

Australian Institute of Geoscientists

AIG NEWS

Quarterly Newsletter • No 114 • November 2013

The Fourth Phase of Water — An EZ Phase to Add?

Louis Hissink, Editor

Water has always been known to have unusual properties — from supporting a running reptile, aptly called the Jesus Christ Lizard, to increasing its specific gravity or density at a temperature of 4 degrees Celsius, forming fluffy white clouds or dark grey storm clouds, or lubricating our skeletal joints without squeaking. You would think that all the physical properties of water would, after all this time, be well known, but apparently not according to Gerald H. Pollack and his co-workers and students at the University of Washington in the US.

We all know that water has three phases, solid, liquid and vapour but Pollack's work has discovered, or perhaps rediscovered, a fourth phase that occurs next to hydrophilic surfaces projecting out by up to millions of molecular layers. And it's almost ubiquitous throughout nature, including the human body.

Rediscovered because a century ago the physical chemist Sir William Hardy argued for the existence of a fourth phase and which has been inferred by an observation by McConnell and Kidd that the shear strength of lake ice was exceptionally low parallel to the lake surface which, from X-ray work, showed that the glide planes were perpendicular to the ice crystal C axis and also parallel to the water surface, suggesting an ordered or structured phase of water that could explain this anomalous shear strength.

Recent work does indeed show the existence of an ordered, liquid crystalline phase of water, allowing new explanations for why gelatin desserts hold their water to why water dowsers can detect underground water courses. One important discovery was the energy source that transforms this liquid crystalline water from the randomly ordered bulk water most of us are familiar with.

This source is radiant energy, occurring from the ultraviolet through visible to infrared, with near infrared the most capable. As Pollack notes, water absorbs energy freely from the environment and uses that energy to convert bulk water into liquid crystalline water, or "exclusion zone", "EZ", water because it profoundly excludes solutes. Hence the buildup of EZ water occurs naturally and spontaneously from environmental energy. Additional energy input increases EZ buildup.

An important property of EZ water is its electrical charge, and it has been found that it is commonly electrically negative. This happens when absorbed radiant energy splits the water molecules into a moiety of negative charge that constitutes the building blocks of EZ water, while the positive moiety binds with water molecules to form free hydronium ions that diffuse throughout the rest of the water. This causes electrical charge separation that can be stimulated with more light to increase that charge separation. So basically EZ water is proton poor water, while the hydronium ions are proton rich water.

Laboratory experimental work has shown that this process resembles the first step of photosynthesis, and suggesting that any hydrophilic surface may catalyse the splitting of water into EZ water and hydronium ions. This charge separation actually resembles a battery and which could supply stored electrical energy to perform work, including fluid flow. This can be demonstrated by immersing tubes of hydrophyllic materials into water that produces flow through those tubes, similar to blood flow through blood vessels. The driving energy comes from the radiant energy absorbed and stored in the water. It's not a perpetual motion machine

Cont. Overleaf

INSIDE THIS AIG NEWS:

	ead Article – The Fourth Phase of Vater: An EZ Phase to Add?	1
• F	From Your President	3
	Some Historic Comments about the Great Artesian Basin	5
	Conference Report — 40th IAH 2013 Perth Congress	6
	A Canary's View of the Mining Boom and Bust Cycle	8
	Say's Law and the Boom Bust Cycle — Another Look	13
9	Book Review — The Birth of Supercontinents and the Proterozoic Assembly of Western Australia	17
	Earth's Mantle Affects Long-Term Gea-Level Rise Estimates	18
• F	Finding Opportunities in the Downturn	21
• 5	Short Course Review	24
	Mines and Wines 2013 — Sampling he Tasmanides	25
• E	Education Report	28
1	Honours Abstract — Luke George, Frace and Minor Elements in Galena — A Reconnaissance LA-ICP-MS Study	30
ι	Honours Abstract — Rhiannon Fullard, Jsing Provenance and Palaeoenvironme o Assess Tectonic Influences in	nts
F	Archaean Greenstone Belts	30
	Kent Street High School — Shark Bay EES Field Trip 2013	31
• (Careers Night A Big Hit	32
	Computer Games and Quizzes — Year 8's Inspire the Next Generation	33
	RPGeo Update and On the Significance of RPGeo Fields of Practice	34
• F	RPGeo Approvals and Applications	35
	Membership Update September	25

AIG Secretariat



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The Fourth Phase of Water — An EZ Phase to Add?

Cont. from Page 1

either, since the incident radiant energy drives the flow in much the same way that it drives the vascular flow in plants.

One example of EZ's central role is weather. Weather is commonly understood as the interplay of two physical variables, pressure and temperature, that are assumed to be capable of explaining everything we experience in terms of weather. However the atmosphere also contains water in the form of micrometer droplets known as aerosols, and make up atmospheric humidity. When the atmosphere is humid, the large number of aerosols scatter light to produce haze, and when only a few, one can see further than when surrounded by the haze.

Pollack's research work shows that the structure of these droplets or aerosols is made up of a shell of EZ water and an interior of hydronium ions. The electrical tension of these two contiguous phases of water creates pressure and explains why those droplets are spherical.

So how do these droplets condense to form clouds? The droplets' EZ shells bear negative charge and hence repel each other, precluding any condensation into clouds, so how could those droplets accumulate? Apparently quite easily because of the unlike charges between the droplets of EZ acting as attractors. This observation adds further insight onto the relationship discovered recently between cosmic radiation and cloud formation, cosmic radiation being principally comprised of alpha particles, or helium nuclei, and hence

electrically positively charged. So an increase in cosmic radiation then causes an increase in cloudiness, increasing the earth's atmospheric albedo and causing cooling.

EZ water also sheds light on the technique of water divining, an ability some people have, including the writer himself. If ground water is flowing and comprised of EZ water, then this can be also viewed as a flow of negative electric charge which produces a localised magnetic field. So it's possible that this magnetic field produced by the flowing EZ water is being sensed by the diviners.

Pollack has also been able to offer explanations for some outstanding anomalies in water science, and in a recent article in EdgeScience, No 16, Nov 2013, considers water's unexpectedly high heat capacity, and its paradoxical density maximum at 4 degrees Celsius.

An essential feature of EZ buildup is the role of radiant energy, and the major driving force for this buildup is heat, or infrared energy. Hence heat builds order (bulk water to EZ water) and also separates charge, yielding potential energy. But the usual way of looking at water is that radiant input simply raises the temperature. Not so, for the radiant-energy also increases the potential energy of the water, and hence is the reason water doesn't heat up as much as anticipated, or as Pollack writes it, "which is another way of saying that water's heat capacity is anomalously high.

Cont. on Page 4



From Your President - Kaylene Camuti

IN THIS ISSUE of AIG News I would like to take the opportunity to acknowledge the many people who have contributed to the AIG this year. While it's not practical to mention everyone by name, there are hundreds of people across Australia whose efforts ensure the Institute continues to thrive and provide services to its members.

Members of this extensive network of volunteers serve on various internal and external committees, including:

- AIG Council;
- AIG State Branch Committees;
- AIG Subcommittees e.g. Ethics, Complaints, Registration Board, Education;
- External Committees e.g. JORC, VALMIN, the AGC, TESEP, and the Australian National Rock Garden Committee.

On behalf of the AIG I'd like to say thank you to all those members for their energy, time and commitment.

The state branch committees have been especially active this year, organizing conferences, workshops and social events for local members. The events on offer this year included:

- The East Asia Geology, Exploration Technologies and Mines Conference, held in Bali in May;
- The 2013 Mines & Wines Conference, held in Orange in September;
- A series of seminars around Australia on the JORC 2012 Code, held in collaboration with the ASX and the other JORC parent bodies;
- Numerous one and two-day seminars on a wide range of topics;
- Career and information events for secondary and tertiary students.

The AIG has also been working towards making technical events more widely available to members, and presentations from several technical events area are now online, some as PowerPoint presentations, others as videos. The presentations are available via the Resources section of the AIG web site, and videos are also available at the AIG YouTube channel at http://www.youtube.com/AIGAustralia.

This year the AIG has also continued to support geoscience education at tertiary level through its Bursary Program, and details of this year's awards are included in the Education Report in this issue of AIG News. Support for geoscience education in schools has also continued through our sponsorship of the TESEP and ESWA teacher education programs.

Through the contributions of many, much has been achieved over the last 12 months, although this year has also presented challenges for many AIG members. Chief amongst these has been the rising rate of geoscientist underemployment and unemployment, and the declining confidence in job security. In AIG News this time last year, I mentioned anecdotal evidence of companies reducing staff and geoscientists losing jobs, particularly in the exploration



sector. Since that time the AIG has run several employment surveys, and survey responses have shown rapidly increasing levels of under- and unemployment amongst geoscientists. Respondents to the latest AIG employment survey, held in September, reported underemployment of 16.9% and unemployment of 13.5%—levels approaching those experienced during the global financial crisis of 2008-2009.

However, in the last month or two there seemed to be hints of optimism creeping into conversations, with mention of increasing investor interest in exploration. At the Mines and Wines conference in NSW in September, the overall mood amongst delegates seemed to be a little upbeat, which was encouraging (although it could be argued that sampling of the local produce contributed somewhat to this slightly rosy outlook).

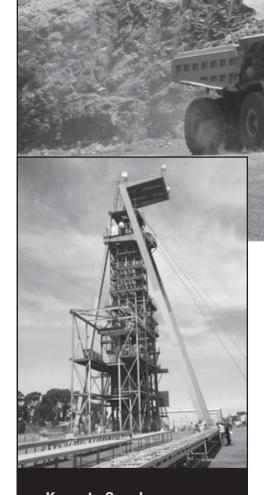
Although there does not yet appear to be obvious evidence of increasing levels of exploration investment and activity, perhaps we can look forward to improving conditions in 2014. The Coalition government went to the September election with a policy of promoting investment in exploration, including the introduction of an Exploration Development Incentive from the 1st of July 2014. Under the proposed Incentive program, Australian shareholders in the junior minerals sector will receive a tax credit for eligible greenfields exploration expenditure. We look forward with keen interest to the introduction of this program, and the potentially positive effects on the employment prospects for geoscientists in the mineral exploration sector.

In the meantime, the AIG will continue to offer opportunities for our members to maintain, improve and diversify their technical skills and, in recognition of the difficult employment situation for many members, some of these opportunities will be offered to unemployed members at highly discounted rates, or for free. However, if the AIG is to keep you informed of upcoming technical and social events, we need to have your current contact details. I encourage all members to inform the AIG secretariat if their contact details change, and to subscribe to the mailing list for local and national e-updates, which can be done via the AIG web site.

I wish you all a relaxing and enjoyable holiday season.







Keynote Speakers:

Bob Foster

(Stratex International PLC, London)
Science and the City - the status
of our gold industry

David Groves

(Consultant, Western Australia)
Province-scale Commonalities
and Contrasts Between Orogenic,
Intrusion-related, Carlin-type and
Iron Oxide Systems

Richard Sillitoe

(Consultant, UK)
Gold Exploration Opportunities

For Further Information:

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Wed 8th to Fri 10th October 2014

WMC Conference Centre
Curtin University, Kalgoorlie, Western Australia



Gold14@Kalgoorlie

INTERNATIONAL SYMPOSIUM







Symposium Themes

Past, present and future of gold exploration and mining

New gold provinces and opportunities

The timing of gold mineralisation

Gold exploration methods and technologies

Programme

Pre-symposium mine visits: 4th to 6th October 2014 (Start and finish Kalgoorlie)

The pre-conference field trip and mine visits will focus around and to the south of Kalgoorlie and will examine Eastern Goldfields outcrop lithostratigraphy and gold mineralisation. Leader: Stephen Wyche and GSWA colleagues.

Short course: 7th October 2014 (Kalgoorlie)

Orogenic gold deposits: nature and geological targeting by David Groves.

Symposium: 8th to 10th October 2014 (Kalgoorlie)

Technical sessions, keynote speakers, poster session and networking events, including sundowner and symposium dinner.

Post symposium mine visits: 11th to 13th October 2014 (Start and finish Kalgoorlie)

The post-symposium trip will focus on the north Kalgoorlie and Leonora areas. The excursion will visit several mines and focus on mine- to regional-scale structural controls on gold mineralisation. Leader: Stephen Wyche and GSWA colleagues.

Short course: 14th October 2014 (Perth)

Porphyry copper-gold and related epithermal deposits by Richard Sillitoe.

Visit: aig.org.au or geosymposia.com.au Email: training@geosymposia.com.au

Some Historical Comments about the Great Artesian Basin

Professor John Walter Gregory, FRS DSc.

In 1899 Gregory was appointed Professor of Geology at the University of Melbourne. His qualifications for the appointment were so outstanding that the London committee did not interview any of the other candidates. His book "The Great Rift Valley" (published 1896) told of his excursion to the Rift Valley in Kenya, the nearby volcanoes, lava fields, geothermal springs and the glaciers of Mt. Kenya – he was the first scientific explorer in this region. The geology of Australia became his new field of exploration, and in 1901-02 he travelled to Lake Eyre and studied the artesian bores there. He wrote a book about this trip, "The Dead Heart of Australia", published 1906. His studies of the GAB have not been equalled in 100 years. Following are some quotations from his book:

"Subterranean water may be derived from one of two sources. Cool water, which occurs at comparatively slight depths, is no doubt, generally, rain-water As this water comes originally from the sky it is called 'meteoric' water..

The second source of subterranean water is the interior of the earth. The rocks of the deeper layers of the earth's crust contain water. The quartz in granite owes its milky whiteness to abundant minute cavities, filled with water. The vast steam cloud, which hangs over volcanoes... has no doubt been brought... from the interior of the earth.

The Fourth Phase of Water — An EZ Phase to Add?

Cont. from Page 2

It is therefore pretty obvious where the missing heat that climate science is searching for - it is in the oceans of the world, and not as thermal heat but as potential energy tied up in the EZ water at the ocean surface. But EZ water plays no role at all in climate science.

The other anomaly occurs when water is cooled, where just before reaching the solid phase it shows an increase in density at 4 degrees Celsius. Further cooling however, brings expansion, not contraction and hence is why ice floats on water. The cause of this peculiar density maximum is EZ water. EZ water structure resembles the molecular structure of ice, a parallel sequence of honeycomb planes linked together by protons. Removal of those protons creates EZ water, or the reverse, have EZ water and by adding protons forms ice.

The pertinent fact is that EZ water is denser than ice and also denser than water, which is demonstrated by the fact that the birefringence of EZ water is higher by 11%. The removal of the protons from bulk water to produce EZ water results in a closer molecular packing, hence also increasing the density.

And it is clear that our understanding of ice formation might also be incomplete, for if the formation of EZ water is a ubiquitous property of water, then solute layering in ice cores may also be due to expulsion from the bulk-water to EZ-water process, than from annual deposition of aerosols caught in the ice.

Reference:

The Fourth Phase of Water, Beyond Solid, Liquid and Vapour, by Gerald H. Pollack, in, EdgeScience, Number 16, November 2013, pp 14-18.

Plutonic waters are especially important in mining countries, because most of the chief ore-deposits are due to them. And as the deep, water-bearing basin of Central Australia is surrounded on all sides by rocks containing rich mineral veins – from the Queensland gold-fields on the east, the Cobar copper-field and Broken Hill in the south, and the Cloncurry gold-field in the west — there is likely to be a considerable amount of plutonic water under Central Australia.

Where these ascending waters are cut off from the surface by an overlying sheet of clay, they accumulate in any porous beds they can enter, and remain in them subject to high pressure. Any plutonic water rising from the old rocks of Central Australia would collect in the permeable beds of sandstone beneath the clays. Thence it would rush to the surface, if a bore-hole were made through the water-tight cap above, just as oil and natural gas escape from the wells of the Caspian and Pennsylvania....

The explanation of the flowing wells of Central Australia as due to water-pressure in the distant Queensland hills is met by many difficulties. One of the chief is, that it under-rates the resistance to the flow of water through rocks due to friction. The analogy between the geological structure of eastern Australia and a U-tube fails, because Australia is not built up of tubes. The water has to percolate, not through open tubes, but through the pores of rocks; and as these rocks are under the pressure of sometimes as much as four or five thousand feet of overlying material the pores will be minute.

The average increase of temperature below the surface of the ground is generally taken as 1 degree F for every 53 feet in depth... But many of the flowing wells in Australia show the rate of one degree F for every twenty-two feet. This high temperature indicates that the water has probably come from a much greater depth than that of the water-bearing layer. It is, therefore, more likely to be plutonic than meteoric water...

The association of compressed gas with the artesian waters has been denied or doubted, but it is admitted that many of the well-waters smell of sulphuretted hydrogen. Many of the Queensland waters are charged with carbonic acid.

I long hesitated before finally rejecting the ordinary artesian theory of the Central Australian wells, The question is not merely one of settling a theoretical explanation. It has an important practical bearing. Many of these wells now run to waste.

This waste is defended on the ground that the water is being renewed at a rate which so vastly exceeds the outflow from the wells, that they will last for ever without any diminished flow...

Legislation to stop this waste has twice been proposed. A Bill was carried through the Queensland Assembly in 1891; but the Legislative Council rejected it. In New South Wales a similar Bill was proposed in 1894, which would have authorised the Water-conservation Department to order the partial closing of the wells; but it also failed to pass.

Nature has stored up a vast – but probably a limited – supply in a safe, underground reservoir. But to allow these deep-well waters – in obedience to a mistaken analogy as to their origin – to run heedlessly to waste, is a policy of which a later generation of Australians may have bitter cause for complaint.

Source: http://www.gabpg.org.au/great-artesian-basin/scientific-papers

International Association of Hydrogeologists (IAH) - 2013 Perth Congress:

Solving the Groundwater Challenges of the 21st Century

Katarina David, MAIG-RPGeo, IAH NSW Chair

IAH HOSTED THE 40th International Congress in Perth, Western Australia from 15th to 20th September 2013. Due to the high level of interest, the Congress was organised in six parallel technical and poster sessions. In addition to some 400 attendees from Australia, the Congress also attracted 300 international participants from over 30 countries, a great effort in the current difficult economic climate.

Six Congress short courses were organised prior to the start of the Congress and one Symposium after the Congress. To break the technical sessions, six different mid-Congress tours were organised with local IAH members volunteering as tour guides. The topics of the tours were: adapting Perth's water supply to a drying climate, managing groundwater allocations, managed aquifer recharge innovations in the Perth Basin, Gnangara mound wetlands and climate change, Perth basin geothermal and groundwater resources, and contaminated sites of Swan Valley.

Some of the excursion highlights were visiting the geothermal bores in the eastern Perth suburbs that extract groundwater from the Yarragadee aquifer at around 45°C, lunch beside Lake Joondalup and discussing managed aquifer recharge at a Swan Valley Winery.



Following the opening of the Congress and Welcome To Country, two plenary sessions were given: Sue Murphy, CEO Water Corporation, discussed Perth's drought-proof water supply followed by Craig Simmons, Director for the National Centre for Groundwater Research and Training at Flinders University, who discussed groundwater being a challenge from different viewpoints in the spirit of the Congress theme. Over the course of the week, many other



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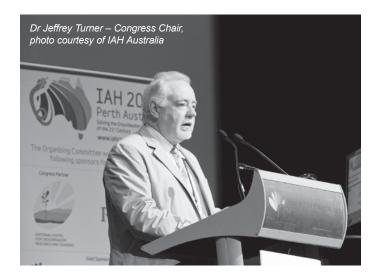
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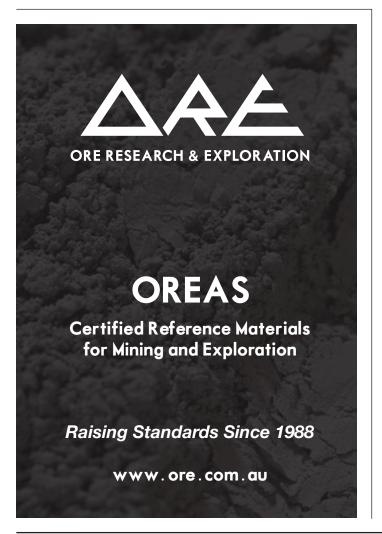
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plenary speakers – Prof Wolfgang Kinzelbach, Prof Stephen Foster, Dr Peter Cook, Geoff Beale, Prof John Doherty, Dr Chunmiao Zheng, and Dr Peter Dillon – talked about the challenges in groundwater resource management from different perspectives such as contamination and remediation, nuclear waste management, mining, research, managed aquifer recharge, and uncertainty in modelling. In addition, 2013 Darcy lecturer Prof Dave Rudolph





presented two lectures on the impact on water quality from agricultural land use practices, and challenges of vulnerability with public supply wells.

Many international and national professionals (too numerous to mention here) delivered keynote speeches and also chaired the sessions. The diversity of technical talks included many different areas: groundwater quality and hydrogeochemistry, managing groundwater resources, surface water – groundwater interaction, climate and groundwater, advances in tools and techniques, agriculture and paleochannels and karst systems. The practical applications of the technical talks included a diverse range of groundwater activities: resource investigation and management, mining, oil and gas, pollution prevention, geothermal development, tunnelling, climate change research and others.

The great success of the Congress would not have been possible without numerous hours given by the IAH 2013 organising committee (Chair, Congress convener, Scientific program co-chairs and committee members), and support from national and state IAH committees across the country. The 41st IAH congress is to be held in Marrakesh, Morocco between 15 – 19 September 2014. Abstracts close on 15 March 2014.



A Canary's View of the Mining Boom and Bust Cycle

by Monica Davis MAusIMM, Resource Geologist, MD Geology and Sally Lonie, geologist

JOKES ABOUT GEOLOGY DEGREES being an excellent qualification to drive a taxi were frequent when we were going through university. As young geologists, the volatile nature of the geology game was often described to us, but the reality of this has

just hit home for the first time for a generation of coal geologists.

No matter how well you think you are prepared, the first mass extinction event stings like nothing else, makes you question your self-worth, how you identify yourself and lays before you the terrifying prospect of having no idea of what will come next. Until you have experienced it, it is difficult to explain the shudder of raw terror every time a recently unemployed geologist is asked 'who do you work for?' or 'what do you do?'. As graduates of 2007, we found ourselves to be in unprecedented demand. Mine geologist roles were being offered to second year students and graduates had their pick of jobs, with many being offered attractive pay packages of more than \$100 000 per annum. A generation of geologists graduated with a grand sense of inflated worth. As demand for

geologists continued to increase rapidly, many commented that the standards of the graduates employed had dropped. Some companies accepted any science graduate – rather than one with a dedicated geology degree – and students began to enter a discipline they had little interest in, lured by the money. Demand for geologists in Australia peaked in June 2012, with more than 2000 positions for geologists and geophysicists advertised (Figure 1).

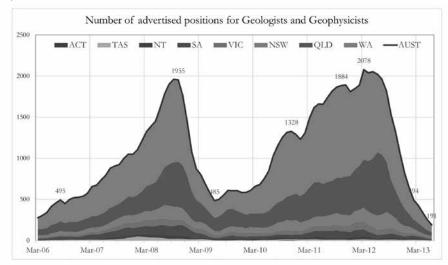


Figure 1. Number of advertised positions for geologists and geophysicists (Source: LMIP 2013).

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But any good bubble will inevitably burst. And when coal exploration fell out of the sky in July 2012, a large number of geologists hit the ground with it. We started writing this article in April 2013 after a Sunday afternoon barbeque, where only two of the fifteen geologists present had a job to go to on Monday. This included not only geologists that had been made redundant, but also those who were on extended leave without pay (under-employed), or those with their own business and limited or no work on the horizon.

The number of geologists demanded by the industry is closely tied to the expenditure on exploration. From 2010 to June 2012, the growth in expenditure on exploration continued to rise at an exponential rate. This spending declined rapidly following the peak in June 2012, as expenditure on coal exploration in Australia dropped by 44 per cent (or \$92 M) in nine months (Figure 2).

As the expenditure on exploration crashed, so too did the number of employed geologists. These job losses have hit the entire coal industry, with as many as 11,000 jobs lost in the coal industry in the past 15 months. A number of coal exploration companies were contacted to assist with this paper, and the chart below shows the correlation between the numbers of geologists employed by each company and the expenditure on exploration (Figure 3).

For some, an exit from a company was lightning fast and others a more drawn-out process. Best practice in retrenching employees recommends foresight and good communication. Dozens of geologists were interviewed in the course of writing this article and the terms 'well planned' and 'well communicated' were not mentioned once. We have collated some of their stories.

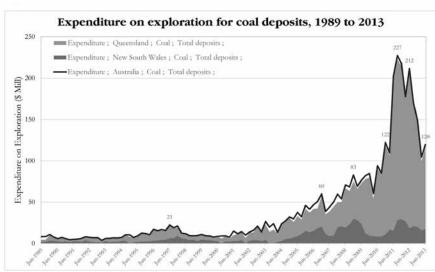


Figure 2. Expenditure on coal exploration in Australia, 1989-2013 (Source ABS 2013)

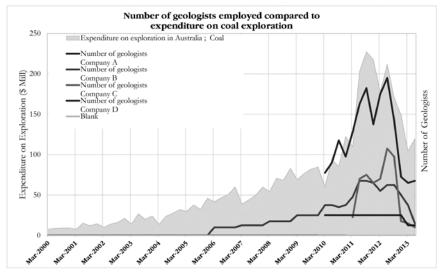


Figure 3. Number of geologists compared to expenditure on exploration. Note: no scale is used for the number of geologists.

Individual Experiences

Alex

'In late March 2013 my whole office was made redundant as well as the majority of the other office, leaving a skeleton staff of four people. The five weeks that I served out my notice period and closed down the office was the most stressful experience I have ever endured in my career. It was not stressful because I could not find work in the industry, it was stressful sharing a small office space with people who were worried about their future after their redundancy period. It was a hostile environment of fluctuating moods, negativity towards company decisions. I broke out in stress rashes, frequently broke down in tears at home. By the end of it was relieved to walk out with my box of belongings and leave it all behind.

'During the redundancy period I spent much time job searching and networking. In all I applied for approximately 50 jobs with only one interview.

'So then I started looking for local jobs outside the industry. I applied for two jobs and was asked to come in for an interview for both applications. I am now an apprentice horticulturist.'

Taylor

'I would look at job websites every hour or so and as soon as a suitable position would pop up I'd apply. I think I applied for at least 25 jobs in all states and I managed to have formal interviews for only three of them. These were also the only three that got back to me. Most of the employers didn't even acknowledge that I hadn't got through the initial cull which I found really frustrating.

'I find if I think too much about what I'm going to do once this current position finishes, I feel like I'm being sucked into a black hole. If I can't get a job as a geo after this I think I will just settle for any old job. This makes me feel very sad as I worked so hard at uni and struggled financially while studying to get where I am. My boss thinks it will get worse before it gets better, but he assures me that it will get better. Sometimes I wish I hadn't just settled for coal.'

Cont. Overleaf

A Canary's View of the Mining Boom and Bust Cycle

Cont. from Page 9

Sam

'I was retrenched at the end of 2012. I felt shock initially, at being the first in a company hit. I went and had a coffee, dazed, only to find I wasn't the only one let go, that morning there were four of us. So many questions went through my head: Why didn't they first offer voluntary pay cuts or voluntary redundancies? What am I going to do? How am I going to tell my partner or pay my mortgage? Wasn't I a good enough geologist?'

Charlie

'I loved my job. I worked long hours – many more than what was stated in my contract – at no extra financial or non-financial compensation. I did it because I loved it and the work never ended. I turned down higher paying jobs because I believed the hype about how we will be looked after in the event of a down turn, I believed in the glossy ideals of the company, I believed the company was different to the others.

'I was one of the first to go. It was brutal. It was lightning fast. It was personal. It was embarrassing. It was devastating. There is no dignity in being made redundant. When someone takes away something you love, you don't know what to do. I ran away. I was on a plane within a week and a half with no idea where I was going after the plane touched down, or when I would return.

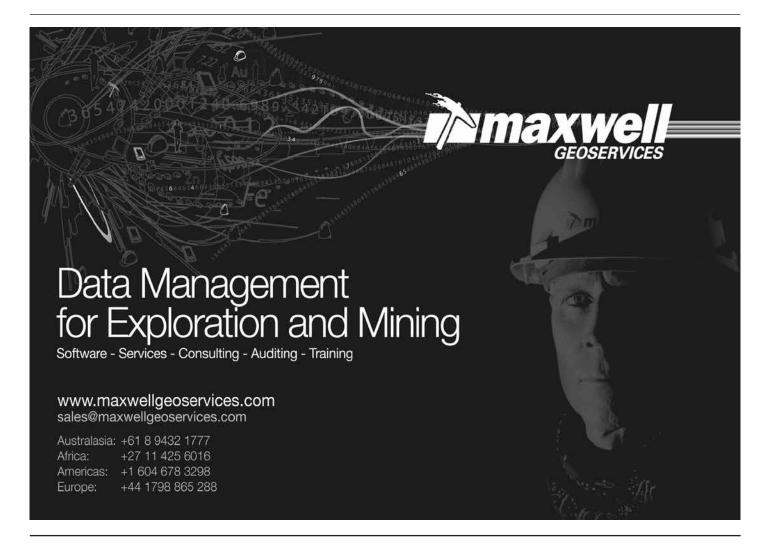
'I have been out of geological work for nearly twelve months. Over

the course of my unemployment, I have watched my friends and colleagues drop like flies from my former company and others. In one way, it may have been better that I was one of the first; the others had to endure months of 'when will I get the tap on the shoulder?' I did learn a lot though. Look after yourself and your Granny was right ... put some aside for a rainy day. Be loyal to yourself, not your company. You are expendable.'

Bernie

'I started as a graduate in a never ending and exponentially expanding 'mining boom'. I did three years with a company and gained enough experience for it to look reasonable on a resume and then headed overseas travelling. When I returned I never blinked an eye, because at the end of March 2011 when I made my announcement that I was arriving back in the country, close to six of my work colleagues/friends offered me work with companies if I wanted it. It was the time of the geo says 'I want this roster and this amount of pay'.

'I was on two weeks on, two weeks off and about \$1100 a day. These 'golden years' lasted about 18 months, but come November 2012, it was over. The contractors on the site I worked for were removed first and I now hear they have axed half of their salary staff in the company directly. The contracting company I was subcontracted to has still not managed to find work since then, only small contracts



that have been 'almost won'. And then the assault on the contracting industry was launched. Massive culls were all I kept hearing about. Every geologist I know within the coal industry was affected, particularly in the exploration side through which most of my connections have been made.

'I humbly decided to pick up work in my small coastal town. I got a job as a dispensary technician in a pharmacy that I've held for the past seven months. Perspective was gained as I looked at my last pay slip before I left the chemist a week ago and it said I had earnt \$14,600 over the past six months. I had to laugh and be humbled. It would have only taken me two weeks to earn that in November last year.

'Things are temporary and change is inevitable. In the mean time I head to Hong Kong next Wednesday and I will deal with getting a job later, whether or not I can be bothered to get one in the industry again will be another story.'

Anna

'Feeling terrified and excited, I turned up to work on my very first day as a graduate for my induction. I sat at my new desk, started my computer and proceeded to read my welcome to work emails... that were followed by others announcing the redundancy of four geologists, all of which were far more experienced than me. The office was filled with an eerie silence and I wondered if I hadn't just made the biggest mistake of my fledgling career.

'Within a few months drilling programs started coming to an end, with no new drilling/field work to replace it. I still had not made it out into the field and was working at a desk for 40 hours a week, tying up loose ends on other people's projects and keeping myself busy. As projects finished, we started to get a few more geologists in the office, making the morning coffee run more interesting. Soon we had a full elevator of geologists going for coffee each morning and it started to feel like our days were numbered...'.

"More (experienced) geologists were made redundant and then finally it was my turn. Pulled aside one morning in April 2013, I was told the news that I was no longer required at work. My dream job had lasted a grand total of seven months and I hadn't seen even a drill rig in that entire time."

Trying to Get Another Geology Job

Discussions with recruitment agencies specialising in coal geologist jobs led to comments that there had been a reduction in advertised roles from small exploration companies and consultancies. Most roles – mine geologist or senior resource geologist roles, rather than in exploration – now on offer are from the owner-operator. For each mine geologist role, there has been a significant number of exploration geologists applying, as many as 400 applications for some roles. A common frustration and a source of anxiety for applicants is not receiving an acknowledgment or an answer to their carefully crafted applications. When the selection process can range from days to months, not knowing if you're in with a chance can be consuming.

Where to From Here?

One of the major questions during the down-turn is what a geologist without a job should do, and what the industry can do to help. An unemployed geologist still wants to contribute and feel valuable in

Jo

'As the industry boomed and the company grew, human resources became more stretched and staff turnover increased. By the time I graduated the consultancy company had grown to approximately 50 people with the company growing both vertically and horizontally. Two years later there were 120 staff members. With such expansion came more opportunity for professional development. In saying this, however, I felt it was a bit of a double-edged sword in that people were able to be promoted up through the ranks more easily, but at the same time missed out on receiving training from industry champions. Speaking from my own experience, once I graduated, I worked with only one geologist that had more experience than me and that occurred nearly three years after graduating.

'I found out from this training that there was a lot of technical knowledge that was not being passed on to me, yet alone anyone else. The extent to which the lack of knowledge was not being passed on and the effects of this is probably never going to be fully realised. The demand for geos continued to grow and grow and we knew it couldn't last forever, but it certainly felt like it would.'

the industry where there are no jobs available. They need to continue to progress their careers and ensure there is not a big gap in their resume, despite no jobs being available. We spoke with a number of people to take suggestions as to what could be done in the current climate and these are listed below.

What Can Unemployed Geologists Do?

- Keep your skills up between jobs. We know this is easier said than done, but when you're not using them, you're losing them.
- · Be prepared to relocate.
- Be prepared to accept less pay.
- Diversify your skills, commodities and locations.
- Keep in touch with the industry! Attend professional development workshops and talks. Volunteer to help with conference organisation or admin roles for events. Be a part of the AusIMM or Australian Institute of Geoscientists network. Come to the Coalfield Geology Council meetings.
- Keep up your professional memberships. They are not just your fair weather friends.
- Keep studying. Use this opportunity to expand your skill set.

How Senior Members, Companies and Professional Bodies of Industry Can Help

Make training available at a reduced rate for unemployed, or underemployed, geologists

An unemployed geologist needs to maintain and improve their skill set in the downtime. The thousands of dollars that some training courses cost are far out of reach. Is it possible for your company to make a few places available at a discounted rate for an unemployed geologist?

Cont. Overleaf

A Canary's View of the Mining Boom and Bust Cycle

Cont. from Page 11

Be a mentor

Most senior geologists have seen this before and may be able to provide advice on where to head next, provide a link to maintain contact with the industry and hopefully teach some new skills.

Provide work experience

There are a large number of graduates who were made redundant in their first six months of work. Many of them have no foot in the door, no real skills or experience, and are competing against a bulging marketplace of experienced geologists. Providing work experience is a valuable way for new graduates to build a relationship with the industry, gain some experience and build some skills.

Offer affordable fees

Offer affordable fees for conference attendances, professional memberships and functions, with discounts for unemployed geologists.

No longer categorise geologists as an occupation with a skills shortage

The occupation of geologist remains on the list for 457 visas (skilled migrant visa), and movements to bring in lower level qualifications for similar roles (such as the TAFE course for core logging) will further erode available employment opportunities for unemployed geologists.

Conclusion

This may be a familiar story for those who have been in the industry for a long time. While a rapid down-turn in the number of geologists is not a new occurrence, it still has a significant effect on the people involved. Many unemployed geologists are not yet showing up in the unemployment figures as we don't yet qualify for unemployment benefits. We can't help but think if this number of people had been retrenched in another industry that it would be headline news.

The overall impact of the current downturn in the industry will be visible for decades down the track. A hiatus in the geology workforce will result in a break of skills and a backlog of graduates and other young geologists fighting for limited positions. The down-turn during the early 1990s resulted in a gap in the workforce that is still evident 20 years on, with a significant shortage of geologists with 15-20 years of experience.

It was easy to see the first signs of the current down-turn in the coal mining industry from the decrease in expenditure on exploration, rather than the coal price or production figures. Geologists, especially those in exploration, are often termed the 'canaries' of the mining industry. But that doesn't make it any easier for the canary.

This article was first published in the AusIMM Bulletin

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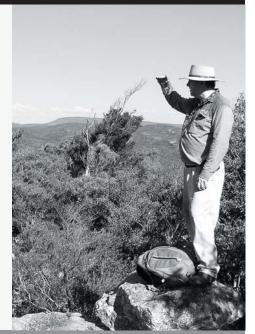
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Say's Law and the Boom Bust Cycle - Another Look

Louis Hissink

SAYS LAW – A seemingly esoteric phrase in economics but it's at the heart of economic policies adopted by the world's governments which believe that state intervention is necessary to steer economies out of recession. So what is Say's Law?

Wikipedia cites Say who wrote 'that products are paid with products'. This has to be self evident since whether it's bartering or sophisticated modern day trade, people primarily exchange produce for other produce, whether directly or via an intermediary item of exchange, money. But it's the stalling of economic activity marked by rising unemployment that seems difficult to mitigate, let alone eliminate. Merchants believe that stalled sales are due to people not having money to spend, others believe that it's in the intrinsic nature of 'capitalism' to over produce resulting in unsaleable products.

Keynes defined Say's Law as "supply creates its own demand" and his seminal text, The General Theory, published in 1936, was a comprehensive rejection of Say's Law. Unfortunately Keynes was quite wrong with his formulation of Say's Law.

Simply producing some or other object in the absence of demand for that object will always lead to economic failure. The best example of this was the production of the Edsel automobile by the US Ford Motor Company during 1958, 69 and 1960. Sales bombed

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and the car had to be taken out of production. Why? The public didn't want it. A classic case of producing something for which there was no identified demand. Another example was the video tape battle between the Sony Betacam format and the JVC/Panasonic VHS tape format. The Betacam was technically superior but Sony never produced a tape long enough to record a superbowl match in one pass, while Panasonic did. The whole idea of video recording was to be able to make unattended recordings — which one could with the VHS tape format. The Sony Betacam format therefore lost the sales battle, as did the vinyl video disk format invented by RCA.

So simply supplying some or other commodity will not create demand for it so Say's Law is more accurately formulated as 'demand creates its own supply'. This is applicable under any economic system, from the free market at one extreme to communist at the other, appearing in the latter as an underground cash, bartering or black market system. The kindest conclusion one could thus make is that Keynes, and hence his followers, never understood Say's Law in the first place.

So what, then, causes economic recessions and depressions what have an acute bearing on geoscience employment? The cause is quite simple to identify – government or state interference in the economy, for whatever reason. (Natural catastrophes are ignored in this article). Governments always intervene in the market to give someone an advantage over someone else. Governments also interfere via their taxing powers to remove capital from the market only to waste it on some grand folly, or sometimes, to conduct war. Funding wars and government follys are only achievable if the state

Funding wars and government follys are only achievable if the state relies solely on taxation in the here and now, with the obvious fact that in order to do so, the state will need the approval of the people. It's when it can't get that approval that more devious means are adopted, and historically that has always been by debasing the money supply. Whether Rome in the past, or the US or the EU today, money debasement is used to pay the state debts by engineering inflation, the phenomenon where money loses its purchasing power, and leads to the flight towards the historical havens of value, gold and silver, or some other sound store of value.

State or government inflation of the money supply follows a trickle down effect with the first beneficiaries, the state itself, getting first crack at the pot of money. States do this in order to pay their immediate debts, public servant wages and entitlements. This new increase in the supply of money then slowly trickles down the food chain of the economy; and that's the irony of it, the money printing or economic stimulus as it is euphemised, benefits the state itself first and not the producers in the private sector that it purports to stimulate. As it trickles through the system people start noticing price increases, which lead to demands for wage increases to make ends meet, businesses discover that the new funds they have borrowed at high interest rates, can no longer be maintained, and start to reduce their costs, usually by shedding employees, or at worst becoming bankrupt or, alternatively, moving elsewhere, where costs are lower.

The trigger for this money inflation has usually been the lowering of central bank interest rates generating the well known but hard to

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AMC - the business of mining

Say's Law and the Boom Bust Cycle - Another Look

Cont. from Page 13

understand business cycle, a cycle that profoundly affects the activities of the mining industry.

It is generally believed economic booms and busts that mark the business or trade cycles are due to various factors such as entrepreneurial excesses, market over enthusiasm and other human failures, but never from the intervention of the state or government in the economies. The Austrian school of economics, first developed by the Austrian economists Carl Menger, Eugen Bohm, Ludvig von Mises and Frederich Hayek, developed a comprehensive explanation for the business cycle based on government interference with the economy. This puts Austrian theory at complete odds with Keynesian theory based on government interference, or management, of an economy. An additional source of confusion is wealth created by fiat, government decree by the issuance of treasuries, bonds and other 'tricks of the trade'. Wealth is first and foremost money savings or incompleted market transactions due to people willfully consuming less than what they produce, the accumulation of capital for the rainy day process. This process is capital accumulation and forms the basis for investments in sound enterprises or stock market floats. Because this wealth had to be created by physical and/or mental exertion and production in the first place, people tend to be careful where they invest their savings.

But when wealth creation is the result of fiat money, or credit expansion, then a more cavalier attitude to that money's deployment occurs since it is, after, money made from nothing. Well not totally nothing since it's the future generations who actually have to pay for it. What happens is that this new money ends up financing ventures that under normal circumstances would not have seen the light of the day. These boom projects then starve the existing businesses of cheap capital which then, if they need capital, have to pay a premium, thus increasing their costs above what they would normally have expected to pay for their capital. But this new wealth is illusory since it was never, from the start, the result of production. Consequently this fiat money results in investments which inevitably end up failing, such as in the exploration industry, when juniors frequently run out of cash.

The problem is not so much that this exploration is misdirected, but that this exploration is spurred on by money printing by the central banks resulting in a lotto effect type of spending spree. There are other factors affecting mineral exploration of course, such as increasing OH&S and environmental compliance regimes which consume much of the scarce capital that the juniors, or those lucky enough, obtain from the market if they have the misfortune of finding a potentially economic mineral deposit. A recent publicised comment noted that if a junior actually found an economic mineral deposit, then the cost of getting it into production from fulfilling the compliance regulations has been estimated to be at least some \$A 8 million over 5 years, with no guarantee that compliance will permit future production. So who would invest in such high risk ventures?

Finally there is the observation that our economic ills are the result of excessive capitalism, as former Prime Minister Rudd wrote some years back in the publication "The Monthly", necessitating mitigation of those excesses by government intervention.

And if a free market is one defined by the fact that it is the market which determines the nature of the intermediary item or good of exchange, i.e. money, then the death of the free market(s) occurred during 1913 with the establishment of the US Federal Reserve, assuming that for the past century world trade was dominated by the US. If this observation is correct, then the business cycle and the recurring economic downturns and depressions can only have one source of causation – the state or government powered by political parties that have the core belief that state intervention is beneficial.

And if Say's Law operates, then the reason production can't supply demand isn't because people run out of money, but because the producers are unable to produce in the first place from state or government restriction of economic activity.

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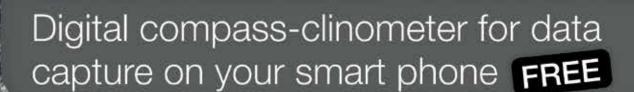
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The Birth of Supercontinents and the Proterozoic Assembly of Western Australia

by Simon P Johnson, Geological Survey of Western Australia, Department of Mines and Petroleum, 100 Plain Street, Perth WA 6004.

The Geological Survey of Western Australia has released its latest publication, the first of a series of compilations of Western Australia's geology that represents the latest understanding of the geological evolution of Western Australia, and by extrapolation Australia, during the Proterozoic era from the integration of the latest geological and geochronological data, the latter mainly U-Pb SHRIMP data. Aimed directly at geologists, especially geological newcomers, it sets out to enable them to quickly get a feel for the geology and economic potential of the various terrains in Western Australia. Other series will include the Archaean, the Gondwana breakup and the last from 100ma to the present. All the information can be accessed directly through the department's website <www.dmp.wa.gov.au/GSWA>.

The book comprises 78 pages and is divided into 8 sections, the last two being a comprehensive bibliography for further reading, and a collection of up to date geological maps.

The book's author has suggested the existence of three supercontinents during the Proterozoic, Nuna (aka Columbia), Rodinia and Gondwana. The reconstruction starts an initial Nuna period from 2500 to 1700 Ma, followed by an inferred period of tectonic stability from 1700 to 1400 Ma, then another tectonic event marking the 'demise' of Nuna from 1400 to 1150 Ma, another period of assembly, stabilisation

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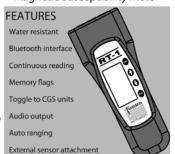




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Book Review by Louis Hissink

culminating in the breakup of Rodinia from 1150 to 750 Ma and lastly the genesis and growth of Gondwana during 570 to 500 Ma.

The reconstruction relies on the mechanism of plate tectonics where stable Archaean nuclei were, over time, sutured into larger cratons and ultimately super continents. A cladogram, Figure 2, summarises the assembly history of the Australian cratonic blocks and a comprehensive time-space plot is provided to link all the disparate orogenies identified in Western Australia, Figure 3 in the book. The various orogenies are interpreted as plate collisions or rifts and spreading zones as the physical mechanisms for the growth and dynamics of the geological evolution described by the book.

The Geological Survey has also completed some selected seismic surveys which have significantly aided the interpretation, and reinterpretation, of the tectonic evolution during the Proterozoic.

Study of the various cross sections and schematics leads to some perplexing anomalies such as apparent immunity of the MOHO to any tectonic disruption over time. Mantle convection and plate tectonics should have homogenised this feature, but no, there it is, a distinct structural boundary as anomalous as the lack of tectonic driver or mechanism for the genesis of the various kimberlite and lamproites in the Kimberley craton, page 42, or those known in the Murchison and eastern goldfields near Leonora, Mount Magnet and Cue. Up to date though this book is, the last two examples show that the science is far from settled.

The book has useful summaries of the known economic mineral deposits for each of the terrains and it is also clear that unambiguous genetical theories are noteworthy by their absence, suggesting scope for new discoveries once the hidden key to unravelling the complex geology is found.

Other oddities are almost ubiquitous transformation of near surface faults to shallow dipping structures depth, and given the tendency to display cross sections with vertical exaggeration for visualisation purposes, those faults will be even more shallowly dipping, or even flat, suggesting that most faults at depth are the response of significant horizontal stresses and confined above the MOHO? Or are these fault traces at depth interpretational artefacts from theoretical assumptions? Another quibble is the dual use of terrain and terrane, although this could be an editorial preference more than anything else.

These theoretical quibbles aside, this latest book is a must read, if only to update one's understanding with the result of the latest research that the Geological Survey has amassed. The book is also available as a PDF online at the department's web site, for no charge.

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Earth's Mantle Affects Long-Term Sea-Level Rise Estimates

H/T Tom Bateman, Member

FROM VIRGINIA TO FLORIDA in North America, there is a prehistoric shoreline which, in some parts, rests more than 280 feet above modern sea level. The shoreline was carved by waves more than 3 million years ago -- possible evidence of a once higher sea level, triggered by ice-sheet melting. But new findings by a team of researchers, including Robert Moucha, assistant professor of Earth Sciences in The College of Arts and Sciences, reveal that the shoreline has been uplifted by more than 210 feet, meaning less ice melted than expected. Equally compelling is the fact that the shoreline is not flat, as it should be, but is distorted, reflecting the pushing motion of Earth's mantle.

This if of significant interest for scientists who use the coastline to predict future sea-level rise, and equally a cautionary tale for those who rely almost exclusively on cycles of glacial advance and retreat to understand sea-level changes.

"Three million years ago, the average global temperature was two to three degrees Celsius higher, while the amount of carbon dioxide in the atmosphere was comparable to that of today," says Moucha, who contributed to a paper on the subject in the May 15 issue of Science Express. "If we can estimate the height of the sea

from 3 million years ago, we can then relate it to the amount of ice sheets that melted. This period also serves as a window into what we may expect in the future."

Moucha and his colleagues -- led by David Rowley, professor of geophysical sciences at the University of Chicago -- have been using computer modeling to pinpoint exactly what melted during this interglacial period, some 3 million years ago.

So far, evidenced is stacked in favor of Greenland, West Antarctica and the sprawling East Antarctica ice sheet, but the new shoreline uplift implies that East Antarctica may have melted some or not at all.

"It's less than previous estimates had implied," says Rowley, the article's lead author.

Moucha's findings show that the jagged shoreline may have been caused by the interplay between Earth's surface and its mantle -- a process known as dynamic topography.

Advanced modeling suggests that the shoreline, referred to as the Orangeburg Scarp, may have shifted as much as 196 feet. Modeling also accounts for other effects, such as the buildup of offshore sediments and glacial retreats.

"Dynamic topography is a very important contributor to Earth's surface evolution," says Rowley. "With this work, we can demonstrate that even small-scale features, long considered









outside the realm of mantle influence, are reflective of mantle contributions."

Building a case

Moucha's involvement with the project grew out of a series of papers he published as a postdoctoral fellow at the Canadian Institute for Advance Research in Montreal. In one paper from 2008, he drew on elements of the North American East Coast and African West Coast to build a case against the existence of stable continental platforms.

"The North American East Coast has always been thought of as a passive margin," says Moucha, referring to large areas usually bereft of tectonic activity. "[With Rowley], we've challenged the traditional view of passive margins by showing that through observations and numerical simulations, they are subject to long-term deformation, in response to mantle flow."

Central to Moucha's argument is the fact that viscous mantle flows everywhere, all the time. As a result, it's nearly impossible to find what he calls "stable reference points" on Earth's surface to accurately measure global sea-level rise.

"If one incorrectly assumed that a particular margin is a stable reference frame when, in actuality, it has subsided, his or her assumption would lead to a sea-level rise and, ultimately, to an increase in ice-sheet melt," says Moucha, who joined SU's faculty in 2011.

Another consideration is the size of the ice sheet. Between periods of glacial activity (such as the one from 3 million years ago and the one we are in now), ice sheets are generally smaller.



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Jerry Mitrovica, professor of geophysics at Harvard University who also contributed to the paper, says the same mantle processes that drive plate tectonics also deform elevations of ancient shorelines. "You can't ignore this, or your estimate of the size of the ancient ice sheets will be wrong," he says.

Rise and fall

Moucha puts it this way: "Because ice sheets have mass and mass results in gravitational attraction, the sea level actually falls near the melting ice sheet and rises when it's further away. This variability has enabled us to unravel which ice sheet contributed to sea-level rise and how much of [the sheet] melted."

The SU geophysicist credits much of the group's success to state-of-the-art seismic tomography, a geological imaging technique led by Nathan Simmons at California's Lawrence Livermore National Laboratory. "Nathan, who co-authored the paper, provided me with seismic tomography data, from which I used high-performance computing to model mantle flow," says Moucha. "A few million years may have taken us a day to render, but a billion years may have taken several weeks or more."

Moucha and his colleagues hope to apply their East Coast model to the Appalachian Mountains, which are also considered a type of passive geology.

Although they have been tectonically quiet for more than 200 million years, the Appalachians are beginning to show signs of wear and tear: rugged peaks, steep slopes, landslides, and waterfalls --possible evidence of erosion, triggered by dynamic topography.

"Scientists, such as Rob, who produce increasingly accurate models of dynamic topography for the past, are going to be at the front line of this important research area," says Mitrovica.

Adds Rowley: "Rob Moucha has demonstrated that dynamic topography is a very important contributor to Earth's surface evolution. ...

His study of mantle contributions is appealing on a large number of fronts that I, among others of our collaboration, hope to pursue."

Journal Reference:

D. B. Rowley, A. M. Forte, R. Moucha, J. X. Mitrovica, N. A. Simmons, S. P. Grand. Dynamic Topography Change of the Eastern United States Since 3 Million Years Ago. Science, 2013; DOI: 10.1126/science.1229180



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Finding Opportunities in the Downturn

The recent downturn has left many mining and exploration professionals out in the cold. The most recent survey by AIG indicates over 13% of AIG members are currently unemployed, over double the national unemployment rate of 5.8%. Over 30% of AIG members are now unemployed or underemployed. AIG recently spoke to executive recruiter and mining engineer Richard Fortune, who with his team at Mining Hive, has developed a website to help mining professionals get better connected with opportunities.

- **Q:** How does the AIG employment survey compare with what you are seeing?
- **RF:** Well it's quite consistent with our observations. I expect the figures could be higher across the broader industry including non-AIG members. There may be some not yet showing up in the statistics, who are using the soft conditions in the industry as an opportunity to take a holiday or sabbatical.
- **Q:** What are some of the trends you are seeing with your clients?
- RF: Access to capital and cashflow are driving our clients right now, and the focus is very much on cost rather than value. Activities unlikely to provide immediate return on investment, for example exploration and new projects, have been turned off or scaled back. Selected projects are going ahead with skeleton teams and sparing use of consultants. There does seem to be a trend for independent consultants and collectives who are more flexible on pricing, embedding themselves in-house, undercutting their larger competitors.

- **Q:** How do you see the work pipeline for professionals?
- RF: I don't anticipate a pickup in hiring activity until at least mid-2014. There are early signs of a pickup in M&A but fear still lingers about the world's economy and the direction of commodity prices. In this climate, business planning is challenging, and hiring intentions are tenuous. Consulting inquiries are starting to pick up from a very low ebb earlier in the year, in particular review work, strategic planning and optimisation which we expect to increase into the new year. International inquiries from Africa and Asia in particular are increasing.
- **Q:** What would be your advice to professionals seeking opportunities?
- RF: The first thing to remember, is that your existing relationships are gold; the people you know and trust from previous jobs. They are the people most likely to refer you for work, or notify you of opportunities. Make sure you reconnect and stay connected, and not just because you want work, because friendship goes a long way. Secondly, define your area of expertise and how this intersects with the needs of the industry in this current cycle. Upskill or do further study if required. Finally, don't underestimate the power of new relationships. Go to conferences, get introduced through connections and, perhaps most importantly these days, make yourself visible on the web. Mining Hive is a good example of such a web presence.

Cont. Overleaf



The Mining Network

Linking your experience with opportunities



News | Deals | Jobs | Companies | Assets | Experts | Events

Finding Opportunities in the Downturn

Cont. from Page 23

Q: *Tell us about Mining Hive?*

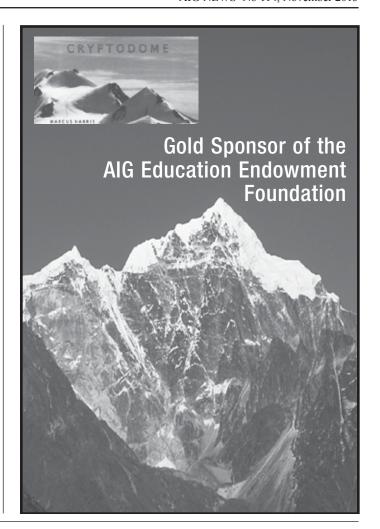
RF: We decided mining professionals needed a website where they could raise their profile in the mining industry, and in doing so increase their network and professional opportunities. I have noticed over the years that hiring managers most often refer to a candidate's last three roles, and in the mining industry this experience is linked to certain mine assets or mineralisation types. None of the other professional networking sites allow professionals to tag their asset experience, so we incorporated this functionality.

Q: What are the benefits in AIG members joining?

RF: Firstly, membership is free, which will give AIG members access to all the jobs, deals, news and company and asset updates our clients post. Furthermore, for AIG members that have 10+ years experience and/or appropriate professional accreditation through the AIG, we will also be giving them free registration on our Experts Register, where their asset-specific experience will be promoted to a global audience of mining executives and financiers.

Mining Hive is now online at www.mininghive.com and accepting registrations from AIG members.

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







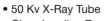
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of Assay Data	
Johannesburg	10-11 Dec
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Reconciliation	40.40 D
Johannesburg	12-13 Dec
Reporting Resources ar Reserves	nd
Perth	13 Jar
Brisbane (Coal Specific)	13 Jar
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Perth	و 14 Jar
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and Investors	
Perth	15 Jar

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In recognition of the services offered by the associations and societies that uphold the professionalism within our global mining industry, we have decided to offer the individual members of the following professional associations a 10% discount off our public training course fees.

Perth

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AIME The American Institute of Mining, Metallurgical, and Petroleum Engineers | AIE American Institute of Engineers | APEG Professional Engineers and Geoscientists of BC | AME BC Association for Mineral Exploration British Columbia | CIM Canadian Institute of Mining, Metallurgy and Petroleum | SEG Society of Exploration Geophysicists | El Instituto de Ingenieros de Minas del Perú | IIMCh Instituro de Ingenieros en Minas de Chile | The AusIMM The Australasian Institute of Mining and Metallurgy | AIG Australian Institute of Geoscientists | AMEC The Association of Mining and Exploration Companies Inc | Engineers Australia | GSA Geological Society of Australia | GSSA The Geological Society of South Africa | SME The Society for Mining, Metallurgy and Exploration | SAIMM Southern African Institute of Mining and Metallurgy | SEG Society of Economic Geologists | IMA Indonesia Mining Association | MNMA Mongolian National Mining Association | CAMESE Canadian Association of Mining Equipment and Services for Export | Australian Institute of Mining equipment and services export association | IMSSA Institute of Mine Surveyors of South Africa | AIPM Australian Institute of Project Management | SBG Sociedade Brasileira de Geologia | MSEG Mongolian Society of Economic Geologists | ECSA Engineering Council of South Africa | APGO Association of Professional Geoscientists of Ontario | GAC Geological Association of Canada | MAC Mining Association of Canada | OMA Ontario Mining Association | PDAC Prospectors & Developers Association of Canada | AZMEC Association of Gambian Mineral Exploration Companies

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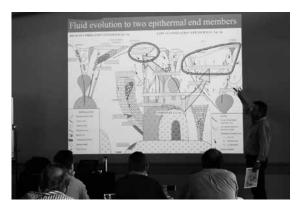
Epithermal & Porphyry Ore Deposits – Field Aspects for Exploration Geologists: Short Course Review

A GROUP OF GEOLOGISTS from all over Australia and overseas attended a two day exploration-based short course entitled "Epithermal & porphyry ore deposits – field aspects for exploration geologists", presented by Greg Corbett. The course was held on the 9th and 10th of September, before the AIG conference Mines & Wines in Orange, NSW.

The short course represents an update of a series of short courses developed and presented by Greg Corbett and the late

Terry Leach in the 1990s. It clearly reflects that Corbett, with his 30+ years of experience on numerous deposits around the Pacific Rim, has a practical and field-based approach. This approach has lead to the development of numerous ore deposit models for explorers working in epithermal and porphyry terrains. The main strength of this short course is the inclusion of abundant examples with photos, the solid framework presented in the models, and examples to back them up, coupled with Greg's animated presentation! The 30 participants were drawn into his passionate world of ore deposits.

Key concepts were explained on the first day. These included fluid evolution, mineralisation style, structural setting, alteration zonation, and controls to mineralisation. Homework exercises



were provided for keen students to test their skills at finding epithermal and porphyry targets. On day two, the focus turned to exploration for blind deposits and deposits under cover. Greg provided some key pointers to help conceptualize, recognize, and characterise the surface manifestations of high to low epithermal and porphyry deposits. The ability to identify what these systems look like on the surface is crucial to vectoring towards those deposits and ore shoots within them.

The course attempted to transfer Greg's in-depth knowledge of epithermal and porphyry deposits from around the world to the attendees. The key tools we obtained were: 1) Develop mineral identification skills to help define the position in the epithermal system in order to; 2) Define temperature and pH conditions and; 3) Look at the system as a whole, in terms of structural regime, host rock competency, and the mineralizing system and its evolution.

This short course is a valuable tool for any explorationist. It can be directly applied in the field to identify and evaluate targets and find more deposits, the ultimate goal. The simple message we take away from this course is to "listen to what the rocks tell us".

By Hanne-Kristin Paulsen and Grace Cumming









Cotopaxi volcano, Ecuador

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Mines and Wines 2013 - Sampling the Tasmanides

Exploration Projects and Mine Case Studies - Orange 11-14 September

Lindsay Gilligan

THE FOURTH Mines and Wines conference was held in Orange, New South Wales in September and brought together almost 200 professional geoscientists. The event was jointly organised by the Sydney Mineral Exploration Discussion Group (SMEDG), AIG and the Geological Survey of New South Wales.

The original concept for Mines and Wines came about after the relocation of the Geological Survey of NSW to Maitland in the Hunter Valley, in 2004. There was concern at the time that being in Maitland

put the Geological Survey below the geoscience "radar", particularly in relation to the mineral exploration industry. Accordingly, Mines and Wines was created, initially in deference to the mines and wines of the Hunter Valley. The first event was held in 2006 in Cessnock near the famous Pokolbin wine-growing region. SMEDG adopted Mines and Wines as its "big ticket" event and AIG embraced it as a key eastern Australian geoscience event.

Mines and Wines 2007 followed in Orange and then the 2010 event in Mudgee, NSW.

The Mines and Wines model is based on technical geoscience

Cont. Overleaf





Mines and Wines 2013 - Sampling the Tasmanides

Cont. from Page 27

presentations with a Tasmanides focus. Presentations are invited from explorationists and project/mine geoscientists. From the start it was made clear that Mines and Wines was not to be an opportunity for spruiking. References to market cap, share price, and the like are banned! The speaker program is supported by invited keynote speakers. Registration is inexpensive and student registration is particularly encouraged.

To keep faith with the banner themes of the conference, wine tasting and winery visits are a feature of the event. The wine theme is supplemented by a mines-related field excursion, short courses, suppliers' booths, and a stunning two days of presentations.

Mines and Wines is an opportunity for young geologists to share the geoscience challenges of their projects with their peers. It is also a feel-good event which celebrates the profession and engenders exploration networking.

Mines and Wines 2013 kicked off with Dick Glen and Dave Houston setting the Tasmanides scene with presentations on tectonics and metallogeny, respectively. Keynote presentations were from Greg Corbett, Phil Blevin, Peter Downes and Ross Large. The 27 presentations were loosely structured around five sessions:- The Big Picture, Arc Mineral Systems, Granites and More, Basins and More, and Orogenic Deposits. Talks covered exploration and mining projects in Tasmania, Victoria, New South Wales and Queensland.

Maggie Hayes also presented on her oral history project which is supported by SMEDG - "Rocks in their Heads - The lives and times of Australian exploration geologists". Commercial sponsors were Pinnacle Drilling, Newcrest Mining, Macquarie Bank, AMML, ALS, Behre Dolbear Australia, Olympus, Hellman and Schofield, and Minotaur Exploration.

The mountaineer/ adventurer/geologist Greg Mortimer was the after dinner speaker with survival recollections of his visits to the Everest and K2 peaks – don't ever lose the romance of the rocks!

The presentations concluded with the usual, well-crafted Ken Maiden doggerel.

Many thanks for the wonderful support of Roger Smyth-King, as well as Graham Butt, Catherine Shirley, and Kevin Capnerhurst (GSNSW). A big thank you to MRGraphics and Makiniteasy who looked after registrations and the website and they did indeed make it seem easy.

Visit the Mines and Wines 2013 web site (www.minesandwines.com. au) and copies of presentations from all Mines and Wines events are available on the SMEDG site (www.smedg.org.au).

There will be another Mines and Wines in 2015 to celebrate the resource endowment and liquid assets of the Tasmanides at a location yet to be confirmed which, of course, will be a happy conjunction of MINES and WINES!



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Mines & Wines 2013 - KJM Summary

We commenced with anticipation A hum of excited conversation Then Kaylene Camuti In her introductory duty Spoke of career expectation

Dick and Dave then both set the scene And they gave a fantastic routine With a framework tectonic And isotopes radiogonic (Well I had to get it to rhyme, didn't I) And everything else in between

We continued with systems magmatic And illustrations diagrammatic Deposits hosted by breccia Full of gold, yes, you betcha, And all of it very dramatic

Grace Cumming whose detailed observations Have such silver-gold implications And then Rosie Sloan Came into her own

With deep IP penetration

There was a session on granites and more And we heard of deposits galore For a start Phil Blevin Was in seventh heaven

At the thought of all that tin ore To the podium strode Andrew White And I thought he was looking quite bright Down there at Mount Adrah They just say "Abracadabra" And Bingo – what a delight

As a stand-in, along came Ross Cayley "Rollback" - he said it so gaily In Mungana the conditions Attract bent politicians -But in Sydney we get that stuff daily

Eoin and Tim with rock alteration To assist with interpretation You can look under cover Where it's hard to discover But plenty of great expectation

Maggie Hayes is a bit of a sleuth She's uncovered all those gems of truth When geologists ancient and wise With excitement still in their eyes Re-lived all the fun of their youth

Peter Downs kicked off on Day Two With the support of a wonderful crew With fantastic oration

About Cobar exploration And quite a lot of it new

We had persistence and dedication We had much structural complication

We had 22 percent copper Now that is a whopper And what a fantastic location

They spoke of silicification Of volcanics and fault activation Though basin inversion Sounds like a perversion In discovery, it's pure revelation

And finally to orogenic gold And here there was much to behold To lead the charge It was up to Ross Large So we'd see the story unfold

There was Simon and there was Bruce Kay There was Cael and Anthony Gray

There's so much euphoria Down there in Victoria

You can hear them shout "hip-hip-hooray"

And north of the border we find They're certainly not left behind In the Girilambone Basin And at Tomingley, they're racin' There's so much more to be mined

If your name didn't get a mention It's not for a lack of attention I could go on for so long I could break into song

It's been such a fantastic convention

If you want new target generation Or you've got academic constipation There's a deposit style

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And provide that much-needed inspiration

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Education Report

Kaylene Camuti (Chair, AIG Education Committee)

2013 AIG Bursary Awards

Each year the AIG Education Committee has the opportunity to review bursary applications from geoscience students around Australia and, this year, it was again a real pleasure to see the high quality of the applications we received, and the range of research topics being carried out by geoscience students around the country. This year the AIG received bursary applications from 38 geoscience students in 15 universities around Australia. After much discussion and consideration by the Education Committee, AIG bursaries were awarded to 18 students. We would like to congratulate the following students on their awards:

- ▲ GORDON WEBB from Melbourne University, who is completing a PhD on "Factors controlling the formation of enriched granites". Gordon's bursary award will fund costs associated with presenting findings from his research at the 2014 Goldschmidt conference in California.
- ▲ STEPHANIE MCLENNAN from Adelaide University, who is working on a PhD on "Post-depositional weathering and geochemistry of the late Miocene-Pliocene Loxton-Parilla sands". The AIG Bursary will assist Stephanie with the costs of presenting her findings at the International Applied Geochemistry Symposium in New Zealand.

- ▲ DIANA PLAVSA from Adelaide University, who used her bursary to assist with the costs associated with presenting findings from her PhD "Tectonic evolution of the southern granulite terrane of India and its role in the amalgamation of Gondwana" at the 2013 Goldschmidt conference in Italy.
- ▲ CHRISTINE WAWRYK from Adelaide University, who is completing a PhD on "Investigation of stable iron isotope systematics in felsic magmas and ore deposits". Christine will use her AIG bursary to help fund a collaborative analytical project using Secondary Ion Mass Spectrometry (SIMS) to measure in-situ iron isotope ratios in magmatichydrothermal sulphides.
- ▲ CAITLIN MORRIS from JCU, who was awarded a Macquarie Arc Conference – NSW Geological Survey – AIG Bursary for her Honours project "Genesis of the Toongi rare metal deposit, NSW".
- ▲ ALEXANDER CHERRY from UNSW, who was awarded a Macquarie Arc Conference - NSW Geological Survey - AIG Bursary for his project "Paragenesis of gold-sulphide mineralisation at the Tomingley gold deposits".
- ▲ JENNIFER PRITCHARD from ANU, who was awarded a Symposium - AIG Bursary for her Honours Project "The geochemistry and geochronology of cassiterite from the Mole Granite, NSW".



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Archean Evolution - Yilgarn Craton

as a thematic issue in the Australian Journal of Earth Sciences (2012, volume 59, issue 5)

Early Earth

a special issue of Precambrian Research (in press, articles online at www.journals.elsevier.com/precambrian-research)

For information about Geoconferences go to: www.geoconferences.org

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- ▲ RHIANNON FULLARD from Monash University, who was awarded an AIG Honours Bursary for her project "Using provenance and palaeoenvironments to assess tectonic influences in Archaean greenstone belts: reconstructing stratigraphic relationships in the Agnew-Mt White region, Kalgoorlie Terrane, Yilgarn Craton, Western Australia.". Rhiannon's Honours thesis abstract is included in this issue of AIG News.
- ▲ LUKE GEORGE from Adelaide University, who was awarded an AIG Honours Bursary for his project "Trace and Minor Elements in Galena: A Reconnaissance LA-ICP-MS study". Luke is hoping to continue with his research and start a PhD next year, and his Honours thesis abstract is included in this issue.
- ▲ JACOB MULDER from the University of Tasmania, who was awarded an AIG Honours Bursary for his project "The structure and metamorphism of the Cox's Bight-Red Point area, Southwest Tasmania".
- ▲ NAOMI TUCKER from Adelaide University, who was awarded a DMITRE-AIG Honours Bursary for her project "Can high-grade metamorphism occur in super-deep sedimentary basins?".
- ▲ LOUISE SCHONEVELD from JCU, who was awarded an AIG Honours Bursary for her project "The genesis of the Central Zone of the Nolans Bore rare earth element deposit, Northern Territory".

- ▲ CHRISTIAAN VAN DER RIET from UWA, who was awarded a Davis – AIG Honours Bursary for his project "Early Archean Anorthosites near Mt Narryer: Australia's oldest rocks?".
- ▲ SARAH MCGILL from QUT, who was awarded an AIG Third Year Bursary. Sarah will be starting an Honours Degree at QUT next year.
- ▲ LARA BOWLT from Monash, who was awarded an AIG Third Year Bursary.
- ▲ SARAH GALLAGHER from QUT, who was awarded an AIG Third Year Bursary.
- ▲ MATTHEW CAMPBELL from UQ, who was awarded an AIG Third Year Bursary.
- ▲ IRRAISHA SORIANO from Adelaide University, who was awarded an AIG Third Year Bursary.

The AIG would like to thank all the students who applied for an AIG geoscience student bursary. We would also like to thank the students who have contacted us to say thank you for their bursary awards – we appreciate hearing from you.

It is important, also, to acknowledge the continuing support of our bursary sponsors. Their support has been crucial in allowing us to maintain and expand the bursary awards in response to the increased student participation over the last few years. Sponsors of the 2013 bursaries are listed on page 32 of this issue of AIG News.

Thank you, also, to members of the AIG Education Committee for the time and effort they contributed to reviewing the bursary applications:

Marcus Harris (AIG WA)

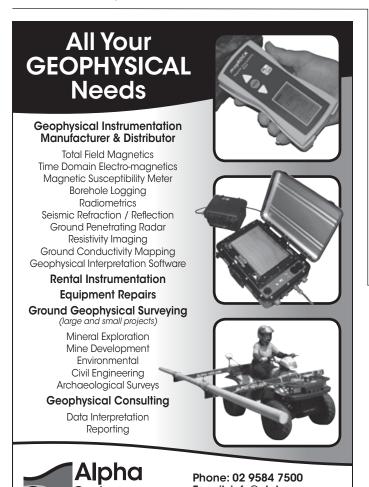
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Doug Young (AIG Councillor, Qld)

I would like to also offer a big thank you to all those AIG members who have donated to the AIG Education Foundation when renewing their membership. Your generosity and support has provided financial support for students and encouragement to all involved in the AIG's education activities.

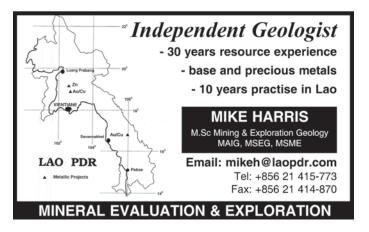


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Honours Abstract:

Trace and Minor Elements in Galena: A Reconnaissance LA-ICP-MS study

Luke George, Adelaide University 2013 AIG Honours Bursary Winner

Many minor/trace elements can substitute into the crystal lattice of galena at various concentrations.

In-situ LA-ICP-MS analysis and trace element mapping are used to obtain minor/trace element data from a range of natural galena specimens aiming to enhance understanding of the governing factors that control minor/trace element partitioning. The



coupled substitution $Ag^+ + (Bi, Sb)^{3+} \leftrightarrow 2Pb^{2+}$, is confirmed by data obtained, although when Bi and/or Sb are present at high concentrations (~> 2000 ppm), site vacancies most likely come into play through the additional substitution $2(Bi, Sb)^{3+} + \square \leftrightarrow 3Pb^{2+}$. Galena is the primary host of Tl in all mapped mineral assemblages. Thallium is likely incorporated into galena along with Cu through the coupled substitution: (Ag, Cu, Tl)⁺ + (Bi, Sb)³⁺ \leftrightarrow 2Pb²⁺. Tin can reach significant concentrations in galena, particularly when the latter formed via metamorphic recrystallisation. Tin is concentrated in galena, likely via the substitution: $Sn^{4+} + \square \leftrightarrow 2Pb^{2+}$, involving the creation of lattice vacancies, or $Sn^{2+} \leftrightarrow Pb^{2+}$. Tin and In concentrations show a strong positive correlation across the sample suite indicating that the availability of these elements is intimately linked in natural systems. Cadmium and minor Hg can be incorporated into galena; the simple isovalent substitution (Cd, Hg) $^{2+} \leftrightarrow Pb^{2+}$ is inferred. Significant oscillatory compositional zoning, and lesser sector zoning of minor/trace elements (Ag, Sb, Bi, Se, Te) is confirmed, for the first time, in galena from two epithermal ores. Zoning is attributed to slow crystal growth into open spaces within the vein at relatively low temperatures. The datasets generated increase understanding of the nature and distribution of minor/trace elements in galena, and partitioning between galena and coexisting minerals. These data have several applications in the minerals industry, particularly in studies of mineral deposit genesis, ore processing and, potentially, also in mineral exploration.

Honours Abstract:

Using Provenance and Palaeoenvironments to Assess Tectonic Influences in Archaean Greenstone Belts:

Reconstructing stratigraphic relationships in the Agnew-Mt White region, Kalgoorlie Terrane, Yilgarn Craton, Western Australia

Rhiannon Fullard, Monash University 2013 AIG Honours Bursary Winner

The Agnew-Mt White Region forms part of a complexly deformed Archaean greenstone belt within the Kalgoorlie Terrane of Western Australia. Like many Archaean sequences it is comprised of a lower subaqueous mafic-ultramafic dominated sequence, and an upper sediment-dominated succession. Due to structural complexities, the relationship and timing of two upper sediment-dominated successions, the Vivien and Scotty Creek Sequences are not well understood. In this thesis, field mapping, drill core logging, petrography, and geochemistry are used to unravel the stratigraphic and structural history of the region, with particular focus on clast provenance. A total of 17 lithofacies were identified including five coherent facies (ultramafic, megacrystic basalt, dolerite, basalt and basaltic andesite), six conglomerate facies (polymictic mafic-felsic, polymictic felsic, polymictic mafic-ultramafic, polymictic mafic-dominated, ultramafic-dominated and mafic-dominated), and six finer-grained sedimentary facies (bedded to cross-bedded sandstone, pebbly sandstone, graded volcaniclastic pebbly sandstone, laminated siltstone/sandstone, laminated mudstone and bedded mudstone and chert). Interpretations of these facies indicate that while all the conglomerates were products of mass-flow events, the Vivien Sequence is dominantly subaqueous, while the Scotty Creek sediments were deposited in a tractional subaerial environment. Clast provenance results indicate that the mafic clasts in all the conglomerates were derived from the stratigraphy of the Lawlers Greenstone Sequence, however unlike the suggestion of previous authors, the felsic clasts do not appear to be sourced from the Lawlers Tonalite. Differences in the textures, abundances, and types of clasts, demonstrates a continuation of uplift and erosion of both the mafic and felsic sources, indicating that Scotty Creek Sequence was deposited after the Vivien Sequence. These results are used to constrain the evolution of the region and it is proposed that extension, compression and three periods of plutonism, resulted in the formation of the Agnew-Mt White Region. This research shows the importance of the use of sedimentary deposits such as conglomerates, as indicators of tectonic events and settings, and in constraining geological reconstructions.

Kent Street High School -

Shark Bay EES Field Trip 2013

Suzy Urbaniak

THE RESCHEDULING OF THE Shark bay field trip from July to October turned out to be one of the best of the 27 field trips that I have run since 2006.

Western Australia's MidWest put on display its best wildflowers for all to see. According to the locals it was one of the grandest showings for a long time and an unexpected privilege for the students to enjoy. The concept 'Biodiversity' by the end of this trip was fully comprehended and appreciated.

From Carnamah to Coalseam, to Galena Bridge, to Shark Bay and back through Murchison, Leeman, Jurien Bay and the Indian Ocean Drive, 9 year 11 and 1 year 12 student correlated the biodiversity with its underlying bedrock whether it was laterite, calcereous sands or high grade metamorphic outcrop. This is what Earth and Environmental Science is, an understanding how the earth works and how each of the earth's spheres are dependent upon each other to ensure a harmonious existence.

The Rock Cycle was experienced by analysing the sedimentary rocks of the Irwin River Coalseam and the Cape Peron successions, igneous rocks included the dolerite dykes of the Northampton Complex and their associated sulphide mineralisation. These dykes were analysed at the Geraldine Mine and mapped and traced through outcrop along the Mighty Murchison River. The metamorphics were represented by the Garnet Granulites of the Northampton Complex and boy some of those garnets were huge. The Mother Lode of carbonate and quartz veins filled with galena and sphalerite together with secondary minerals was collected and is bound for sawing in half as the students are excited about its mineralogical assemblage. This hydrothermal mineralisation was complimented by the Heavy Mineral Sands 'in action', Law of Uniformitarianism deposition of garnet, ilmenite and rutile which was witnessed at Cape Peron. The students were in awe of not only the pink to purple beach but the fact that the garnets were sourced from the Northampton complex some 200 km away and transported by the river and Ocean currents to this point.

A lot of knowledge was acquired on this field trip as well as a lot of firsts! This camping expedition was a character building experience for a lot of the students and ranged from never having had kiwi fruit or eating salad to first time tenting and camping and 4WDriving.

The atmosphere that was created at camp, to the laughter and conversation that was exchanged over the 2-ways and the adventure



Suzy and students enjoying the field trip.

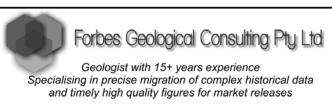


At work analysing cross bedding within the High Cliff Sandstone of the Irwin River Coalseam Succession!!!

that was had hiking up hills, walking through caves or swimming at Shark Bay off Cape Peron was just awesome. This is the best way to learn and you have fun learning! Until next time......

A sincere thank you to AIGWA for there continued support of Kent St EES students in experiencing these unique educational opportunities and ESWA who also provide financial assistance to ensure that our students are offered with the best educational opportunities.

This form of awareness is encouraging students to be the Geoscientists of the future!



Duncan Forbes Principal Geologist

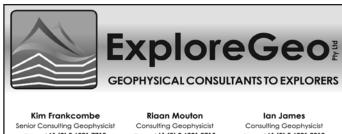
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Careers Night A Big Hit

The Careers in Geoscience Committee, 2013

ON MONDAY August the 26th the annual Careers in Geoscience night was held at the Tech Park Function Centre Bentley.

This booth style careers event is run by the Australian Society of Exploration Geophysicists (ASEG), the Australian Institute of Geoscientists (AIG), the Petroleum Exploration Society of Australia (PESA) and the Geological Society of Australia (GSA); with support from Earth Science Western Australia (ESWA).

This year drew quite a selection from the industry with BHP Billiton, ConocoPhillips, the Geological Survey of WA, Schlumberger, Woodside, Chevron, UWA, Curtin University, Newmont Resources, Petroleum Geo-services, Southern Geoscience Consultants, Terrasearch and Fortescue Metals Group represented. As well as, Atlas Iron Ltd, Digirock, Aker Solutions and GHD.

The first session kicked off at 4pm with over 40 high school students from Canning College, Chisholm Catholic College, Churchlands SHS, Como SHS, John Forrest Secondary College, Kent St SHS, Mercy College, Perth Modern, Scotch College and Willetton SHS joining exhibitors to find out about the many exciting opportunities in this sector. They heard from WA Scientist of the Year (2012), Professor Peter Quinn, and then embarked on a networking competition which ultimately led to a lucky student being awarded an iPad mini.

From 6 - 7:30pm over 100 University students relished the opportunity to interact with potential employers and inspirational people, including Geologist and Mining Entrepreneur David Flanagan (Atlas Iron) and representatives from BHP Billiton.

After plenty of networking, with yummy food and drinks, a raffle draw gave us another lucky winner of an iPad mini.

Positive feedback started rolling in the day after the event including:

'A big thank you for putting on the event I thought you did an awesome job...The ability to have small quick chats with various people is much better than having too many speeches...The best part of this event from a geology student's point of view was how many companies were there that were actually looking for geologists. Too many other events are focused around engineers or other disciplines; this one is special in this regard.'

Phil, University Student

'The event went nicely and the people at the stands were nice, friendly and talkative. They answered all the questions we had and thanks to them I now know what the options are for my future. I would like to say thank you for holding this event and I would come back next year.'

Tiffany, High School Student

Plans are already in place to make the 2014 event even bigger.



Computer Games and Quizzes: Year 8's Inspire the Next Generation.

Michael Curtis (AIG committee WA)

AS PART OF CONTINUING AIG community outreach, I enjoyed the afternoon of 24th October at Kent St Senior High School. The year eight classes were presenting their Earth Science projects, which they had been working on since the start of term. The members of the group who produced the best project had been promised prizes sponsored by the AIG.

The task was to produce a piece to teach year six students about the rock cycle, geological time and fossils. It was evident the students had put a lot of thought into what children of this age would find engaging, and projects included computer games, quizzes, papier-mache models and poster displays. The year eights were keen to answer all of my questions, and enthusiastically told me about what they had learnt whilst working on their projects.

All work was of a very high standard, which made it very difficult for the judge (Suzy Urbaniak, of the WA committee) to pick a winner. The AIG sponsored four \$100 prizes for the members of the winning team, and one \$50 prize for the student deemed most diligent.

The winners were Device Purushothama, David Peacock, Bob Hoang, and Lee-An Lu, who had built a model of a volcano, with a slice through to the Earth's core beneath. They also put together a geological time chart which contained diagrams of key fossils from each period in Earth's history. Hiker gIa won the prize for diligence,



Left to right, Michael Curtis (AIG WA Committee), Bob Hoang, Device Purushothama. David Peacock and Lee-An Lu

as she had worked extremely hard, and often on her own??? all term. All prize winners were told not to spend their money in one go!

Opportunities like this, which enable the AIG to inspire the next generation of geoscientists are extremely important. It is a testament to the dedication our organisation that these outreach projects are in place, and that they are so well received. The students I spent the afternoon with were all extremely appreciative of our time and effort, and I have pride in passing on their sincere thanks to everyone who makes this scheme possible.



Update for Registered Professional Geoscientists On the Significance of RPGeo Fields of Practice

Mike Smith, Chairman AIG Registration Board

THE AIG'S REGISTERED PROFESSIONAL GEOSCIENTIST program provides an excellent mechanism for experienced professionals to verify their skills and capabilities. Issue 112 of AIG News contained a lead article on the registration process, interwoven with testimonials from AIG members who have applied for and been granted membership as an AIG RPGeo.

One of the key aspects that is apparent in these short descriptions is the importance of the AIG's identification of Fields of Practice. Thus a professional hydrogeologist with RPGeo status is identified to the business community at large as undoubtedly qualified to practise in that field, and therefore preferable for employment in that field to another person who lacks such accreditation. Similarly a local council or government agency wishing to have civil works programs overseen by a geoscientist who is an expert in the field of geotechnical and engineering geology can rely on the selection of an RPGeo in the field of Geotech and Engineering. An RPGeo in the field of Environmental Geoscience is distinguished from others who claim broad geological expertise but have not been approved as being registered in the particular field.

The AIG RPGeo program also recognises those geoscientists who are confirmed to have significant experience in certain commodity types including minerals, water, coal and petroleum, as well as those with

expertise in specific disciplines including geochemistry, geophysics, information geoscience and regional studies (the last would cover, for example, remote sensing, tectonic studies or metalliferous province analysis).

The methodology of approving RPGeo status in specific fields of practice is especially rigorous. The assessment is based primarily on the reports of referees who state their direct knowledge of the applicant's experience in the requested field of practice. Registration requires a minimum of 4 referees, but an RPGeo applicant may need to seek the support of 6 or 7 referees to substantiate his/her claim over the requisite time period to specific fields of practice. The documentation is first assessed by a sub-committee of an AIG State Branch involving 3 senior geoscientists. The sub-committee's recommendation and the candidate's documentation are then studied by the very experienced 7-man Registration Board of the AIG. At any time during this process an applicant's request for specific fields of practice may be rejected. It is not uncommon for an applicant to be approved in just one of the two or several fields initially applied for, if there is a lack of verification of experience in such fields.

The AIG assessment process thus involves at least 14 geoscientists (4 referees, 3 state representatives and 7 board members) in the approval process. When there are 6 or 7 referees, this number rises to 16 or 17. Clearly this methodology adds greatly to the credibility and the strength of the AIG's RPGeo program and distinguishes it



from other accreditation programs around the world. The possibility of granting reciprocity with international geoscience organisations is superficially appealing, but AIG members should first think carefully about ensuring that the beneficial aspects and status of our own program are not weakened. Many geoscientists already holding accreditation with other jurisdictions (South Africa, individual states of the USA and individual provinces of Canada) have applied for and been granted RPGeo status throughout Australia. One instructive example was provided within the testimonials contained in the registration article in AIG News 112. The holding of accreditation in another jurisdiction adds to the credibility of the documentation lodged by these candidates, yet they must comply with the same process as any Australian geoscientist.

The previous edition 113 of AIG News presented the longest list of approved RPGeos in the history of the program, as well as a large number of names of new candidates published for Peer Review, and there are numerous new applicants in this issue. The increasing interest in the RPGeo program is generating administrative challenges for the volunteer members of the state sub-committees, the Registration Board and especially the chairman. Assistance in this area is now being provided. Members seeking to become RPGeos should inform the AIG Secretariat as early as possible (and before obtaining all their referee reports) so that the Peer Review publication is not delayed by 3 months for the next publication.

Registered Professional Geoscientist Approvals & Applications

CANDIDATES APPROVED BY AIG COUNCIL IN SEPTEMBER AND NOVEMBER 2013

Mr. Grant Boxer of Perth, WA, in Mineral Exploration **Mr. Roderick Arnold** of Narellan, NSW, in Mining.

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

Ms. Anne Tomlinson of East Fremantle, WA, is seeking registration in Geophysics and Mineral Exploration

Mr. Peter Nicolsen of Wakatipu, New Zealand, is seeking registration in Mineral Exploration

Mr. Christopher Bennett of Mitchelton, Qld, is seeking registration in Geotechnical and Engineering

Ms. Ellen Kwantes of St. Leonards, NSW, is seeking registration in Hydrogeology

Dr. Jan Vermaak of Lesmurdie, WA, is seeking registration in Hydrogeology

Mr Francisco Maturana of West Perth, WA, is seeking registration in Mining

Dr. Matthew Landers of Bardon, Queensland, is seeking registration in Geochemistry

Mr Tony Goddard of Mt. Lawley, WA, is seeking registration in Mineral Exploration and Regional Geology

Mr Costante Conte of Hove, South Australia, is seeking registration in Hydrology, Environmental Geoscience and Coal.

Membership Update

STOLZ

TREES

New Members and Upgrades at the September Council Meeting 2013

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TURNER	Geofferv	
HEHDEDA	,	
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G	RADUATES		
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S	TUDENTS		
	ABLETT	Sonia	
	BOORD	Luke	Elkington
	BOWLT	Lara	Jane
	BROWN	Jesse	
	CAMPBELL	Matthew	
	FULLARD	Rhiannon	
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	GILLESPIE	Jack	Alexander
	GRAVES	Isaac	Samuel
	KOERBER	Matthew	James
	LAMPLUGH	Clinton	
	LUCAS	Andrew	Riaz

Geofferv

Keith

William

Geofferv

MARTINS	Karen	
McGILL	Sarah	Myfamwy
MULDER	Jacob	
PALOMBI	Bianca	
PERRY	Prudence	
POLLACCHI	Andre	
POON	Philemon	Tak-Yeung
RICHTER	Ross	Michael
THOMPSON	Christine	
VAN DER RIET	Christiaan	
WAUGH	Samuel	Alexander
001	Seow	Gaik
VERACRUZ	Jose	
YOUNG	Benjamin	



We welcome all new members to the AIG.

36

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AIG NEWS

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Avoid disappointment by contacting the Editor at least several days

CONTRIBUTION DEADLINE
January 31st
April 30th
July 31st
October 31st

beforehand to advise submission of items for the newsletter.

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