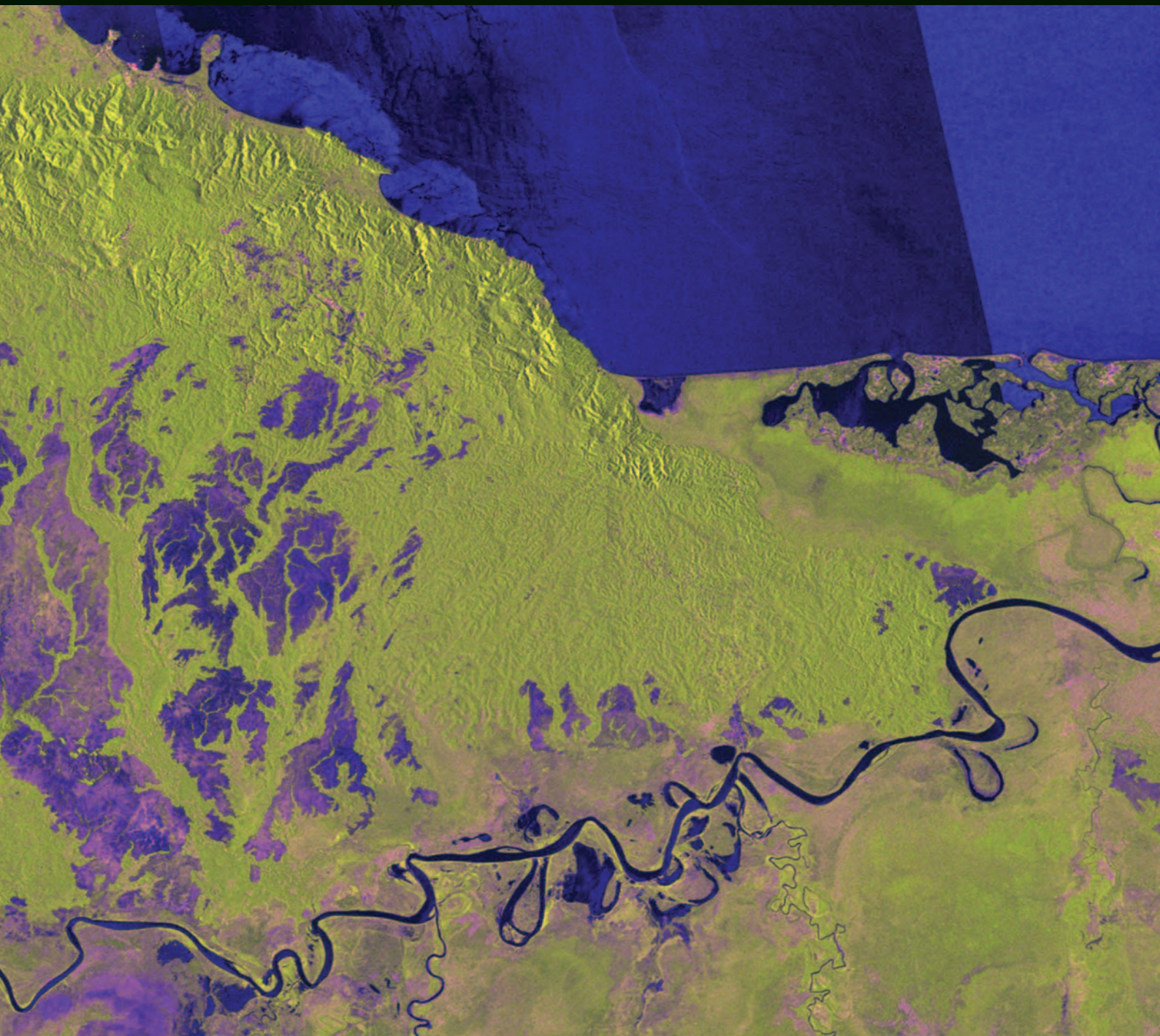


# P **PREVIEW**

AUSTRALIAN SOCIETY OF EXPLORATION GEOPHYSICISTS



## NEWS AND COMMENTARY

Farewell to Peter Elliott  
23rd IGC: ASEG-PESA 2013  
call for papers

## FEATURE ARTICLES

The mining boom: is it really over?  
Satellite imagery: the range and value  
FIFO: sex workers, STDs and myth







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John A. Theodoridis

It would be proper to commence this issue of *Preview* with a tribute to the late Dr Peter John Elliott. Although we weren't acquainted, I found myself pausing and reflecting over a passage in his obituary (see p. 9): amongst his countless achievements in life, Dr Elliott raised the early ASEG news letter to periodical status giving rise to *Preview* itself and, by default, became its first editor.

One only needs to Google their newspaper of choice, and run a search of its contents for 'mining boom', to unleash a string of headlines declaring the boom to be over with follow ups of post-boom

investment strategies. Without falling into the tar pit that is politics, I wonder how many of our readers share my slight bemusement when politicians oversimplify the complexities of the industry for sake of expediency in policy delivery. If I may quip – it seems that ignorance is of high value in political currency. This question is explored as David Denham investigates the health of the mining sector in his article: 'Is the boom really over?' (see p. 17).

Derived from a well received presentation held in Brisbane earlier this year, Sylvia Michael offers us a concise walkthrough in the types of high quality satellite imagery currently available and some of the applications that utilise this wonderful imagery (see p. 20).

Without doubt one of the most exciting aspects of being Editor is to receive emails from researchers eager to share their work and enthusiasm; more so when a submission comes from those whose discipline resides outside of mainstream geophysics – yet still engage in research that is relevant to geophysics proper. Such disciplinary transgressions

are often termed the cross-fertilisation of ideas – or the spice of innovation. So you can imagine my excitement when an opportunity came to review a submission originating from the social sciences canvassing the modern phenomena of fly-in fly-out (FIFO) workers (see p. 26). What is shaping up to be a three-part series by John Scott, together with colleague Victor Minichiello and research student Catherine MacPhail – University of New England, the first of these articles will challenge populist notions – emanating from politicians and residents alike – that bored and cashed up FIFO workers are directly responsible for increases in STI and HIV infection rates. The remaining two articles will explore issues surrounding assimilation and integration of FIFO workers – reluctance in welcoming outsiders is an all too human story, and finally FIFO amenities. Be warned: as a TEM anomaly is to a geophysicist, so too taboo is to a social scientist – curiosities to be examined; some may find these articles both confronting and challenging, but all shall find them refreshingly truthful.

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I'll start this edition's President's Piece with an acknowledgement to Peter Elliott. As you know, Pete was tragically killed when his survey plane crashed in Kalimantan in August. The society has lost a great contributor and the geophysics business has lost another colourful character. Listening to Pete's family at his funeral it was driven home to me that for a little bloke he packed a lot into his life. He symbolised the old adage, 'If you are looking for someone to do a job for you, look for someone who is busy'.

The new website is still not with us and unfortunately, probably won't be by the time you receive this. Carina is pushing the developer to have it ready in time for dues renewal process otherwise we may have to defer the launch until the bulk of the online dues payments are completed.

Talking of dues, the Fed Ex have finally bitten the digital bullet and when you renew your subscription this year you will have the option to receive a paper copy of *Exploration Geophysics* for a little extra cost. Alternatively you can pay less than you did last year and have digital access only. We have decided that until we can resolve a way of protecting advertising revenue that *Preview* will be mailed to all Australian members, but because of the high postage costs, overseas members will have the option to pay extra to receive it or not and pay the same as a local. We have also decided to charge late payers a fee to help cover the cost and wasted time the secretariat and state committees spend each year chasing tardy members. The good news in all this is that if you opt for digital only journal access and pay early your fees will be less than last year. If you live overseas and take the full digital only option you'll be able to shout the bar but wait until I'm around to do it!

At the Brisbane Conference earlier this year the local organising committee softened the Fed Ex up for a reduced financial return from the conference. The society relies heavily on the conferences for its running and the projected results from Brisbane were disappointing and would have seen us spending more than we earned for 3 years in a row. In the long term that would compromise the service we are able to provide to members and the amount we are able to give the Research Foundation. I'm delighted to say that the Brisbane committee under promised and over delivered and have returned the sort of surplus we have come to expect from our conferences. Combined with our share of the surplus from the very successful IGC, also in Brisbane, we will return to the black this year, which is a great relief for all of us on the Fed Ex, particularly our treasurer Reece Foster who on hearing the news announced he was going to Las Vegas for a honeymoon. I'm not implying that there is a connection – yet! Congratulations to the Brisbane committee for delivering in a difficult environment.

That provides a cheap segue for me to mention the SEG convention in Las Vegas scheduled for November. For those in oil there will as always be plenty to do and for those of us in minerals, Mark Shore and the Mining and Geothermal Committee of the SEG have put together a solid programme of talks, workshops, social events and excursions.

Back on this side of the Pacific the Melbourne (pronounced Mel-bin for any of you overseas people thinking of coming and wanting to ensure you have the correct pronunciation) organising committee are moving faster than a warming glacier to bring the next ASEG conference to us. The dates are set for

11–14 August 2013; arinex, the same group involved with Brisbane (pronounced similarly, Bris-bin), have been appointed the professional conference organiser (PCO) and PESA have agreed to co-host the event. Look out for progress updates in future issues of *Preview*.

As forecast in the last edition, the UNCOVER working group have released their vision for exploration in Australia. I encourage you to download a copy from the Australian Academy of Science's website: <http://www.science.org.au/policy/uncover.html/>. The vision lays out what we need in order to make the next round of major discoveries in Australia. What it does not do is suggest how these needs will be achieved. This is the next step and the working group is seeking help from people like us to shape the future programme and provide practical input on how the vision might become a reality. The ASEG will do this in collaboration with other geoscientific bodies to try and focus research where it is needed.



Kim Frankcombe  
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## New ASEG website coming soon... [www.aseg.org.au](http://www.aseg.org.au)

The ASEG Website Committee has been working really hard over the past 12 months to deliver you a new website that will have all of the bells and whistles of our modern age.

Development is in the final stages and we will see the new website launched in stages commencing late October. Hopefully

the new website will be up and running by the time this hard copy of *Preview* has reached your desk.

Contact the ASEG Webmaster, Carina Kemp, for more information. Email: [kemp.carina@gmail.com](mailto:kemp.carina@gmail.com)



## New members

The ASEG extends a warm welcome to 23 new individual members and two new corporate members to the Society (see Table). These memberships were approved at the Federal Executive meetings held in July and August 2012.

Name	Organisation	State/Country	Member grade
Cameron James Adams	Cameco Australia Exploration	WA	Active
Chukwudi Uba Anyanwu	Curtin University	WA	Student
Trent Alan Bowman		NSW	Active
Natasha Bysterveld	University of Adelaide	SA	Student
Daniel Robin Eden	Mira Geoscience	WA	Active
Rommy Angela Fisher	University of Adelaide	SA	Student
Karunakar Gandarapu	Hindustan Zinc Limited	India	Active
Josephine Laura Goonan	Adelaide University	SA	Student
John Mark Graham	Macquarie University	NSW	Student
Aaron John Hollingsworth	Curtin University	WA	Student
Kirsti Karlsson	Geopublishing Ltd	UK	Corporate
Manish Kumar	Rio Tinto	South Africa	Active
Sherwyn Lye	Macquarie University	NSW	Student
John Mitchell	Lightning Nickel	WA	Active
Nathan Taovasi Mosusu	Mineral Resources Authority	PNG	Associate
John Paul Mubita	Curtin University	WA	Student
Austin Oyinkuru Oki	Curtin University	WA	Student
Diana Plavsa	University of Adelaide	SA	Student
Augustinho Rigoti		Brazil	Retired
Tatiana Isabel Rodriguez	Curtin University of Western Australia	WA	Active
Alistair John Stanley	Total Depth Pty Ltd	WA	Active
Timothy Vale	University of South Australia	SA	Student
Liz Winn	Gold and Copper Resources	NSW	Corporate
Rachael Louise Wood	Curtin University	WA	Student
Victor Ziolkowski	GeoEnergy Consultants	QLD	Active



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## Peter John Elliott: 3 September 1954 – 24 August 2012



It is with great sadness that I pass on to you news of Peter's death as a result of an aircraft accident in Kalimantan on Friday 24 August 2012.

Peter was actively involved in the ASEG and will be known to most of you. He served at State Branch level in Victoria (founding Secretary in 1977) and Western Australia (Treasurer 1981 and President 1982) before moving to Adelaide and joining the Federal Executive as Business Manager in 1984 when the Executive started its move away from Sydney. In 1985 he became Honorary Secretary and took on responsibility for publishing the newsletter, which at the time was printed and distributed from Sydney, at considerable cost to the society. Seeing the inefficiency in this, Peter decided to change the format of the newsletter to qualify for periodical status with Australia Post and moved the printing to Adelaide, thereby significantly reducing the cost of the Newsletter. In order to qualify for periodical status with Australia Post the publication had to have a name and thus in January 1986, *Preview* was born. Peter became the first editor of *Preview* and oversaw the production of the first four editions before becoming 1st Vice President of the Society, a position he held for 2 years until the executive moved to Perth. In 2004 after returning to Australia from

living in Indonesia Peter rejoined the Western Australian Branch committee and held a number of roles before signing up for a second term on the Federal Executive in 2007, becoming Federal President the following year. He contributed significantly to the international linkages of the ASEG through his professional contacts with government bodies and geophysics societies in Indonesia and India.

Peter not only gave his time, enthusiasm and energy to the society, he supported the ASEG through Corporate Membership, advertising and most recently, generation of promotional posters for display at overseas conferences where we were represented.

Peter graduated with a BSc(Hons) in Geology and Geophysics from the University of Melbourne (1976). He was later awarded a MSc from the University of Melbourne in 1984, and a PhD from Macquarie University in 1997. His PhD supervisor, Professor James Macnae, said of him:

*Peter managed to complete a PhD in airborne electromagnetics at Macquarie University in his 'spare' time during the 1990s, with very little direct supervision from me. Despite all the full-time pressures of running a very successful business, Peter managed steady progress during the planning, research, data analysis and thesis writing, and easily met all the University deadlines. Peter had the ability, in business and research, to clearly grasp the essence of any problem, and find an efficient solution to it. Our interactions, before, during and after his part-time postgraduate student days were always a pleasure. Mining geophysics has lost an energetic and astute achiever.*

He started his profession as a Cadet Geologist with the Geological Survey of Victoria in 1975 working as a geologist in Regional Mapping for a couple of years and then as a Geophysicist with the newly formed Geophysics Section in the Dept of Mines, Victoria (1977–1980). He later joined the Shell Company (Australia) Ltd in 1981 where he worked as a Regional Geophysicist with the Metals Division (1981–1987). During this time he worked out of Melbourne, Perth and Adelaide. In 1987 Peter left Shell and with Alex Copeland established Search Exploration Services. Peter then moved to Indonesia to set up his own exploration services company, Elliott Geophysics International. The company now has offices in four countries: Australia, Indonesia, India and Philippines. In addition to setting up a multi-national geophysical contracting firm, Peter gave courses in Electrical Geophysics at the University of Adelaide and published more than 20 scientific papers. He held three patents, based around his FlairTem technology, in Canada, USA and Australia.

Our thoughts are with his family as well as the families of the three other men killed in this tragic accident: the pilot – Marshal Basyir, EGI geophysicist – Muhammad Rizal, and Air Force observer Captain Suyoto.

Peter was a caring and considerate person, always ready to assist family and friends in need. He enjoyed field work and it is perhaps of some small comfort that he died doing something he enjoyed, something we would all wish for.

He will be missed by the exploration community and his many friends and acquaintances.

Kim Frankcombe  
President of the Australian Society of  
Exploration Geophysicists

## Australian Capital Territory

Eva Papp, currently a School visitor at ANU's Research School of Earth Sciences, gave a presentation on 3 July dealing with 'The parameter space of the Telegraph equations'. She provided a refresher on EM theory from Maxwell's equations to the Telegraph equations and outlined potentially new and novel applications to the evolution of the universe. Among the 15 or so attendees was a 7 year old who took great pleasure in reproducing Eva's equations and diagrams.

Lucy MacGregor of Rock Solid Images in the UK held her ASEG Distinguished Lecture in Canberra on 3 August – her penultimate stop on a whirlwind tour across Australia that culminated in a Keynote address at the International Geological Congress in Brisbane the following week.

In Canberra, approximately 40 ASEG and PESA members heard Lucy's excellent overview of why seismic doesn't tell you everything. The talk was a great illustration of the necessity for data integration and the clear benefits of utilising integrated data. The talk was also a valuable reminder that no single model

gives all the answers and those misfits between a model and constraining data tell you something. Lucy's talk was also well received by 50 enraptured attendees as a grand finale of the IGC Symposium, 'Putting the geo into geophysics – adding clout through better datasets and joint interpretation'. The ASEG Federal Executive is to be commended for financially backing a lecture tour by a geophysicist of this calibre – the benefits arising from the ASEG's support for Lucy's tour were clear to all.

Hot on the heels of the IGC, Professor Peter Styles came to Canberra on 15 August to present his course, 'Environmental Geophysics: everything you wanted (needed!) to know but were afraid to ask'. Feedback from the 28 attendees, some from interstate, was very positive. Peter was clearly and engaging presenter who covered a wide range of topics in a manner understandable and useful to all. Hopefully this new initiative from the EAGE will continue in the future.

As a further spin-off from the IGC, Judith Sippel from the Helmholtz Centre GFZ Potsdam (Germany) made a quick trip to Canberra on 27 August to speak on 'Data-based 3D models of sedimentary

basins'. Using an example from the Mackenzie–Beaufort Basin off northern Alaska, Judith showed how her group are building gravity-constrained 3D models that are subsequently used to model the temperature distribution in sedimentary basins.

The next event planned for the ACT is a joint-societies Quiz Night on 27 September organised by the local branches of PESA, ASEG, GSA, AusIMM and IAH. By the time this update is published, many ACT geoscientists will no doubt have vastly improved their cross-disciplinary knowledge of the geosciences!

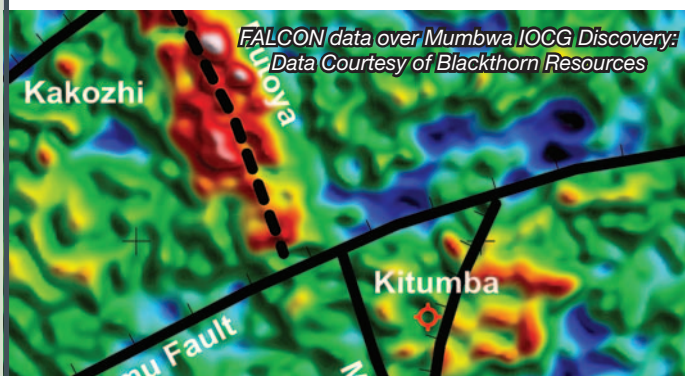
For updates on upcoming events, keep an eye out on the webpage or link yourself to the ASEG on LinkedIn.

*Ron Hackney*

## New South Wales

In July we held our annual dinner. From memory, which I admit is a little fuzzy, it was held in a steakhouse; we ate lots of steak, drank lots of red, and discussed lots of geophysical and non-geophysical topics. We had a good turnout and a great time was had by all.

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In August, James Austin and Dean Hillan from CSIRO spoke on iron oxide copper gold deposits and new methods for modelling self-demagnetisation. James discussed some of the challenges associated with modelling magnetite-rich IOCGs, and in particular the relative importance of remanence and self-demagnetisation. Dean Hillan then introduced and compared techniques available for making self-demagnetisation corrections in modelling. Dean outlined how new sub-volume modelling codes have been applied to a range of synthetic and real examples to demonstrate the effects of self-demagnetisation and multiple body interactions. The methods were demonstrated on a model of the Candelaria IOCG in Chile containing highly susceptible magnetite sheets.

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 Friday 27 July, the ASEG alongside PESA and SPE held their annual quiz night. This event raises money for the Royal Flying Doctor Service, and we are pleased to announce that we raised \$2371.45! Thank you to everyone who got involved, and to those who got into the fancy dress spirit! Congratulations to the Smurfs who won first prize.

Lucy MacGregor from Rock Solid Images plc, Aberdeen, visited us on 31 July and presented 'Integrating well log, seismic and CSEM data for reservoir characterization'. This multi-discipline talk engaged the interest of both sides of the industry, and it was a full house.

On 16 August we welcomed Richard Smith from Laurentian University (Canada) who presented 'The SLUTH method for automatic interpretation of magnetic data: profile and grid implementations'. Richard's insights into this interpretation technique were very well received by the audience. Again, it was standing room only and the questions lasted long into the evening.

Our wine tasting evening was held on the 31 August and we are pleased to


announce the two winners for 2012: the Bremerton 2010 Selkirk Shiraz and the Second Nature 2012 Sauvignon Blanc. Look out for the order form in this edition of *Preview* and online.

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](mailto:aseg@casm.com.au).

Philip Heath







A University of Adelaide student picks Richard Smith's brain on the fine details of the SLUTH technique.



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Lucy Macgregor lecturing on well log, seismic and CSEM data.



Congratulations to the Smurfs who took first place (and a lot of prizes) at the Annual Quiz night.

## Victoria

On 2 August the ASEG Victorian Branch hosted the technical presentation 'Integrating well log, seismic, and CSEM data for reservoir characterisation' by Lucy Macgregor, SEG 2011 Honorary Lecturer, Europe, from Rock Solid Images. The presentation was well received with several local PESA members in attendance.

On 13 September Graeme Beardsmore from Hot Dry Rocks presented 'Geophysical applications of precise temperature measurements' covering recent developments in rapid earth temperature and heat-flow measurements. Graeme spoke to a select crowd with many questions fielded after the presentation.

On 24 October it is time again for the Annual Student Night! Come in and learn what the next generation of exploration geophysicists from Monash University

and RMIT are getting their teeth into for their Honours and PhD projects. This is one night when we expect to see many ASEG Victorian Branch members as the students put tremendous efforts into these presentations.

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'.

All technical meetings are held at the Kelvin Club in Melbourne's CBD. We look forward to seeing many ASEG Victorian Branch members at the coming meetings.

*Asbjorn Norlund Christensen*

## Western Australia

On 30 July, SEG Europe Honorary Lecturer Lucy MacGregor gave a well-attended lecture entitled 'Integrating well log, seismic, and CSEM data for reservoir characterisation'. Our August Tech Night was an interesting presentation by GBGMaps of recent results from shallow environmental and archaeological surveys in the Perth area, including the Victoria Quay development site in the city. We hosted Professor Peter Styles from Keele University who gave his 1-day workshop on environmental geophysics, which is the current EAGE Education Tour. Our 12 September Tech Night was presented by Dr Tim Dean of WesternGeco Geosolutions, who gave a talk entitled 'The "low-down" on land seismic acquisition'.

The Curtin Exploration Geophysics Students Society (KEGS) has been active this year with current President Aldo de Rooster also sitting on the state committee. In conjunction with the ASEG WA Branch, they held a careers information Q&A session at the university on 14 August. Four industry professionals, and ASEG members, from the minerals, petroleum and environmental sectors spoke to the students about their professional

experiences and what to expect. The annual Student Geoscience Night was also held on 21 August and was well attended by high school and university students from across the greater Perth region.

The year will continue to be busy with an evening presentation and a half-day workshop being presented by Geoscience Australia on the new National Australian Pool of Ocean Bottom Seismographs. Dr Nicholas Rawlinson will present at our 10 October Tech Night and the workshop will be held at Minerals House in East Perth on 11 October.

Our November Tech Night will be the annual Student Presentation Night where honours and postgraduate students from Curtin and UWA will present their research projects. We will also be presenting the inaugural ASEG WA Awards, applications for which have just closed.

We'll finish 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 earlier time of 3:30 pm on Friday 14 December at the usual City West 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.

Registrations for the 'A practical one-day workshop on airborne electromagnetics' are now being taken, so check out the advertisement in this edition of *Preview* for details or go to the WA Events page on the ASEG website. 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 at <http://eepurl.com/nleOD> to receive email notifications of WA events and news.

*Anne Tomlinson*



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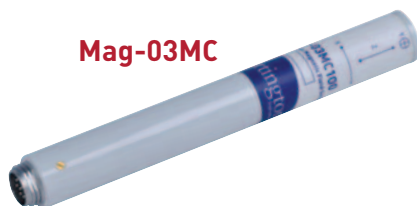
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## Call for papers – 23rd International Geophysical Conference and Exhibition



# ASEG-PESA 2013

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The Conference Organising Committee is now inviting expressions of interest for papers to be delivered at the next ASEG Conference and Exhibition.

As in the case of the very successful Brisbane conference in 2012, this conference will feature a series of keynote talks (30 or 60 minutes), oral presentations (30 minutes including questions) and poster presentations.

The Conference themes are chosen to cover the wide range of applied geophysics topics in mineral exploration, mine-site studies, petroleum exploration and alternative energy sources, and engineering–environmental applications.

Enabling technologies with application to multiple areas of endeavour are especially encouraged.

ASEG Conferences have a high reputation for delivering excellent case-history material to the industry. Quality case histories will be welcomed and as noted below become part of the permanent online database of geophysical literature.

Keynote talks are selected either by invitation or submission; authors with an interest in presenting highly topical leading-edge material are invited to contact the Technical Program Chairman Michael Asten ([michael.asten@monash.edu](mailto:michael.asten@monash.edu))

### Themes for submission

Authors can select up to three of the following themes that relate to their submission.

### The submission process

Submission of papers is a two-step process:

Authors are required to submit a brief expression of interest (up to 300 words) of their intended paper using the form on the conference website: [www.aseg-pesa2013.com.au](http://www.aseg-pesa2013.com.au).

Authors whose papers are accepted will be required to submit an Extended Abstract (typically 4–8 pages). These Extended Abstracts become part of the permanent geophysical literature accessible from the ASEG and the SEG websites.

### Invitation to sponsors and exhibitors

The conference will bring together a mix of domestic and international delegates from industry, government and education. As a Sponsor and/or Exhibitor, companies will have unique access to the marketing and publicity opportunities associated with Australasia's premier exploration geophysics conference.

The Sponsorship and Exhibition prospectus will be released shortly and we encourage potential exhibitors and sponsors to uncover (discover) their own 'Eureka moment'.

*Suzanne Haydon*  
Publicity Subcommittee Chairman

Minerals Stream	Transition Stream	Petroleum Stream
Mineral Exploration – Case Histories	Coal Geophysics – Case Histories	Seismic Interpretation - Case Histories
Regional Studies	Unconventionals (Coal Seam Gas, Shale Gas, CO <sub>2</sub> )	Seismic Acquisition
Deep Exploration	Geothermal energy	4D Seismic
Mining Geophysics		Seismic Processing
Hard-rock seismic Methods	Environmental and Engineering Geophysics	Imaging
Electrical and EM Methods	Groundwater and contamination mapping	Attributes and Seismic
AEM Modelling	Geohazard and Geophysics	Inversion
Geophysical Inversion		Visualization methods
Potential Fields – constrained geological inversion		Rock Physics
Data visualization and joint inversion		Seismic velocities and applications
Borehole Geophysics and Rock Physics		Anisotropy
		CSEM

Dates to remember	
Deadline for Expressions of Interest to Submit	7 December 2012
Extended Abstract Deadline	15 February 2013
Author Notification of Acceptance for oral or poster presentation	22 March 2013
Author Registration (Early Bird Registration Closure)	12 April 2013
Conference Start	12 August 2013



## Update on Geophysical Survey Progress from the Geological Surveys of Queensland, Western Australia, Northern Territory and New South Wales (information current at 14 September 2012)

Tables 1 and 2 shows the continuing acquisition by the States, the Northern Territory and Geoscience Australia of

the airborne magnetic and radiometric data of the Australian continent. Figure 1 shows the survey boundary for the

Marree airborne magnetic and radiometric surveys. 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 <sup>2</sup> )	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 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	QA/QC of final data in progress
Perth Basin North (Perth Basin 1)	GSWA	Fugro	11 Jun 11	96 000	400 m 60 m E–W	30 000	100% complete @ 18 Dec 11	TBA	150 – Feb 11 p20	Data released via GADDS on 2 August 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
Murgoo (Murchison 1)	GSWA	Thomson	28 Feb 11	128 000	200 m 50 m E–W	21 250	100% complete @ 16 Nov 11	TBA	150 – Feb 11 p20	Data released via GADDS on 2 August 2012
South Pilbara	GSWA	GPX	14 May 12	136 000	400 m 60 m N–S	42 500	53.5% complete @ 9 Sep 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	QA/QC of final data in progress
Cape Leeuwin – Collie (South West 3)	GSWA	Fugro	25 Mar 11	105 000	200/400 m 50/60m 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	73.% complete @ 9 Sep 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

Table 1. *Continued*

Survey name	Client	Contractor	Start flying	Line (km)	Spacing AGL Dir	Area (km <sup>2</sup> )	End flying	Final data to GA	Locality diagram (Preview)	GADDS release
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	Est. 6 Oct 12	131 090	400 m 80 m N–S	46 169	TBA	TBA	This issue	TBA

TBA, to be advised.

Table 2. Gravity surveys

Survey name	Client	Project management	Contractor	Start survey	No. of stations	Station spacing (km)	Area (km <sup>2</sup> )	End survey	Final data to GA	Locality diagram (Preview)	GADDS release
East Amadeus	NTGS	GA	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	TBA
Esperance	GSWA	GA	TBA	TBA	TBA	2.5 km and 1 km along roads/ tracks	TBA	TBA	TBA	158 – Jun 12 p23	TBA
West Murchison	GSWA	GA	Atlas Geophysics	2 Sep 12	11 897	2.5 km	TBA	TBA	TBA	158 – Jun 12 p22	TBA

TBA, to be advised.

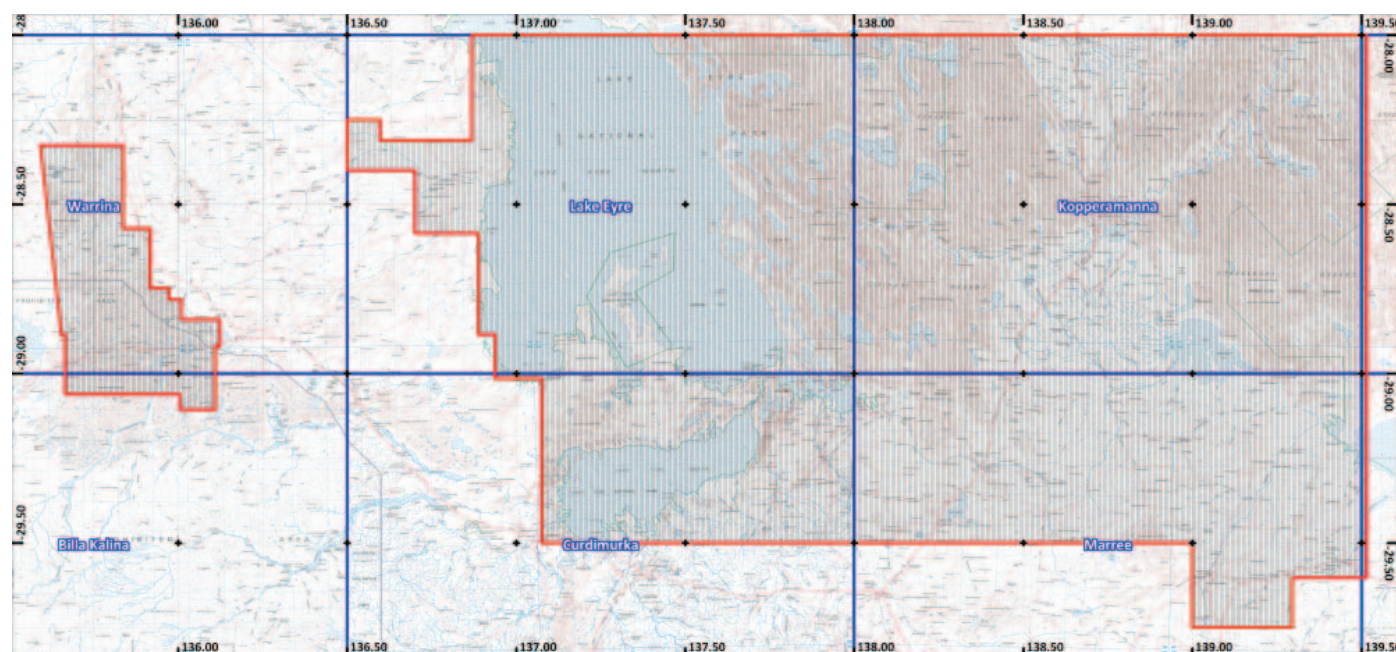


Fig. 1. Marree airborne magnetic and radiometric survey locality diagram © Commonwealth of Australia (Geoscience Australia) 2008 NATMAP Digital Maps 2008.



## Is the boom really over?



David Denham

Email: [denham@webone.com.au](mailto:denham@webone.com.au)

Australian resource industries are in good shape, despite Minister Ferguson's remarks about the boom in commodity prices being over. Those listed on the ASX are performing much better than those in other sectors; there is going to be a continued and increasing demand for mineral and petroleum resources as the world population grows and the standards of living increase; and Australia is investing in the future with vigorous exploration programs. There may be hiccups on the way but in the medium to long term the future looks good.

### Background

The media love disasters and bad news because they think these sell newspapers, boost television ratings and make many of the viewers and readers feel safe and comfortable at home away from all the turmoil. So after Martin Ferguson the Minister for Resources and Energy said (23 August 2012), in response to BHP Billiton's decision to delay the expansion of Roxby Downs that 'The boom in commodity prices is over' there has been considerable debate about the well-being of the Australian resource industry.

I do not believe it is sound to assess the health of our industry on one decision made by BHP Billiton approximately 1 month ago. Rather, we should examine the trends over the past few years because the exploration, discovery/development timeframe is a lot longer than 1 month. And in any case, there is always variability in prices and demand.

My aim is to examine four factors that play important roles in assessing the health of the sector, and to draw some conclusions based on this evidence. These factors are:

- the value of the market capital of Australian resource companies listed on the ASX
- the annual global production rates of coal, gold, iron ore and oil (this is a proxy for demand)
- the price of these four commodities
- the exploration investment in Australia for these commodities.

### Market capitalisation

The total market capitalisation of resource companies listed on the ASX provides one measure of the health of the industry. Figure 1 shows how this factor has changed over the past 12 years. The total is the sum of the market capital of all the resource companies listed in the top 150 companies in the ASX.

The numbers have been normalised using the CPI published by the Australian Bureau of Statistics in the September quarter 2012. The numbers for BHP Billiton and Rio Tinto have also been plotted.

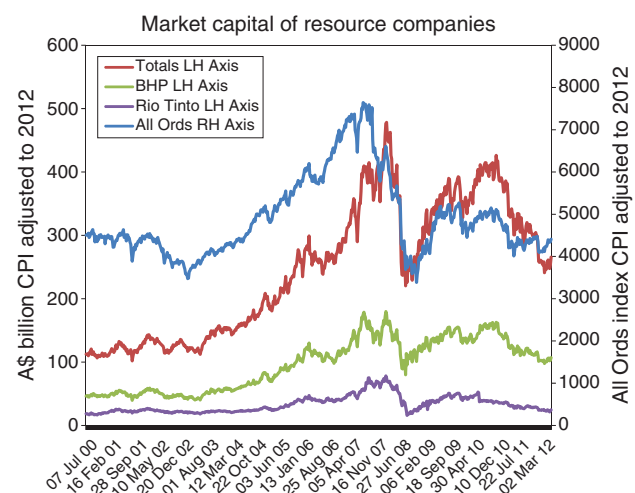
I make three observations on this data set:

1. Before the GFC, the peak of the AllOrds (June 2007) was 12 months in advance of the resource company peak (June 2008). After the GFC the two curves follow similar timelines. The reason for this is not evident.
2. There has been an overall decline in value of both the AllOrds and the 'Totals' since the peaks in 2007–08.
3. The value of the AllOrds in September 2012 is almost the same as it was in July 2000, whereas the resource market capital has more than doubled its value in the same period.

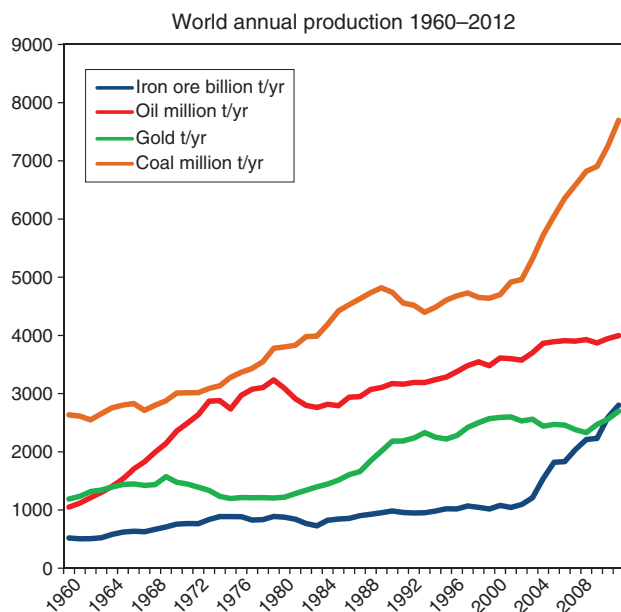
In summary, the resource companies in the ASX's top 150 companies are in comparatively good shape, particularly as several overseas takeovers in the last 12 years have reduced the number of companies registered on the ASX.

### Production/demand

Global production/demand is crucial because if there is no demand then there will be a problem for the resource industries. I am using production as a proxy for demand, because although there may be temporary gluts of production these will eventually even out. Figure 2 shows global production for coal, gold, iron ore and petroleum from 1960 through 2011. These are arguably the four most important commodities for Australia in an economic context. It is clear that the production rates for coal



**Fig. 1.** The AllOrds index and total market capital of resource companies listed in the top 150 companies on the ASX, adjusted to September 2012 A\$. BHP Billiton and Rio Tinto vales are also plotted.



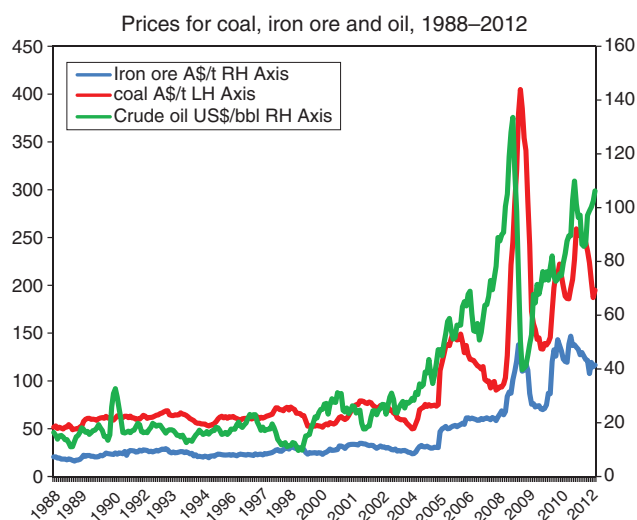
**Fig. 2.** Annual world production of coal, gold, iron ore and oil for 1960 through 2011. Note that the production rates for coal and iron ore are all increasing significantly. Gold and oil are only increasing gradually because they are close to peak production levels.

and iron ore have all increased significantly in recent years. Gold and oil are only increasing gradually because they are probably close to peak production rates; they are just getting harder to find and extract – there is certainly no decline in demand.

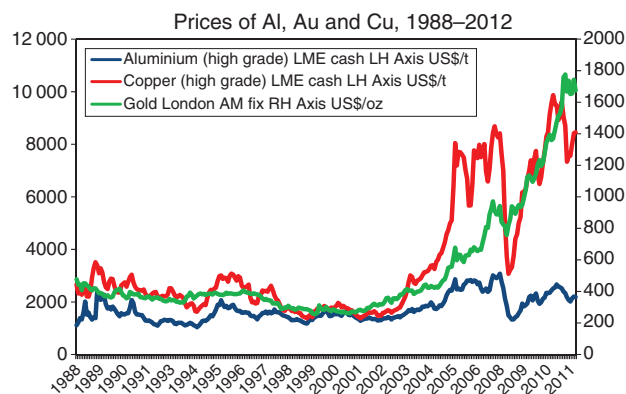
Consequently, even if global demand levels off and production rates fall, production levels will still be well above the levels of 10 years ago and consequently there should be enough demand to maintain a strong industry.

### The price of the commodities

Of all the factors impacting on the well-being of Australian resource industries, price is probably the most important. Figures 3 and 4 show the prices for aluminium, coal, copper, gold, iron



**Fig. 3.** Price for coal, oil and iron ore for the period 1988–2012. Notice how there has been a significant increase in the price of all three commodities since 2004 and also the huge short-term variability in the data sets. No CPI correction has been applied.



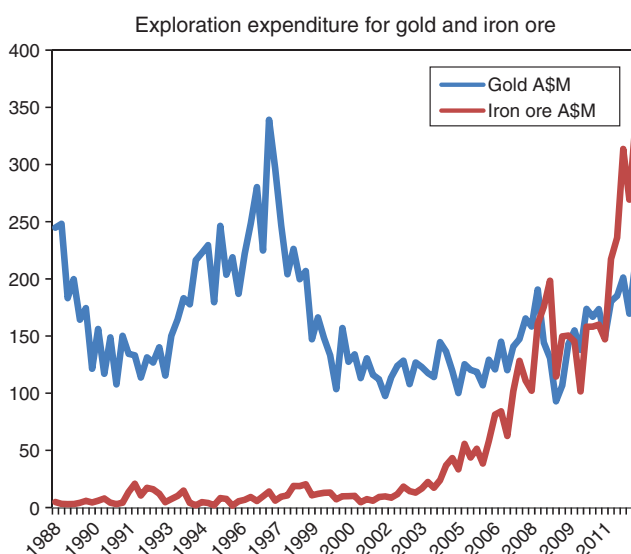
**Fig. 4.** Price for aluminium, copper and gold for the period 1988–2012. Notice how the price of gold has increased steadily since 2000. The copper price shows a high variability and the aluminium price reflects only a gradual increase. No CPI correction has been applied.

ore and oil from 1988–2012. Notice how there has been a significant increase in the price of all commodities since 2004 apart from aluminium. These data sets show large short-term fluctuations, which lead to difficulties in forward planning for new developments. However, since 2004 the long-term trend has been upwards; and provided there is not some sort of catastrophic collapse, the future looks sound as long as it is assessed over a ‘several-year’ time window. Price spikes such as those that occurred in 2008 before the GFC can give an over optimistic view of what to expect in the future and care should be taken if these are factored into future financial planning.

As long as the global population continues to grow and the BRIC countries continue to expand there should be an increasing demand for mineral and petroleum resources.

### Exploration investment in Australia

Another critical factor is the level of investment in new resources. In other words, how much is being spent on mineral and petroleum exploration. As deposits become harder to find it is important that effective long-term exploration programs are



**Fig. 5.** Quarterly exploration investment for iron ore and gold in Australia 1988–2012. Adjusted to September 2012 A\$.



carried out. The time between discovery and resource extraction is of the order of 10 years, so there must be long-term exploration programs. BHP's Roxby Downs situation is a good example. The company has spent millions of dollars proving-up the extended gold/copper uranium deposits but has decided not to develop this now because it has assessed the economic conditions of investing billions of dollars at this time is not good business. However, it is not all doom and gloom – far from it. The extent of the deposit has been mapped and it is still in the ground ready for extraction at some future date. The point being, it is vital to continue exploration programs so that when deposits reach the end of their life there are proven resources available to develop.

Figures 5–7 show how exploration expenditure for coal, gold, iron ore and petroleum has, in general, increased during the past 20 years, with gold the only commodity where expenditure has fallen. Figure 7, which combines all the mineral-related exploration expenditure, shows very clearly how even up to the

June quarter of 2012 the investment is still increasing. In fact, even after allowing for CPI increases, the level of investment is at a record level.

As we know, these increases cannot continue forever, but even if they fall by say 10% over current levels the resource industry should be in good shape.

### Sources for the data

The data used to compile the charts were taken from the following sources:

CPI: <http://www.abs.gov.au/ausstats/abs@.nsf/mf/6401.0>

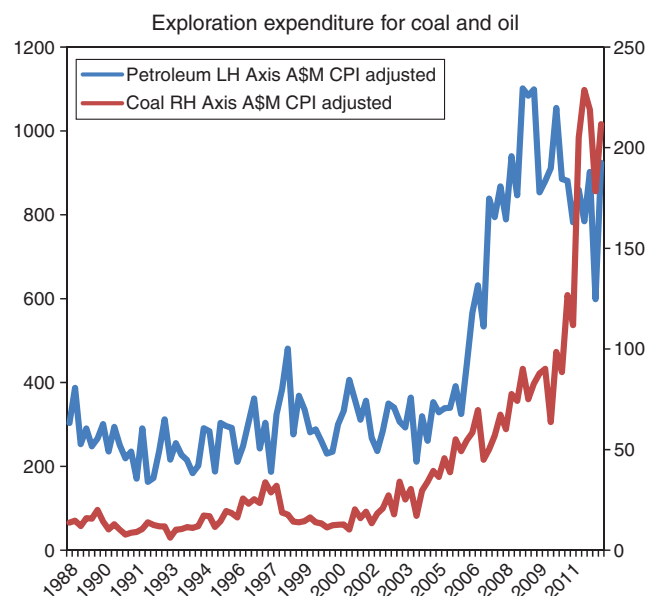
Australian mineral and petroleum exploration expenditure: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/ProductsbyTopic/7008565B2DD42E23CA25718C00151590?OpenDocument>

World production of coal and oil: [http://www.bp.com/assets/bp\\_internet/globalbp/globalbp\\_uk\\_english/reports\\_and\\_publications/statistical\\_energy\\_review\\_2011/STAGING/local\\_assets/pdf/statistical\\_review\\_of\\_world\\_energy\\_full\\_report\\_2012.pdf](http://www.bp.com/assets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2011/STAGING/local_assets/pdf/statistical_review_of_world_energy_full_report_2012.pdf)

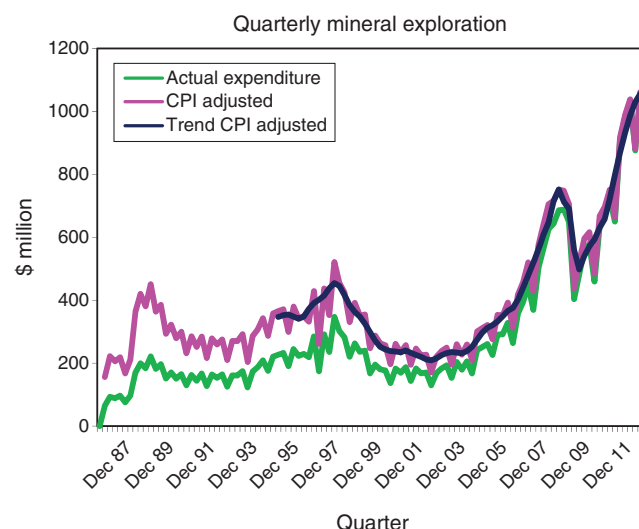
World production of coal, iron ore and gold: <http://minerals.usgs.gov/minerals/pubs/myb.html>

Prices of commodities and Australian production statistics:

[http://www.daff.gov.au/abares/publications\\_remote\\_content/publication\\_topics/minerals?sq\\_content\\_src=%2BdXJsPWh0dHAIM0EIMkYIMkYxNDMuMTg4LjE3LjIwJTJGYW5yZGwIMkZEQUZGU2VydmIjZSUyRmRpc3BsYXkucGhwJTNGZmlkJTNEcGVfYWJhemVzOTkwMDE3OTdfMTJhLnhtbCZhbGw9MQ%3D%3D](http://www.daff.gov.au/abares/publications_remote_content/publication_topics/minerals?sq_content_src=%2BdXJsPWh0dHAIM0EIMkYIMkYxNDMuMTg4LjE3LjIwJTJGYW5yZGwIMkZEQUZGU2VydmIjZSUyRmRpc3BsYXkucGhwJTNGZmlkJTNEcGVfYWJhemVzOTkwMDE3OTdfMTJhLnhtbCZhbGw9MQ%3D%3D) and <http://www.bree.gov.au/publications/res.html>



**Fig. 6.** Quarterly exploration investment for coal and petroleum in Australia 1988–2012. Adjusted to September 2012 A\$.



**Fig. 7.** Quarterly mineral exploration investment for Australia for 1986–2012. CPI adjusted data have been aligned with the September 2012 A\$.

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## Satellite imagery: the range and value



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High quality, medium resolution satellite imagery has been available worldwide since the mid-1980s, and in the late 1990s high and very high resolution imagery became available. We now have a wide choice of data captured by satellites to help satisfy requirements in terms of scale, area of coverage, application and budget. Due to the broad range of sensors onboard current and recent satellites, most parts of the world have been covered by usable imagery and that imagery is available for download or purchase. This paper provides a brief description of the range of satellite imagery currently available, some of the applications of this imagery, and also a summary of what satellites are expected to be launched in the near future.

**Keywords:** Satellite imagery, spatial resolution, spectral resolution, archive, fresh capture

### Introduction

Satellite imagery can be broadly categorised in three ways: by spatial resolution, by spectral resolution, and whether the data exists in archive only or is programmable for capture.

Medium resolution sensors including Landsat, ASTER and SPOT 1-4 have a pixel resolution of larger than 5 m; high resolution sensors including SPOT 5 and ALOS have a pixel resolution of 2.5 to 5 m; and very high resolution sensors including WorldView-1 and -2, GeoEye-1, QuickBird, IKONOS and Pléiades have a pixel resolution of less than 2.5 m and are usually sub-metre.

Once acquired, either by regular capture, for example in the cases of Landsat and ASTER, or by background or programmed tasking, for example in the cases of SPOT5 and GeoEye-1, the data is 'archived' and available for download or purchase. Web-based search engines allow perusal of the archives to facilitate choosing the imagery that best satisfies requirements.

As indicated in Table 1, some sensors can capture in stereo mode, allowing the generation of digital elevation models (DEMs). In general DEMs produced from satellite imagery are at twice the spatial resolution of the source imagery and the accuracy is dependent on the accuracy of the sensor itself. For example, DEMs produced from the GeoEye-1 or either of the WorldView sensors have a spatial resolution of 1 m and an

accuracy of 0.5 to 0.7 m, whereas DEMs produced from ALOS PRISM imagery have a spatial resolution of 5 m and an accuracy of 2 to 4 m.

### Medium resolution imagery

Within this category there are the optical sensors: Landsat (Figure 1), ASTER and SPOT1-4, the radar sensors Radarsat-1, JERS, PALSAR (Figure 2), ERS and Envisat and DEMs generated from ASTER and SPOT HRS. Apart from Radarsat-1, imagery from all of these sensors is available as archived data only.

### High resolution imagery

High resolution optical imagery includes SPOT5 Pan, SPOT5 pan-sharpened colour (Figure 3), ALOS PRISM, ALOS PRISM pan-sharpened colour and SPOTMaps. Radarsat-2, TanDEM-X and TerraSAR-X radar imagery and DEMs from ALOS PRISM (Figure 4) also fall within this category.

### Very high resolution (VHR) imagery

Launched in 1999, IKONOS was the first commercial satellite to acquire very high resolution imagery. Since then QuickBird, WorldView-1, GeoEye-1 (Figure 5), WorldView-2 (Figure 6), Kompsat, Pléiades and the very recently launched SPOT6 have increased the options for delivery of VHR imagery over Australia and the rest of the world.

The choice of spatial resolution is determined by the size of the area to be covered, the working scale and budget. The medium and high resolution datasets are especially useful for regional coverage (Figure 7); however, large area coverage of VHR imagery is also made possible by a digital mosaic of the same or different data types.

The availability of imagery is also a factor in choosing the most appropriate sensor. In tropical areas, it is often difficult to find low-cloud optical imagery whether held in archive or programmed for fresh capture. Radar imagery is useful for structural analysis in these areas as radar is an active sensor and can penetrate cloud and/or be acquired at night (Figure 8).

### Spectral resolution

Knowledge of the spectral resolution of the different types of satellite imagery helps to understand which sensors provide the most suitable responses to ground cover for an application.

All optical sensors respond to light in the visible to near infrared wavelengths of the electromagnetic spectrum. In addition, some optical sensors capture in the short wave and thermal infrared and the coastal band and radar satellites capture in the microwave wavelengths (Figures 9 and 10).

### Archived versus tasking requests

As indicated in Table 1, some of the satellites can be programmed for fresh capture. This is useful if the data held in

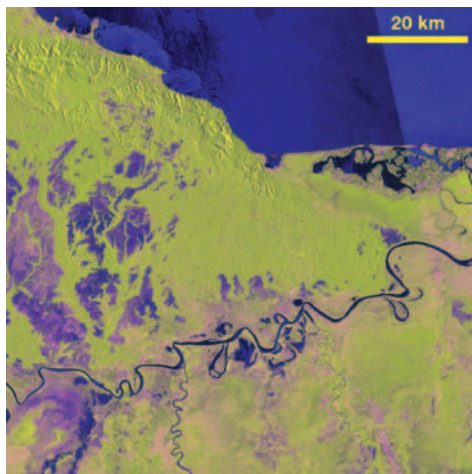


Table 1. Comparison of the spatial and spectral resolutions of commercially available medium to very high resolution satellite imagery currently available, as well as sensors which may be programmed for fresh capture

Satellite/ Sensor	Panchromatic resolution	Multispectral resolution	Pan-sharpened resolution	Bands available	Swath width	Programmable	Stereo available	Notes
Medium Resolution Imagery								
ASTER	N/A	15 m VNIR, 30 m SWIR, 90 m TIR	N/A	15 bands	60 km	No	Yes, as Level 1A NIR	
Landsat 7 ETM+	15 m	30 m TM	15 m	8 bands	180 km	No	No	SLC off since June 2003
Landsat 5 TM	N/A	30 m	N/A	7 bands	180 km	No	No	Non- operational
SPOT 1,2,3	10 m	20 m	10 m	3 bands	60 km	No	No	Non- operational
SPOT4	10 m	20 m	10 m	4 bands	60 km	No	No	Non- operational
Resourcesat	N/A	23.5 to 56 m	N/A	4 bands	141 to 740 km	No	No	
Radarsat-1	10 to 100 m	N/A	N/A	C band	50 to 500 km	Yes	No	
JERS	18 m	N/A	N/A	L band	75 km	No	No	Non- operational
ERS	30 m	N/A	N/A	C band	100 km	No	No	Non- operational
Envisat	30 to 1 km	N/A	N/A	C band	100 to 400 km	No	No	Non- operational
PALSAR	6.25 to 100 m	N/A	N/A	L band	70 to 350 km	No	No	Non- operational
SPOT HRS	20 m	N/A	N/A	DSM	N/A	No	N/A	
ASTER GDEM	30 m	N/A	N/A	DSM	N/A	No	N/A	Mosaic of DEMs from NIR
High resolution imagery								
SPOT5	2.5 to 5 m	10 m	2.5 m to 5 m	4 bands	60 km	Yes	Yes	
ALOS	2.5 m	10 m	2.5 m	4 bands	70 km	No	No	Non- operational
RapidEye	N/A	5 m	N/A	5 bands	77 km	Yes	No	
Radarsat-2	1.6 to 160 m	N/A	N/A	C band	18 to 500 km	Yes	Yes	
Tandem-X	1.1 to 18.5 m	N/A	N/A	X band	7 to 150 km	Yes	No	
TerraSAR-X	1.1 to 18.5 m	N/A	N/A	X band	7 to 150 km	Yes	No	
ALOS PRISM DEMs	5 m	N/A	N/A	DSM	35 km	No	Yes	Non- operational
Very high resolution imagery								
WorldView-2	0.5 m	2 m	0.5 m	8 bands	16.4 km at nadir	Yes	Yes	
WorldView-1	0.5 m	N/A	N/A	1 band	17.6 km at nadir	Yes	Yes	
GeoEye-1	0.5 m	2 m	0.5 m	4 bands	15.2 km at nadir	Yes	Yes	
Pléiades	0.5 m	2 m	0.5 m re- sampled	4 bands	20 km at nadir	Yes	Yes	
QuickBird	0.65 m	2.6 m	0.6 m re- sampled	4 bands	16.5 km at nadir	Yes	No	
IKONOS	0.8 m	3.2 m	0.8 m	4 bands	11 km at nadir	Yes	Yes	
Kompsat	1 m	4 m	1 m	4 bands	15 km at nadir	No	No	



**Fig. 1.** Landsat 5 TM bands 147 in BGR, 30-m resolution, Queensland.

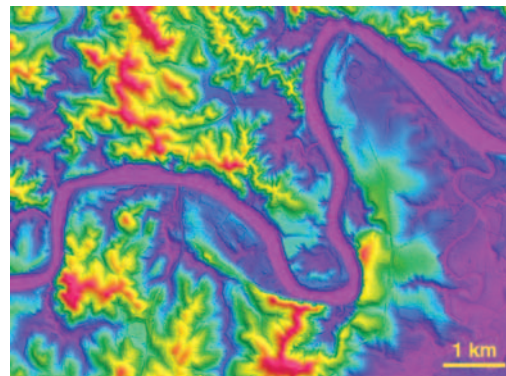


**Fig. 2.** ALOS PALSAR Fine Beam dual-polarisation, 50-m resolution, Papua New Guinea.



**Fig. 3.** SPOT5 pan-sharpened colour, 2.5-m resolution imagery, New South Wales.

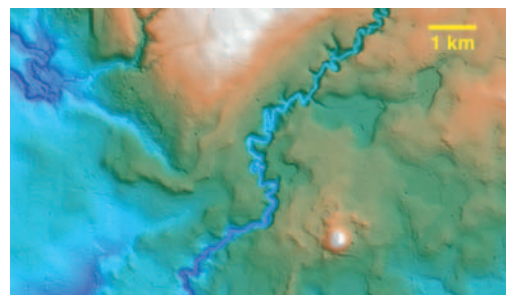
archive is cloud affected, is too old or is incomplete over the area of interest, etc. In this case, a programmed task is requested over the area of interest until the capture is successful or the nominated time constraints are exceeded.



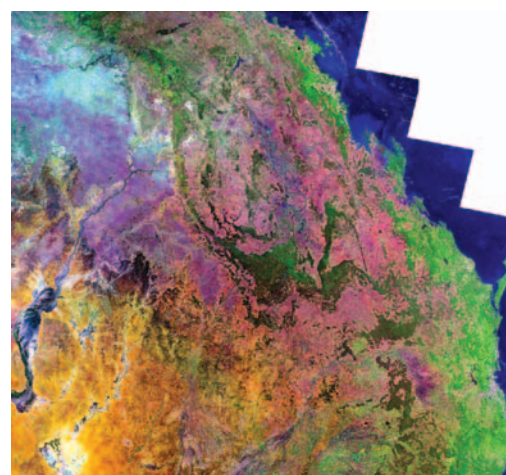
**Fig. 4.** ALOS PRISM DEM, 5-m resolution, Queensland, shaded drape.



**Fig. 5.** GeoEye-1 pan-sharpened colour, 0.5-m resolution imagery, Northern Territory.

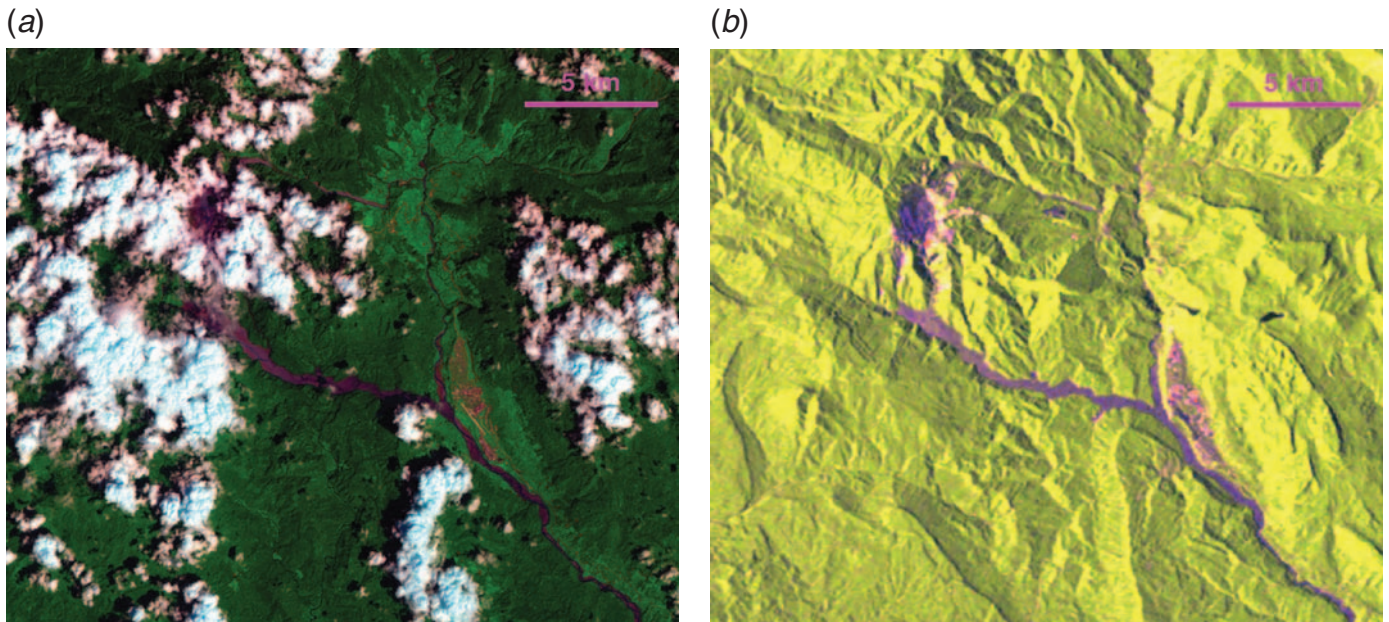


**Fig. 6.** WorldView-2 DEM, 1-m resolution, Victoria, shaded drape.

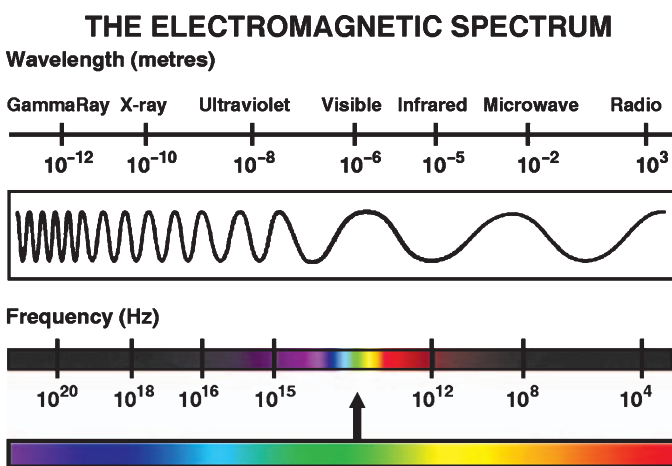


**Fig. 7.** Landsat 5 TM digital mosaic of 47 scenes, 30-m resolution, Bowen Basin, Queensland.

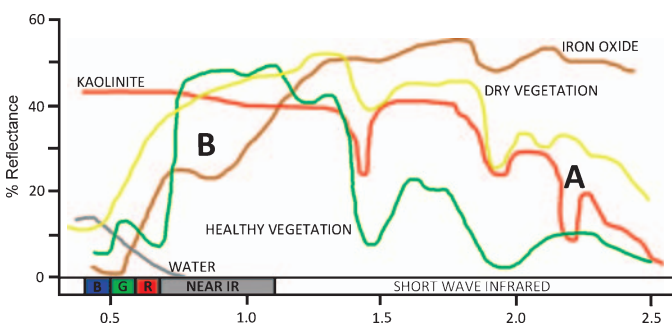




**Fig. 8.** (a) Landsat 5 TM with ~50% of the area shown covered in cloud. (b) PALSAR over the same area, Papua New Guinea.

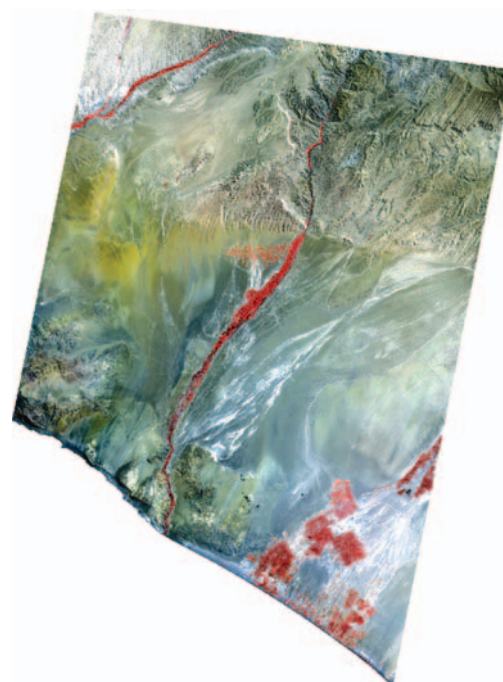


**Fig. 9.** The electromagnetic spectrum from gamma ray to radio waves.



**Fig. 10.** Part of the electromagnetic spectrum from Figure 9 showing examples of ground cover responses in the visible, near infrared and short wave infrared wavelengths.

In Australia we are fortunate to have a large archive of low-cloud imagery but even so fresh capture may be required. Because we have minimal conflict for tasking requests and along with our low-cloud conditions, programming requests usually

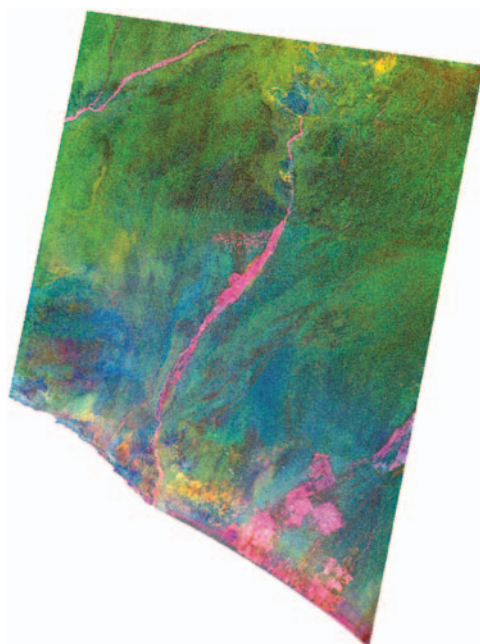


**Fig. 11.** ASTER double scene, false colour (vegetation in red), Peru.

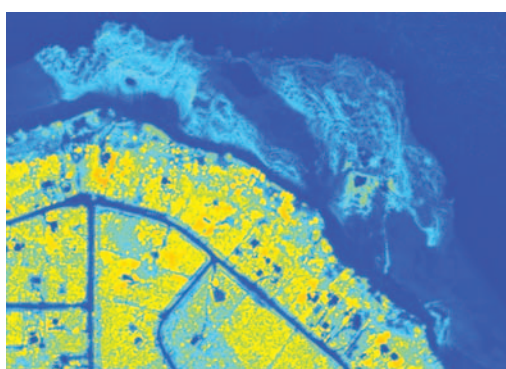
result in successful capture. In other areas of the world archived data may be difficult to find or tasking delays may be lengthy because of weather conditions or programming conflicts; however, we have virtually unlimited access to satellite imagery of some form, even over regions that may be inaccessible for reasons of geography or political instability.

## Applications

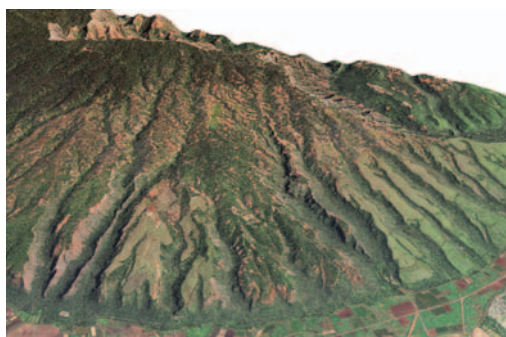
The uses of satellite imagery are many and varied and applicable to most sciences and industries. Following are a few examples of these uses.



**Fig. 12.** Larry Rowan's Relative Band Depth image of Figure 11 highlighting the kaolinite/alunite group in red, the illite group in green and the chlorite group in blue.



**Fig. 13.** NDVI image of Figure 5, showing healthy vegetation in yellow-orange-red, water and impervious surfaces in blue, less healthy or sparse vegetation in cyan.



**Fig. 14.** WorldView-2 natural colour draped over a regional DEM, Hawaii.

#### *For mineral exploration:*

The presence of clays at surface is indicated by a strong absorption in the short wave infrared (SWIR). This is shown by the trough (A) in the kaolinite (red) graph in Figure 10. Landsat 5 TM, Landsat 7 ETM+ and ASTER sense in SWIR at a

wavelength suitable for clay detection. Landsat has one band in the SWIR however ASTER has six bands in this range and better defines groups of clays than does Landsat (Figures 11 and 12).

#### *For mineral exploration:*

The presence of iron oxides is enhanced by the ratio of visible red on visible blue. This ratio exaggerates the sharp rise in the iron oxide (brown) graph in the visible bands shown in Figure 10. All optical sensors have at least two bands in the visible range.

#### *For vegetation studies:*

The normalised difference vegetation index (NDVI) is a standard ratio that may be used to indicate vegetation health or to delineate impervious bodies, for example, bitumen surfaces (Figure 13). The ratio uses the sharp rise in the healthy vegetation (green) graph between the visible red and the NIR as shown in Figure 10.

#### *For structural analysis:*

Digital elevation models are an integral part of any geospatial analysis. They can be used to map potential flood levels, provide line-of-sight information or can provide a topographic base over which other imagery is draped for 3D visual analysis (Figure 14).

### A look to the future

Later this year and into 2014, the following satellites are expected to be launched:

- Pléiades 2, which is identical to Pléiades 1, acquiring 0.5-m imagery re-sampled from 0.7 m
- The Landsat Data Continuity Mission (Landsat 8) providing medium resolution imagery
- ASNARO acquiring ~0.5-m pan-sharpened colour
- GeoEye-2 acquiring 0.25-m pan-sharpened colour
- ALOS-2 acquiring 3-m L-band radar
- WorldView-3 acquiring 0.31-m pan-sharpened colour in 16 spectral bands.

### Conclusion

Satellite-borne sensors have been acquiring high quality imagery over the Earth at medium resolution since the mid-1980s and at high to very high resolution since the late 1990s. As a result, we now have easy access to a large amount of useful data, either already acquired and held in archive or for which we can place programming requests.

The decision on which satellite imagery is best suited to requirements should be based on a consideration of:

- Which spatial resolution is best suited to the scale and size of the area to be covered?
- Is a monoscopic image only required as a backdrop or for spectral analysis or is a DEM also needed?
- Which spectral resolution is relevant to the application?
- What is the suitability of archived imagery or is fresh capture more appropriate?
- Is optical imagery likely to be cloud affected and if so would radar imagery be more useful?



## Acknowledgements and copyright statements

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## Bang and bust: almost everything you wanted to know about sex and the mining boom (but were afraid to ask)



John Scott

Catherine MacPhail

Victor Minichiello

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### Introduction

Recent growth and expansion of the fly-in/fly-out (FIFO) model of mining in remote rural Australia has led to concerns about the health and well-being of those employed by the mines and those in the small rural communities where they are based. A particular concern has been the potential disruption to sexual norms in mining towns and increases in sexually transmitted infections (STIs) and HIV.

In May this year it was widely reported that AMA Queensland President, Dr Richard Kidd, had cited 'bored and cashed-up' workers to blame for increasing rates of STIs in mining communities. Kidd is not a lone voice, with the Queensland Health Minister, Lawrence Springborg, blaming sex workers operating in mining regions for rising rates of HIV in his state. That clients, whether the mine (as opposed to sex) workers or men in the community are not mentioned in these stories is interesting, but perhaps another story. The Australian Sex Workers Association responded strongly to these claims, arguing that sex work in Australia is well regulated and that unprotected sex is more likely to occur in non-commercial encounters. Sex industry advocates have claimed that FIFO sex workers can be enlisted via appropriate public health interventions to be part of the solution for decreasing rates of STIs and HIV, rather than being part of the problem. Janelle Fawkes of the Scarlet Alliance observed that 'sex workers ... have positive effects on local communities where we bring safe sex education and skills'. This paper contextualises the debate by providing an overview of the sex industry in rural and regional areas where mining booms are currently underway.

### Mining, change and social disorder

When we think of the sex industry it is usually in the context of urban life. Rural and isolated communities tend not to be associated with sex work. In contrast to the often fragmented and impersonal relations of urban life, rural places are projected as embodying relations of stability and social cohesion with strong family and marital relationships. In recent times it has been argued that rural and isolated communities may possess what has been described as 'social capital', which has been defined in terms of density of civic participation. Social capital

'is the networks, norms and trust which constitute the resources required for individuals, workplaces, groups, organizations and communities to strive for sustainable futures in a changing socio-economic environment'. Low social capital can be linked with poor health outcomes and crime (Falk and Harrison 1998). Social capital is likely to exist in communities that exhibit stable population patterns and widespread and intimate personal bonds between both individuals and the community. It has been argued that strong social organisation is to be located predominantly in rural communities with small population size and restricted intimate and interpersonal networks (Jobes *et al.* 2004). Mining boom towns appear to possess features that would limit the development of social capital.

For social scientists, mining boom towns appear to have many features in common with cities. Traditionally, the social sciences have been concerned with social problems present in the public spaces of large cities. If rural and isolated communities have plenty of social capital, cities have been viewed as lacking it. Modern conceptions of crime and social disorder, such as sex work, are linked with the rise of cities, population growth and processes of urbanisation. While the link between high residential mobility and social disorder need not necessarily be disputed, there can be little doubt that the effects of migration and workforce mobility to and from rural areas have often been ignored in research. This is of special concern when considering the great demographic movements that have created rural Australia during the past 200 years and now, according to some, threaten it.

In contrast to agricultural centres, mining 'boomtown' dynamics have been linked with various forms of social disorder, such as crime, alcohol abuse and psychological isolation (Jobes *et al.* 2004). Mining towns, largely because of their itinerant and fluctuating populations have been considered as having less social capital than settled agricultural communities. The large numbers of relatively young men involved in mining also provide a link to crime and social disorder. A consistent feature of crime statistics, be they associated with property or violent crime, is that crime is overwhelmingly perpetuated by males. Males also continue to be the bulk of clientele of sex workers. The sex workers themselves are by and large female, although male sex workers also work in mining regions in very small numbers. The large part of the clientele for male sex workers is also men, although numbers of women seeking the services of male sex workers has been reported as increasing. This paper will primarily focus on female sex workers and their clients.

Research has however found that rapid growth cannot universally be associated with social disruption (Hunter *et al.* 2002) and that links between mining and social problems are more likely to be about fears brought about by rapid social change than actual disruptions. Here social change is linked with increased anxiety regarding crime victimisation (Freudenburg and Jones 1991). The research on fear of crime in rural and isolated communities suggests the threat of crime may be located in terms of internal and external sources of communal threat. Typically, external crime threats involve an urban stranger, while internal threats have been associated with groups such as youth and/or racial minorities. For example, O'Connor and Gray (1989) researched Walcha, a relatively culturally homogenous community with strong agricultural roots, and



noted that fears about crime were generally associated with outsiders. This strong externalisation of crime can be partly explained by Walcha's geographic isolation and strong social integration of the local community. The authors argued concern about crime may actually be concern about unwanted social change – a threat to 'how the place used to be'. FIFO miners and sex workers have recently become rallying points for concern about rapid change in some Australian communities.

### Sex work and social disorder

In Australia, sex work laws vary between jurisdictions. Legislation and the way in which it is enforced determines the way in which sex work is structured and organised in different locations. Regulation determines where sex workers work and how they do their work. Although the act of sex work has never been illegal in Australia, the states have developed complicated legal frameworks that bring all activities associated with sex work under the regulation of criminal authorities. In all jurisdictions, sex work-related offences have tended to include the categories of soliciting, brothel keeping, and living off the earnings of sex work. Legislation has had a gender and class bias, having targeted the most disadvantaged of women who work in the sex industry. That is, those most visible due to age, ethnicity, attractiveness, or socio-economic circumstance. Notably here, legislation has been concerned with restricting visible displays of sex work. A desire to limit the visibility of sex work remains today: a FIFO sex worker recently won a discrimination case after a Queensland motel attempted to prevent her from working from their premises (Latimer 2012).

The association of sex work with urban areas has been supported by research in the social sciences, which has focused largely on public manifestations of sex work in inner city areas: what has been described as 'street prostitution'. Street workers have been transformed in popular culture into the archetypal sex worker, coming to represent much of what is considered to be socially problematic with commercial sex and, by association, urban life. Large cities are more likely to accommodate public displays of sex work and press coverage almost solely concentrates on this aspect of the sex industry (Committee on Population 2003). It is unusual to find street workers outside of larger metropolitan centres. The main trade in mining towns has been brothel and escort work. Sex industry research provides an unbalanced and distorted picture of sex work and the bulk of academic writing equates sex work with street work. The irony is that street work is the least prevalent type of sex work. Research suggests street work is likely to comprise no more than 10–20% of all sex work-related activities (Egger and Harcourt 1991). Also not captured here is the online pay for sex talk that is increasingly occurring, where escorts 'perform' their work via chat rooms, for example.

Despite the strong association of sex work with urban spaces, the historical existence of sex work beyond the city limits is regularly acknowledged. For example, sex work is a crucial element of frontier mythology in Australia, the United States and Canada. Yet, in historical references, sex work forms part of a rural community that has ceased to exist through the progressive taming of the frontier. During the late 19th century, various expressions of vice in frontier communities became increasingly restricted as communities developed stable agricultural economies that drew more women and families to the frontiers (Harvie and Jobes 2001). This was not so much an attempt at abolition, but an attempt by authorities to minimise

the 'public nuisance' aspects of sex work and its supposed negative effects on feminine morals. In Australia, legislation forced sex work from the main streets of towns and restricted it to the margins of rural communities.

Rural sex work has been found to be a common phenomenon in all non-western nations. In these contexts, sex work is a service industry and usually relies on a disposable cash economy, resulting in most of the recorded forms of rural sex work being largely restricted to major transportation routes (Dandona *et al.* 2006). This indicates the local rural economy is unlikely, on its own, to sustain a prominent sex industry and must rely on outside from major urban centres to support the sex industry in rural or remote areas.

In Australia sex work was increasingly subjected to a process of geographic decentralisation during the 20th century, there being a movement away from inner city zones into suburbia, aided by technologies such as the telephone and automobile (McKewon 2003). Decentralisation has encouraged the growth of more privatised forms of sex work, such as escorts or women working without pimps from home, as increasing numbers of women declined to work in brothels to avoid arrest or police harassment (Sullivan 1997).

During the late 1980s and 1990s, advertisements for sexual services increasingly became more commonplace in rural Australian print media. Analysis of rural media reveals advertisements for private workers, now a common feature in many rural and regional newspapers, first appeared during the early 1990s, coinciding with the expanding market for mobile telephones (Scott *et al.* 2006). As with urban settings, decentralisation resulted in a marked increase in escort services, and a smaller increase in women working from private homes. One distinct aspect of rural escort services' expansion is motel work, whereby women advertise in rural media by providing a mobile phone contact. Mobiles overcame geographic restrictions of rural sex work, offering enhanced mobility and confidentiality. Increasingly sex workers were able to provide services at varied times and in multiple townships. No longer did rural sex workers need to reside in the town where they work. These changes are important when considering the phenomenon of FIFO sex workers associated with the recent mining boom.

### Social disorder and FIFO

Tensions between non-resident workers and permanent workers in mining towns have been well-documented, there being a general understanding that FIFO operations provide less social and economic benefits to rural and regional areas than other forms of mining (Pick *et al.* 2008; Storey 2001). Resentment and conflict also occur because unskilled and semi-skilled miners, in such regions, often earn more money and occupy better and cheaper housing than professional workers (Petkova-Timmer *et al.* 2009). Contempt for FIFO is no better captured than by the inversion of FIFO by some locals to the slogan 'fit-in or f--k-off'.

The literature suggests that FIFO operations, especially the long hours of shiftwork, place physical strains on workers, which places them and others at risk to safety, both inside and outside of work (Lockie *et al.* 2009). FIFO has also been accused of dislocating workers from community and family life, thus causing social and economic isolation. Research has found that

miners and their partners suffered higher rates of psychological stress than other rural people due to social isolation from family, boredom, climate, sexual need, transient nature of community life and alcohol abuse (Lockie *et al.* 2009). One perception is that shift work and commuting patterns place excessive strain on family relationships. There is also the perception that mining is a patriarchal culture that encourages the expression of male power over women (Nancarrow *et al.* 2009). In contrast, research has also noted benefits of FIFO for workers, such as opportunities to earn high incomes, to have flexibility in where they live, and to use extended periods of leave to pursue recreational interest for additional income (Houghton 1993).

A recent study (Scott *et al.* 2012) of FIFO and fear of crime found that FIFO workers pose an externalised threat to traditional norms and values associated with rural and outback life. Traditional signs of Aboriginal social disorder in rural communities, such as alcohol and drug use, overcrowded dwellings, noise pollution, promiscuity, sexual assault and violence have been transferred by locals to FIFO populations. For example, some participants in the study associated littering, a sign of social disorder, with Aboriginal and FIFO cultures. FIFO culture was depicted as in conflict with traditional aspects of rural towns. FIFOs were thought to spend money in a reckless and wanton way, showing lack of control and foresight in purchases of luxury goods, while locals were presented as investing in the family home and community life, a well-spring of social capital. If offensive behaviour or crime had not increased, concern and fear had.

Like mine workers, FIFO sex workers also present as an outsider group. While violence has been readily associated with male FIFO populations, the archetypal form of female deviance is sex work. In this respect, it is not difficult to see why female sex workers have become emblematic of social problems associated with changes in the social and moral order.

## FIFO and health

As noted at the outset of this paper, there has been speculation that the conditions associated with FIFO mineworkers in Australia might have the potential for an increase in STIs. The popular media has focused on concerns about increased STIs and HIV associated with FIFO mining operations. Stories such as 'AIDS worry from fly-in, fly-out miners' 'risky sex' from *The Australian* and 'Fears as sex workers cash in on the new mining boom' from the Queensland *Sunday Mail* highlight concerns about the potential for increased STI transmission. To date, however, the published literature on such changes to STI epidemiology is limited.

There have certainly been reports of increased rates of common STIs in Queensland and Western Australia, but increases have also been noted in the Northern Territory and Victoria (Australian Bureau of Statistics 2012). A review of syphilis epidemiology in Western Australia between 1991 and 2009 has shown an increase up until 2008. The majority of infections remain among indigenous people; however, the greatest increase has been among older non-indigenous men in WA metropolitan areas. Most report infection through same sex casual partners. Increases seen to 2008 have not been maintained and there was a subsequent decline during 2009 (Kwan *et al.* 2012).

Published data on FIFO and health has focussed specifically on mental health issues for workers and their families (Gent 2004;

Kaczmarek and Sibbel 2008; Taylor and Simmonds 2009; Torkington *et al.* 2011; McLean 2012). Other research has focused more on occupational risks such as fatigue and hydration (Carter and Muller 2007; Muller *et al.* 2008). While there is currently little published evidence of a link between FIFO mining and increased STIs/HIV, an association has been established between FIFO and social behaviours frequently associated with increased risky sexual behavior. Lozeva and Marinova note that 'mining contributes to increasing social and health problems with the decline of traditional mechanisms for social control, influx of transient male workforce and lack of formal employment opportunities for women. Increased alcohol consumption, domestic violence, sexually-transmitted diseases and sex work are some examples' (Joyce *et al.* 2012; Lozeva and Marinova). Research from other countries with large-scale migrant mining have examined a relationship between masculinity, risk behaviours and work settings involving separation from family and increased risk of STIs/HIV transmission (Campbell 1997; Kis 2010; Van Tuan 2010). A recent special edition of *The Australian Community Psychologist* focused on FIFO work has made no mention of STIs/HIV or of the potential for an increase in sex work in rural mining communities, focussing rather on family issues as a result of FIFO mine employment.

Increased risk of STI/HIV infection associated with FIFO is generally assumed to be due to two factors:

1. Increased sexual relationships between FIFO miners and local indigenous women
2. An increase in the number of sex workers in rural communities where FIFO operations are located and FIFO miners' use of international sex workers during their time off.

In general, STI prevalence is significantly higher among Indigenous populations than among non-indigenous in Australia. Some rural communities have been identified as having rates as high as 1 in 4 women infected with STIs (Panaretto *et al.* 2006), and prevalence of diseases such as syphilis tends to increase with remoteness (Kwan *et al.* 2012). There is currently no evidence to support the link between FIFO and high prevalence of STIs in local rural communities, nor has the link been made between increased STI prevalence among urban-based partners of FIFO mineworkers.

The above noted, there is no hard evidence to show that sex workers are any more responsible for the transmission of disease than any other group in the community. Indeed, there has not been a documented case of a sex worker in Australia receiving or transmitting HIV infection during sexual intercourse with a client. Sex workers living with HIV tend to have intravenous drug use as a possible mode of transmission. Research also argues that female sex workers are more likely to engage in 'unprotected sex' during non-commercial encounters with 'private partners', an observation that questions the association of commercial sex with disease (Donovan *et al.* 2012). Australian sex workers have the lowest rates of STI infection for any population in the community, and among sex work populations in the world. Given that fears about STI and HIV transmission from Australian sex workers appear to be unlikely, blame has also increasingly been focussed on international sex workers. For example, in an interview on ABC Radio National's Bush Telegraph, 31 May 2012, AMA Queensland President specifically linked sex tourism and foreign sex workers to the increases in STIs and HIV across Queensland. He argued that it is not 'our own Australian sex workers' who are responsible for



rising rates of STIs, but sex workers ‘flying on from other countries’, especially Asia. He also blamed ‘local people’ or what is referred to in the interview as ‘opportunistic sex workers’.

### Improving sexual health outcomes

While sex workers may have lower rates of STIs and HIV, this does not help to explain current increasing rates of both in some parts of Australia. What we do know is that these increases often pre-date the current mining boom and are not restricted to regions with mining growth. There is much research, which has indicated that safe sex compliance among both gay and heterosexual populations began to decline in the past decade. The growth of the internet saw an explosion of subgroups seeking partners to intentionally engage in unsafe sex, a practice referred to as ‘bare-backing’. Increases in this practice have been attributed to: ‘AIDS optimism’ and ‘condom fatigue’. In this context, it is difficult to restrict increases in STIs and HIV in Australia to sex work populations. If nothing else, contracting a disease is bad for business for sex workers. While the internet can be used to promote sex workers, it is also increasingly being used by clients to elate the quality of sex services and identify sex workers deemed to offer a poor quality or dangerous service.

One of the few studies (Scott *et al.* 2008) on sex work in rural and remote areas in Australia examined the health of a small sample of rural female sex workers. It found that sex work in rural areas was similar in vital aspects to the escort and brothel work in urban contexts. A wide variety of services were offered in rural settings, including same-sex and fantasy services. Participants reported that bookings in rural areas were relatively longer than those they had encountered in urban settings. Rural clients were more likely to seek more intimate and less overtly sexual services, such as massage. Not unlike escorts and call girls in urban settings, there appears a high expectation that rural sex workers engage in emotional work, requiring them to counsel, befriend and support clients. This could partly explain the demand for sex workers among FIFO workers.

Confidentiality was a significant issue for sex workers in rural communities. It is notable here that in the context of an occupation such as sex work, maintaining a degree of anonymity is important in terms of safety and security. Close-knit communities may present as intimidating or dangerous places for sex workers. In particular, the more traditional moralities of such may operate to amplify the stigma associated with sex work. Because the client base was a lot smaller, it was more likely workers would come into contact with clients outside of their working lives. For these reasons, it seems surprising that sex workers in mining regions would be disrupting amenity, as has been reported. To work successfully, sex work needs to be discrete. Even visiting a local general practitioner could be an ordeal in smaller communities, with workers wanting to protect their anonymity and not disclose their association with sex work.

Notably, all workers used condoms with clients for intercourse and oral sex. High levels of condom usage are consistent with other research carried out with non-street working populations. At the same time, workers were aware of other rural workers who did not use condoms during intercourse. The reason for not using a condom with clients was primarily thought to be financial; although it was considered that some workers were

more susceptible to manipulation by clients or management, lacking assertive skills.

It was thought that sex workers in rural areas would benefit from access to the same services provided to sex workers in urban settings. Rural communities lacked specialist services. Sexual health clinics were limited to larger regional centres and access to general medical services could be restricted in rural settings because of high demand and limited hours of operation. For example, an absence of 24-h medical or chemist services in rural communities meant condoms could be difficult to access outside of regular business hours. Moreover, there was the problem of affordability of services in rural areas, services being more costly than in metropolitan centres, where services could often be accessed free of charge. These concerns should not be restricted to sex workers, but must be considered as impacting on the wider community.

Concerns about access to health care for sex workers are echoed for FIFO miners. Given the alarm over potential links between FIFO and STIs, there are concerns that FIFO lifestyles militate against men being able to access health care rapidly should they find themselves infected. Working time is focussed on production with little time for accessing health care services beyond emergencies and men are unlikely to spend their ‘down time’ attending medical appointments. Lack of health practitioners in regional areas and employees being afraid to log many sick days also might contribute to a lack of appropriate treatment in FIFO workers (McEwan 2011).

### Some final observations

While space and geography have been historically important with regard to structuring and regulating the sex industry, research has ignored rural manifestations of sex work. There are unique issues facing sex industry workers in regional and rural areas, associated with isolation, occupational discrimination and confidentiality. As such it is important that we avoid stigmatising sex workers in such locations. Stigmatising sex workers may result in them being further isolated from resources and support services. These locations present a number of specific difficulties in that they are unlikely to provide the same levels of health service and care encountered in urban settings.

When trying to understand why Australian sex workers have relatively low rates of STI and HIV it is important to move away from the stereotypical imagery of sex workers as exploited and drug-addicted opportunists working the streets. For those entering into sex work on a full-time or long-term basis, contracting a STI or HIV is bad for business. Discretion is also important to success, especially in smaller regional communities. Sex workers in Australia also experience relatively good sexual health because of the legal status of the industry. States such as NSW and Victoria have decriminalised or legalised the sex industry and this has resulted in better health outcomes for sex workers and their clients who have not been forced underground, with sexual health regarded as an occupational health and safety issue. At present, concerns about the role of FIFO mining and associated FIFO sex work on STI and HIV rates appear to constitute a ‘moral panic’ more than an evidence-based concern. However, there does appear to be a space to develop a better understanding of the social and health dynamics of changing rural environments with the increase in FIFO operations.

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## Industry standards?



Guy Holmes

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Over the years I have had to deal with many different data sets from around the world. Ethiopian seismic data shot by Russians using Chinese equipment, Canadian well logs drilled by a Norwegian company using American down-hole tools and recorded on Japanese recording media, and even elevation data written in French using a German-made pencil.

The one thing that all of these data sets had in common is absolutely nothing.

Standards are so important these days, but I think most of us just take it for granted that the data we receive will be ready to use right out of the box, tape, CD or download. In my line of work the use of data format standards or recording standards takes all of the fun out of my day. My preference, to be totally honest, is that everyone loosely follow the standards provided by industry, but just make them your own – even just a tiny bit. After all, where is the fun in consistency?

For those of you who don't know, the Society of Exploration Geophysicists (SEG) formed a Digital Recording Standards Committee in the 1960s and have been trying to bring some consistency to the way data is recorded in all realms of Geophysics. They have done an amazing and somewhat thankless job ever since and still oversee the development of new or revised formats today. The first format for seismic recording created by this team took on the name SEG-A (Society of Exploration Geophysicists – Format A). Format A was shortly followed by SEG-B, SEG-C, SEG-D and eventually SEG-Y. (There is no SEG-E thru SEG-W, no one knows what happened to them – I think the SEG team thought – 'Let's just jump to the

final letter of the alphabet. No... let's go one before the letter Z in case we need to make one more adjustment to it – that way we can keep one up our sleeve'.)

The standards produced by this team were very detailed and explicit. They covered everything from the media to record to, the density, the number systems to be used, the blocking structure, bit use and many more features. And if everyone used the format to write data, then everyone would be able to read the data universally. Brilliant!

In the SEG-Y format specification it says 'Individual oil companies and contractors may be convinced of their own format's merits, but the use of this recommended exchange demultiplexed format must be given serious consideration in order to achieve some level of industry standardization. Such thought and many suggestions from users have been utilized in establishing a flexible format that yields specifics and can be used by all companies in the industry. Adoption and use of this format will save substantial sums of money in computer time and programming effort in the future', (Barry, K. M., Cavers, D. A., and Kneale, C. W. (1975). Report on recommended standards for digital tape formats: *Geophysics*, 40, 344–352.). Seems as though they were trying to put me out of business! But fortunately, not everyone listened to their wise words.

However, many companies did use the format specifications as the base for their own internal recording formats. SERCEL created a 96 channel format specification that looked remarkably like the 48 channel SEG-B format from the SEG. In fact, they looked for all intents and purposes identical except for one small difference – 96 channels were interleaved into 48 by secretly alternating samples

between the two arrays. Looked like a duck, quacked like a duck – but it was not SEG-B.

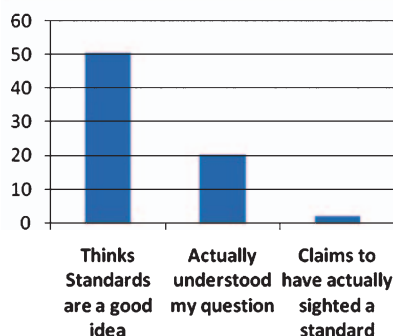
In regards to SEG-A everyone made changes to suit their own purposes. The French made some tweaks to it; the Russians ignored it all together, but at least used the letter A in its name; and the Americans developed new technology that made the format specification redundant before the specification could gain traction. The SEG committee then got clever and allowed the standards to have self-defining areas where companies could use the standard, but also modify the format in certain areas and in certain ways to suit themselves while still technically meeting the standard.

I did some research on the use of format standards in the exploration industry and found some very interesting information. In 1993 a survey of 50 geologists and geophysicists was conducted on the use of format standards in the industry. Coincidentally, research was done on the merits of Santa Claus. The results were astonishingly similar (see figure).

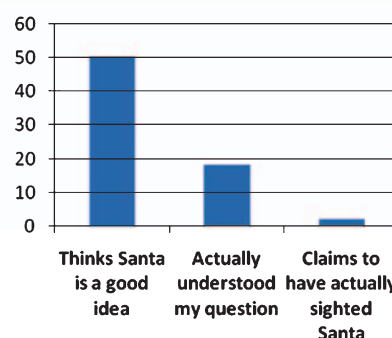
As you can see from the chart, 50 out of 50 people surveyed believe that standards are a good idea. But in reality not many people really know the standards and more people have seen Santa Claus than have sighted an actual recording standard.

All joking aside, the format standards created by the SEG are a great service to us all and a very important asset to the industry as a whole. The standards are publicly available for download on the SEG website ([www.seg.org](http://www.seg.org)) and while most of us would not contemplate trying to understand the complexity of the documents, just knowing they are there lets me sleep a little easier at night – except on Christmas Eve...

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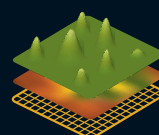
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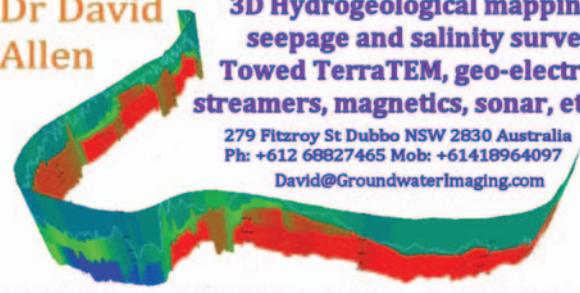
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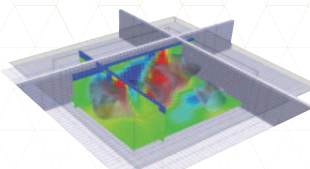
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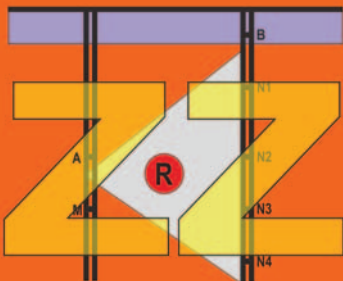


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 MASS - Density, Porosity (permeability also avail.)  
 MAGNETIC - Susceptibility, Remanence; Aniso.  
 ELECTRICAL - Resistivity, Anisotropy; IP effect [galvanic]  
 ELECTROMAGNETIC - Conductivity, mag k [inductive]  
 SEISMIC - P, S Wave Velocities, Anisotropy  
 DIELECTRIC - Permittivity, Attenuation (by arrangement)  
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November		2012	
4–9 Nov	SEG International Exposition and 82nd Annual Meeting <a href="http://www.seg.org">http://www.seg.org</a>	Las Vegas, Nevada	USA
25–28 Nov	Integrated Reservoir Modelling: Are we doing it right? <a href="http://www.eage.org">http://www.eage.org</a>	Dubai	UAE
December		2012	
3–7 Dec	AGU Fall Meeting 2012 <a href="http://fallmeeting.agu.org/2012">http://fallmeeting.agu.org/2012</a>	San Francisco, California	USA
3–5 Dec	Arctic Technology Conference <a href="http://www.arctictechnologyconference.org/">http://www.arctictechnologyconference.org/</a>	Houston, Texas	USA
March		2013	
17–21 Mar	SAGEEP 2013 <a href="http://www.eegs.org/AnnualMeetingSAGEEP/SAGEEP2013.aspx">http://www.eegs.org/AnnualMeetingSAGEEP/SAGEEP2013.aspx</a>	Denver, Colorado	USA
18–19 Mar	Petroleum Geoscience Conference and Exhibition 2013: Innovative Geoscience: Securing Energy Needs <a href="http://www.pgcm.com/">http://www.pgcm.com/</a>	Kuala Lumpur	Malaysia
26–28 Mar	International Petroleum Technology Conference <a href="http://www.iptcnet.org/2013/">http://www.iptcnet.org/2013/</a>	Beijing	China
April		2013	
16–18 Apr	IOR 2013: From Fundamental Science to Deployment <a href="http://fallmeeting.agu.org/2012">http://fallmeeting.agu.org/2012</a>	Saint Petersburg	Russia
May		2013	
13–16 May	Geoinformatics 2013: XIIth International Conference 'Geoinformatics: Theoretical and Applied Aspects' <a href="http://www.eage.org">http://www.eage.org</a>	Kiev	Ukraine
June		2013	
10–13 Jun	London 2013: 75th EAGE Conference & Exhibition incorporating SPE EUROPEC2013 <a href="http://www.eage.org">http://www.eage.org</a>	London	UK
August		2013	
11–14 Aug	ASEG-PESA 2013: 23rd International Geophysical Conference and Exhibition <a href="http://www.aseg-pesa2013.com.au/">http://www.aseg-pesa2013.com.au/</a>	Melbourne	Australia
September		2013	
8–11 Sep	Near Surface Geoscience 2013 <a href="http://www.eage.org">http://www.eage.org</a>	Bochum	Germany
October		2013	
7–10 Oct	7th Congress of the Balkan Geophysical Society <a href="http://www.eage.org">http://www.eage.org</a>	Tirana	Albania
November		2013	
24–27 Nov	2nd International Conference on Engineering Geophysics <a href="http://www.eage.org">http://www.eage.org</a>	Al Ain	UAE
June		2014	
16–19 Jun	76th EAGE Conference & Exhibition incorporating SPE EUROPEC 2014 <a href="http://www.eage.org">http://www.eage.org</a>	Amsterdam	The Netherlands

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The ASEG SA/NT Branch is pleased to be able to present the following wines to ASEG members. These wines were found by the tasting panel to be enjoyable drinking and excellent value. The price of each wine includes GST and bulk delivery to a distribution point in each capital city in early December. Stocks of these wines are limited and orders will be filled on a first-come, first-served basis.

Please note that this is a non-profit activity carried out by the ASEG SA/NT Branch committee only for ASEG members. The prices have been specially negotiated with the wineries and are not available through commercial outlets. Compare prices if you wish but you must not disclose them to commercial outlets.

**2012 ASEG  
WINE OFFER**  
orders close  
Friday 2nd of  
November 2012

## Bremerton 2010 Selkirk Shiraz

The 2010 Selkirk Shiraz offers distinctive varietal characters of dark berry fruit and savoury spice supported by soft supple tannins and complemented by well integrated oak. The wine is balanced on the palate and has great length.

*"Deep colour, with rich, warm and spicy fruitcake and sage aromas; the palate is warm, unctuously textured, finishing with notes of savoury licorice and tar"*

-James Halliday Aus. Wine Companion 2013 edition – 90 points

**ASEG PRICE \$140/dozen (RRP \$264)**



## Second Nature 2012 Sauvignon Blanc

Second Nature is made by premium boutique winery Dowie Doole. The 2012 was sourced entirely from Norm and Jane Doole's Home Block vineyard in the cooler Adelaide Hills region. Fresh, tight and juicy underpinned by a touch of green grass. A lingering, zesty palate with excellent texture and minerality. Bright, racy acidity made for drinking young and fresh.

**ASEG PRICE \$120/case (RRP \$216)**



**Please order online at [www.aseg.org.au](http://www.aseg.org.au) (click on "Wine Offer") and pay by credit card, or fill in below order form**

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Address: \_\_\_\_\_ Capital city for collection: \_\_\_\_\_

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Number of dozens	Wine	Price per Dozen	Total
	Bremerton 2010 Selkirk Shiraz	\$140	
	Second Nature 2012 Sauvignon Blanc	\$120	
		TOTAL	

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**ASEG Wine Offer, c/o. Philip Heath, PO Box 489, Marden, SA 5070**

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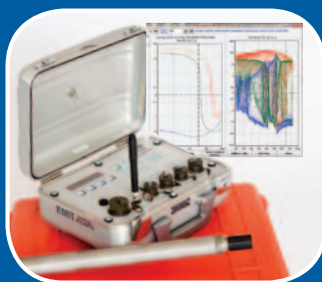
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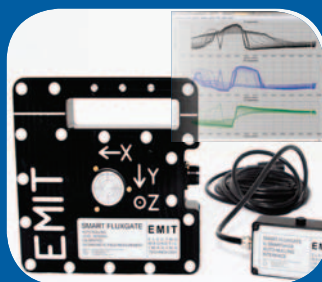
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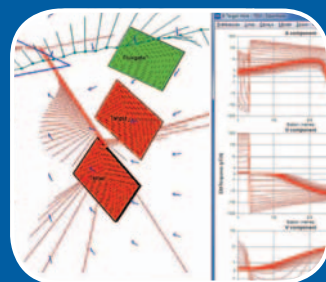
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