PNG. The target formed a low, dome-like hill in a valley and nearby was a small village. The locals believed that a large snake lived under the hill, and snakes being snakes, they had to be fed. During the course of my work I encountered several snakes. They were small, and to be avoided. One of them clung to the vertical side of the creek in which I was wading and obviously had an affinity for rock. There were lots of cracks in the rock.

The local contention was that the small snakes had come from somewhere, there were cracks in the rock and of course snakes have to have parents. It is quite logical to create the hypothesis that the snakes originated out of the cracks in the rock, and that therefore their parent lived inside the rock. And of course parents are bigger than children so the parent snake must be big. All very logical.

It seemed that one could not adequately test the hypothesis that a large snake lived under the hill, until the day we started drilling. At the time the geology office consisted of bare poles and had not been closed in. On the night after we had started drilling, at about 7pm, a 5-metre long python was seen to slither from the direction of the hill into the geology office, climb up one of the studs, slide along the top plate to the far end, looking around as it did so, slide down the end stud and peacefully amble its way into the bush on the far side of the camp. This created the hypothesis that this was the parent snake from under the hill, who had come out because it had been disturbed by our

drilling and wanted to check what was going on. The drilling and resultant emergence of the python was seen as a test of the hypothesis that a large snake did indeed live under the hill. This is not unreasonable, based on observation and the current state of the local knowledge. It is no more unreasonable than arguing that Archaen sedimentary rocks originated as do modern sediments, as they look similar; this depends on the untestable assumption of continuity of process through a very long period of time. The only other way to test the hypothesis that a snake lived under the hill would be to mine out the hill, but this would chase away the snake before we found it, proving that the snake had lived there.

## Superstition? Science? Or Pseudoscience?

As an argument it is no worse in kind than some of those put up by our revered cosmologists who base a mumbo-jumbo of esoteric clap-trap (or is it?) on Hubble's red-shift and the implicit assumption that either the speed or frequency of light we observe today has remained constant throughout all of time, an assumption that can be no more proved than can the hypothesis inferred from a set of observations that a large snake lived under the drill-target (should anyone argue that Einstein proved that the red-shift should occur in his relativistic universe, my understanding is that he assumed a constant speed and frequency for light throughout time for the Lorentz transform equations).

On further thought, was the python alive or dead before it was seen to have come from under the hill? One has no way of knowing and therefore it must be regarded as being in both states at the same time. Thus we arrive at an argument used in quantum mechanics through considering what most of us see as superstitious nonsense.

**R. H. Findlay (M.AIG)**

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# From the Editor

## — Louis Hissink

**THIS EDITION OF AIG News continues with the MARV series of articles by Fallon, Guj and Porwall, plus branch news from both Queensland and Victoria.**

The Letters section has some interesting viewpoints and unsurprisingly the climate debate seems to have heated up a little with the revelations that all is not well with the IPCC, what with Climate Gate, Himalaya Gate, Amazon gate to mention a few of the "scandals" involving the IPCC process now being reported by the UK press; it seems the sceptics may have been barking up the right tree after all. AIG Members might also have noticed that the Viscount Christopher Monckton of Brenchley was on a lecture tour in Australia, accompanied by Professor Ian Plimer. The lectures were to packed houses at each venue, and due to the response additional lectures were scheduled in Perth and culminating with a debate in Sydney on the 12th of February. Members might also be bemused by Des Moore's review of a recent paper, published with kind permission by Quadrant Magazine, which shows how different trends in the data can be produced by choice of averaging period. Seems climate science could do with a bit of a JORC.

The first MEGWA talk featured Ben Hames, AIG Bursary recipient and WA committee member - who presented the results of his honour thesis at the Irish Club on the 20th January.

Geoscience Australia has released its latest report on Australia's identified mineral resources and the Australian Financial Review of 8 February pointed out that the mining industry seems to be finally facing the end of a bottomless pit, principally because of a lack of green fields exploration, but also because of the globalisation of the mining industry where mining companies are focussing on those mines which produce the best bottom line performance. Intriguingly Ian Lambert of Geoscience Australia pointed out that mining companies seem to be showing little interest in looking for new deposits, concentrating on brownfields exploration at the expense of greenfields exploration. One reason might be related to taxation, in which the states exact a royalty from the industry on commencement of mining, and which is payable even if the company isn't making a profit.

Those of us involved in grassroots exploration have another take on the lack of exploration success and that has more to do with ever increasing regulation of exploration in terms of OSH and environmental issues, and the dominance of the dreaded HR departments in the larger companies. And the mindless implementation of affirmative action also seems to have affected exploration success, where geologists are not appointed on the basis of technical competence but on gender criteria. One sometimes gets the impression that HR departments don't understand that geology is a vocation, and not just a "mere" job. During 1977 when the editor was retrenched, and subsequently applied for a job with a large Australian company, (no not that one), the HR people decided that the editor was not suitable for remote area employment. Other HR types in another organisation deemed the editor over qualified and too intelligent for a particular position. Perhaps the lack of exploration success might have something to do with the HR department's employment criteria than anything else.

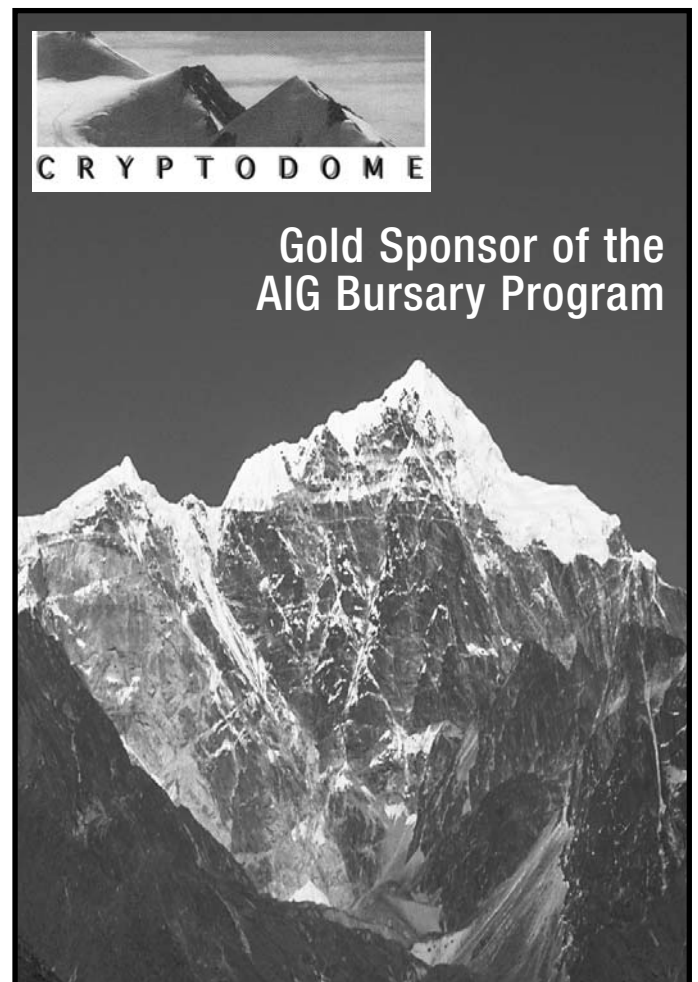
An interesting development is in the reporting of a resources balance sheet in which years of accessible resources were tabulated. Just how these statistics tie in with Andrew Waltho's comments is another matter which AIG Members should starting looking into. The report



*Ben Hames receiving his bursary award*

and the executive summary can be downloaded from the Geoscience Australia website.

Plenty of happy snaps of the WA branch Christmas River Cruise feature in this issue, and we have had an influx of applicants for RPGeo registration this issue, and AIG continues to grow in membership, though as the complaint column points out, membership has its benefits but does not automatically mean one is a competent person in terms of reporting, though how companies are supposed to fulfil this requirement when they actually can't get staff fitting into a strict interpretation of the competent person's definition. ▲▲





## HONOURS ABSTRACT - AIG Honours Bursary Winner:

### Contribution of mantle convection to shifting South American coastlines during the Cenozoic

South America is characterised by major anomalies in surface topography. The continent lies adjacent to one of the world's largest oceanic depth anomalies, the Argentine Basin. Similarly, a major change in continental tilt is implied by the Miocene disappearance of the Pebas fluvio-lacustrine system in northwest South America, and subsequent formation of the eastward-draining palaeo-Amazon River. Both processes hint at plate tectonic and mantle convection causes - yet this connection to surface dynamics has not been explored. The westward translation of South America over the subducted slabs of the Farallon, Phoenix and Nazca plates, presents a time-dependent mechanism to drive the surface evolution of South America. Recently developed high-performance computing geodynamics software, *CitcomS*, coupled to the plate kinematic *GPlates* software, now allows the reconstruction of past mantle structures in a context of dynamic plate boundaries and velocities. We present two modelling approaches, a forward model and an adjoint model. These methodologies differ in their model constraints, namely kinematically imposed slabs for the forward model or slabs constrained by seismic tomography for the adjoint model. Adjoint models, which use backward and forward iterations, predict the most realistic magnitude and spatial distribution of dynamic topography. Forward models on the other hand, are useful in the southern regions where seismic

tomography is poorly constrained. The contribution of mantle convection to surface elevation is evaluated, and we find that an evolving dynamic topographic low since 100Ma can be attributed to up to 40m of mantle convection-driven subsidence per million years across the central and eastern basins. Subsequent uplift of up to 70m/m.y., which also migrates east, is predicted along the western margin from approximately 40Ma. Using geodynamic model outputs we generate digital palaeo-continental elevation models back to 76Ma correcting for dynamic topography and eustatic sea level effects. To validate the palaeo-topography reconstructions we compare the predicted palaeo-coastlines to those inferred from geological observations. We find that the Haq and Al-Qahtani (2005) eustatic sea level amplitudes are most accurate for South America in this context. A new hypothesis is presented attributing dynamic subsidence and uplift, in conjunction with flexure from Andean uplift, to Miocene changes in the low-lying Pebas system in the western Amazonas and the formation of the palaeo-Amazon River. Similarly, our dynamic topography magnitudes provide evidence for deeply-seated mantle downwelling causing the negative residual depth anomaly of the Argentine Basin. ▲▲

Grace E Shephard, University of Sydney

## HONOURS ABSTRACT 2009 Consolidated Minerals - AIG Honours Bursary Winner: Petrology, petrogenesis and mineralisation of granitic pegmatites of the Mount Wills District, northeastern Victoria

The Mount Wills tin field is located 30km north-northwest of Omeo in northeastern Victoria, Australia. Tin bearing pegmatite dykes were discovered in 1887 and a short-lived rush began. Focus quickly shifted to nearby gold deposits as a variety of issues such as difficulties in milling recovery and the sparse distribution of high grade ore lenses hindered tin operations. Very little work has been carried out on the field since the 1900's.

With recent increasing interest in the adjacent Glen Wills and Sunnyside goldfields, supported by current exploration and resource definition work being undertaken by Synergy Metals, an up to date description and assessment of the nearby tin mineralisation is required. The tin dykes, and possibly the gold mineralisation, are currently assumed to be most likely genetically related to the nearby Silurian Mount Wills Granite.

In this study, a petrological and scanning electron microprobe survey of the pegmatites has shown that they fall within the REL-Li-beryl-columbite and REL-Li-complex-amblygonite, lepidolite geological subclasses, both belonging to the Li-Cs-Ta family of pegmatites. The dykes show a strong spatial relationship with the nearby Mount Wills Granite. CHIME Th-U-Pb monazite geochronology was conducted at the University of Tasmania, and a Late Silurian age of 420+/-4Ma was obtained from one dyke. This

places a minimum age on the poorly-constrained Mount Wills Granite, as the dyke swarm crosscuts the granite.

Pegmatites close to the Mount Wills Granite are relatively unfractionated, and bear little tantalum, niobium or tin mineralisation. Further east, away from the granite, columbite-tantalite and cassiterite begin to occur in varying (and historically economic) amounts. The most distal dykes are compositionally zoned, with the inner zones containing evolved LCT mineral assemblages. ▲▲

Ryan Eagle, University of Ballarat

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# Education Report

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

**LAST YEAR WE HAD** an excellent response to the AIG bursary program. We received applications from 40 students, and awarded bursaries to 18 students from 12 universities across Australia. In this issue of AIG News we include abstracts from three students who were awarded AIG Honours bursaries in 2009.

The students are:

**Ryan Eagle**, from the University of Ballarat, who has completed his project *"Petrology, petrogenesis and mineralisation of granitic pegmatites of the Mount Wills District, northeastern Victoria"*. Ryan was awarded a Consolidated Minerals - AIG Honours Bursary in 2009, and this year is looking to work as a graduate geologist in exploration.

**Angela Marshall**, who completed her Honours project *"The genesis of the Womnumma Marra Mamba iron ore deposits in the Hamersley Basin, Western Australia"* at the University of Wollongong last year, and was awarded a Digirock-AIG Honours Bursary. Angela is currently considering graduate positions in coal and iron ore.

**Grace Shephard** from the University of Sydney, who completed her project *"Contribution of mantle convection to shifting South American coastlines during the Cenozoic"* last year and was awarded an AIG Honours Bursary. This year Grace is starting a PhD at the

University of Sydney using recently developed 4D virtual earth simulation software to reconstruct how mid-ocean ridge creation and the recycling of old, cold oceanic plates into the mantle has driven surface topography, sea-level change, sedimentary basin formation, and uplift and erosion in the Arctic region since the breakup of Pangaea.

AIG state branches have held bursary presentation functions for 2009 bursary winners in Perth, Adelaide and Brisbane, and on the 25th February SMEDG and AIG NSW are having a student award evening featuring a presentation by Laura Klingberg from Adelaide University, winner of the 2009 SMEDG-AIG Bursary (further information at <http://www.smedg.org.au/StudentBursary2010.htm>).

The application form for 2010 AIG Third Year, Honours and Postgraduate bursaries will be available in April. The form will be distributed to student members and to universities throughout Australia and will also be available on the AIG web site and from the AIG secretariat.

Many thanks to sponsors and donors for your support of the AIG bursary program. ▲▲

For the latest in Geoscientist news, views, codes, events, employment and education visit the AIG website:  
**[www.aig.org.au](http://www.aig.org.au)**

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- Mining
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## HONOURS ABSTRACT 2009 Digirock - AIG Honours Bursary Winner: The genesis of the Wonmunna Marra Marmba iron ore deposits in the Hamersley Basin, Western Australia

The Pilbara region of Western Australia is one of the world's major iron-ore provinces but still today a satisfactory iron-ore enrichment model does not exist. This study focuses on a high-grade iron-ore deposit in the Hamersley Province of the Pilbara region of Western Australia. Detailed geological mapping and sampling of the Wonmunna iron-ore deposit was undertaken to determine the processes involved in its enrichment. Petrographic studies, combined with XRD and XRF analysis of the un-enriched parent rock and the enriched ore zone form the basis of this study. The deposit is hosted within the Marra Mamba Iron Formation, a banded iron-formation (BIF) unit well known for its ochreous martite-goethite ores, though currently unacknowledged for its potential to host the higher-grade microplaty-hematite ores. This study revealed abundant microplaty-hematite within the high-grade ore zone of the Wonmunna deposit. Previous exploration models for the region are predicated on either burial metamorphism or hypogene processes to form this microplaty-hematite, yet the evidence from the Wonmunna deposit challenges the importance of these processes. The results from this study suggest that a simpler model of Cenozoic regolith enrichment of the parent BIF is solely responsible for the formation of high-grade iron-ore deposits. In this model, the original magnetite within the parent BIF is oxidised to martite by descending meteoric waters and ground water. These fluids selectively leach most of the gangue minerals from the system, with goethite replacing any remaining gangue. The petrography, mineralogy (XRD) and geochemistry (XRF) results all confirm that iron enrichment is directly related to a top-down propagating weathering front. Enrichment of immobile elements in the high-grade ore suggests an overall volume reduction of ~45%. These processes produced a relatively flat-lying, supergene enrichment zone within the

overall regolith profile that has developed on a tightly folded BIF basement. A change in environmental conditions from a wetter climate favouring goethite precipitation, to a more arid climate, resulted in the dehydration of goethite to microplaty-hematite in shallow, regolith weathering conditions. This is a much simpler model for the enrichment of BIF to iron-ores, and could potentially create new exploration targets in the Pilbara which were previously not considered as potential hosts for iron-ore. ▲▲

**Angela Marshall, University of Wollongong**

### Education – QLD

Chris McNamara, a third year student at Queensland University of Technology (QUT) received an AIG Education Bursary award in 2009. Chris, who is completing a Bachelor of Applied Science (Geoscience) with the School of Natural Resource Sciences was able to accept his certificate at the AIG Brisbane Mineral Industry Christmas Party in December.



Chris receiving his Bursary certificate from Qld Branch chair Mark Berry, with Federal Council member Doug Young (MC for the evening) looking on.

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# Update on 34th International Geological Congress (IGC)

## Brisbane, Australia 2 - 10 August 2012

**PLANNING FOR THE 34th International Geological Congress (IGC), or AUSTRALIA 2012, to be held at the Brisbane Convention and Exhibition Centre is gaining momentum. During the last three months activity has focused on general planning of the two week scientific program, the exhibition program and the sponsorship package.**

The core Organising Committee currently meets quarterly and is comprised of: **President** - Neil Williams (GA); **Secretary General** - Ian Lambert (GA); **Deputy Secretary General, Coordination** - Paul Kay (GA); **Deputy Secretary General, International** - Paulo Vascencelos (U. Qld.); **Treasurer** - Miriam Way (AusIMM); **Scientific Program** - Lynton Jaques (GA/GSA); **Scientific Program Alternate** - Colin Simpson (IUGS); **Field Trips** - Dave Mason (GS Qld); **Workshops** - Mark Berry (AIG); **Sponsorship** - Barry Goldstein (PESA); **Exhibitions** - Andrea Rutley (ASEG); **Australian Geoscience Council** - Michael Leggo and Mike Smith; and **New Zealand representatives** - Des Darby and Hamish Campbell (GNS New Zealand).

A wide-ranging scientific program under the theme 'Unearthing our Past and Future' will highlight the crucial contributions of geoscience in meeting societal needs and sustaining planet Earth - with particular emphasis on future mineral and energy supplies, land and water management, mitigation of geohazards, and geoscience information and standards.

Major contemporary issues will be highlighted in plenary 'theme-of-the-day' sessions. Some 30 concurrent symposia on a wide range of

topics are proposed for each of the 7 full days of scientific sessions. Individuals will only be permitted one oral presentation, and there will be a strong complementary poster program.

Suggestions for Symposia topics, and nominations for convenors, are being sought and should be sent to Lynton Jaques (Lynton.Jaques@ga.gov.au).

A series of expert workshops on topics such as mineral exploration, mining regulation, environmental impact assessment and resource assessment are planned, particularly (but not exclusively) to attract geoscientists from developing countries under a GeoHost program.

Approximately 30 pre- and post-Congress field trips are being considered, which offer diverse opportunities to see the fascinating geology of the region. Collectively, these field visits will take in all Australian states and the Northern Territory. Field trips are also being planned to New Zealand, Malaysia and New Caledonia/Vanuatu. There will also be a range of 1 day tours available during the conference.

Nominations are being sought for the Field Trip Committee, and for trip leaders. It is not too late for additional trip suggestions, particularly if they come with a potential leader. Contact David Mason for more details (david.mason@nrm.qld.gov.au).

If you have any queries on any aspect of IGC, visit the website ([www.34igc.org](http://www.34igc.org)) or contact me. ▲▲

**Mark Berry** (AIG representative on the IGC Organising Committee) [mberry@amccconsultants.com.au](mailto:mberry@amccconsultants.com.au)



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# Upcoming Conferences and Events

## Epithermal Deposits and Processes: Implications for Exploration and Discovery

Tuesday, February 23 - Thursday, February 25, 2010, 08:30am - 05:00pm  
EGRU, James Cook University, Townsville, North Queensland

## Aquifer Testing Course

Wednesday, March 03 - Friday, March 05, 2010, 08:00am - 05:00pm  
Karstens at CQ, 123 Queens Street, Melbourne

## Advances in Rapid Geochemical Mineralogy - AIG Event

Monday, March 08, 2010, 08:00am - 05:00pm  
Burswood on Swan, Perth

## Introduction to Financial Modelling for Resources Projects

AIG Event.  
Friday, March 12, 2010, 12:45pm - 05:00pm  
Theodore Club, 13th Floor, 333 Adelaide Street Brisbane

## IAGOD 2010 - Giant Ore Deposits Down Under

Tuesday, April 06 - Friday, April 09, 2010, 08:00am - 05:00pm  
Adelaide SA

## 37th Symposium on the Geology of the Sydney Basin

Wednesday, May 05 - Friday, May 07, 2010, 04:00pm - 05:00pm  
Pokolbin NSW

## CIM 2010 Vancouver Conference and Exhibition

Sunday, May 09 - Wednesday, May 12, 2010, 08:00am - 05:00pm  
Vancouver Canada

## Australian Earth Sciences Convention 2010

Sunday, July 04 - Thursday, July 08, 2010, 08:00am - 05:00pm  
Canberra ACT

## 5th International Archean Symposium - Evolving Early Earth

Sunday, September 05 - Thursday, September 09, 2010, 08:00am - 05:00pm  
Burswood Entertainment Complex Perth, Western Australia

## FOSS4G (Free & Open Source Software for Geospatial)

Monday, September 06, 2010 - Thursday, September 09, 2010  
08:00am - 05:00pm  
Barcelona Spain

## Mines and Wines 2010 - AIG Event.

When: Thursday, September 23 - Friday, September 24, 2010  
08:00am - 05:00pm  
Mudgee NSW

## Geo-Computing 2010 Uses and Abuses - AIG Event

Wednesday, September 29 - Friday, October 01, 2010, 08:30am - 05:30pm  
Rydges Hotel Southbank, Brisbane

## Bowen Basin Symposium 2010

Wednesday, October 06 - Friday, October 08, 2010, 08:00am - 05:00pm  
Mackay Qld

## 34th International Geological Congress - AIG Event

Thursday, August 02 - Friday, August 10, 2012, 08:00am - 05:00pm  
Brisbane Qld

For further information on any of these events, please visit the  
AIG website: [www.aig.org.au](http://www.aig.org.au)

Go to the "Events" page and simply click on the  
link below your selected item of interest.

## PROFESSIONAL DEVELOPMENT TRAINING

### Environmental Awareness for Non-Mining Industry Specialists

Perth - 16 February

### Geology for Non-Geologists

Brisbane - 16 February  
Perth - 17 February  
Vancouver - 18 February  
Johannesburg - 9 March  
Toronto - 11 March

### Mining for Non-Miners

Brisbane - 17 February  
Perth - 18 February  
Vancouver - 19 February  
Johannesburg - 10 March  
Toronto - 12 March

### Metallurgy for Non-Metallurgists

Perth - 19 February  
Johannesburg - 12 March

### Introduction to Geostatistics

Perth & Brisbane - 22 February  
Toronto - 4 March

### Successful Sampling

Perth & Brisbane - 23 February  
Toronto - 1 March

### QAQC of Assay Data

Perth & Brisbane - 24 February  
Toronto - 2 March

### Grade Control

Perth & Brisbane - 25 February

### Practical Reconciliation

Perth & Brisbane - 26 February

### Reporting Resources and Reserves

Toronto - 3 March  
Perth - 4 March  
Brisbane - 11 March

### Mineral Project Evaluation

Perth - 3 March  
Brisbane - 10 March

### Technical Report Writing

Perth - 5 March  
Johannesburg - 8 March  
Brisbane - 12 March

### Practical Variography

Vancouver - 5 March

### Mining Finance for Non-Finance Professionals

Johannesburg - 11 March

### Grade Control in Underground Gold Operations

Vancouver - 11 March

### Resource Estimation

Toronto - 15-19 March  
Perth & Vancouver - 22-26 Mar

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## AIG WA Christmas Cruise 09









# AIG Council Minutes

*Comments and suggestions from members are always welcome. Contact details for Councillors appear in each issue of AIG News, or the Secretariat office in Perth can assist with contact details for Councillors and State Branches.*

The AIG Council at its January meeting resolved to include a brief summary of Council business in each issue of AIG News. This reflects a strong commitment to making management of AIG as open and transparent as possible and to provide an enhanced opportunity for members to provide feedback to Councillors on issues of interest. Council meets bi-monthly, usually by teleconference, although an effort is made for Councillors in the same city at the time of a meeting to get together for the conference call. A brief summary of significant issues discussed at the January Council meeting follows.

## AIG Constitution

AIG's Articles and Memorandum of Association have served the Institute effectively since its inception in 1981. There have been a number of changes in the environment in which AIG operates and the structure of the Institute over the past 29 years. Council has initiated drafting of a new Constitution for the Institute to bring it up to date and formally address issues including the status of state branches, AIG's new ethics and professional practice complaints processes introduced several years ago, clarify requirements of membership, the RPGeo program, the new Education Foundation and address changes to the corporate compliance regime. A draft is expected for review by mid-2010.

## Reciprocal Recognition

Initial discussions have been held dealing with establishing mutual recognition of professional registration with the Canadian Council of Professional Geoscientists, with the aim of establishing a mutual recognition agreement that would make it easier for Australian geoscientists to practice as geoscience professionals in Canada where

professional registration is required by law in most Canadian provinces. AIG is also represented on an IUGS task force responsible for improving international recognition of geoscience qualifications and licensure.

## Face to Face Council Meeting

As mentioned previously, the AIG Council usually meets by teleconference every two months. A face to face meeting is being planned for April, to be held in Adelaide. The meeting will provide an opportunity for members based in Adelaide or attending the Giant Ore Deposits conference to informally meet with Councillors and discuss any aspect of AIG's activities and services to members.

## Publications

Plans are being developed for a series of publications covering best practice and latest developments in key geoscientific skills.

## Policy and Promotions Officer

AIG has historically relied on volunteers for all aspects of the Institute's policy and promotions activities, although all "back end" administrative functions have been performed through an outsourcing arrangement with the Centre for Association Management for a number of years. The Institute has experienced considerable growth in recent years, resulting in a dramatic increase in the workload faced by the Council and State Branches. A decision has been made to engage professional assistance for the development of policy initiatives, promoting the Institute and helping to deal with enquiries and requests from members on professional issues, initially on a part time, contract basis. ▲▲

Andrew Waltho

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## Planet Earth Lisbon 2009 - Present for the Future

I ARRIVED IN LISBON on November 19th, just 20 hours after handing in my final thesis for my MMinRes. Despite being deprived of sleep, I was excited about the prospect of the following days. My bags were lost in transit between Singapore and Lisbon, so I had to acquire some necessities for the following day.

That afternoon I met up with Margarida (the local student organiser) and the incoming students from various countries from around the world before we all prepared for our meet and greet party at a local bar. It was great meeting new people with similar interests from all parts of the planet. From the outset, I was sure that this was going to be a great opportunity for me to learn from leaders in the industry and make long-lasting international contacts.

The opening ceremony and first days' proceedings were held in the Camões Theatre on the waters' edge in Lisbon. Event organisers were introduced and speeches were accompanied by the opening statements of government officials from around the world. Speakers emphasized that current environmental trends and climate changes warranted continued monitoring and laid emphasis on the significance of events such as the Planet Earth conference, one speaker stating it plainly, "every year should be considered an International Year of Planet Earth (IYPE)."

After the introductions, the afternoon session opened with a short song and performance, with the aid of all of the students. The first conference, 'Renewable Energy,' was broken down into the practical perspective of science, politics and industry. Each speaker expressed the importance of the transformation process from fossil fuels to renewable energy sources. It was also suggested that more emphasis should be placed on research into lesser known renewable energy sources such as biofuels that have the potential to replace common fossil fuels. After a short break the second conference, 'Sustainable Land and Water Management,' began and again the speakers provided their views based on their background in science, politics and industry. Speakers commented on the importance of optimising crop yield, limiting the negative effects of land/water use, and mine rehabilitation. It was concluded that each of these could be achieved through research and technical innovation.

On the first afternoon there was a short presentation from 'One Geology' presenting their work on creating a global geological database. The aim of this project is to provide 'interoperability' between geological communities worldwide and is a vital step towards efficient international collaboration in earth science projects. Sharing of geological information on a global basis was put forward as one way of maximizing the knowledge critical to processes with global significance.



*Above: Local musicians performing at the conference venue during morning tea on the first day of the conference*



*Right: Conference attendees Phillip Klintmalm, Joel Stockill, Conference mascot and Andrew Webber, during dinner in the science pavilion on the first night of the conference.*

The fundamental part of the student attendance was the Conference for Young Earth Scientists. During this conference there were presentations from students on their personal experience of attending events such as the IYPE event in Lisbon. The day concluded with an open discussion and brainstorming session focusing on "how geosciences can be made more attractive to younger generations" where the attendees developed ideas of how geosciences can be made more attractive to younger generations. The take home message from the days' proceedings was that "we can have our say in the future of our planet and influence the decisions that affect our lives and the environment." We can all be involved and "make a difference".

In addition to the various talks and presentations given over the two days, there were organised events that allowed attendees to network and discuss the conference proceedings. All students made the most of the down time during this event seeing the sights in Lisbon, becoming good friends in the process. This gave me the opportunity to make friends from Europe, America, Africa and also closer to home. My time spent in Lisbon was a thoroughly enjoyable and fulfilling experience, and I know I will take a lot home even from the short time spent there.

I would like to thank the Australian Institute of Geoscientists for making it possible for me to attend this event. I am sincerely grateful for being given this opportunity. ▲▲

**Joel Stockill**

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# AIG Victorian Branch News

**THERE WAS A CHANGING of the guard at the Annual General Meeting of the AIG Victorian Branch in October. Rod Boucher took over from Rod Fraser as Chairman and Allan Rossiter from Geoff Turner as Secretary. Rod F. decided to remain on the Committee while Geoff opted for a well-earned rest. The Committee extends its appreciation to Geoff for his tireless efforts for the AIG over the years. Tim Evans remains Treasurer and Fiona Makin is the other, and perhaps the most energetic, Committee Member. Additional personnel would be most welcome.**

Chairman Rod (B.) sees regular GPIC (Geology Professional Interest Committee) meetings as the way to get the Branch humming. Meetings are now held at 7.30 pm on the second Tuesday of every month at Basement on View, 50 View Street, Bendigo. AIG members pay a \$5 entrance fee, non-members pay \$10. The generosity of a sponsor normally means that the fee includes a free drink. Normally quite a few people gather for a meal before the meeting (and often a beer afterwards).

At the November meeting noted historian and author Ralph Birrell talked on "The History of Gold Mining Operations at St Arnaud". Ralph noted that the St Arnaud gold deposits differed from most others in eastern Australia in their complex metallurgy. The ores were rich in iron, copper and lead sulphides and silver chlorides and bromides. It was difficult to separate out the gold and the silver and special methods were introduced and tested with varying success. The complexity of the ores attracted industrial chemists and metallurgists to the field from the late 1850's, but the problems of extracting the gold were not solved until the 1890's and early 1900's as mining technologies improved and experience was gained. The problem of extracting the silver was never solved. The field effectively closed down in 1915.

In December Tom Burrowes of Providence Gold & Minerals Pty Ltd gave a talk on exploration north of Bendigo entitled "Burrowing Undercover for the Next Big New Goldfield". Tom's presentation concentrated on an area about 60 km north of Bendigo close to Leviathan's (now Northgate) Tandarra discovery. Providence found airborne magnetics to be of limited use but a Falcon airborne gravity survey over 400 sq. km. and the GSV Mitiamo ground gravity survey have enabled the Whitelaw and Sebastian Faults to be traced. Target areas a few km west of the Whitelaw Fault (i.e. in a similar structural position to the Bendigo Goldfield) have been delineated. Thick Permian tillite thwarted the first drilling program but later aircore drilling encountered intersections of 0.5 g/t Au or higher in three of 11 holes. Drilling density remains low in the region. Tom is confident that dedicated persistent prospecting will find gold deposits concealed below the Murray Basin. The logistics of the region are favourable for establishing a mine.

Despite the holidays the January meeting attracted more than 20 people who heard Trevor Hall, General Manager of Deepcore Drilling Pty Ltd, give a talk entitled "One Target, Two Opinions". Trevor spoke on various aspects of surface and underground diamond drilling, including deep directional drilling using downhole motors, casing wedges and various barrel configurations and tailoring drilling muds to suit different ground conditions. He stressed that drilling cost per metre comes down as a result of safety, production, maintenance, supervision, training and planning. Trevor concluded his presentation with some graphic images to highlight the importance of safety in the

drilling industry. One came away from the meeting with an appreciation of how skilful the modern driller must be to reach the top of this profession.

GPIC now has a website. Anyone wanting information about upcoming meetings is encouraged to join the mailing list by visiting <http://www.gpic-events.com/>. Summaries of previous talks are available on the website as well. Offers to speak at GPIC or sponsor an event will be gratefully received. Talks should have an earth science bent but need not be geological. We'll see you at GPIC soon, perhaps on March 16 (yes we know it isn't the second Tuesday) to hear Neil Phillips' presentation on "What Makes Some Goldfields Look the Way They Do? Ideas for North Central Victoria". ▲▲

## Taking Action to Avoid Brain Drain

**MINISTER FOR MINERAL RESOURCES DEVELOPMENT Paul Holloway said today the Rann Government is acting to prevent the loss of mining expertise from South Australia in the aftermath of the global financial crisis.**

Mr Holloway says \$750,000 to support the Geoscientist Assistance Program for two years aims to encourage mining professionals to remain in South Australia to maintain their skills and expertise.

"While the current economic climate has cast a shadow over the short-term outlook for the minerals sector, the fundamentals of the mining industry, particularly in South Australia remain positive," he says.

"Mining companies tend to take a long-term view and so does this Government, which is why we are developing this industry support program to position ourselves for the next upswing."

"The Geoscientist Assistance Program will ensure that our highly skilled work force doesn't drift off interstate and overseas before the next stage of the recovery."

The program is being developed through the South Australian Chamber of Mines and Energy, Primary Industry and Resources S.A. and local academics, and is fully endorsed by the South Australian Minerals and Petroleum Expert Group, or SAMPEG.

Mr Holloway says with a strong pipeline of mining projects working their way through the approvals process it is important to have a skilled workforce ready to make the most of these opportunities.

"The Geoscientist Assistance Program aims to retain the current and future graduates within South Australia, ready to swing into action when the recovery picks up momentum," Mr Holloway says.

"These graduates are an important component of South Australia's skilled and highly trained mineral exploration and mining work force.

"The program provides short-term contracts within government and industry for recently retrenched workers and new graduates. It also offers additional training and development and further study.

"This mix of short-term work within the industry as well as training programs will reduce the risk of potential loss of expertise from the South Australian exploration and mining industry." ▲▲



## Geoscientist Assistance Program



The Geoscientist Assistance Program (GAP) is a collaboration between PIRSA through The Plan for Accelerating Exploration (PACE) and The South Australian Chamber of Mines and Energy (SACOME) in response to the effect of the GFC on the South Australian Resources and Energy industries.

The success of these industries is a crucial component to securing South Australia's economic future. Skills retention is a critical aspect of ensuring that the sectors achieve the very best outcomes for South Australia.

During the current GFC and also the natural lows of the exploration cycle the GAP will provide graduates and experienced geoscientists with a level of certainty regarding their career prospects, ensuring that we do not lose them interstate, overseas and to other sectors.

The GAP will place skilled and graduate Geoscientists into work placements facilitating the retention of these skills in SA. The Program will provide skills and professional development opportunities for participants, ensuring that their skills meet the future needs of industry.

The Program aims to

- Prevent the loss of experienced and highly trained geoscientists from the South Australian exploration, mining, petroleum and energy industries
- Maintain, develop and diversify the skills of geoscience graduates and experienced professionals affected by the GFC

The key functions of the GAP will be to

- Provide subsidies for the employment of GAP approved candidates. Candidates may be either graduates or experienced geoscientists
- Provide up to \$1000 contribution towards site readiness training e.g. First Aid
- Assist industry with program application processes
- Source and match suitably qualified candidates for GAP approved projects
- Provide additional opportunities for training and development of skills
- Provide mentoring opportunities for geoscience graduates

For more details about industry sectors and job titles covered by the funding please refer to SACOME's website : [www.sacome.org.au](http://www.sacome.org.au)



For more information regarding the program please talk to us today

**Lisa Jeffery** - Manager, Geoscientist Assistance Program

**Antonia Mertiris** - Director, Skills & Education

Project application forms are available online at:

Phone **08 8202 9999**

Email [ljeffery@sacome.org.au](mailto:ljeffery@sacome.org.au)

Email [amertiris@sacome.org.au](mailto:amertiris@sacome.org.au)

**[www.sacome.org.au](http://www.sacome.org.au)**





# Geoscientist Employment Crisis Continues

*Some good news but reasons for concern in latest AIG geoscientist employment survey results*

**18.7 % of professional geoscientists (geologists and geophysicists) in Australia are currently unemployed or underemployed. The unemployment rate of 8.8 % masks difficulties being experienced by self employed geoscientists.**

**This figure is 21.1 % for the mineral exploration sector, down from 37.4 % in Q1 2009 but well above near full employment prevailing throughout 2008.**

**Government programmes to support resource industry employment during the global financial downturn have been completely ineffective. Both Commonwealth and State governments need to act urgently to address impediments to exploration investment through taxation reforms and reducing bureaucracy impeding access to land for exploration.**

**Continued inaction on these issues is indirectly but tangibly impeding the ability of Australia's exploration and mining industries to contribute to economic recovery and impeding development of Australia's geoscience capabilities generally.**

The latest geoscientist employment survey conducted by the Australian Institute of Geoscientists revealed little improvement in the dramatic downturn in employment prospects for Australia's geoscientists that have plagued the profession throughout 2009.

**Some 18.7 % of professional geoscientists remain unable to secure their desired level of employment.**

This represents a decrease from 20.2 % recorded three months prior to the latest survey, and 24.5 % at the beginning of 2009, following the onset of the global economic downturn. Across the profession, 8.8 % of geoscientists are unemployed, 1.6 % remained compelled by employers to work reduced hours and 8.3 % are unable to achieve their desired level of self employment. The decrease in unemployment amongst geoscientists employed by companies has, partly, been at the expense of self employed geoscientists.

Mineral exploration remains the hardest hit sector of the profession where the unemployment and underemployment rate is 21.1 %, a significant improvement from the rates of 37.4 % in the first quarter of 2009 and 25.3 % mid-year, but a marked difference from the situation of near full employment in 2008. These figures include geoscientists compelled to work shorter hours of 11.8 %, up from the March figure of 6.7 %. Self employed geoscientists are finding times particularly hard with 47.1 % of unemployed or underemployed geoscientists unable to achieve their desired level of self employment, a dramatic increase from 18.5 % in the March survey, and 36.4 % in June.

Government programs targeting a downturn in resource industry employment implemented by several state governments provided no tangible support for geoscientists in exploration and mining. Only 2.0 % of unemployed or underemployed geoscientists were able to access any form of government support (apart from unemployment benefits which could not be accessed readily by self employed professionals).

The latest figures do contain some encouraging signs, amongst which is a decrease in the rate of unemployed and underemployed geoscientists seeking opportunities outside the profession from 26 % in June to 16 % in the latest survey, and an increase in confidence of returning to full employment within 12 months from only 50.9 % in June to 63.5 %.

"The decrease in the rate of unemployment and underemployment in

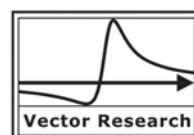
the latest survey results is welcome but no cause for complacency" according to AIG Vice President Andrew Waltho.

"Unemployment and underemployment amongst Australian geoscientists, particularly in mineral exploration, remains disturbingly high". "these figures, coupled with the downturn in exploration expenditure reported last week by the Australian Bureau of Statistics point to a lack of investment in the future of Australia's resource industries which is troubling at a time when Australia is looking to the resource sector to underpin its recovery from the global economic downturn". Both Commonwealth and State governments need to act to promote exploration to maintain the project pipeline that is critical to the sustainability of Australia's resource industries". "Measures to promote exploration investment, notably flow through shares, and improve access to land for exploration, something that has become ensnared in red-tape in recent years, require urgent action".

"The downturn in mineral exploration, by making geoscience careers for a large proportion of the profession appear unattractive, deters prospective students from entering the profession and, by doing so, becoming aware of the full range of career opportunities available - something students gain little insight into before entering university".

"AIG has consistently expressed concerns that continued government inaction on exploration investment indirectly impairs the development of Australia's geoscience skills base, reducing our capacity to deal with important geoscientific issues including management of groundwater resources, urban and engineering geology, assessment and mitigation of geological hazards, environmental remediation and even climate change".

"These concerns remain very real and in urgent need of attention."



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# Complaints, Complaints, Complaints

## AIG membership doesn't mean you are a "Competent Person"

Over the last few years, AIG membership has grown from about 1400 to just over 2000. Motives for taking up membership of AIG are varied but a significant number of industry professionals join AIG in order that they can sign-off as a "Competent Person" on public reports outlining mineral Exploration Results, Mineral Resources or Ore Reserves. ASX-listed entities must use the JORC Code for public reporting and adherence to the JORC Code is a requirement for AIG members claiming to be a "Competent Person". AIG has an enforceable Code of Ethics and a Complaints Management System to deal with breaches of the JORC Code. The AIG membership application form requires that applicants agree to be bound by AIG's Code of Ethics, which in turn contains a clause stating that members must conform to Australian Securities Exchange listing rules - which include the JORC Code.

The three tenets of public reporting under the JORC Code are transparency, materiality and competence. AIG membership does not mean that you are automatically a "Competent Person" who can sign-off on public reports. Competence means that a public report is based on work that is the responsibility of suitably qualified and experienced persons who are subject to an enforceable professional code of ethics. AIG membership only provides the "enforceable professional code of ethics" bit. Therefore, AIG membership is only a prerequisite for being a "Competent Person".

Clause 10 of the JORC Code requires that a "Competent Person" must have a *minimum of five years experience* relevant to the:

- style of mineralisation; and
- type of deposit under consideration; and
- activity which that person is undertaking (e.g. exploration, resource estimates, ore reserve estimates, feasibility studies, mining etc).

Notice that there are "and's and not "or's between the three bullet-pointed elements of competency.

Although you are a member of AIG, are you also a "Competent Person"? ▲▲

**Rick Rogerson**  
Chairman, Complaints Committee

# Professional Employees Award

## New Industrial Award Sets Minimum Standards for Professional Employment in Australia

Under the new "Fair Work Australia" policies of the Commonwealth Government, a new award setting minimum standards for professional employees comes into force nationally from 1 January 2010. The award covers both engineers and scientists.

Under the award, a Professional Scientist is a person possessing a diploma from an Institute of Technology as a minimum qualification. Within this definition, additional categories of Experienced Scientist and Qualified Scientist are also defined.

Quality Auditors in both the scientific and engineering fields receive specific attention, in terms of both education and experience requirements under the award.

Employers are required to ensure that copies of this award and the National Employment Standard are available to all employees to whom they apply either on a noticeboard which is conveniently located at or near the workplace or through electronic means, whichever makes them more accessible.

The award includes provisions for dealing with major workplace changes and dispute resolution between employees and employers, termination of employment and redundancy. ▲▲

# RPGeo Approval and Applicants

## CANDIDATES APPROVED BY AIG COUNCIL IN JANUARY 2010

**Mr. Philip Styles**, of Warranwood, Victoria, in the field of Geotechnical and Engineering

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

**Dr. Gabor Bekesi**, of Adelaide SA, is applying in the field of Hydrogeology

**Mr. Michael Edwards** of Annandale, NSW. Is applying in the field of Environmental Geoscience

**Ms. Fabienne d'Hautefeuille** of Bondi, NSW, is applying in the field of Hydrogeology

**Ms. Maria Dubikova** of Sutherland, NSW is applying in the fields of Hydrogeology and Geochemistry

**Mr. Ray Hartley** of Double Bay, NSW, is applying in the field of Hydrogeology

**Ms. Sarah Hill** of Freshwater, NSW, is applying in the field of Hydrogeology

**Mr. Julius Marinelli** of Carindale, Queensland, is applying in Mineral Exploration

**Stephen Sugden** of Willetton, WA, is applying in Mineral Exploration and Geochemistry

**Dr. Andy Wilde** of Berwick, Victoria, is applying in Mineral Exploration and Geochemistry

**Mr. Steven Williamson** of Richmond, Victoria, is applying in Mineral Exploration and Hydrogeology

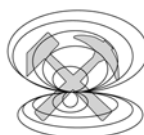
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## Membership Update

### New Members and Upgrades at the November Council Meeting 2009

#### FELLOWS

DAVIES	Roderick	Michael
TURBOTT	Michael	John

#### MEMBERS

DAO	Moussa	Gabriel
DAVIES	Richard	Charles
DE CAMPOS CORDEIRO		Ricardo

DE JONG	Andreas	
FAHEL	Andre	Ricardo
FLETCHER	Michael	George
GARTON	Geoffrey	
GUO	Bin	
HOUSTON	Anthony	James
HOVEY	Andrew	Gregory
JONES	Daniel	Peter
KARGBO	Sonsiama	Anthony
KHUDEIRA	Baker	
PATTERSON-KANE	Glenn	John
PETERSON	Anthony	R
URBISINOV	Serikjan	

#### GRADUATES

BACKUS	Rachel	Juliet
BROWN	Jamie	John
CORNISH	David	
CUMMING	Grace	
DIEMAR	Glen	Alfred
WILLIS	Stephanie	Ford

#### STUDENTS

ABBOTT	William	
MCGEENEY	Dayna	Elise
MURPHY	Nicholas	Peter
PARKER	Paul	James
SULLIVAN	Thomas	Patrick

### New Members and Upgrades at the January Council Meeting 2010

#### MEMBERS

AXFORD	Todd	Wayne
BISHOP	Scott	Raymond
BRAY	Richard	Anthony
CARNEY	Catherine	
CARR	Howard	William
COCHRANE	Denise	Eileen
DANGERFIELD	Philip	James
ELLIOTT	Lauren	Kate
ELLIS	Margaret	Jadwiga
FLYNN	Steven	Grant
GAVRILIU	Dragos	
HANDIKO	Deddi	
HOLMAN	Nicholas	William
JAMES	Damien	
KELLY	Allan	John
KOTE	Jacqueline	Josephine
MAFUMA	Wonai	
MATEMA	Moses	Itayi
MCEVILLY	Roger	Paul
MOSER	Andrew	Peter
REED	Anthony	David
STOCKFELD	Kenneth	John
SUBRAMANYA	Anil	Colin
VASSALLO	Kristy	Elaine
WHITBREAD	Michael	Simon
WIJNS	Christopher	Paul
WILLIAMSON	Steven	Luke

#### GRADUATES

ASHBY	Elliot	Dean
BURTON	Jeremy	Alan
VAN ROIJ	Alwin	

#### STUDENTS

ADAMS	Michael	
DEAN	Abbie	Sarah
KOEFOED	Piers	Prince
TURNER	Emma	Louise

*We welcome all new members to the AIG.*



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## AIG NEWS

### CONTRIBUTION DEADLINES

AIG News is published quarterly as per the following table. Avoid disappointment by contacting the Editor at least several days beforehand

ISSUE DATE	CONTRIBUTION DEADLINE
February	January 31st
May	April 30th
August	July 31st
November	October 31st

to advise submission of items for the newsletter.

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

### The EDITORIAL ADDRESS is:

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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.

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The AIG Website is currently undergoing a major update. Comments on content suggestions or new features should be directed to Andrew Waltho ([andrew.waltho@bigpond.com](mailto:andrew.waltho@bigpond.com))

