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PREVIEW

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PREVIEW

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Diana Plavsa enjoying lunch with a very enthusiastic group of children on the way home from school in a small town of Mahadevi, Tamil Nadu, India (see article beginning p. 27; image courtesy of Diana Plavsa).

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John A. Theodoridis

Sitting in my inbox is an important email requiring immediate actioning. Yet despite this fact, along with numerous self-reminders, it has sat there dormant awaiting my attention since 9 November. Moreover, it is highly likely that many of you are in possession of this very same email; yes, you know what I'm talking about, the one headed *ASEG 2013 Membership Renewal*. Now before you slip into a state of indifference, do read Kim Frankcombe's *President's Piece* on the ramifications for our society when dues are late. His well-meaning scolding will prick your conscience as it did mine. Although, I must confess, that not so long ago I found myself in the rather unscrupulous situation of being a state secretary for the ASEG with a lapsed membership (Oops!); apologies to Kim and to my fellow members.

Whether it be forgetfulness, procrastination or reluctance at having to flip through your little code book to fish out your long forgotten ASEG username and password – now is the time to renew your membership and view it as an excellent opportunity to explore our beautifully refurbished website.

In October this year, Olavarria, Argentina, hosted the 6th International Earth Science Olympiad (IESO), an event that attracts student teams from secondary schools worldwide. I am absolutely delighted to present a submission from the Australian Science and Mathematics School (ASMS), in which Year 11 student Darcy Cathro writes of the participation of his team at the IESO. Dr Bronte Nicholls – assistant principal of ASMS, presents the unique pedagogy of the school and its approach to teaching science via interdisciplinary, authentic and inquiry-based learning strategies (see p. 21). Please remember that unique opportunities such as these can only be afforded to students by the efforts of highly dedicated teachers, in conjunction with ongoing funding through sponsorships.

As part of her ASEG travel scholarship to the Brisbane IGC, PhD candidate Diana Plavsa shares with us research from her project entitled 'The tectonic evolution of Southern India', and explains how she seeks to resolve an ambiguity in the location and existence of a suture zone by means of detrital provenance studies of zircons (see p. 27).

Thus, in this closing issue for 2012, I hope you may come to appreciate a little more, the full spectrum of scientific enquiry from secondary studies to cutting-edge postgraduate research, and marvel at the continuity in the love of knowledge for knowledge sake. May each of you enjoy a safe and merry festive season.

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AEROSYSTEMS

AEROSYSTEMS

Another year gone already!

In a clear demonstration that time is non-linear, another year is drawing to a close. I'd just got used to the idea of it being 2012 and can see I'll have to gear up for lucky 13; hopefully the software marketing people won't hijack it and turn it into 20X3

It has been a busy couple of months in our industry with consolidation in the contracting arena from Geotech taking over Aeroquest and CGGVeritas buying Fugro's Geoscience Division. Although neither of these events would have made it to the finance report in the evening news they are large transactions in our small world. Lion Selection, a company I held shares in for several years, has an interesting clock charting the share market cycle (see www.lionselection.com.au: Investment centre > Quarterly Report > 30 April 2011).

Lion believes that the market overall is currently at about 8 o'clock; however, these two transactions would suggest that the geophysical market is at about 5 o'clock and that we are yet to peak! Whether the clock analogy is correct or not, one thing we can be sure of is that this consolidation will, as have all previous consolidations in our industry, lead to the birth of new, small operators (7 o'clock). This new growth is likely to include innovation and significant competition in the acquisition sector. As a user of these services I will add the Aeroquest and Fugro marketing merchandise to my collection of caps, mugs and stubby holders from contractors that are now just memories and look forward to what the future holds in terms of innovation.

It has also been a very busy couple of months for Carina and the web development team and I am delighted that I can finally say that we have a new website. Great work Carina! Currently it has similar functionality to the old site but significant improvements are being added to enable us to communicate with each other in ways that were not previously possible. Thanks also to Staz for keeping the old site limping along for a lot longer than he originally planned.

Last week I attended the very successful Airborne EM workshop put on by the WA Branch. It was fully booked and included about twice as many geologists as geophysicists. Although presenting to a mixed audience provided a challenge to the presenters, particularly those of us presenting in the EM basics part of the workshop, the lively discussions during the breaks indicated that most people got a lot from it. Congratulations to Anne Tomlinson and Chris Wijns and the Western Australian Branch for a well conceived and run event. The WA Branch is talking about running similar types of events next year. I'd encourage other states to consider doing the same, particularly covering topics of interest to a broader audience than just geophysicists.

You will, or should, have received your membership renewal notice for 2013. There are two important additions to the notice this year. The first is that we are including a digital copy of *Exploration Geophysics* with each membership. Paper copies can still be included, at a small additional charge. Overseas members will only receive a digital copy of *Preview,* but again paper copies can be included for a small fee. We have done this to try and make the cost of membership the same around the world. The high costs of postage for the journals had previously made this impossible. The second important addition this year, is to offer a discount to those that pay their dues on time – before 1 January 2013. In the past we have had a disappointingly large number of people who have left their renewal until September the following year and only paid on threat of excommunication. This wastes a significant amount of both the Federal Executive and the Secretariat's time in chasing late payers. Combined with the carrot of a discount for on time payment, we will be using the stick of withdrawal of membership rights earlier next year. If you have not already done so, I would encourage you to log onto the website and pay your dues now!

I'm writing this at the start of the silly season but by the time this reaches your desk the season will be nearing its climax and many of you will be taking time off work to spend with your families. To those members, have a good break and we'll see you next year. Others of you will be working through, including over Christmas. There will be a third, smaller group swapping their attentions between family, friends and festivities and emails from the latter group. As someone in the third group I hope that all the contractors have a trouble free end of year and that your data are nice and clean and require minimal intervention from the client's geophysical consultant!

Early next year the process of electing new State Branches will begin, followed by the election of the Federal Executive. If you would like to be more involved in the society why not consider nominating for a position on either your local or the federal committee? In addition or instead of these committees, there are several sub-committees you might consider volunteering your time to. These are particularly relevant to those of you not living in a capital city as most communication is by email and meetings are virtual. There is a contact list of the chairs of these subcommittees on the website if you want more information about what they do and what would be required of you if you joined them.

As always, if you have a gripe about the society or a clever idea you think we might adopt, feel free to drop me a line at kfrankcombe@iinet.net.au.

Kim Frankcombe
kfrankcombe@iinet.net.au

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New members

The ASEG extends a warm welcome to 17 new individual members (see table) to the society. The Federal Executive approved these members at the 27 September and 29 October meetings in 2012.

Name	Organisation	State/Country	Member grade
Nader Issa	UWA	WA	Associate
Baqir Al-asadi	Curtin University of Technology	WA	Student
Emma Louise Halpin	Macquarie University	NSW	Student
Sean Christopher Herbert	Vortex Geophysics	WA	Active
Andy Jollands	Beach Energy	SA	Active
Easwaran Kanason	Asia Edge Pte Ltd	Singapore	Associate
William Lazell	University of Adelaide	SA	Student
Tye Hapa Maree McKain	Curtin University	WA	Student
Felix Menu	Curtin University	WA	Student
Janet Morrissey	Rio Tinto	WA	Active
Siti Aishah Ridzuan	Curtin University	WA	Student
Muhammad Mudasar Saqab	UWA	WA	Student
Maryam Shafaee	CGGVeritas	WA	Associate
Nathan Andrew Tabain	Curtin University	WA	Student
Ben Van der Hoek	UWA	WA	Student
Liam Patrick Webb	MMG	VIC	Active
King Tai Wong	UWA	WA	Student

Jodie Gillespie: 1972 – 5 October 2012

The passing of Jodie Gillespie, Business Development Manager for Fugro Geoscience division, is received with great sadness.

Everyone who knew Jodie will know that she loved to travel. She travelled frequently for both business and pleasure but tragically and so suddenly, Jodie passed away on 5 October 2012. Jodie will be remembered as a very beautiful woman both inside and out. She had sparkling eyes, a radiant smile and possessed a loving, caring and warming spirit.

Jodie was philanthropic, a humanitarian, socially conscious and deeply concerned about the state of the world. She had great compassion and idealism. Jodie will be remembered for her friendliness and for her kind, sweet and cheerful way. She was a true egalitarian, never prejudiced nor accepting of others' social bias. Jodie was exceptionally intelligent and an amazing networker. She was always impeccably dressed, even on remote field trips. Jodie was at her best when giving, sharing and self-sacrificing for the achievement of a larger goal, never expecting anything in return.

Jodie always represented her company, her industry and herself in the most professional manner. Her honesty, integrity and her sense of responsibility was admirable. She was incredibly well rounded and worldly, comfortable mixing with people from every walk of life, from taxi drivers and hotel porters to company CEOs and government ministers. With each and every person she would be totally engaged and interested in the conversation. All who met her could not help but like her, Jodie was one of the best.

Jodie was born and grew up in Belmont on the eastern shores of Lake Macquarie, New South Wales, Australia. Many a teenage summer's day was spent on the local beaches or around the lake, an area that she treasured. Later, she and her fiancé Rui Goncalves returned to her beloved lake, purchasing property in Marks Point from where they based their international travels.

High school geography began her obsession with rocks, which stayed with her throughout her life. Many times friends have listened to detailed descriptions of how a certain cliff was formed or why a particular rock was a certain shape. Her photo albums contain numerous pictures of rock formations with the odd picture of a friend or colleague.

Jodie graduated with a B.Sc. from the University of Sydney in 1994. Her extensive geographical experience centred on oil and gas exploration as well as minerals. Earlier in her career, Jodie worked for Gerard Daniels, Paras Consulting, American Express and Geoterrex in both technical fields and management consultancy. For the past 6 years Jodie was Business Development Manager representing the Fugro Geoscience division. In recent years she also held the position of Chair for the International Association of Geophysical Contractors for the Asia Pacific region. Jodie played a crucial role in representing geophysical contractors and lobbying for positive change when industry issues arose with authorities and governments.

Her life was indeed cut short in this world, but Jodie was here long enough to gain the love and admiration of all those who knew her. Her beautiful nature leaves an indelible legacy in the hearts and lives of her fiancé Rui, her parents Frances and Dennis, her sister Nadeene, her brother-in-law David and the host of relatives, friends and colleagues who had the pleasure of her wonderful company. She was an outstanding individual and a true professional.

Her loss will be greatly felt throughout the exploration industry.

Jodie, rest in peace. We will all miss you.

Jodie's funeral was held in Lake Macquarie. Messages of condolence emailed to forjodie@fugro.com before 22 October 2012 were presented to her family in a commemorative book.

Rather than flowers, the family suggested donations are made to the 'Jodie Gillespie Memorial Fund' for the Hunter Medical Research Institute. To make a donation, go to secure website www.hmri.net.au and click 'donate now'.

Australian Capital Territory

The highlight in a relatively quiet period for the ACT Branch was the joint-societies Quiz Night on 27 September organised by the local branches of PESA, ASEG, GSA, AusIMM and IAH. A very small ASEG contingent made a big impact – branch Treasurer Tim Jones did an admirable job as Joint Quiz Master, while yours truly was on the winning table. The win was helped by successfully picking the gas–water contact in a seismic section, something that even the table of PESA participants failed to achieve!

Upcoming events include the now traditional joint Christmas BBQ with the local GSA and AusIMM branches on Tuesday 11 December. We are also hoping to hear a talk from Professor John Close from ANU on cold-atom gravimetry. Scheduling this talk is proving a challenge, but the date will be announced via email and LinkedIn.

Ron Hackney

New South Wales

In September, Ken McCracken from Jellore Technologies and the University of Maryland, presented a talk on the Sun's influence on geophysical phenomena over the past 10 000 years, and in the future. Ken discussed how he and his colleagues used 10Be and 14C data to describe how geomagnetic activity, the ionosphere, radiation exposure in space, and the terrestrial climate have varied in the past. Ken also extrapolated their findings to predict what we will experience in the near and more distant future. The talk was enjoyed by all and there was much discussion afterwards.

In October, we held our student night where four students from Macquarie University and the University of Sydney gave talks on their studies. The talks were well received and invoked much discussion. The speakers and the titles of the talks are as follows:

A fluvial constraint on geodynamic mantle convection models: Australia focus
Nicholas George Barnett-Moore, The University of Sydney.

Geodynamics of Venusian-type planets
Samuel Matthews, Macquarie University.

Constrained 3D magnetic modelling, predicting the resource grade of magnetite at Hawsons Knob, western New South Wales
Ristch (Rusty) Camille, Macquarie University.

Modelling the history of extension and subduction east of Australia
Joel Potter, The University of Sydney.

Student presenters with the NSW ASEG President: (L to R) Rusty Camille, Sam Matthews, Nick Barnett-Moore, Joel Potter and Mark Lackie.

ASEG News

An invitation to attend NSW Branch meetings is extended to interstate and international visitors who happen to be in town at that time. Meetings are held on the third Wednesday of each month from 5:30 pm at the Rugby Club in the Sydney CBD. Meeting notices, addresses and relevant contact details can be found at the NSW Branch website.

Mark Lackie

South Australia/Northern Territory

On 25 September we welcomed Miles Davies (General Manager, PACE 2020) to speak on the topic 'What's up with PACE geophysics, anyway?'. His talk outlined the geophysical projects in which the South Australian government is currently involved, including the proposed plan to undertake a gravity survey in the Woomera Prohibited Area (WPA).

Our annual industry night was held on 23 October and filled the Thomas Cooper room at the Coopers Alehouse to capacity. Archimedes Consulting, Zonge Engineering, AusGeos Consulting, Ginkgo ENP GNG and JRS Petroleum Research all presented company profiles, each describing their services and shared with us some of the geophysical work that they've undertaken.

One hundred people attended the ever popular Melbourne Cup luncheon sponsored by Beach Energy; congratulations to all those who picked winning horses! Many thanks go to Jenni Clifford who organised the event, and to Neil Gibbons who MC'd the event. Thank you everyone who helped out on the day.

Our annual student night, held on 8 November at the Coopers Alehouse, filled the function room to capacity. ASEG Scholarship winners Philippa Murray and Bradley Grosser, as well as Millicent Crowe and Carissa Digance, presented their honours work to 30 industry, consultant, government and university geophysicists. Congratulations go to Carissa whose talk was judged best on the night! Her talk was entitled 'A seismic sequence stratigraphic model of Miocene reef systems, their depositional environment and implications for shallow drilling hazards in the Browse Basin, North West Shelf, Australia'.

We hold technical meetings monthly, usually on a Tuesday or Thursday, at the Coopers Alehouse in Adelaide beginning at 5:30 pm. New members and interested persons are always welcome. For further details, or if you are interested in presenting a talk to the local group, please contact Philip Heath (philip.heath@sa.gov.au). If you are a SA/NT member and are not receiving emails regarding events, please update your details through aseg@casm.com.au.

Philip Heath

Victoria

The previously announced 24 October Annual Student Night regrettably had to be cancelled due to an insufficient number of submissions – we will try again next year.

On 6 December we will be hosting the 2012 SEG Near Surface Honorary Lecturer Rick Miller from Kansas Geological Survey presenting 'Near-surface seismic: more than a problem of scale'. This evening meeting will be held at the Kelvin Club, Melbourne Place, in Melbourne's CBD, starting at 6 pm (drinks) for 6:30 pm presentation - RSVP by 3 December to John Theodoridis, ASEG Victorian Branch secretary, at jthe1402@bigpond.net.au.

On 16 January Dr Manika Prasad, 2012 Fall SEG/AAPG Distinguished Lecturer, from Colorado School of Mines will present 'Shales and imposters: understanding shales, organics, and self-resourcing rocks'. This presentation will be a joint noon lunch meeting with our PESA colleagues at The Victoria Hotel, 215 Little Collins Street in Melbourne's CBD starting at 12 noon (drinks) for 12:30 pm lunch and presentation. Registration is mandatory by 14 January via the PESA event website: http://events.pesa.com.au/Default.aspx

We look forward to seeing many ASEG Victorian Branch members at the coming meetings.

Asbjorn Norlund Christensen

Western Australia

It's been a busy couple of months in WA with two major events being held. The WA Treasurer Amanda Carreno and her team organised a fantastic night on 5 November that brought together young and senior geophysicists for a night of networking at the Melbourne Hotel. We look forward to this Junior Geophysicists Forum becoming an ongoing annual event (see p. 13 of this issue for full details).

The WA Branch also hosted *A Practical One Day Workshop on Airborne Electromagnetics.* This event sold out and attracted over 150 WA-based geophysicists and geologists and also interstate and international visitors (see p. 14 of this issue for full details). We look forward to holding this event annually and focussing on topical near-surface and minerals geophysics themes.

Dr Nicholas Rawlinson presented on the technical aspects of the new National Australian Pool of Ocean Bottom Seismographs at our October Tech Night; Geoscience Australia hosted an extended workshop on the same topic at Minerals House in East Perth the following day.

By the time this issue goes to print, we will have also held our November Tech Night, which will be the annual Student Presentation Night where we will have Honours and Masters geophysics students from Curtin and UWA presenting their research projects. We'll also be presenting the inaugural ASEG WA Awards. This award attracted a strong pool of applications, but it's my pleasure to congratulate Rachael Wood, undergraduate student at Curtin, and Lisa Gavin, PhD candidate at UWA, for each taking out a 2012 award … congratulations to you both!

We shall wrap up the year with our AGM and Christmas Party at Rigby's Bar in the CBD on 12 December. But before we put 2012 to bed completely, Rick Miller will be in town presenting his SEG Honorary Lecture on 'Near-surface seismics' at the usual time of 5:30 pm on Thursday, 13 December at the Belgian Beer Café, Perth (note the change in date, time and venue).

The WA monthly Tech Nights are usually held on the second Wednesday of each month at the City West Function Centre, 45 Plaistowe Mews, West Perth starting at 5:30 pm.

All WA events are now being posted on the ASEG website so keep a look out and follow the links for full event details as well as to register online. You can also sign up to our mailing list at http://eepurl.com/nleOD to receive email notifications of WA events and news.

Anne Tomlinson

News

Conference update – 23rd International Geophysical Conference and Exhibition

Registration

Online registration for the ASEG-PESA 2013 Conference and Exhibition will open in December 2012. Confirmed registration fee levels and a list of registration entitlements are available at www.aseg-pesa2013.com.au: Registration. To receive an email notification when registration is open and to keep up to date with conference news, join the electronic mailing list through the Conference website.

Dates to remember	
Registration opens	December 2012
Extended abstract deadline	15 February 2013
Author notification of acceptance for oral or poster presentation	22 March 2013
Author registration due (early bird registration closure)	12 April 2013
Conference start	12 August 2013

Workshops

The main technical program will be supported by up to 22 workshops on specialised topics, pre and post the main program. Make the most of this opportunity to update your skills and fulfil your training needs for 2013.

Topical themes in petroleum, mineral and general subjects will be offered in a mixture of styles including traditional presentations as well as field trips and participatory forums. A variety of software vendors will also provide training in a hands-on and/or classroom-style environment. For detailed information on workshops go to www.aseg-pesa2013.com.au/workshops.

Invitation to sponsors and exhibitors

The Sponsorship and Exhibition Prospectus is now available through the conference website at www.aseg-pesa2013.com.au: Sponsorship & Exhibition

We have a wide range of sponsorship and advertising available to suit your needs and budget from Platinum Sponsor through to sponsorship of specific items and advertising in the Conference Program Book. We recognise that the support of our Sponsors is a key contributor towards the success of an ASEG-PESA Conference and are keen to tailor a package to optimally promote your organisation to our delegates.

The Exhibition will offer over 2500 square metres of exhibition space and will accommodate over 110 booths and stands. A number of affordable configurations are available to ensure that your company commands a presence. The Exhibition will provide organisations with a fantastic opportunity to showcase their products and services to Conference delegates in a face-to-face environment.

To discuss your marketing package please contact the Conference Sponsorship and Exhibitions Manager, Kirsty O'Brien on +61 2 9265 0700 or email sponsorship@arinex.com.au.

Suzanne Haydon
Publicity Subcommittee Chair
www.aseg-pesa2013.com.au

Junior Geophysicists Forum

On Monday 5 November 2012, the first meeting of the Junior Geophysicists Forum (JGF) was held at The Melbourne Hotel in Perth. The event was a great success with approximately 120 geophysicists attending.

The purpose of the JGF was to allow current students, recent graduates, and individuals with less than 5 years experience the opportunity to network with established geophysicists in the mining and petroleum industries.

The JGF originated with the CSEG in Canada, where it has been running successfully since 2005. The idea was put forward to the ASEG WA committee by Amanda Carreno to run the JGF in Perth. This idea was accepted with enthusiasm, and the planning began.

Amanda Carreno (Organiser).

We chose the Melbourne Hotel as the venue for the first JGF due to its convenient location and ease of access to almost everyone. The venue was fantastic and happily catered to our every need. The food that came out was tasty and plentiful. The only people who left hungry were those that wanted to.

We started the evening with a couple of speakers who each gave a brief overview of their careers working in the minerals and petroleum industries. First up was Stewart Bayford of Sun NL Resources talking about his vast global experience in the search for petroleum. Next time you run into Stewart at an industry event, ask him about his equations. Next we had Bill Peters of Southern Geoscience Consultants (SGC) who talked about his travels all over the world, and what led him to co-found SGC. Both speakers were very well received.

Stewart Bayford (Oil and Gas Geophysicist).

Bill Peters of Southern Geoscience (Mineral Geophysicist).

We followed this up with an ice breaker quiz. Attendees gathered into randomly assigned teams, and had to work together to answer 15 questions of varying degrees of difficulty. The first team to turn in the answer sheet with the most right answers won a $50 Coles/ Myer Gift Card for each member of the team.

Once the formalities of the evening were over, there was a great round of networking where everyone had the chance to make new contacts, as well as catching up with some old ones. Much fun and networking was had by all.

The event was made possible by the financial support of numerous sponsors. These companies were Fugro, Ikon Science, Woodside, Shell, Outer Rim Exploration Services, DownUnder Geosolutions, Electro Magnetic Imaging Technology, Geotech Airborne Geophysical Surveys, Independence Group, Rio Tinto, Resource Potentials, Schlumberger, Vortex Geophysics and Newmont Mining. The JGF committee thanks you for your financial support and for your belief in the value of this event.

A big thank you also goes out to the JGF organising committee for all of their hard work in bringing this event together. This year's committee consisted of Amanda Carreno, Daniel Card, Aldo de Rooster, and a bit of help from Craig Gumley – even though he hates to admit it.

For those of you that might be wondering, the next JGF will be held sometime in mid-2013, so stay tuned.

The JGF Committee
Amanda Carreno
Amanda.carreno@woodside.com.au

ASEG WA Branch Airborne EM Workshop: 7 November 2012 – Perth

The WA branch of the ASEG held its *Practical One-Day Workshop on Airborne Electromagnetics* on 7 November in Perth. The workshop was a one-day seminar series targeted at geophysicists and geologists that focussed on practical near-surface and mineral applications of airborne EM.

The event ran at capacity with 150 geoscientists attending from WA, interstate and overseas. Attendees were given an overview of airborne EM methods to start the day. Paul Mutton of Southern Geoscience Consultants reminded us about what we are measuring. Bill Peters then ran through the multitude of airborne EM systems available, survey objectives and design considerations. Finally, ASEG Federal President Kim Frankcombe wrapped up the morning session with a look at data visualisation.

Over the following two sessions, industry geophysicists presented eight mineral and near-surface case studies. These included 'hot off the press' VTEM data over the Abra polymetallic deposit and AEM applied to gold, manganese, uranium, sedimentary-hosted copper and diamond exploration. Camilla Sorensen from the University of Adelaide and Aarhus Geophysics impressed upon the audience the importance of having good quality data if you want good quality models with her talk on hydrogeological applications of AEM. Workshop co-organiser Chris Wijns of First Quantum Minerals presented his use of AEM data for geotechnical and regolith studies over projects in Finland and southern WA.

The final session of the day looked to the future, with presentations from Yusen Ley-Cooper and Tim Munday from the CSIRO. Tim discussed the role AEM will play in identifying distal footprints of large ore systems and the future challenges of exploring under cover. Peter Fullagar wrapped up the day with his presentation on the *Future of AEM*.

This turned out to be a great day, one that had only been made possible with the generous support of our sponsors Fugro Airborne Surveys, Geotech Airborne, GPX Surveys, GroundProbe, UTS Geophysics, SpectremAir, and the CSIRO's Minerals Down Under Flagship, which sponsored a low student registration rate.

The WA branch is looking forward to holding annual workshops focussing on a different geophysical theme each year.

Anne Tomlinson
ASEG WA Branch President

Sponsor area with workshop attendees.

Shane Mule and Heather Carey at the Fugro Airborne Surveys booth.

CSIRO's Tim Munday discussing the challenges of exploring under cover and the role AEM will play.

Peter Fullagar giving his presentation on the Future of AEM.

Gemma King presenting on the use of AEM for manganese exploration at Consolidated Minerals' projects in the Eastern Pilbara.

Update on Geophysical Survey Progress from the Geological Surveys of Queensland, Western Australia, Northern Territory and New South Wales (information current at 5 November 2012)

Data tables showing the continuing acquisition by the States, the Northern Territory and Geoscience Australia of the airborne magnetic, radiometric (Table 1) and gravity data (Table 2 and Figure 1) of the Australian continent. All surveys are being managed by Geoscience Australia (GA).

Table 1. Airborne magnetic and radiometric surveys

Survey name	Client	Contractor	Start flying	Line (km)	Spacing AGL Dir	Area (km^2)	End flying	Final data to GA	Locality diagram (*Preview*)	GADDS release
Grafton – Tenterfield	GSNSW	GPX	16 Jun 11	100 000	250 m 60 m E–W	23 000	100% complete @ 6 Nov 11	TBA	151 – Apr 11 p16	QA/QC of final rad data in progress
West Kimberley	GSWA	Aeroquest	29 Jun 11	134 000	800 m 60 m N–S. Charnley: 200 m 50 m N–S	42 000	100.0% complete @ 11 Dec 11	TBA	150 – Feb 11 p20	Data released via GADDS on 25 October 2012
Perth Basin South (Perth Basin 2)	GSWA	Fugro	22 Mar 11	88 000	400 m 60 m E–W	27 500	100% complete @ 23 Dec 11	TBA	150 – Feb 11 p20	QA/QC of final data in progress
South Pilbara	GSWA	GPX	14 May 12	136 000	400 m 60 m N–S	42 500	63.9% complete @ 4 Nov 12	TBA	150 – Feb 11 p21	TBA
Carnarvon Basin South (Carnarvon Basin 2)	GSWA	GPX	TBA	128 000	400 m 60 m E–W	40 000	TBA	TBA	150 – Feb 11 p21	Data released via GADDS on 11 October 2012
Cape Leeuwin – Collie (South West 3)	GSWA	Fugro	25 Mar 11	105 000	200/400 m 50/60 m E–W	25 000	100% complete @ 23 Dec 11	TBA	150 – Feb 11 p22	Data from the Collie area released via GADDS on 6 September 2012. Data processing for Cape Leeuwin is ongoing
Mt Barker (South West 4)	GSWA	GPX	24 Apr 11	120 000	200 m 50 m N–S	20 000	87% complete @ 4 Nov 12	TBA	150 – Feb 11 p22	TBA
Galilee	GSQ	Aeroquest	11 Aug 11	125 959	400 m 80 m E–W	44 530	100% complete @ 10 Jun 12	TBA	151 – Apr 11 p15	TBA
Thomson West	GSQ	Thomson	14 May 11	146 000	400 m 80 m E–W	52 170	100% complete @ 20 May 12	TBA	151 – Apr 11 p15	TBA
Thomson East	GSQ	Thomson	14 May 11	131 100	400 m 80 m E–W	46 730	100% complete @ 20 May 12	TBA	151 – Apr 11 p16	TBA
Thomson Extension	GSQ	Aeroquest	22 Jun 11	47 777	400 m 80 m E–W	16 400	100% complete @ 10 Aug 11	TBA	151 – Apr 11 p16	TBA
Thomson North	GSQ	Thomson	11 Mar 12	21 900	400 m 80 m E–W	7543	100% complete @ 20 May 12	TBA	157 – Apr 12 p32	TBA
Marree	GSSA	UTS	29 Oct 12	130 473	400 m 80 m N–S	46 169	0.1% complete @ 4 Nov 12	TBA	160 – Oct 12 p16	TBA
Widgiemooltha – Norseman	GSWA	Thomson	Est. 12 Nov 12	131 900	100 m 50 m E–W	11 520	TBA	TBA	This issue	TBA

TBA, to be advised.

Table 2. Gravity surveys

Survey name	Client	Contractor	Start survey	No. of stations	Station spacing (km)	Area (km²)	End survey	Final data to GA	Locality diagram (*Preview*)	GADDS release
East Amadeus	NTGS	Atlas Geophysics	26 May 12	7560	4 km regular with infill at 2 km and 1 km	101 090	TBA	TBA	158 – Jun 12 p22	Data released via GADDS on 17 September 2012
Esperance	GSWA	TBA	TBA	TBA	2.5 km and 1 km along roads/tracks	TBA	TBA	TBA	158 – Jun 12 p23	TBA
West Murchison	GSWA	Atlas Geophysics	2 Sep 12	11 897	2.5 km regular	TBA	85.8% complete @ 4 Nov 12	TBA	158 – Jun 12 p22	TBA

TBA, to be advised.

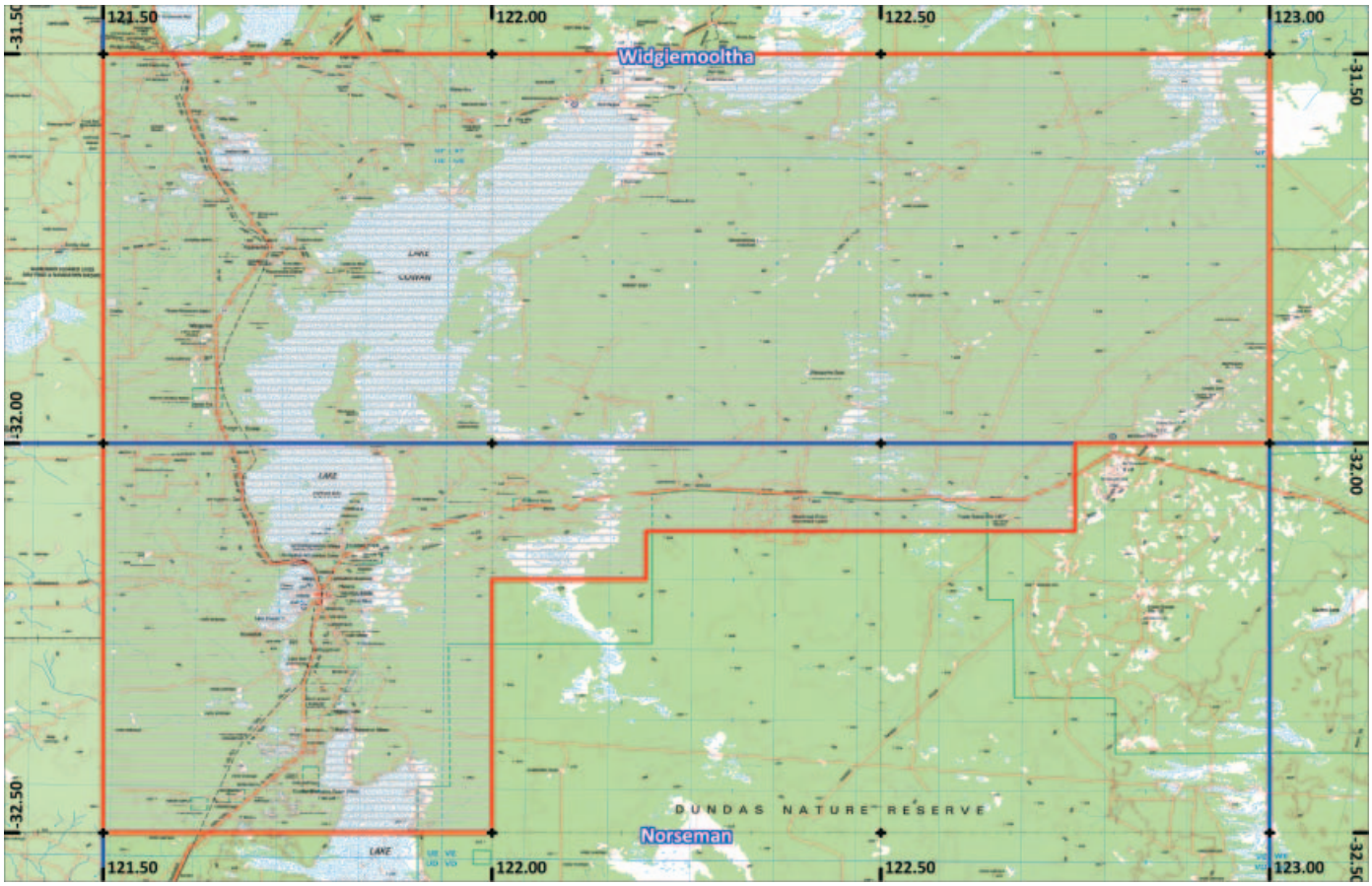

Fig.1. *Locality diagram outlining the Widgiemooltha airborne magnetic/radiometric survey.*

Airborne geophysical data release

On 12 November 2012, the Geological Survey of Queensland (GSQ) released regional airborne magnetic and radiometric data for three areas in southern and central Queensland.

The Thomson and Thomson Extension Surveys were conducted in south-western Queensland (Figure 1). These surveys extended over a large part of a geological terrane known as the Thomson Orogen. The northern exposed margin of this geological terrane hosts major mineral deposits, including the world-class Charters Towers Goldfield. The surveyed areas are considered to be prospective for several types of mineral resources, including major porphyry and other intrusion-related copper and gold deposits. In the survey areas, prospective geological formations are covered by barren sedimentary and volcanic rocks and remain poorly explored.

The Galilee Survey covered a large part of the central Galilee Basin – an emerging major energy resource province in central Queensland. The surveyed area is centred on the town of Muttaburra in central Queensland (Figure 2). The new geophysical data will be a valuable guide for future energy resource exploration, including the search for new coal, coal seam gas and geothermal resources.

Data collection for these surveys involved acquisition of over 460 000 line km of airborne data covering more than 165 000 km^2. The data was collected at 400 m line spacing in an east-west direction. Commissioned by GSQ, and run in association with Geoscience Australia, the Thomson Survey was conducted by Thomson Aviation and the Thomson Extension and Galilee Surveys were conducted by Aeroquest Airborne.

The data was collected from May 2011 to June 2012 as part of the Queensland Government's $18 million Greenfields 2020 Program, which aims to encourage and support mineral and energy exploration in poorly explored parts of the state. These geophysical surveys extend the modern airborne magnetic and radiometric coverage of Queensland to approximately 95% of the state. The high quality regional airborne magnetic and radiometric coverage of Queensland has increased by over 50% in the past 6 years.

The new magnetic and radiometric data is now available from the GSQ Sales Centre located at Level 10, 119 Charlotte Street, Brisbane City, or can be ordered online from sales@dnrm.qld.gov.au. The data is also available for free download from the Geoscience Australia's Geophysical Archive Data Delivery System website (www.geoscience.gov.au/gadds).

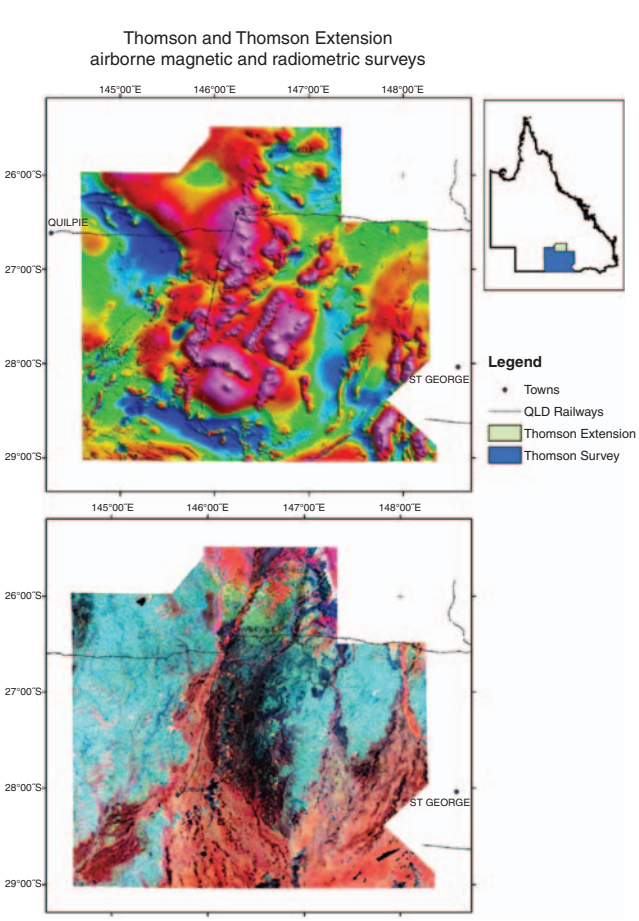

Fig. 1. *Magnetic and radiometric data for the Thomson and Thomson Extension surveys.*

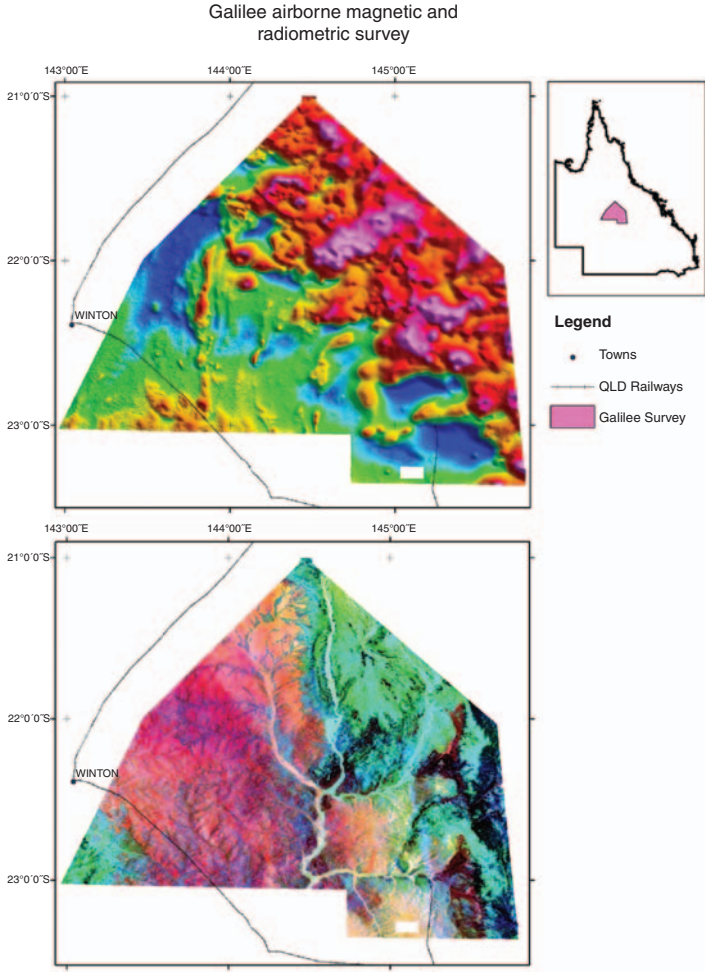

Fig. 2. *Magnetic and radiometric data for the Galilee survey.*

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Magnetotellurics for unconformity-related uranium exploration in the Cariewerloo Basin, South Australia

The Cariewerloo Basin is located on the eastern margin of the Gawler Craton, South Australia (Figure 1). The basin has been identified as prospective for unconformity-related uranium, exhibiting many of the criteria associated with this mineralisation model (Fairclough, 2006). Since 2009, the Geological Survey of South Australia (GSSA) has conducted a number of investigations in the region, including lithostratigraphic logging, HyLogger spectral analysis, AEM surveying and 3D modeling (Wilson *et al*., 2010). In 2012 GSSA supported an Adelaide University Honour's project to test the viability of magnetotelluric (MT) techniques for unconformity-related uranium exploration.

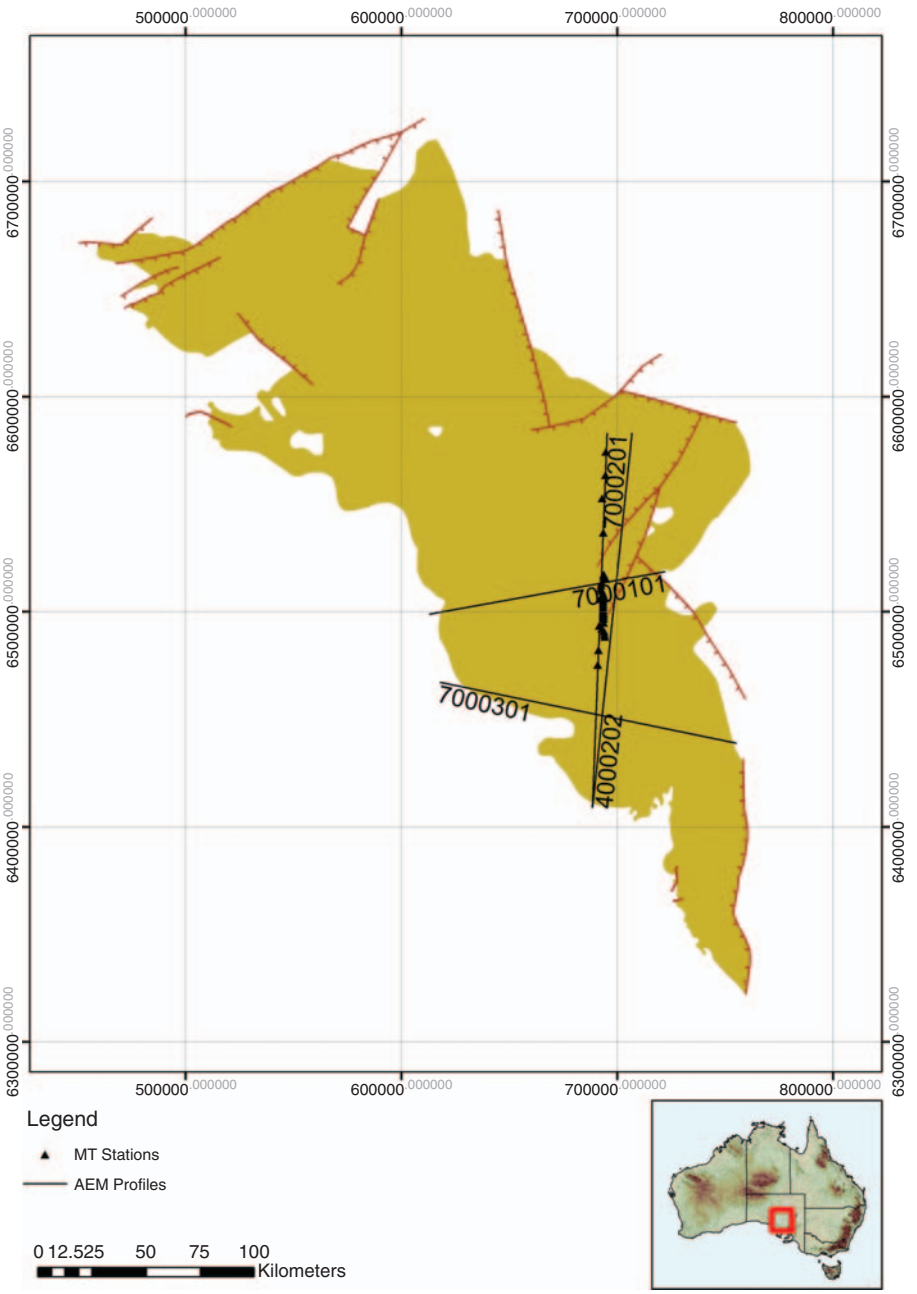

Fig. 1. *Location of Cariewerloo Basin with AEM flightlines and MT sites shown.*

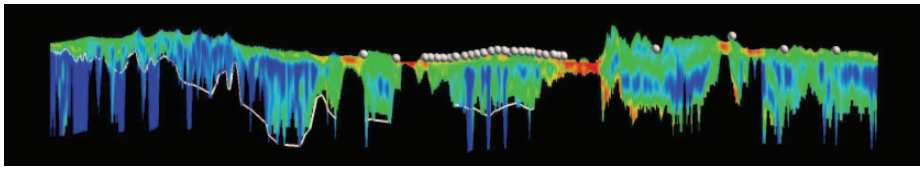

Fig. 2. *AEM line 7000201 Geoscience Australia Layered Earth Inversion (hot colours are low resistivity, cold colours are high resistivity). The white line is the unconformity surface interpretation and the white spheres are the location of MT sites. The section is approximately 175 km long and 600 m deep (vertical exaggeration 50 times) and is viewed from the east; the northern end of the line is to the right.*

Unconformity-related uranium deposits generally lie in close proximity to the unconformity surface. One of the key inputs in exploring for this style of mineralisation is an understanding of subsurface geometry and location of the unconformity. As part of the Cariewerloo Basin project four Tempest AEM lines (Figure 1) were flown to test if AEM could penetrate the salt dominated cover sediments and image the unconformity surface. This proved partially successful, with a conductive boundary associated with the unconformity imaged in the southern portion of the basin (Figure 2). This boundary was lost in the northeast of the basin where the sediments overlying the unconformity thicken to greater than 500 m.

A magnetotelluric survey was conducted in June 2012 in an attempt to image the unconformity surface in the northeast portion of the Cariewerloo Basin (Crowe, 2012). Eight Auscope broadband MT instruments were used to collect data at 29 sites using a sample rate of 1000 Hz. The MT data was modeled using the OCCAM2D algorithm of deGroot-Hedlin and Constable (1993), the final model incorporating the AEM data as a-priori information.

Figure 3 shows the AEM constrained MT model overlain by a geological interpretation. The model imaged the conductive anomaly associated with the unconformity surface at depths of approximately 600 m. Two faults identified within the model are consistent with known faults in the region. Within the deeper model two regions of decreased resistivity are visible, and are possible palaeo-fluid pathways.

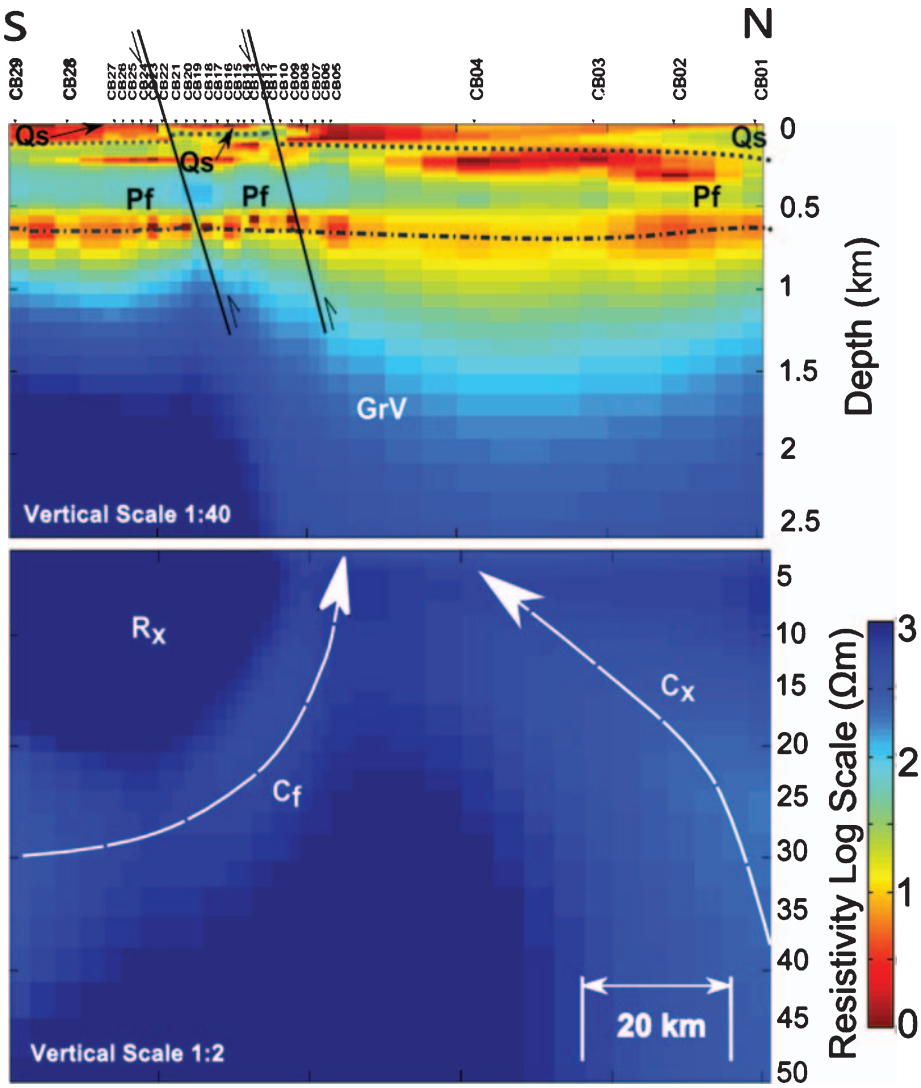

Fig. 3. *Geological interpretation overlaying the MT model with AEM a-priori information: Qs indicates Quaternary sediments and Adelaidean sequences; Pf is the Pandurra Formation and GRV is the Gawler Range Volcanics; Rx is an anomalous reisistive body and Cf and Cx are regions of lower resistivity interpreted as palaeo fluid paths; F1 and F2 are faults offsetting Qs and Pf. The unconformity surface at the base of the Pandurra is highlighted by the dashed line.*

This work has shown that MT is an effective tool for imaging basement in regions of conductive cover. Within the Cariewerloo Basin the MT survey successfully identified the unconformity surface; however, detailed resolution was not possible due to the wide station spacing. The MT data collected through this survey will become available for download through the electrical techniques layer in SARIG in the near future.

For further information please contact Tania Dhu (tania.dhu@sa.gov.au).

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Teaching Earth Science through an interdisciplinary scientific studies framework

Bronte Nicholls

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At the Australian Science and Mathematics School (ASMS), science is 'taught' quite differently to a traditional subject silo approach. Not only is the curriculum different, so are the underpinning pedagogical principles.

The learning programs at the ASMS are built around the following key principles:

- New sciences: emerging areas of science such as nanotechnology, biotechnology, polymer science, robotics and communication science are incorporated into the school curriculum;
- Inquiry learning: students engage in deep study in personal projects of major significance, especially through problem-based and inquiry-based learning approaches;
- Interdisciplinary curriculum: programs with a focus on scientific and mathematical processes in ways that are closely linked with learning from all areas of study;
- Authentic experience: students study real work ideas, problems and issues to make connections within their learning that are meaningful to them in their present and possible future lives;
- Engagement and retention: increased participation and success of senior secondary students in science, mathematics, and related technologies transforms students' attitudes to science and mathematics as career pathways.

Students begin their studies at the school in Year 10, and enter the Central Studies programs in combined Year 10 and 11 classes of approximately 24 students. Teachers work in teams to develop and deliver the curriculum. There are three Central Studies presented in each semester over a 2 year cycle.

The interdisciplinary approach means that students do not study the traditional science subjects in 'silos', rather through unique courses organised around a Fertile Question that drives the students' thinking. Big ideas in science, including concepts from the traditional disciplines of Chemistry, Physics, Biology, Psychology and Geology are brought together in the Central Studies. During 2012 the students began the year with two science-based studies, Biodiversity and Nanotechnology, and a maths-based study, Order and Chaos, with English embedded in the science programs and Philosophy in both the Maths and Science programs.

The Biodiversity program had as its Fertile Question – Does Humanity control diversity? This involved students' developing a deep understanding of the diversity of life on Earth through the role of evolution in the development of species. Major areas of investigation included geological time, natural selection and Earth processes such as plate tectonics, dating methods and mass extinctions. Learning activities included a major field investigation to Hallett Cove Conservation Park where evidence of climate change and plate tectonics could be observed in the field.

In the second semester, the students have been studying Earth and Cosmos as one of the science-based Central Studies, with the Fertile Question – Where lies the final frontier? This study explores the structure and size of the universe, understandings of time and space, compositions of planets, evolution of the Earth's atmosphere, oceans and geological formations, and space exploration. This year, a unit around Geophysics and Mining Issues was introduced to investigate how physical features of Earth such as magnetism, behaviour of seismic waves and gravitational variances can be used to explore for Earth resources.

This innovative approach to teaching science means that approximately 240 Year 10 and 11 students are exposed to the Central Studies programs each year – in 2012 approximately one-fifth of this program involved students developing an understanding of Earth Science concepts. They do this in an authentic, interdisciplinary learning environment using inquiry to drive their learning. The result is high levels of engagement and retention, with over 90% of Year 12 students going on to university studies. Petroleum Engineering and Geophysics attracted approximately six students in 2012 and similar numbers have indicated these as university preferences for 2013.

The ASMS is recognised for its leadership of innovation and reform of learning and teaching in science and mathematics, so the introduction of the International Earth Science Olympiad (IESO) into the school's activities in 2011 was a way to promote Earth Science to students within the school. A small group of students indicated an interest in the event and worked hard to learn the international syllabus during first semester of 2011. From this group, four students were selected to represent Australia at the 5th IESO in Modena, Italy, in September. This was the first step to promoting the event. In 2012, schools involved with Teaching Earth Science Education Program and Geoscience Pathways were invited to nominate students for the team. The Geology teacher, Wally Pillen, from Yankalilla Area School, a small rural school on the southern Fleurieu Peninsula in South Australia indicated that he and some of his students might be interested. The final team for the 6th IESO in Olavarria, Argentina, consisted of Wally, two students from Yankalilla Area School, two students from the ASMS and me. The hope is to grow interest from organisations and companies to secure sponsorship to run a national event in 2013 with a team for the 2014 IESO to be selected from Year 10 and 11 students Australia wide.

A Year 11 student perspective of the 6th International Earth Science Olympiad, Olavarria, Argentina, 8–12 October 2012

Darcy Cathro

Year 11 Student
Australian Science and Mathematics School (ASMS), Flinders University, South Australia

The second Australian team to participate in the International Earth Science Olympiad (IESO):

Students: Clara Tate, Darcy Cathro, Year 11 students from the Australian Science and Mathematics School, and Maddi Mellow and Luke Bartlett from Yankalilla Area School, South Australia.

The Australian ASMS IESO team departing Adelaide Airport: (L to R) Bronte Nicholls, Clara Tate, Maddi Mellow, Luke Bartlett, Darcy Cathro and Wally Pillen (photograph by Helen Pillen).

Mentors: Dr Bronte Nicholls (Australian Science and Mathematics School), Mr Wally Pillen (Yankalilla Area School).

Sponsors: Geological Society of Australia – Federal Division, Australian Society of Exploration Geophysicists, Petroleum Exploration Society of Australia, Beach Energy, Australian Institute of Geoscientists (SA Branch), Resource and Engineering Skills Alliance, Flinders University Centre for Science Education in the 21st Century.

Awards

Individual competition: Bronze medal – Luke Bartlett

Country team poster competition: 3rd prize

International Team Field Investigation (ITFI): Most Cooperative Investigation – Winning team member: Luke Bartlett

Honourable mention: Best solutions – Team member: Clara Tate

Background

In October 2012, two students from the Australian Science and Mathematics School and two from Yankalilla Area School were selected to travel to Argentina in order to compete in the 6th IESO. It was an opportunity for individuals with a passion for earth science to come together from 17 countries to share our knowledge and ideas on the earth sciences.

Preparing for the IESO was a joint effort by team members. A new event was added to the IESO this year – the poster competition where students describe a site of geological significance in their country. Because we came from two different schools in different parts of South Australia, we first had to agree on a geological site to investigate. We settled on Hallett Cove given the excellent evidence of Permian glaciation. We went on a field trip to the site then worked on our poster over the next few weeks. We were very proud to have our poster win 3rd prize. Because we were not from the same school we had to do a lot of work on our own. Coming together as a team on the flight over enabled us to work through past exams and clarify concepts.

The ASMS IESO team departing Adelaide bound for Sydney, the first leg of the journey to Argentina: (L to R) Maddi Mellow, Darcy Cathro and Luke Bartlett (photograph by Wally Pillen).

The following report is my perspective of this event and the impact the experience had on me.

As with the majority of our team, this was my first time overseas – matched with the unknown of the IESO, the trip seemed quite daunting. But within the first few days in Olavarria I couldn't understand why I had ever had doubts.

The first day's main events were the Opening Ceremony and the zoo visit. We walked to the Teatro Municipal of Olavarria and sat in the large hall to watch proceedings. It was firstly a chance to see a little of each team as the participating countries flags were brought out. After taking this in, we were given a taste of Argentinian culture – through a tango dance and numerous songs by different bands and singers. This is when I began to really feel like I was overseas, seeing the change in scenery and ambience in the streets plus the different customs shown on stage.

The ceremony also included a lecture from a Planetary Geologist. I found this very interesting; particularly in the way two seemingly different areas of Earth science could be linked. I soon learnt this is part of what the Olympiad aims to do and it really made me think differently about careers in these areas!

The trip to the Zoo was more of a touristy trip but it was a good chance to bond with mentors and fellow competitors alike, while learning even more about Argentina – in this case the animals.

Day 2 was time for the ITFI. Speaking to old scholars of the Olympiad from my school, I felt this could be one of the highlights of the Olympiad. With this in my mind I was looking forward to the day and was pleased to be matched

6th IESO Argentina Opening ceremony: (left) Luke Bartlett, flag bearer for the Australian team; (right) flag bearers from each of the 17 participating countries (photograph by Wally Pillen).

up with students from Kuwait, Ukraine, Spain, Italy and Germany – all of which turned out to be great contributors. Later that day was the poster exhibition where we set up our countries flag, map and team poster.

Everyone assumed a role in the ITFI groups relatively quickly and I knew having English as my first language meant that I would have to be somewhat of a leader. But I soon discovered three of my team mates had very good English and thus one of them seemed to lead more while I helped with grammar and presentation. In the field, one member was a good artist who drew sketches of the surrounds and took photographs. Following the field investigation I got a chance to speak to some Olavarrian high school students and learnt about them and their culture, also of how we were to spend more time with them during the week. The following night we observed each other's posters.

Local teachers and mentors observing flood damage along the Tapalque River, Olavarria, Argentina, site of the ITFI (photograph by Sabine Seidl).

The ASMS IESO team with their poster display and poster acknowledging sponsors: (L to R) Luke Bartlett, Darcy Cathro, Maddi Mellow with Clara Tate at the rear (photograph by Sabine Seidl).

Day 3 we went to the high school to begin the exams. Today was the theory component and hearing about other countries preparation made me less confident. In the end I still felt reasonably pleased with the Geosphere section because this I had periodically

Australian team poster display, foyer of the student's hotel in Olavarria (photograph by Sabine Seidl).

studied at school. Day 4 we went back to the school, this time for the practical examinations. Unfortunately by the end of these I was even less confident with results. I had expected the practical components to be much more hands on problem solving. Instead, the majority involved using formulas to work out problems, just like what I imagine a normal theory test but nonetheless I felt that I had done a reasonable job in the Geosphere section.

Final instructions for students competing in the IESO before the written examination – local school, Olavarria (photograph by Sabine Seidl).

On each of these days 3 and 4, after each test we went by bus with our mentors and our friends of the Olavarrian high school to a number of locations, including: a rare red granite quarry; inside a ceramic tile factory; and visited a site with an interesting sedimentary sequence, which included stromatolites.

For me this was probably the most enjoyable component of the Olympiad as it blended all of my favourite experiences into a few trips. We got to bond with the local students constantly, while experiencing their culture, and also saw some amazing scientific sites that couldn't be seen anywhere else in the world.

After all these events unfolded it came to the last day, which was very busy. This was another great day that topped off an incredible week. We presented our field investigation, which was quite nerve racking, being in front of 200 people. But my group was very successful and I felt all points were put across well. Following this we saw who received the medals. Luke scored highest from the Australian team and thus received a Bronze, while Korean, Japanese and Taiwanese students took out the seven gold medals. It was good to see them happy with their results after all the work they had seemed to put into studying.

Following this, a number of country teams presented an aspect of their culture through dance or song. The celebrations finished with a 'Pizza Party' before midnight when our bus for the 5-hour drive back to Buenos Aires left.

Now the Olympiad had finished we were to move on to Iguazu Falls to experience even more of what Argentina had to offer. It was a good chance to reflect on all I had learnt/experienced in the previous week and even add to it as we visited an amethyst mine, observed basalt flows and I saw my first wonder of the world, Iguazu Falls, which was one of the most amazing experiences of my life.

The ASMS IESO team during the visit to Wanda Amethyst Mine – Misiones Province, Argentina (photograph by Wally Pillen).

The students of the Australian IESO team enjoying the 'beach' on San Martin Island, Iguazu Falls, Argentina, part of the post-Olympiad tour: (L to R) Darcy Cathro, Luke Bartlett, Clara Tate and Maddi Mellow (photograph by Wally Pillen).

So throughout the 14 days we spent in Argentina I was learning on a number of levels; whether it was about safe travelling, food, the local economy and political situation, it also felt like I learnt

a lot about myself. My biggest learning curve came in the area of Earth Sciences. Spending time with university mentors studying earth sciences, teachers who had studied and teach earth sciences along with students who wanted to study earth sciences really gave me a brand new perspective on this area as a career path. I now see an area that gives fresh opportunities to work with wonderful people and explore the world.

Summary of the Australian team IESO and extension activities

Date	Student activities
6 Oct	Travel from Adelaide and arrive in Buenos Aires
7 Oct	Travel from Buenos Aires to Olavarria
8 Oct	Registration and Opening Ceremony Visit to the Zoo and Science Museum
9 Oct	International Team Field Investigation Map and poster exhibition
10 Oct	Written exam Visit a red granite quarry
11 Oct	Practical exam Visit a geological site
12 Oct	Presentations of International Field Investigations Closing and Awards ceremony
13 Oct	Travel to Buenos Aires Travel to Iguazu
14–17 Oct	Field trip to Iguazu Falls and surrounds including Wanda Amethyst Mine
17–19 Oct	Travel to Buenos Aires Tour of Buenos Aires
20 Oct	Travel from Buenos Aires to Adelaide

New exchange format for electrical survey data to be known as 'ASEG-ESF'

Over the past 6 months, the ASEG Technical Standards Committee (TSC) developed a format standard for electrical survey data to facilitate the exchange of data between individuals and organisations.

The standard is for all electrical survey types (EM, IP, MMR, CSAMT, MALM, SP, ERI, AMT and MT) covering borehole, surface and airborne survey modes. It was prepared under a special TSC sub-committee – the IP/TEM Format Group led by Kim Frankcombe – which consisted of 18 members prominent in the IP and TEM industry. After several draft formats conducted over several months, their recommendations have now been endorsed by the TSC.

These new standard formats are considered to be flexible enough to allow for unforeseen changes in instrument output over time; while the ASCII format ensures platform independence and durability. Examples of use of this new format are included at the end of the format description.

The TSC has recommended, with FEDEX approval, that this new standard be adopted and known henceforth as the 'ASEG-ESF'. It is expected that all geological surveys conducted by Australian and international organisations will adopt this standard for submission/acceptance of electrical data; this standard will compliment the widely internationally accepted ASEG-GDF standard.

In the ensuing months the TSC, in collaboration with the ASEG Webmaster, will update the *ASEG Technical Standards* section of the ASEG web page to promote this new and innovative standard.

David Robson
Chair of the ASEG Technical Standards Committee

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On the hunt for suture zones in South India

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Each year, the Australian Society of Exploration Geophysicists (ASEG) is kind enough to award travel scholarships to postgraduate students that wish to attend conferences, thus giving them the opportunity to present their research. This year I was lucky enough to have been awarded the $1500 travel scholarship in order to attend the International Geological Congress (IGC) in Brisbane.

In 2008, when I decided to do a Doctorate of Philosophy (PhD), I never dreamed geology could be so exciting. My interests have always been focussed on tectonic reconstructions in high-grade Precambrian terranes, so when I saw the postgraduate project offered by Associate Professor Alan Collins (The University of Adelaide) titled: '*The tectonic evolution of Southern India'*, I couldn't resist.

The Southern Granulite Terrane of India (SGT) is located at the apex of the Indian subcontinent. This terrane is dominated by granulite facies rocks and is separated from the largely greenschist to amphibolite facies Archaean (Dharwar Craton) rocks to the north by a series of anastomosing crustal scale shear zones (Drury *et al*., 1984) here termed the Palghat-Cauvery Shear System (PCSS; Figure 1). These shear zones represent a zone of reworking of the SGT during the latest Neoproterozoic (500–550 Ma) that is associated with the final stages of the Gondwana amalgamation (Collins *et al*., 2007; Clark *et al*., 2009; Santosh *et al*., 2009; Plavsa *et al*., 2012). In particular, the southernmost Palghat Cauvery Shear Zone (PCSZ) is thought to represent the suture zone that resulted in the closure of the Mozambique Ocean between the Indian and East African (Congo/Tanzania/Bangweulu) cratons around 500 million years ago (Collins and Pisarevsky, 2005; Sato *et al*., 2011; Santosh *et al*., 2012).

Geophysical surveys (including seismic, MT and gravity data) show a southward deepening of the Moho across the PCSS and provide further evidence of crustal thickening in this domain (Mishra and Vijaya Kumar, 2005; Singh *et al*., 2006; Naganjaneyulu and Santosh, 2010). However, ambiguity still exists on the exact location of this suture zone as isotopic data

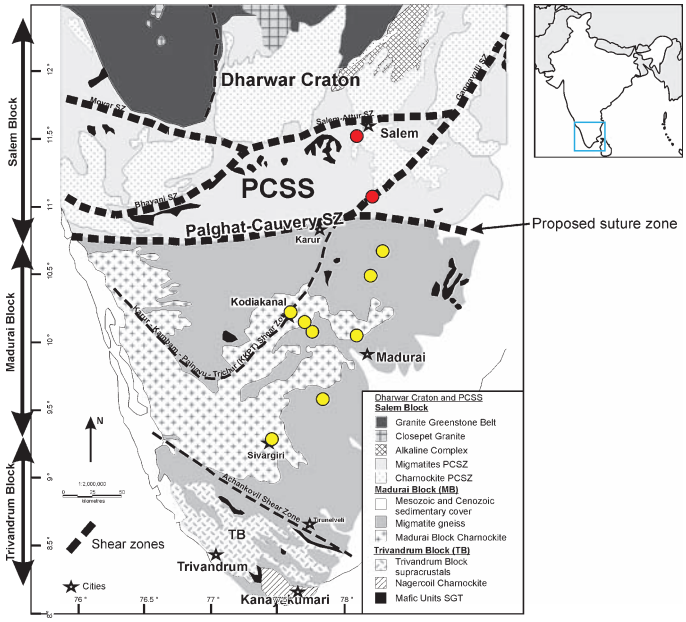
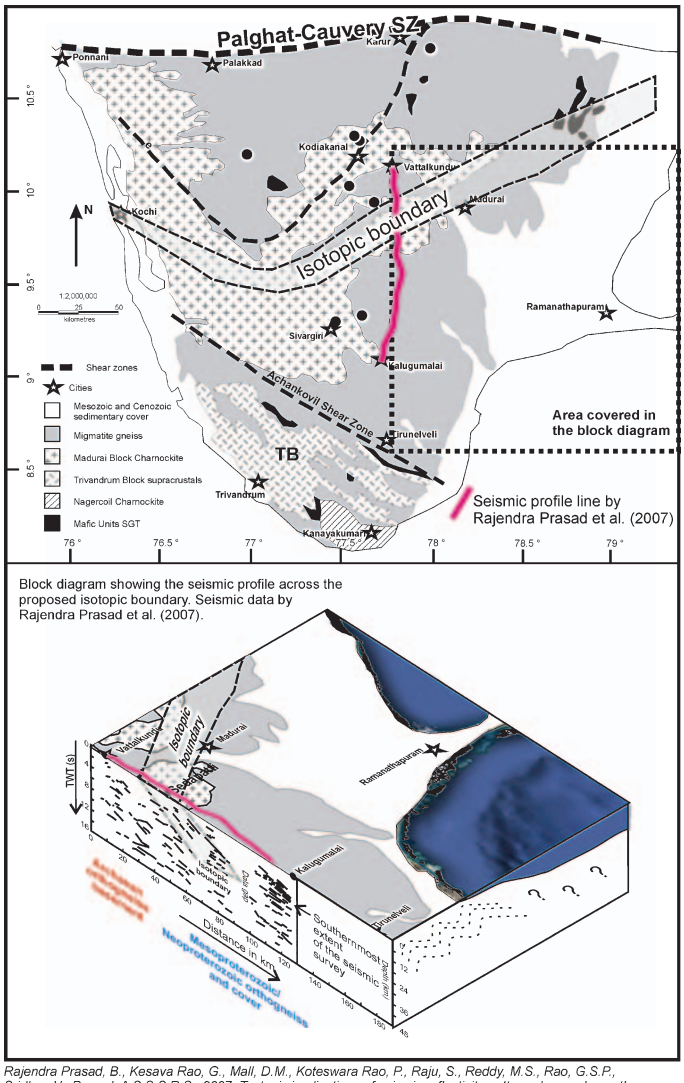


Fig. 1. *Geological map of the Southern Granulite Terrane of India (SGT). The filled circles show locations of the metasedimentary samples analysed in my study. Red circles are metasediments north of the proposed suture zone (Palghat-Cauvery SZ) and the yellow circles are metasediments south of the proposed suture zone.*

show similarities in the ages of igneous rocks (~2.5–2.7 Ga) on either side the proposed suture zone (Harris *et al*., 1994; Bhaskar Rao *et al*., 2003; Ghosh *et al*., 2004; Plavsa *et al*., 2012). Furthermore, geochemical and structural data (and lack thereof) only add to the ambiguity associated with the exact location of the suture zone and its continuation into the neighbouring continental blocks in Gondwana reconstructions.

Working in high-grade terranes is not exactly a walk in the park as many geologists found out over the years. Isotopic systems tend to get reset due to high temperatures and pressures (of up to 1000°C and 12 kbars in SGT, Braun and Appel, 2006; Shimpo *et al*., 2006; Tsunogae *et al*., 2008; Clark *et al*., 2009), structural geology becomes very complex due to its highly ductile nature and not one, but a number of deformational events overprinting each other (Ghosh *et al*., 2004; Cenki and Kriegsman, 2005). However, the resilience of one mineral under such extreme conditions can still provide some insight into the nature of the original protolith and that mineral is zircon.

To find this enigmatic suture zone, or to prove/disprove its existence, I have decided to carry out detrital provenance studies of zircons from metasediments on either side of the proposed suture zone using U-Pb geochronology and Hf isotope studies of detrital zircons. The isotopic analyses were carried out using Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICPMS) and multi collector (MC) LA-ICPMS for U-Pb and Hf isotopic studies, respectively. The U-Pb and Hf isotope duo works extremely well as not only is the age of the detritus in metasediments determined, but also Hf isotopes provide information on whether that age represents crust derived from the mantle (juvenile) or reworking of older crustal material (evolved).



Rajendra Prasad, B., Kesava Rao, G., Mall, D.M., Koteswara Rao, P., Raju, S., Reddy, M.S., Rao, G.S.P., Sridher, V., Prasad, A.S.S.S.R.S., 2007. Tectonic implications of seismic reflectivity pattern observed over the Precambrian Southern Granulite Terrain, India. Precambrian Research 153, 1-10.

Fig. 2. *Seismic reflection survey showing a series of south dipping reflectors interpreted to represent basement/cover relationship between the Archaean basement and largely Mesoproterozoic/Neoproterozoic metasediments to the south. Figure as published in Plavsa* et al. *(2012).*

Numerous arduous hours sitting on the laser (LAICPMS) shooting zircons well into the night in the basement of Adelaide Microscopy (The University of Adelaide) as well as days spent on the Waite Campus (CSIRO) mass spectrometers analysing Hf isotopes in zircons were absolutely worth it after data was processed. The results show that metasediments north of the proposed suture zone (PCSZ) are dominated by Archaean detritus with largely juvenile signatures most likely derived from the basement rocks they were deposited on, while metasediments south of the PCSZ have ages varying between 0.6–3.1 Ga and Hf isotopic evolution that shows detritus derived from juvenile Neoproterozoic and reworked Archaean terranes, most akin to the rocks of the East African (Congo/Tanzania/Bangweulu) cratons. Furthermore, the metasediments south of the PCSZ show a basement/cover relationship as determined from geochronological, isotopic and seismic data showing a series of south dipping reflectors (Figure 2; Rajendra Prasad *et al.*, 2007). The disparity of the detrital provenance data from these metasediments confirm that until the latest Neoproterozoic, the basement rocks of the metasediments north of the PCSZ were proximal to the Dharwar (Indian) Craton, while those to the south were proximal to the East African Craton.

While making breakthrough research is exciting, what is even more so is presenting it. Thanks to the ASEG I have had the opportunity to present my research at the IGC held in Brisbane in August earlier this year. With over 6000 delegates attending the congress, it was amazing to see the diversity of topics and scientific research that is currently taking place all over the world. I sincerely hope that my small contribution has helped in unravelling part of the mystery that is our planet.

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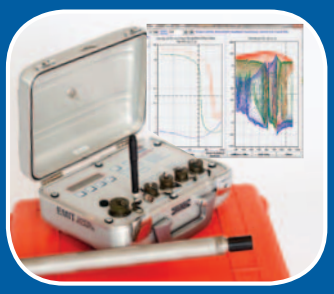

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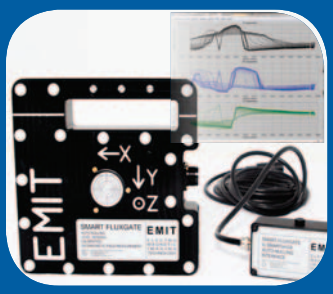

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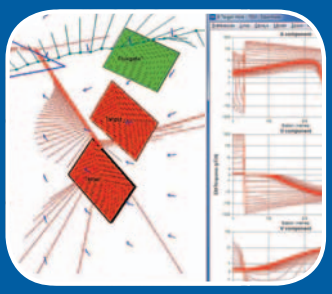

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