

# THE VICTORIAN GEOLOGIST



August 2013

THE GEOLOGICAL SOCIETY OF AUSTRALIA  
Victoria Division

## Student Night

**Thursday 29th August at 6:15 p.m.**

Seminar is preceded by drinks (cost \$2) and  
followed by pizza in the 4th floor tea room

### **Non-traditional trace element investigations into arc magmatism**

**Matthew Bliss, School of Earth Sciences, University of Melbourne**

### **Were the Pre Lower Pumice 1, Lower Pumice 1 and Lower Pumice 2 eruption sequences sourced from the same magma reservoir, Santorini Caldera, Greece**

**Jack Simmons, School of Geosciences, Monash University**

### **The effect of lake loading on groundwater levels around Lake Tutchewop in the Murray-Darling Basin, southeastern Australia**

**Tim Robson, Environmental Geoscience, LaTrobe University**

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**ABSTRACTS****Non-traditional trace element investigations into arc magmatism****Matthew Bliss**

With continued technical advances our ability to acquire robust data for a range of trace elements in geological samples continues to improve. Nevertheless there remain a number of elements that are under utilised in geological studies. We address this issue by examining the behaviour of As, Mo, Ag, Cd, In, Sb, Sn, W, Tl and Bi in samples from three subduction suites (Mariana, Tonga-Kermadec, New Britain) alongside more commonly analysed elements (LILE, HFSE, REE) and isotope compositions (Nd, Sr, Hf, Pb). The long history of research conducted on these three intra-oceanic subduction suites provides a well-constrained framework within which to examine how these elements behave and therefore to assess how they may be implemented in future research. Initial results from these studies will be presented.

**Were the Pre Lower Pumice 1, Lower Pumice 1 and Lower Pumice 2 eruption sequences sourced from the same magma reservoir, Santorini Caldera, Greece****Jack Simmons**

The Santorini Archipelago of Greece preserves 650 kyr of volcanic activity, including 12 major explosive eruptions, which incorporate two 180 kyr mafic to silicic magmatic cycles, as well as the remnants of multiple lava-dome complexes, lava shields, stratovolcanoes and at least four caldera collapse events. The 3.5 ka Minoan eruption terminated the second magmatic cycle and was responsible for the destruction of a Minoan settlement at Santorini. The Pre Lower Pumice 1, Lower Pumice 1 (183.5 ka) and the Lower Pumice 2 (172 ka) eruptions ended the first magmatic cycle and are considered chemically similar to deposits of the Minoan eruption (dates from Keller et al. 2000). This could suggest cyclicity in magma generation processes.

The Pre Lower Pumice 1, Lower Pumice 1 and Lower Pumice 2 eruption deposits are variably exposed within the caldera cliffs and outer extremities of southern and eastern Thera. The Pre Lower Pumice 1 sequence is represented by 13 small volume pyroclastic fallout, ignimbrites and obsidian clast surge deposits, the latter resulting from the volcanic destruction of a lava dome. A paleosoil separates the Pre Lower Pumice 1 succession from the overlying pyroclastic fallout (LP1-A), ignimbrite (LP1-B) and lithic-rich lag breccia (LP1-C) deposits of the Lower Pumice 1 eruption. The Lower Pumice 1 eruption sequence is disconformably overlain by pyroclastic fallout (LP2-A), ignimbrites (LP2-B), phreatomagmatic ignimbrites with basal layer 1 ground breccias (LP2-C), and lithic-rich lag breccia (LP2-D) deposits of the Lower Pumice 2 eruption.

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**ABSTRACTS**

Crystal-poor, dacitic white pumice fragments represent the dominant juvenile product within each sequence. Subordinate abundances of transitional basaltic-dacitic banded and grey pumice fragments, in addition to mafic scoria, are also present. Chemically, these rock types depict two magma batches: (1) a dacitic (to rhyolitic) magma, and (2) a basaltic magma. The intrusion and subsequent mixing and mingling of the mafic magma with a cooling dacitic–rhyolitic magma, is considered responsible for the formation of both banded and grey pumice fragments within each eruption sequence. C1 chondrite normalised rare earth element (REE) plots, of dacitic white pumice fragments, depict uniformity in REE patterns within and between eruption sequences. This suggests an homogeneous source for each eruption and indicates the presence of a long lived magma reservoir. Episodic basalt magma injection into this reservoir may have triggered each eruption.

**The effect of lake loading on groundwater levels around Lake Tutchewop in the Murray-Darling Basin, southeastern Australia****Tim Robson**

The Murray-Darling Basin, which provides 80% of Australia's \$28.3 billion irrigated agriculture industry, has the Murray River as its major drainage outlet, and management of salt loads in the river is required to ensure the agricultural viability of the basin. One available management option is to divert the saline groundwater flowing towards the Murray River using salt interception schemes.

Lake Tutchewop, a salt evaporation basin within one of these interception schemes, has received ~1 million tonnes of salt since 1968. The bores drilled around the lake to monitor the groundwater and investigate the fate of the added salt have many years of monthly water level measurements, making them ideal for stochastic time series modelling. Because the addition of saline disposal water to the lake is often not synchronous with rainfall events, the impact of lake loading on surrounding groundwater levels is relatively easy to distinguish, unlike for many lakes. The predefined impulse response function in continuous time (PIRFICT) model was applied to the available data using the commercially available program Menyanthes. The PIRFICT model is a transfer function noise (TFN) model that is able to handle input and output data with different observation frequencies. The input variables (rainfall, FAO-56 evapotranspiration, pan evaporation and lake levels) were tested in double and triple input models.

The results showed that for bores within ~5.5 km of the lake, triple input models with lake level, rainfall and FAO-56 evapotranspiration produced better results than models using rainfall and evapotranspiration only; this effect extends to depths of ~70 metres below the lakebed. The response in groundwater levels to lake level changes is due to a pressure response rather than movement of saline disposal water. The results indicate the importance of quantifying surface water responses in groundwater systems, and this is also of value in determining the management options for saline disposal basins.

## STUDENT CONTRIBUTION

*Gordon Webb*

School of Earth Sciences, University of Melbourne  
GSAV Student Scholarship Recipient

In late July of this year I attended the biannual meeting of the GSA-Specialist Group in Geochemistry, Mineralogy and Petrology (SGGMP). The meeting was held at Mission Beach in Queensland. For those of you who don't know the area, Mission Beach is often described as paradise on earth. It is situated two hours south of Cairns, just within the 'wet tropics' climate zone. Dunk Island is just off shore of the beautiful palm lined, tropical beach. All in all not a bad spot to spend a week!

The conference itself comprised three days of talks interspersed with two field trips. This format was great because everyone had a day of mental relaxation before launching back into technical science. Being a specialist conference most of the talks were pitched at a high level. As a consequence the audience were very engaged and there were a lot of interesting debates during questions. My talk, on the role of deformation in regulating melt loss during partial melting, seemed to be well received. I had some good discussions with experts in related fields and received some excellent constructive criticism that has served to improve my understanding of my research topic significantly.

The first field trip was to the Atherton Tablelands. We visited a quarry on the side of a small scoria cone. The quarry waste heaps contained lots of well-preserved xenoliths of peridotite. We also visited some large granite slabs with well-exposed mixing/mingling textures and metasedimentary xenoliths.



The highlight of the day was seeing a cassowary up close on the way back from the last stop. The second field trip involved taking a water-taxi out to Dunk Island. We snorkeled, ate fresh coconuts straight off the tree and saw some interesting altered serpentinites (even tropical islands have interesting geology!).

In summary, it was an excellent conference with the right mix of interesting talks, posters, field trips and opportunities for social interactions. For anyone who has never been to a small, specialist meeting I would thoroughly recommend the experience.

**SELWYN SEMINAR - SEPTEMBER 26TH****Why should we be interested in Intra-plate Continental Basaltic Volcanic Provinces? Reassessing what we know about the Newer Volcanics Province, SE Australia.**

Intra-plate Continental Basaltic Volcanic Provinces (ICBVPs) are a long ignored species of volcanic system. They have never been viewed as being sexy as large volcanoes such as large conical stratovolcanoes and explosive calderas or supervolcanoes have been. However, as the world's population increases, and settlements encroach more onto volcanoes, the hazards to society from even the small volcanoes of ICBVPs are becoming more apparent, and there is just a renewed research interest internationally in wanting to find out what makes these volcanic systems tick. ICBVPs can be considered to be "leaky" volcanic systems, fed by repeated small but intriguingly variable magma batches that produce multiple small volcanoes distributed over a large region, rather than a single central vent edifice. What factors cause them to form and what controls where, when and how they erupt?

The Newer Volcanics Province (NVP) of western Victoria and southeastern South Australia is one of the largest ICBVPs in the world, covering an area of >23,000 km<sup>2</sup>, and known to have ~400 volcanoes. It ranges in age from 4.6 Ma to Recent. Its morphological expression is extensive plains forming lava flows and point source volcanoes. Although the volcanoes of ICBVPs are commonly considered to be monogenetic and monomagmatic. Intriguingly, volcanism began and has continued at a time when southeastern Australia was/is in a state of compression. Was the volcanism the result of Australia drifting over a mantle hot-spot or decompressional mantle melting consequent upon continental Gondwana rifting, lithospheric edge-driven melting or trans-tension related decompressional melting?

Recent research on the NVP at Monash has identified

- Subtle variations in erupted magma compositions from single volcanoes (e.g. Mt Gambier, Purrumbete, Mt Rouse)
- Improved understanding of the subsurface structure of maar volcanoes using geophysics and modeling
- Factors which have influenced changing eruption styles in monogenetic volcanoes
- The value of remote sensing in producing maps and relative stratigraphies in ICBVPs
- Eruption magnitudes, potential hazards similar to the 2010 Eyjafallajökull eruption, Iceland.

However, patterns of eruption age migration, provincialism in compositions of erupted products, and understanding of where future eruptions will occur remain obscure due to inadequate data that has a sound regional scale chrono-stratigraphic framework. Understanding of the dynamics of ICBVPs requires new generation maps combined with new strategic geochronology and geochemistry to be able to assess what patterns exist regionally.

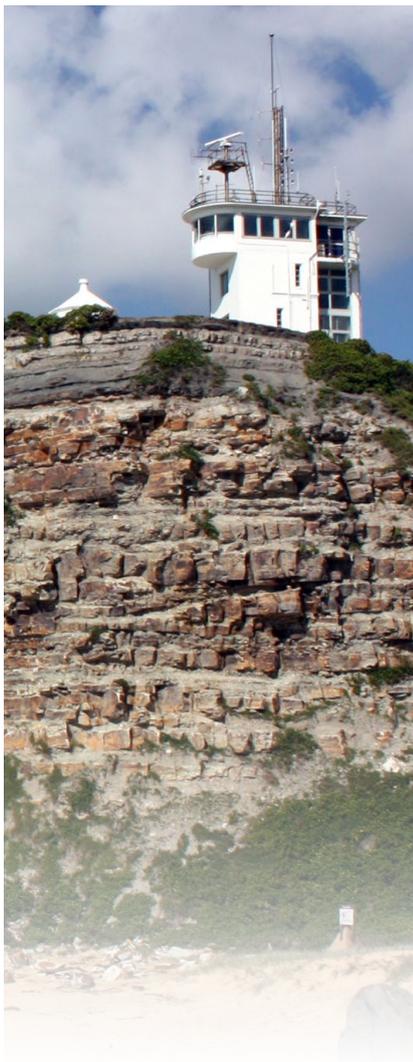


# AESC

australian earth sciences  
convention

Sustainable  
Australia:  
7-10 July 2014

NEWCASTLE, NSW, AUSTRALIA



AESC 2014 will be held in Newcastle, a vibrant port city that is characterised by its working harbour, beautiful surf beaches and proximity to many of Australia's most prestigious wineries.

It is the gateway to the Hunter Valley – heart of the Sydney Basin coalfields, centre of power generation for New South Wales, and home of the NSW Institute for Frontier Geoscience, a joint initiative of the University of Newcastle and the NSW Department of Trade and Investment. Combined with the city's focus on energy efficiency via the Federal Government's Smart Grid, Smart City initiative and the CSIRO Energy Centre, Newcastle is an ideal site for our convention – **Sustainable Australia.**

The convention will be based around the themes of energy, basin geology, geodynamics, resources and the environment. Dedicated symposia include the 39th Symposium on the Advances in the Study of the Sydney Basin and Comparisons & Contrasts in Circum-Pacific Orogens.

AESC 2014 offers all geoscientists a unique opportunity for professional development and a chance to hear firsthand the latest developments in geosciences.

## Plan your trip to Newcastle

Call for Abstracts:  
**October 2013**

Abstracts Deadline:  
**March 2014**

The website is coming soon, in the interim please contact:  
**info@gsa.org.au**

**Presentation:** Oral and poster

**Registration:** early 2014

### Workshops and field trips:

The convention invites proposals for short courses, workshops and field trips.

### Exhibition:

The convention will host an exhibition. We welcome companies and businesses to participate so they can promote the emerging opportunities in their organisation, state or territory.

### Supporters:

The organising committee invites companies, institutions and technology providers to support this meeting.

### Expressions of interest:

info@gsa.org.au

### Convention location:

Newcastle City Hall



Coalfield Geology Council  
of New South Wales

T + 61 2 9290 2194  
F + 61 2 9290 2198

Email: info@gsa.org.au  
Convention Website: coming soon



# AESc

australian earth sciences  
convention

**Sustainable  
Australia:**  
7-10 July 2014

NEWCASTLE, NSW, AUSTRALIA



Earth scientists recognise that the key to sustaining the Australian society, economy and environment into the future lies in an understanding of the make-up, structure and deep-time history of the continent, and its setting in an evolving planet.

## THEMES

### Energy

Increases in the global demand for energy has been driving advances in the efficiency of coal and conventional hydrocarbon extraction, while also urging the rapid growth of interest in unconventional hydrocarbons. Future energy supplies are likely to include all fossil fuels, nuclear sources, and significant increases in the use of renewable energy and cleaner alternatives. Building on the public debate to be stimulated by the 'Energy 2050' public forum, the Energy theme will encompass Earth Science perspectives on energy sources, exploration and extraction methods, and environmental consequences and solutions.



Coalfield Geology Council  
of New South Wales

### Resources

In an era of increasing demand for mineral resources from the developing Asian economies, and declining rates of discovery of new deposits, new mineral exploration strategies are vital. Discovery will be stimulated by new technologies, new methods of data interpretation and dissemination, refined and novel understandings of mineral systems and ore environments, and the strength of the pre-competitive geological and geophysical data sector, all addressed under the Resources theme.

### Environment

Earth's environment is a dynamic and responsive system with a long geological record of change and an immediate and future impact on society, particularly in an Australian context. High-resolution records of past climates (including outcome of the International Ocean Drilling Program), assessments of the state and future of our ground- and surface-water resources, predictions of the response of the Australian environment to climate change, and studies specific to the Australian arid and semi-arid zones, will be major elements of the Environment theme.

### Service and Community

The Earth Sciences have an ongoing role of service by informing, influencing, and supporting Australian society, and a proud history of education and research. The Service and Community theme will address the geoscience response to distributed grid computing and cloud storage, the dissemination of geoscience information in a high-bandwidth environment, the continuing and evolving role of geoscience outreach and education, geohazard studies and their role in protecting the community, the contributions of geotourism and geoheritage, and the historical record and influence of Earth scientists.

### Dynamic Planet

Today's Earth is the sum of 4.5 billion years of geological processes. The Dynamic planet theme will address: the geodynamic evolution of Australia and other continents from the Hadean to the present; the evolution of the Earth-Moon system and the meteoritic impact record; the expression of the circulation driven by the Earth's heat engine in lithospheric plate tectonics, mantle dynamics and differentiation, and core evolution; the processes that govern deposition and deformation in intracratonic settings; processes of crustal growth and recycling, at convergent margins and in other settings; geophysical and geochemical evidence of the structure and composition of the deep subsurface; and the influence of all of these elements on the formation and distribution of mineral and energy resources.

### Living Earth

Life has fundamentally influenced the development of the Earth, making it unique with respect to its planetary neighbours. The Living Earth theme will investigate: the evolution of life as witnessed in the fossil record; consider novel methods to supplement traditional palaeontological approaches; investigate the major events in the evolution of life, the hydrosphere and atmosphere; and draw contrasts and comparisons with other planets.

## SYMPOSIA

39<sup>th</sup> Symposium on the Advances  
in the Study of the Sydney Basin

Comparisons & Contrasts  
in Circum-Pacific Orogens

T + 61 2 9290 2194  
F + 61 2 9290 2198

Email: [info@gsa.org.au](mailto:info@gsa.org.au)  
Convention Website: coming soon

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**STUDENT FUNDING OPPORTUNITIES**

## **Geological Society of Australia (Victoria Division) Student Research Scholarships**

The GSAV are pleased to offer up to \$10,000 per year in scholarships available to honours and postgraduate students for assistance with travel costs associated with conferences and field work.



The scholarship is valued at up to \$500 for travel within Australia and \$700 for travel outside of Australia. The number of and value of the scholarships awarded each year is made at the discretion of the GSA(Vic) committee.

Funding will not be granted retrospectively and applicants are asked to submit forms no later than 6 weeks prior to their trip to give the committee time to consider the application.

Students that receive this scholarship are required to submit a report for publication in the newsletter, "The Victorian Geologist", following their trip. A presentation may also be requested by the committee, which will consist of a short, 10-15 minute presentation prior to the monthly seminar.

Applications forms can be scanned and emailed to: [secretary@vic.gsa.org.au](mailto:secretary@vic.gsa.org.au)

or mailed to:

Geology Research Scholarships Victoria  
Geological Society of Australia (Victoria Division)  
GPO Box 2355  
Melbourne VIC 3001

More information including eligibility criteria can be found on the form and by contacting Barbara Wagstaff ([wagstaff@unimelb.edu.au](mailto:wagstaff@unimelb.edu.au))

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### **Something interesting to share? Want to see your name in print?**

Don't be bashful, contribute to the GSA(V) monthly newsletter!

If there are any events, happenings, news, or views that would be of interest to the membership, please send your details and information to Matt Bliss at [mbliss@student.unimelb.edu.au](mailto:mbliss@student.unimelb.edu.au)

**We'd be glad to hear from you**

## FORTHCOMING SEMINARS AND EVENTS

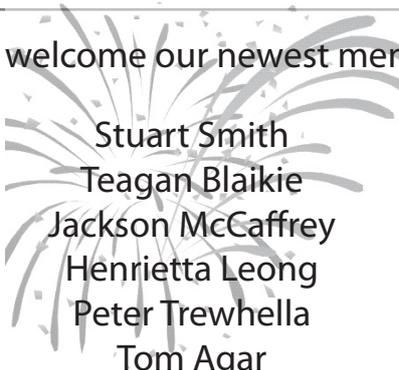
to be presented at  
GSA (Victoria Division) meetings

Note: unless otherwise indicated, all 2013 talks will be held in the  
Fritz Loewe Theatre, Earth Sciences Building, University of Melbourne.

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September 26th	Selwyn Seminar - Ray Cas
October 31st	TBA
November 28th	Liz Rogers <i>Diving Exploration and Cave Geology on the Nullabor</i>

Please welcome our newest members



Stuart Smith  
Teagan Blaikie  
Jackson McCaffrey  
Henrietta Leong  
Peter Trewhella  
Tom Agar

Visit the GSAV on [www.vic.gsa.org.au](http://www.vic.gsa.org.au) or the GSA on [www.gsa.org.au](http://www.gsa.org.au)  
• Renewing your GSA membership is easy - it can now be done online. •

### CONSIDER CONTRIBUTING TO TAG!

It is member contributions which make TAG a member magazine – please keep the contributions coming and assist with informing all of the membership (not just your Division) about your activities.

Please send your news to: [tag@gsa.org.au](mailto:tag@gsa.org.au)



tag

### GSA (VICTORIA DIVISION) COMMITTEE

Please address all correspondence to the GSA Victoria Division  
GPO Box 2355, Melbourne, VIC, 3001  
Internet address: [www.vic.gsa.org.au](http://www.vic.gsa.org.au)

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#### OTHER CONTACTS

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#### Newsletter deadline:

First Friday of the month except Dec & Jan  
[mbliss@student.unimelb.edu.au](mailto:mbliss@student.unimelb.edu.au)

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