



AESOC
australian earth sciences
convention

SUSTAINABLE AUSTRALIA

7-10 JULY 2014

NEWCASTLE, NSW, AUSTRALIA

REGISTRATION AND CONVENTION PROGRAM



*Coalfield Geology Council
of New South Wales*





INVITATION TO ATTEND

The Geological Society of Australia invites you to participate in the biennial Australian Earth Sciences Convention 2014. AESC 2014 will be held in Newcastle, a vibrant port city that is characterised by its working harbour, beautiful surf beaches and proximity to many of Australia's most prestigious wineries. It is the gateway to the Hunter Valley, heart of the Sydney Basin coalfields, centre of power generation for New South Wales, and home of the NSW Institute for Frontier Geoscience - a joint initiative of the University of Newcastle and the NSW Department of Trade and Investment. Combined with the city's focus on energy efficiency via the Federal Government's Smart Grid, Smart City initiative and the CSIRO Energy Centre, Newcastle is an ideal site for our convention - ***Sustainable Australia***.

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

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

We welcome you to participate in the AESC 2014 convention in Newcastle and look forward to seeing you there.



SECRETARIAT ADDRESS

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ORGANISING COMMITTEE

- Anita Andrew, *Australian Journal of Earth Sciences & Environmental Isotopes Pty Ltd*
- Dioni I. Cendón, ANSTO
- Bill Collins, Newcastle University
- Colin Coxhead, Coalfield Geology Council of NSW
- Anthony Dosseto, University of Wollongong
- Sue Fletcher, Geological Society of Australia
- Ian Graham, University of New South Wales
- John Greenfield, NSW Trade & Investment – Resources & Energy
- Sarah Jardine, NSW Trade & Investment – Resources & Energy
- Craig O'Neill, Macquarie University
- Robert Musgrave, NSW Trade & Investment – Resources & Energy
- Kaydy Pinetown, CSIRO
- Dave Robson, NSW Trade & Investment – Resources & Energy
- Greg Skilbeck, University of Technology
- Mike Smith, Austpac Resources NL
- Martin Van Kranendonk, University of New South Wales



CONVENTION VENUE

Newcastle is Australia's sixth largest city and one of its oldest. It has a fast growing reputation as a convention destination as it offers a unique blend of big city facilities and country town friendliness. It is the capital of the Hunter Region - the most popular tourist destination outside Sydney in New South Wales.

The reasons why are very easy to find. It is surrounded by superb beaches and as Australia's second oldest settlement, is rich in cultural heritage. Many historic buildings including the magnificent Civic Theatre, Customs House, Station Masters Cottage, the Court House, quaint rows of iron-laced terraced houses, a fine gothic-style Cathedral and Fort Scratchley - Australia's only fort that went to war. Museums, art galleries, shopping, nightclubs, restaurants, theatres, a magnificent harbour foreshore, picturesque parks, bushland reserves and a wide variety of excellent sporting facilities all add to the surprises.

The main venues for this convention are Newcastle City Hall and the adjacent Civic Theatre. They are located in the heart of the CBD opposite Civic Park. These grand 1920's buildings have become a focal point for the city and have been faithfully restored to their former glory. City Hall contains elegant chambers and meeting rooms and a stylish main concert hall that adds elegance and style to any convention. Designed by famed 1920's architect Henry Eli White in his famous 'Spanish Baroque' style, Civic Theatre will leave a lasting impression with its grand marble foyer and staircase, terrazzo balcony, beautiful interiors and historic auditorium chandelier.



GENERAL INFORMATION

Weather

In early July, Newcastle generally enjoys bright sunny, dry but cool day winter weather with average maximum temperatures of 16.7° C and a minimum of 8.4° C.

How to get to Newcastle

Road

The main access from Sydney by road is the M1 (formally F3) – an easy 2 hour drive. Take the Newcastle/Wallsend exit and follow the signs to the City Centre. The New England Highway is the inland route north to Queensland and the Golden Highway provides easy access from Western NSW.

Rail

As part of the City Rail network, there is an almost hourly service from Sydney Central station to Newcastle. Fast Countrylink trains connect Sydney, Newcastle, Brisbane and other regional NSW centres. See City Rail website for timetables and further information www.cityrail.nsw.gov.au

Air

Newcastle Airport (Williamstown) is located a short 25 minute drive from to the north of the CBD. It is served by direct daily flights to/from Sydney, Melbourne, Brisbane, Canberra, the Gold Coast and some other regional centres of NSW by Qantaslink, Jetstar, Virgin Australia, Brindabella, Rex and Aeropelican Airlines. See www.newcastleairport.com.au for further details and timetables of the airlines

Airport Transfers

Taxis are available to/from the airport at a cost of approx \$40-\$50 to the CBD. Door to door transfers can also be pre-arranged by contacting Newcastle Airport Information Services on P: 02 4928 9822 E: nais@newcastleairport.com.au - cost starting from \$45 for two persons. Delegates arriving on late flights in the evening are particularly advised to pre-book. For further information go to www.newcastleairport.com.au

OTHER INFORMATION

For further information on Newcastle and the Hunter Region we suggest that you visit the following websites:

NEWCASTLE:

www.visitnewcastle.com.au

HUNTER VALLEY WINE COUNTRY:

www.winecountry.com.au

LAKE MACQUARIE:

www.visitlakemac.com.au

PORT STEPHENS:

www.portstephens.org.au

INVITED SPEAKERS



Professor Iain Stewart of Geoscience Communication at Plymouth University (UK), is an Earth scientist and broadcaster who specialises in recent geological change. After completing his undergraduate studies in Geography and Geology at Strathclyde University (1986), and a PhD in earthquake geology at Bristol University (1990), he taught Earth Science at Brunel University in west London, before leaving in 2002 to develop television projects on geoscience. Since then he has presented major television series for the BBC on the nature, history and state of the planet, most notably 'Earth: The Power of the Planet'; 'Earth: The Climate Wars'; 'How Earth Made Us', 'How To Grow A Planet'; 'Volcano Live', and 'Rise of the Continents'. He regularly fronts BBC Horizon specials on geoscientific topics, such as the Japanese earthquake, the Russian meteor strike, Shale gas/ Fracking, and Florida sinkholes. Some of his most programmes have explored his old 'backyard' with 'Making Scotland's Landscape' and a celebration of the Scottish pioneers of geology, 'Men of Rock'. He is currently President of the Royal Scottish Geographical Society, an Honorary President of the Scottish Association of Geography Teachers and a Patron of the Scottish Geodiversity Forum. In 2013 he was awarded the American Geophysical Union's Athelstan Spilhaus Award for conveying to the general public the excitement, significance, and beauty of the Earth and space sciences.



Professor Mike Archer was born in Sydney but grew up in Appalachia, USA, where, while learning to play banjo and make moonshine, he became obsessed with fossils from the age of 11. After graduating from Princeton University (MCL; Geology & Biology) he did his PhD in the University of Western Australia (Zoology), became Curator of Mammals at the Queensland Museum, Lecturer in the University of New South Wales, Director of the Australian Museum in Sydney, Dean of Science at the University of NSW and now Prof. and Head of the Evolution of Earth & Life Sciences Research Group at UNSW. His research projects focus on the deep past such as the World Heritage fossil deposits at Riversleigh, the fragile present such as conservation through sustainable use of native resources including having native animals as pets, securing the future based on the wisdom of the fossil record, and trying to bring extinct species back into the world of the living. He has supervised >85 PhD and Hons students, produced >275 scientific publications including 15 books and received 25 awards including Fellowships in academic societies such as the Academy of Science and Royal Society of NSW, Eureka Prize for the Promotion of Science and Member of the Order of Australia.



Dr Chris Pigram has over 35 years experience in geoscience covering minerals, petroleum, basin analysis and marine geoscience with over 100 publications and is member of several professional geological societies. He has worked in Southeast Asia and the West Pacific as well as extensively in Australia.

Dr Pigram currently holds the position of Chief Executive Officer in Geoscience Australia.



Prof Craig Simmons is Schultz Chair in the Environment at Flinders University and Director, National Centre for Groundwater Research and Training (Australia). One of Australia's foremost groundwater academics, Professor Simmons has been a significant contributor to global advances in the science of hydrogeology for many years and has published widely in areas including variable density groundwater flow, surface water - groundwater interaction, fractured rock hydrogeology, aquifer storage and recovery, and groundwater flow and solute transport modelling. He is a member of the Statutory Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development. His work has been recognised by numerous national and international research and teaching awards including the Anton Hales Medal for outstanding research contributions to the Earth Sciences by the Australian Academy of Science. Professor Simmons has served as an Editor and Associate Editor for numerous major international journals including Hydrogeology Journal (Editor), Water Resources Research, Environmental Modeling and Assessment, Journal of Hydrology, Groundwater and Vadose Zone Journal.

PROGRAM

	SUNDAY 6 JULY		MONDAY 7 JULY	TUESDAY 8 JULY	WEDNESDAY 9 JULY	THURSDAY 10 JULY	
0815	GSA Council Meeting 0930 - 1330		Opening Plenary Session Main Auditorium	Plenary Session Main Auditorium	Plenary Session Main Auditorium	Plenary Session Main Auditorium	
1000			Concurrent sessions/ Sydney Basin Symposium	Concurrent sessions/ Sydney Basin Symposium	Concurrent sessions/ Circum-Pacific Orogens	Concurrent sessions	
1030			Morning tea & Poster Viewing	Morning tea & Poster Viewing	Morning tea & Poster Viewing	Morning tea & Poster Viewing	
1100			Concurrent sessions/ Sydney Basin Symposium	Concurrent sessions/ Sydney Basin Symposium	Concurrent sessions/ Circum-Pacific Orogens Symposium	Concurrent sessions	
1230		Lunch and Poster viewing	Lunch and Poster viewing	Lunch and Poster viewing	Lunch and Poster viewing		
1330		GSA AGM 1430 - 1600	Registration opens from 1400	Concurrent sessions/ Sydney Basin Symposium	Concurrent sessions/ Sydney Basin Symposium	Concurrent sessions/ Circum-Pacific Orogens Symposium	Concurrent sessions
1530				Afternoon tea & Poster Viewing	Afternoon tea & Poster Viewing	Afternoon tea & Poster Viewing	Afternoon tea & Poster Viewing. Exhibition closes at end of Afternoon tea
1600				Concurrent sessions/ Sydney Basin Symposium	Concurrent sessions/ Sydney Basin Symposium	Concurrent sessions/ Circum-Pacific Orogens Symposium	Concurrent sessions
After sessions/ evening		ICE BREAKER AT NEWCASTLE MUSEUM 1800 - 1930	PUBLIC FORUM AT CIVIC THEATRE 1930 - 2130	GSA AWARDS 1800 - 1930 MAWSON LECTURE 1930 - 2100	CONVENTION DINNER AT FORT SCRATCHLEY/ CIVIC THEATRE 1830 - 2300		

CALL FOR ABSTRACTS

Abstracts are invited for both oral and poster presentations for the Australian Earth Sciences Convention 2014, with electronic submission up to 14 March 2014. All abstracts must be prepared according to the guidelines. Abstracts must be formatted according to a template and submitted through the online submission site, via the AESC website.

Important Dates

Closing date for submission of abstracts
14 March 2014

Acceptance, allocation or rejection will be advised by **the end of May 2014**

Themes

The program for the AESC2014 will be organised through a set of themes, with sessions running through the course of the meeting. The program will be arranged to minimise clashes between themes.

The main themes are:

- Energy
- Resources
- Environment
- Infrastructure, Service and Community
- Dynamic Planet
- Living Earth

In addition there are 2 symposia:

- 39th Symposium on the Advances in the Study of the Sydney Basin
- Comparisons & Contrasts in Circum-Pacific Orogens

Abstracts should be submitted to the themes or symposia and will be organised by the Program Committee into appropriate oral and poster sessions. Note those accepted for the symposia will also be required to prepare an extended 2-4 page abstract.

Submission Details

Authors should submit abstracts online (via the AESC website), as early as possible, but no later than **14 March 2014**. You will receive an automatic acknowledgement of the receipt of your abstract and you will be notified by email by the end of May 2014 on the success of your submission and the required format. The Organising Committee reserves the right to contact authors, if required to clarify the nature of intended presentations prior to making decisions regarding their acceptance.

Abstract Guidelines

- Abstracts must focus on scientific results or their application, in fields relevant to the convention's scientific themes or the symposia. The Scientific Program committee may decline to consider abstracts with other focus.
- For each abstract, authors should indicate their preference for either an oral or poster presentation. However, the Scientific Program committee reserves the right to reassign abstracts to the alternative format, subject to timetabling considerations.
- Abstracts may be submitted to any of the themes or symposia. Within the themes, authors may choose to nominate their submission within one of the pre-defined sessions, or may leave their submission ungrouped within the broad theme.
- Following the abstract deadline, submitted papers may be placed in a different, more appropriate session than the one to which they were submitted. Abstracts submitted to the broad themes will be grouped with other, similarly focussed abstracts into additional sessions devised by the program committee. Final decisions regarding placement of individual papers into sessions rests with the Program Committee.
- Within the thematic sessions, a limit of 1 oral presentation and 1 poster presentation may be submitted per presenter, who must be a registered delegate and should appear as the first author. Similar conditions apply separately to each of the two symposia.
- Presenting authors may appear as co-authors on other presentations, without limits.
- Plenary, keynote and invited oral or poster presentations will not be counted towards the oral or poster limit. Presentations submitted to either of the two symposia will also not count towards the presentation limits for the thematic sessions.
- Only presenters will be listed in the program. All co-authors will be included in the abstract section of the convention handbook. By submitting an abstract the author(s) agree to publication of the abstract in the convention handbook and any other convention promotional material.
- Authors will be notified of acceptance/rejection before the end of May 2014.
- All abstracts are to be submitted online using the online abstract submission form. If you cannot view your abstract in the speakers portal within 24 hours after submission, please contact the convention organisers.
- If you are unable to submit via the website or are experiencing difficulties please contact the convention organisers.

Note: Abstracts submitted via fax, email or on disk/CD will not be accepted.

Format for Abstracts

The following format must be followed for all abstracts:

Title - 12 point, bold typeface, Arial font, left aligned

Leave one blank line (12 point)

Authors - 10 point, Arial font, Surname, First name, Presenting Author to be bold

Affiliations numbered in superscript

Leave one blank line (12 point)

Affiliations - 10 point, Arial font, Italics, Affiliation, City, Country

Leave one blank line (12 point)

Abstract Text - 10 point, Arial font, left aligned, single spacing.

Maximum of 500 words

Please note the following:

- Do not insert any tables or figures
- Do not include titles or degrees
- Check spelling and grammar. Submitted material will be published in the convention handbook - the abstract should, therefore, contain no errors.
- Standard scientific abbreviations may be used - non-standard abbreviations should be included in parenthesis after the first use of the full word.
- Do not indent paragraphs.
- Name the file with the first 8 characters from the surname of the first author (for example: wolf.doc).
- Present sufficient data to support conclusions - it is unsatisfactory to use statements such as "data will be presented" or "results will be discussed".

Public Forum: Energy 2050

Date: Monday, 7 July 2014

Time: 1930 - 2130

Venue: Civic Theatre, Newcastle

Cost: Single ticket \$10. Family ticket (2 adults, 3 children) \$20

As part of the Australian Earth Sciences Convention 2014, a public forum on **Energy 2050: The Future of Energy in Australia** will be held on Monday July 7th at 1930 at the Civic Theatre, Newcastle. The forum panel will consist of world class speakers including Professor Iain Stewart, Geoscience Communication of Plymouth University (UK); Dr Gary Ellem, University of Newcastle; Professor Ben Hankamer, University of QLD, Institute for Molecular Bioscience; Dr Tony Irwin, SMR Nuclear Technology and Dr Alex Wonhas, CSIRO.

An abundance of relatively cheap energy has been the critical support component of the quality lifestyle we enjoy in Australia. It powers the cars we drive, the appliances we use in our homes, and the industry we rely on for creature comforts and wealth creation. Most of this energy comes from fossil fuels; For example, coal accounts for over half of Australia's domestic energy production; ~90% of NSW electricity comes from coal. But fossil fuel resources (oil, gas, coal) come at a cost to the local environment and probably to the global climate. Moreover, we live on a finite planet, so the shift from the industrial era to the sustainability era must come, if we are to maintain our lifestyle through the 21st century and beyond. Alternative renewable sources of energy are available, but many of these have their own limitations in terms of capacity, environmental effects, and high production costs. At present they represent less than 5% of our energy production. Moreover, the impacts of energy production, particularly coal mining, are strongly felt by local communities when mines encroach on urban areas and valuable agricultural land. Thus, the key themes are the future of energy resources in Australia, and the social impact of our transition to a secure renewable energy future. These are key national issues and will increasingly become global issues.

So, what does the future hold for Australia? What are the best resources/alternatives to secure a reliable energy future and what are their environmental effects? Are alternatives really viable and what are the implications of transitioning society into the 'sustainable era'?

'Energy 2050' will consist of presentations by earth scientists who have intimate knowledge of their respective industries, or have a vision of where we need to be in 2050. Presentations will be followed by a public question and answer period. The evening will commence at 7:30 pm at Newcastle's famous Civic Theatre, run for two hours, and end at 10:30pm at the close of the Q & A programme.

Why Newcastle?

The Hunter region with its capital Newcastle, has been coined the 'Energy Hub of Australia', reflecting its high rates of energy production and ongoing potential underpinned by vast reserves of coal and coal seam gas (CSG). But it is also where coal mining intensification and CSG exploration impinges on an ever-expanding urban zone and critical agricultural clusters, including the equine and viticulture industries. Conflicting land use issues are probably more strongly focused here than any other region of Australia. The competing land use issues have created a high level of community uncertainty and concern centred upon environmental and water resource impacts. In response, the Australian and NSW Governments have introduced tough new regulations, which will change the way coal mining and CSG exploration take place in NSW for the next 20 years. Partly in response to these regional imperatives, the University of Newcastle has launched a long-term whole of university research project focussed on achieving the balanced social, environmental and economic transitions required in the Hunter region during the next two decades. These are the key issues to be discussed at the 2050 forum.

SYMPOSIA

39th Symposium on the Advances in the Study of the Sydney Basin

Theme Convenor: Colin Coxhead, Coalfield Geology Council of NSW

The Sydney Basin forms part of the Sydney-Gunnedah-Bowen Basin, a major foreland basin system which extends from southern coastal New South Wales to Central Queensland. This Permo-Triassic basin is bounded by older Palaeozoic rocks of the Lachlan Fold Belt, to the south and west, and the New England Fold Belt to the northeast. The basin has both an onshore and offshore component which extends to the edge of the continental shelf. Three major cities are located in the region - Sydney, Newcastle and Wollongong. There has a long history of coal exploration and mining within the basin, with several thousand boreholes that have been drilled. Petroleum exploration has been modest but the basin is considered prospective for oil, gas, coal seam methane and oil shale.

Initiated by the University of Newcastle in 1967, the long-running series of symposia on 'Advances in the Study of the Sydney Basin' has become a well established focal point for the discussion of research findings and other studies of academic, industrial and community interest for one of the most significant geological provinces in Australia. A wide range of topics are presented at the 'Sydney Basin Symposium', including fundamental geology, coal exploration and mining, coal seam gas, groundwater resources, industrial minerals, developments in technology and geological aspects of the natural and urban environment.

Comparisons & Contrasts in Circum-Pacific Orogens

Theme Convenor: Bill Collins, University of Newcastle

Fundamentally different tectonic evolution models have been applied to circum-Pacific orogenic belts, depending on location in either the eastern or western Pacific realms. For example, for the last three decades, North American Cordilleran models have focussed on accretion of suspect oceanic terranes to grow the orogen, whereas more recent models for the SW Pacific have focussed on growth by protracted slab rollback and intermittent contraction (tectonic mode switching), which have been applied to the Paleozoic Gondwanan orogens now exposed in Australia, Antarctica, and New Zealand. What is the geological evidence for these competing models?

Can each model be applied to either side of the Pacific? If not, why not? What insights can be gleaned from Andean tectonic evolution, which seems to be dominated by subduction-erosion processes? Are there fundamentally different geodynamic drivers that permit this supposed contrasting tectonic evolution across the Pacific?

This special session of AESC will explore these questions and related issues on circum-Pacific tectonic evolution.

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WORKSHOPS & FIELD TRIPS

AESC 2014 FIELD TRIPS

All Field trips will begin and conclude at Newcastle City Hall unless otherwise noted.

PILBARA, WA FIELD SCHOOL 2014

Leader: Prof Martin J. Van Kranendonk, *University of NSW* **CANCELLED**

No. of Days: 8 days/7 nights

Departure: Saturday 28 June

Return: Saturday 5 July

Cost: \$3000 p/p

NB This tour departs from Perth

Inclusions: All accommodation (Sat 28 /6 – Fri 4/7 incl.); transport *, all meals#, mapping equipment & notebooks.

(*Transfers to Perth to join this field trip and from Perth to Newcastle at its conclusion are not included. #Meals on travel days –Sat 28/6 and Sat 5/7 are not included).

Booking deadline: Friday 30 May 2014

The field school will examine the early Archean rocks of the Pilbara Craton of Western Australia, in the North Pole Dome and around the town of Marble Bar, where fossilised remnants of Earth's oldest convincing evidence of life are preserved in excellent exposures. The field school is designed to give participants the chance to observe these ancient fossils in their natural settings and to spend time mapping key exposures in order to gain experience in geological mapping techniques and an appreciation for the complexity of geological interpretation and habitat reconstruction in these very old rocks.

This field school is designed for both experienced geologists and novices alike: educators, administrators and others with an interest in early life on earth and the search for life on Mars are encouraged to attend.

Access to the sites will be by 4-wheel drive vehicles. Indoor accommodation will be provided near mapping sites, but participants will have the option to camp Aussie-style, under the stars.

Participants are advised to bring sun protection (hat, sunglasses, sunscreen) and wear appropriate clothing, including study rubber-soled hiking boots, leg gaiters (for spinifex) and either shorts or lightweight long pants. Temperatures can be warm to hot during the day (22-35°C/72-95°F) and cool to warm during the night (10-20°C/41-68°F). Although rain is not common at this time of year, a raincoat is advised. Participants should bring a camera.

GEOLOGY & MINERAL SYSTEMS OF THE NEW ENGLAND OROGEN **CANCELLED**

Leader: Dr Sol Buckman, *University of Wollongong*

Contributors: Dr Phil Blevin, *Geological Survey of NSW*

No. of Days: 4 days/3 nights

Departure: Thursday 3 July, 0730

Return: Sunday 6 July, 1700

Cost: \$750 p/p Twin Share; \$900 p/p Single*

Inclusions: Pick up from Newcastle City Hall; 3 nights' accommodation (Nundle, Armidale & Port Macquarie); all meals except dinners which will be paid individually and return to Newcastle in time for the Convention Ice Breaker. (NB: Twin share accommodation only, is available in Nundle).

Booking deadline: Friday 30 May 2014

The New England Orogen forms part of the Tasmanides in eastern Australia stretching from north of Newcastle to northern Queensland. Exposures in northern NSW present an opportunity to view and discuss different facets of the New England Orogen, including:

- Comparison of the Gamilaroi terrane (a Siluro-Devonian intra-oceanic island arc sequence) and the Kuttung Arc (Carboniferous-Permian Andean-style continental arc sequence).
- The nature of oroclines in the southern part of the orogen. The oroclines can be traced by the presence of serpentinite.
- I-, S- and A-type granites of the Late Carboniferous-Triassic New England Batholith.

The orogen has a rich mineral endowment with significant Sn, Au, Ag and Sb production, as well as production of other metals, industrial minerals and gemstones

HUNTER VALLEY COAL: FROM THE EXPLORATION SITE TO THE COAL SHIP

Leader: Ms Sarah Jardine, *Geological Survey, NSW*

No. of Days: 1 day **CANCELLED**

Departure: Saturday 5 July, 0800

Return: Saturday 5 July, 1700

Cost: \$110 p/p

Inclusions: Pick up from City Hall; all refreshments, return to CBD hotels

Booking deadline: Friday 30 May 2014

The Hunter Valley is the largest coal-producing region in NSW. It is rich in resources, hosting several large coal mines, an extensive transport network and one of the largest coal-exporting ports in the world.

This field trip follows the journey of mined coal through the Hunter Valley. The day starts at an exploration drill rig where Permian black coal resources of the northern Sydney Basin are discovered and analysed to determine their mining potential. The trip continues to an open-cut coal mine operation, where mine design, mining techniques, coal processing and handling will be observed.

Most coal is transported to a domestic or international market via a rail network. This network delivers the export product to large coal terminals at the port of Newcastle. The field trip continues on through the port's coal terminals, where the trains are unloaded, coal is stockpiled and ships are loaded.

The field trip is a must for those interested in the complex process of discovering, mining, transporting and exporting coal from the Hunter Valley

BLUE MOUNTAINS WORLD HERITAGE AREA/ JENOLAN GEOTOURISM **CANCELLED**

Leader: Mr Angus Robinson, *Chair, GSA Geotourism Sub Committee*

Contributors: Dr Ian Percival, *Chair, GSA NSW Division Geoheritage Sub Committee*; Mr John Pickett, *lead author of Layers of Time*

No. of Days: 2 days/1 night

Departure: Saturday 5 July, 0600 (Newcastle), 0800 (Sydney)

Return: Sunday 6 July, 1800

Cost: \$395 p/p Twin Share; \$495 Single

Inclusions: Two day excursion – coach departs Newcastle 6am for 8am pickup at Sydney Central Station; visit Mt Tomah (Blue Mountains World Heritage Centre); guided cave tour and surface walk at Jenolan Caves; overnight accommodation at historic Caves House including Yulefest dinner and breakfast; visit Govetts Leap, descent into Jamison Valley (and return ascent) on the recently modernised Scenic World Railway, and lunch on second day. (NB lunch on Day 1 at own expense). Return transport to Newcastle. Complimentary copies of *Layers of Time* (Blue Mountains geology field guide) and Earth Sciences History Group field notes.

Booking deadline: Friday 2 May 2014

The Greater Blue Mountains World Heritage Area is an accessible wilderness, covering more than one million hectares of rainforest, canyons, eucalypt forest and heath lands west of Sydney. It extends north to the Hunter Valley and includes various national parks (e.g. Blue Mountains and Kanangra-Boyd), as well as the Jenolan Karst Conservation Reserve. The Blue Mountains is a sandstone plateau of Triassic Age which shelters a rich diversity of fauna and flora, including a number of ancient plant species, the most famous of which is the Wollemi Pine. The area is also home to the world famous and

historic Jenolan Caves, eroded into Silurian limestone, and arguably Australia's first significant geotourism icon.

This two day excursion will showcase some of the most scenic and historic vistas in the Blue Mountains. We will visit the World Heritage Exhibition Centre in the Mt Tomah Botanic Gardens, and various geosites including the iconic sandstone landscape at Govetts Leap as well as the sandstone escarpment and underlying Permian coal measure exposures in Jamison Valley, accessed by the steepest passenger railway in the world. Staying overnight in the famous heritage accommodation at Caves House, the excursion at Jenolan Caves will include guided tours of selected caves and encounters with wildlife including the quite unique opportunity to experience platypus frolicking in the wild in Jenolan's Blue Lake. The Yulefest Dinner that evening will be enlivened by a presentation of the fascinating Earth Sciences History of the Greater Blue Mountains by a distinguished scientist. The excursion will conclude in Newcastle in time for delegates to attend the AESC Ice Breaker function.

NB. This excursion will involve negotiating numerous flights of stairs (generally with handrails) within the caves at Jenolan. Some short bush walks are also included. Participants should be reasonably fit and mobile to fully enjoy the experience.

GEOLOGY OF THE GLOUCESTER BASIN

Leader: Ms Sarah Jardine, *Geological Survey of NSW*

No of Days: 1 day

Departure: Sunday 6 July, 0800

Return: Sunday 6 July, 1700

Cost: \$165 p/p

Inclusions: Pick up from City Hall; all refreshments, return to CBD hotels

Booking deadline: Friday 30 May 2014

The fault-bounded Gloucester Basin contains coal-bearing Permian sedimentary and volcanic units resting unconformably on Carboniferous strata of the New England Orogen. The basin's Permian sequence contains up to 50 coal seams which were deposited in an actively subsiding graben. The area hosts two operating coal mines, a developing petroleum industry and various agricultural enterprises.

This one day field trip will provide an overview of the geology of the region. Companies face challenges in extracting coal from seams that outcrop along the eastern margin of the basin, where the strata are folded and dip steeply. Towards the centre of the basin, the seams are flatter but deeper and the petroleum industry is developing projects to extract gas associated with the coal seams. Farming in the area has a long, successful history as a result of the soil and water resources associated with the local geology.

A coal mine, a coal seam gas field development and dairy farm will be visited allowing attendees to gain an understanding of how each industry operates and co-exists with others in the basin.

GEOLOGY AND WINES OF THE LOWER HUNTER VALLEY

Leaders: Mr Phil Gilmore, *Geological Survey of NSW*; Dr John Greenfield, *Geological Survey of NSW*

Contributors: Mr John Davis, *Tallavera Grove Vineyard*

No. of Days: 1 day

Departure: Sunday 6 July, 0800

Return: Sunday 6 July, 1700

Cost: \$120 p/p

Inclusions: Pick up from City Hall; all refreshments including a vineyard lunch; return to CBD hotels. Does not include wine with lunch.

Booking deadline: Friday 30th May 2014

The vineyards of the Hunter Valley are famous for their Semillon and Shiraz. This field trip provides a chance to sample local wines at the cellar door and examine the geology of the Mount View and Pokolbin area in the local Hunter Valley.

Geology stops will examine Late Carboniferous volcanism of the New England Orogen (Mount View inlier) and Early Permian sedimentary sequences (Sydney Basin).

The role of underlying geology and soil formation in viticulture will be examined, particularly their importance in the development of suitable soil profiles for growing Hunter Valley Shiraz.

Lunch will be provided in the vineyards, and of course there will be an opportunity to sample and purchase fantastic Hunter Valley wines.

GEOLOGY, SURF AND SCENERY OF NEWCASTLE: A SUNRISE COASTAL WALK

Leader: Mr Phil Gilmore, *Geological Survey of NSW*

No. of Days: 2½ hours

Departure: Wednesday 9 July, 0600

Return: Wednesday 9 July, 0830

Cost: \$40 p/p

Inclusions: 0600 bus pick up at CBD hotels for transfer to Nobby's. Coffee at Merewether Surf House before return transfer to hotels by 0900

Booking deadline: Friday 30 May 2014

A 6km sunrise walk along the Bathers Way from Nobby's to Merewether to enjoy the spectacular coastline, examine the local geology of the Late Permian Newcastle Coal Measures, discuss the European settlement and development of Newcastle and spot some whales! A good level of fitness is required for this tour.

GEOLOGICAL HISTORY OF THE LOWER HUNTER VALLEY

Leaders: Mr Phil Gilmore, *Geological Survey of NSW*; Dr John Greenfield, *Geological Survey of NSW*

No. of Days: 1 day

Departure: Friday 11 July, 0800

Return: Friday 11 July, 1700

Cost: \$95 p/p

Inclusions: Pick up from City Hall; all refreshments; return to CBD hotels

Booking deadline: Friday 30th May 2014

This one-day trip provides an overview of the geology of the Newcastle area from Port Stephens to the north, the coalfields to the west, Lake Macquarie to the south and coastal sections along the Tasman Sea. The role of mapping by Edgeworth David and others leading to the rich mining culture in the region will also be discussed.

Four main aspects of the local geology will be examined at field stops:

- Late Carboniferous sequences including volcanism of the New England Orogen in the Port Stephens area, and varved shales related to glacial activity in the Seaham area;
- Fossiliferous shallow marine sedimentary rocks of the Early Permian Branxton Formation;
- Sedimentary sequences of the Late Permian Newcastle Coal Measures, including *Glossopteris* and other plant fossils;
- Quaternary geology of the Hunter Valley, including formation of the barrier systems of Stockton Bight and the impacts of past climate change in the area's geomorphology.

INDIGENOUS SITES OF THE HUNTER VALLEY

Leader: Dr Anita Andrew, *Environmental Isotopes Pty Ltd*

Contributor: Ngurra Bu Cultural tours

No. of Days: 1 day **CANCELLED**

Departure: Friday 11 July, 0800

Return: Friday 11 July, 1800

Cost: \$160 p/p

Inclusions: All transport, morning & afternoon tea and lunch.

Booking deadline: Friday 30th May 2014

Join experienced Ngurra Bu Aboriginal guides as they share with you their knowledge of the culturally significant sites of Hunter Wine Country & the diverse uses of the

surrounding bushland. The Wollombi and Broke Valleys in the Hunter Valley are home to numerous Ceremony and Lore sites. This tour follows the traditional ceremonial journey to share the stories including why Mt Yengo is as significant to NSW Aboriginal people as Uluru is to the Central Desert people. Your tour includes a visit to the Biame cave at Milbrodale where Biame is depicted in red ochre in a cave painting, as a large figure with long outspread arms protectively embracing the tribal territory and the people of the valley. You will also have the opportunity to learn about rock carvings that are over 12,000 years old, bush food and medicines of the local area, artwork caves and how to connect to the spirit that is within us all.

GEODIVERSITY, GEOHERITAGE AND GEOTOURISM OF THE PORT MACQUARIE – LAURIETON- KEMPSEY- SOUTH WEST ROCKS, MID NORTH COAST OF NSW

Leaders: Dr Ian Percival, *Geological Survey of NSW*; Dr David Och, *Parsons Brinkerhoff*

No. of Days: 2 days/1 night **CANCELLED**

Departure: Friday 11 July, 0730

Return: Saturday 12 July, 1700

Cost: \$300 p/p Twin share, \$350 p/p Single

Inclusions: Pick up from Newcastle City Hall; 1 night accommodation in Port Macquarie; all meals except dinner which will be paid individually; entrance to Aarakoon Gaol; Return transport to Newcastle with drop off at Newcastle Airport and Newcastle CBD.

Booking deadline: Friday 30th May 2014

The Mid North Coast region of NSW, centred on Port Macquarie and extending north as far as South West Rocks (85 km by road), south to the Laurieton area (40 km by road), and occupying a relatively narrow coastal strip encompassing the inland towns of Kempsey and Wauchope, is exceptionally diverse in terms of its underlying rock types and overlying soil and sediment cover. Ages of the rocks we will see ranges from Ordovician (around 460 Ma) to Devonian, Permian, Triassic and Holocene. Geomorphological features of the region resulting from emplacement and erosion of these rocks are equally varied, and serve as the basis for the great variety of plant communities that are present, which in turn support a complex mosaic of native animal habitats. This excursion, conducted over two days, will sample some of the representative exposures of the region's geodiversity; one of these outcrops has significant

geological heritage value, and this and other sites have potential for inclusion in a regional geotourism strategy. Most of the excursion stops are beach outcrops or coastal headlands, and the area is very scenic. A visit to the only coastal exposure of blueschist-lawsonite-eclogite facies rocks in eastern Australia at Port Macquarie will be a highlight. A moderate level of fitness is required, involving walking over rocky outcrops and descending/ascending flights of stairs to access the beach

GEOLOGY & MINERAL SYSTEMS OF THE LACHLAN OROGEN **CANCELLED**

Leader: Prof Bill Collins, *The University of Newcastle*

Contributors: Dr Joel Fitzherbert, *Geological Survey of NSW*; Dr. Gary Colquhoun, *Geological Survey of NSW*

No. of Days: 5 days/4 nights

Departure: Friday 11 July, 0730

Return: Tuesday 15 July, 1800

Cost: \$1250 p/p Twin share, \$1500 p/p Single

Inclusions: All transport to/from Newcastle; 4 nights' accommodation (Orange x 2 nights, Cooma & Narooma); all meals except 1 dinner which will be paid individually. Return transport to Newcastle with drop off at Sydney Airport en route.

Booking deadline: Friday 30 May 2014

The enigmatic Lachlan Orogen forms part of the Tasmanides in eastern Australia. Exposures in central and southern NSW present an opportunity to view and discuss different facets of the Lachlan Orogen, including:

- Litho-stratigraphic relationships in the Lachlan Orogen.
- Intra-oceanic arc rocks of the Ordovician to Early Silurian Macquarie Arc, and the world class porphyry Cu-Au deposits (e.g. Cadia) hosted by the arc.
- Characteristics, petrology and tectonic setting of Silurian and Devonian I- and S-type granite.
- The Cooma metamorphic complex – a high temperature / low pressure metamorphic complex.
- Late Silurian to Early Devonian rift basins, including the Goulburn Basin, that hosts significant VMS mineralisation (e.g. Woodlawn, Captains Flat) and the Hill End Trough, that hosts the orogenic Au deposits at Hill End.

Spectacularly folded Ordovician deep marine sedimentary rocks at Narooma.

AESC 2014 WORKSHOP SUMMARY

All workshops will take place in Newcastle City Hall unless noted otherwise.

HYDROTHERMAL ALTERATION

Presenters: Adj. A/Prof Paul Ashley, *University of New England* and Dr Nancy Vickery *University of New England* **CANCELLED**

No of Days: 2 days

Date: Saturday 5 & Sunday 6 July

Time: 0900- 1700

Cost: \$1400 p/p

Inclusions: Morning Tea, Lunch & Afternoon tea and course notes

Booking Deadline: Friday 30 May 2014

A 2-day workshop on the nature and causes of hydrothermal alteration and its association with a wide variety of different mineral deposit types. Lecture-type presentations will be accompanied by hands-on practical sessions. These will include examination of hand samples of rocks from ore deposit systems such as porphyry Cu-Au, intrusion-related Au and Mo systems, intrusion-related Sn, epithermal precious metal systems (including low and high sulphidation types), a diversity of skarn types, iron oxide-Cu-Au deposits, volcanic-associated massive sulphide systems, "Cobar-type" Au and base metal deposits, orogenic Au (-Sb) and sediment-hosted sulphide deposits, including shale-hosted, red-bed hosted and carbonate-hosted. Observations can be augmented by the use of petrographic microscopes with real time projector demonstrations. An infrared spectral analyser and portable XRF analyser will be available to demonstrate geochemical and mineralogical attributes of different alteration types.

NB: Attendees are required to bring own laptops.

GEOLOGICAL INTERPRETATION OF AEROMAGNETIC DATA **CANCELLED**

Presenter: Mr Leigh Rankin, *Rankin Consultancy Pty Ltd (trading as Geointerp)*

No. of Days: 2 days

Date: Saturday 5 & Sunday 6 July

Time: 0900- 1700

Cost: \$930 p/p

Inclusions: Morning Tea, Lunch & Afternoon tea and course notes

Booking Deadline: Friday 30 May 2014

This workshop is designed to develop skills in the integration of aeromagnetic and geological data, particularly in the exploration environment. It is suitable for all geoscientists involved with field mapping and exploration. Two exercises from different geological settings (Pine Creek Geosyncline and Charters Towers areas) will demonstrate a reliable methodology for interpretation and analysis, and will be interspersed with presentations on key issues of the physical and geological aspects of magnetisation, processing and imaging of

magnetic data and interpretation methodology.

Whilst the exercises in this workshop focus on two gold exploration districts, the methodology presented will have application to most geological environments.

All materials will be provided (exercises are hand drawn) – computers will not be required.

REGIONAL GEOCHEMICAL MAPPING – PRINCIPLES & PRACTICALITIES

Presenters: A/Prof David Cohen, *University of NSW*
Dr Patrice de Caritat, *Geoscience Australia*

No. of Days: 1 day **CANCELLED**

Date: Sunday 6 July

Time: 0900- 1700

Cost: \$370 p/p

Inclusions: Morning Tea, Lunch & Afternoon tea and course notes

Booking Deadline: Friday 30 May 2014

Geochemical mapping programs have been conducted in many parts of the world, at sampling densities as low as 1 sample per 5,000 km².

Originally directed at mineral exploration, in post-mining and industrialised areas geochemical mapping is now primarily used for environmental, health and agricultural purposes. Even at low sampling densities, regional geochemical maps can provide fascinating insights into processes affecting the geochemical characteristics of regolith (soils and sediments) and permit separation of natural and anthropogenic factors affecting the distribution of elements.

This workshop will cover various aspects of regional geochemical mapping (and some general aspects of geochemistry) – from sampling design and analytical options to data processing approaches. A number of case studies will be presented, including data derived from the recently completed geochemical atlases of Australia and Cyprus. It is a workshop and participants will have opportunity to undertake various exercises ranging from analytical data quality to interpretation of regional geochemical patterns.

NB Participants are required to bring their own laptops.

TECHNOLOGY TO IMPROVE GOLD EXPLORATION AND ORE CHARACTERISATION

Presenter: Prof Ross Large, *UTAS Distinguished Professor, Professor of Economic Geology, CODES* **CANCELLED**

No. of Days: 1 day

Date: Sunday 6 July

Time: 0900- 1700

Cost: \$400 p/p

Inclusions: Morning Tea, Lunch & Afternoon tea and course notes

Booking Deadline: Friday 30 May 2014

The workshop will cover advances in laser analytical techniques that have led to the development of new exploration strategies for orogenic, sediment-hosted and Carlin style gold deposits. Several case studies will be discussed covering geology, geochemistry, ore genesis and gold ore characterisation.

ESTABLISHING AND DEFINING STRATIGRAPHIC UNITS

Presenter: Ms Catherine Brown, *Geoscience Australia*

No. of Days: ½ day

Date: Friday 11 July

Time: 0930 - 1200

Cost: \$100 p/p

Inclusions: Morning Tea and course notes

Booking Deadline: Friday 30 May 2014

The Workshop aims to encourage more of Australia's geologists to define and/or redefine stratigraphic units, through discussion of Australian examples and issues.

We hope to:

- Demystify the fundamental concepts such as what is lithostratigraphy? Why are definitions important? What is a type section? What procedures apply in Australia? How do I pick a suitable name?
- Provide advice on locating important resources such as the Australian Stratigraphic Units Database, the International Stratigraphic Guide, the Australian Stratigraphy web pages and unit definition form, members of the Australian Stratigraphy Commission, and the current International Time Scale.
- Use Australian examples to show how the International Stratigraphic Guide has been interpreted in Australia. This will include discussion on ways of dealing with various lithologies, mixed lithologies, and particular issues with igneous units; what to do with 'legacy units' that don't meet the current guidelines; why units are split up or grouped together; and any other stratigraphic issues participants wish to raise.
- Explain how data from your publications gets into the Australia Stratigraphic Units Database and offer ideas on streamlining your writing and refereeing processes to get high quality new unit definitions approved and published in a timely manner.

Contact for more information: Cathy.Brown@ga.gov.au



INTERPRETATION OF HYLOGGER DATA TO EXPLORATION & MINING

Presenter: Dr Sasha Pontual, *AusSpec International*

No. of Days: 1 day **CANCELLED**

Date: Friday 11 July

Time: 0900 – 1700

Cost: \$715 p/p

Inclusions: Morning Tea, Lunch & Afternoon Tea, course notes & USB containing data discussed during workshop

Booking Deadline: Friday 30 May 2014

A hands-on workshop on how to interpret HyLogger data and to best identify alteration assemblages to assist targeting of economic mineralisation. The workshop will introduce participants to the theory behind hyperspectral analysis to provide a strong background and understanding of the relevance of infrared data to alteration mapping. Using case study data sets, the workshop will also introduce participants to some key features of The Spectral Geologist (TSG) software for interpreting and manipulating hyperspectral data collected by the HyLogger systems. Participants will learn methods of extracting mineral information from VNIR-SWIR-TIR reflectance data and how to integrate these data with assay and logging data

NB: Participants are required to bring their own laptops

COAL QUALITY ASSESSMENT FOR GEOLOGICAL PURPOSES

Presenter: Prof. Colin Ward, *University of NSW*

No. of Days: 1 day

Date: Friday 11 July

Time: 0900 – 1700

Cost: \$435 p/p

Inclusions: Morning Tea, Lunch & Afternoon Tea & course notes

Booking Deadline: Friday 30 May 2014

This one-day course is intended for geoscientists newly engaged or seeking involvement in coal exploration and mining activities. The program aims to increase participants' awareness of the physical, chemical and petrographic properties of coal, the geological factors affecting coal sampling and analysis results, the significance of quality parameters in coal utilisation and marketing, and geological considerations in obtaining and dealing with coal quality data.

1. General Introduction

- Fundamental concepts of coal rank, type and grade.
- Relevant Standards and other information sources.

2. Coal Testing and Analysis

- Coal sampling and sample preparation
- Proximate and ultimate analysis
- Other general tests and analyses
- Special tests for coal combustion
- Coal carbonization and coking tests
- Assessment of gas in coal seams

3. Coal Petrology and Petrographic Analysis

- Microscope techniques used in coal petrology
- Microscope coal constituents: macerals and microlithotypes
- Coal lithotypes and megascopic (hand specimen) seam description
- Nature, analysis and significance of mineral matter in coal

4. Quality Assessment in Exploration and Mine Geology Programs

- Sampling and analysis strategies
- Selection of working sections; allowance for dilution
- Calculation of quality parameters for ply and seam composites

PHYSICAL VOLCANOLOGY **CANCELLED**

Presenters: Prof Jocelyn McPhie, *The University of Tasmania* and Dr. Carol Simpson *Consultant Volcanologist*

No. of Days: 2 days

Date: Friday 11 & Saturday 12 July

Time: 0900 – 1700

Cost: \$910 p/p

Inclusions: Morning Tea, Lunch & Afternoon Tea & course notes

Booking Deadline: Friday 30 May 2014

This course is aimed at geologists who would like an introduction to volcanic textures, facies and processes or would like to refresh their knowledge in this area. The course will develop participants' skills in observing, naming and systematically describing volcanic rocks using appropriate terminology. Facies characteristics that underpin genetic interpretation will also be covered. These skills are equally important to the field geologist and industry geologists logging drill core. Participants will receive a series of lectures covering volcanic processes and the range of textures and rock types produced and learn how to record their observations as descriptions and graphic logs in the case of drill core. Ample time is provided to practise these skills on hand specimens and drill core during the two day course. Course notes will be made available to participants.

SALT LAKE POTASH RESOURCES – FROM EXPLORATION TO DEVELOPMENT

Presenter: Adj. Prof Aharon Arakel,
Macquarie University

No. of Days: 1 day **CANCELLED**

Date: Sunday 6 July

Time: 0900 – 1700

Cost: \$200 p/p

Inclusions: Morning Tea, Lunch & Afternoon Tea & course notes

Location: Crowne Plaza Newcastle

Booking Deadline: Friday 30 May 2014

Salt lakes are a ubiquitous feature of Australia's landscape and their hydrological evolution closely linked with a major phase of arid-zone internal drainage basin development in Australia, dating back to Tertiary times. Historical and scientific information point to elevated concentrations of potassium and other valuable dissolved elements in the brine pools of many Australian salt lake basins. However, there is currently no established salt lake potash mining operation in Australia and until recently no systematic exploration effort was directed towards assessing the potash recovery potential of the Australian salt lakes. This is despite the fact that Australia has more than double the number of salt lakes as the rest of the world combined, and its strategic location with respect to SE Asian and Chinese fertiliser markets.

This one-day course is intended for geoscientists seeking involvement in salt lake potash exploration and mining activities. It aims at providing first-hand information on the approaches and scientific methods applied to systematic evaluation of mineral brine fields and techno-economic aspects of potash recovery from salt lake basins as a strategic resource. Topics to be covered:

1. General Introduction

- Overview of global activities and market attractiveness
- Fundamentals of salt lake exploration for strategic resources

2. Salt Lake Exploration Approaches

- Exploration models
- Resource development models

3. Hydrogeological Investigations

- Geophysical signatures
- Geologic controls
- Hydrogeologic setting

4. Drainage Basin Hydrological Evaluations

- Drilling
- Pump tests
- Field evaporation trials
- Hydrological modelling

5. Delineation of Mineral Brine Pools

- Palaeodrainage characteristics
- Host sediments and regolith cover

- Physical barriers
- Chemical barriers

6. Exploration, Planning and Implementation

- Exploration Strategy
- Definition of exploration targets
- Planning and implementation

7. Brine Quality and Resource Evaluations

- Brine types
- Brine analysis and statistical analysis
- Laboratory isothermal evaporation trials
- Geochemical modelling
- Resource estimation methods

8. Product Streams and Mining Methods

- Evaporation, mineralisation and separation trials
- Integrated brine processing and mineral recovery

9. Techno-Economic Evaluations

- Scoping study
- Pre-feasibility study
- Definitive feasibility study

THE GLOBAL MULTIPLE SULPHUR ISOTOPE RECORD: INSIGHTS INTO THE EVOLUTION OF THE EARLY EARTH AND GENESIS OF MINERAL SYSTEMS

Presenter: Prof Marco Fiorentini,
University of Western Australia

No. of Days: 1 day

Date: Friday 11 July

Time: 0900 – 1700

Cost: \$250 p/p

Inclusions: Morning Tea, Lunch & Afternoon Tea & course notes

Booking Deadline: Friday 30 May 2014

Sulfur (S) is a crucial element that is involved in numerous biological processes and is a critical ligand that complexes, transports and concentrates a wide range of metals in hydrothermal fluids and silicate melts. As a result, sulfides play a key role in the formation of numerous world-class mineral systems, including gold, nickel, copper and the platinum group elements.

However, even if the scientific community broadly agrees that sulfur most likely played a crucial role in the establishment of the first forms of proto-life, the relationship between the global sulfur cycle and the evolution of the biosphere-atmosphere-hydrosphere-lithosphere in the Early Earth is still a hot topic of debate. Furthermore, although the genetic association between sulfur and metal enrichment is well established, it is generally difficult to fingerprint and spatially localize the sulfur and metal sources that play a role in ore genesis.

This workshop aims at bringing together the sulfur isotope community to present the latest advances in our

understanding of the multiple sulfur isotope signature record and jointly identify the greatest knowledge gaps that should be addressed in the short term future. In particular, the main topic of debate will be focused on the processes that lead to the genesis and preservation of mass independent sulfur isotope signatures in the global geological record. In fact, in the last two decades, the discovery and measurement of non-mass dependent sulfur isotope signatures in sedimentary, igneous and metamorphic rocks has permitted the formulation of numerous new hypotheses on the evolution of the Early Earth. The analytical techniques, both for whole-rock and in-situ analysis of a wide range of S-bearing phases, including sulfides, sulfates and phosphates, have dramatically improved and it is now possible to measure precisely and accurately extremely faint isotopic signals. However, our capacity to generate data has overcome our ability to interpret them.

REMOTE SENSING AND FIELD SPECTROSCOPY FOR GEOSCIENTISTS

Presenter: Dr Rob Hewson,
Royal Melbourne Institute of Technology

No. of Days: 1 day

Date: Saturday 12 July

Time: 0900 – 1700

Cost: \$570 p/p

Inclusions: Morning Tea, Lunch & Afternoon Tea
& course notes

Booking Deadline: Friday 30 May 2014

A one day workshop on the background of remote sensing and mineral spectroscopy relevant for geological and regolith investigations. Lecture-type presentations will be accompanied by hands-on practical sessions accessing remote sensing imagery, derived map products and mineral spectral signatures. Geological case studies, with a focus on mineral exploration, will be examined using ASTER multispectral satellite, airborne hyperspectral imagery and field spectrometer data sets. Issues covered include costings, sensor resolution, atmospheric interference, illumination conditions, vegetation cover and other quality control aspects. Examples of strategies to integrate such datasets with geophysical data (e.g. aeromagnetics, radiometrics), DEMs and public domain fractional cover estimates (e.g. vegetation cover %). A detailed examination of current (and future) airborne / satellite sensors and field spectrometers will be described.

The resulting take home information will provide an overview of various operational remote sensing and field data sets, to enable the participant to assess its viability for specific geoscientific questions. The ultimate aim is to empower the participant with the knowledge to initially undertake or contract out spectral investigations as part of mineral exploration.

Participants are required to bring their own laptops



REGISTRATION



Each person attending the Convention needs to complete a registration form online at www.aesc2014.gsa.org.au. For those without internet access, you can complete the form at the end of this brochure and email/fax/post it back.

A letter of confirmation will then be forwarded by email. Please ensure you read all information in this brochure carefully before completing the registration form.

Registration Fees

(All prices are in Australian Dollars and inclusive of GST)

	Early Bird On or before 4 April 2014	Standard On or before 30 June 2014	Late After 30 June 2014
Member	\$780	\$880	\$990
Non Member	\$990	\$1100	\$1220
Student/Retired/Unemployed	\$295	\$365	\$445
One Day Member	\$395	\$445	\$505
One Day Non Member	\$495	\$550	\$615
Two Day Member	\$595	\$655	\$725
Two Day Non Member	\$795	\$865	\$945
Public Forum			
Public Forum single ticket	\$10	\$10	\$10
Public Forum family ticket (2a +3c)	\$20	\$20	\$20

Members - A significant discount is available for all current members of the Geological Society of Australia (GSA), International Association of Hydrogeologists (IAH) and Coalfield Geology Council (CGC). If you are a non-member and would like to join the GSA and be eligible for the discounted member convention rates, please contact the Geological Society of Australia on 02 9290 2194 or email info@gsa.org.au.

INCLUSIONS FOR REGISTERED PERSONS

Members, Non Members, Students/Retired and Unemployed

- Attendance at Sessions
- All Official Documentation
- Morning & Afternoon Teas & Lunches as scheduled in program
- Ice breaker
- Entrance to exhibition
- GST

Day Delegates

All entitlements for day of attendance only

- Attendance at Sessions
- All Official Documentation
- Morning & Afternoon Tea & Lunch as scheduled in program for day of registration
- Ice breaker (two day only)
- Entrance to exhibition
- GST



PAYMENT OF FEES

All prices are quoted in Australian dollars. Payment of fees must accompany all registrations and may be made by cheque or credit card (MasterCard or Visa only). Cheques should be made payable to Australian Earth Sciences Convention (AESC) and drawn on an Australian bank.

GST

ABN: 93 652 757 443

GST has been calculated and included in all registration fees. You will be sent a tax invoice once your registration has been received. Please refer to the accommodation section for tax invoices relating to accommodation bookings.

CANCELLATIONS AND REFUNDS (REGISTRATION)

Cancellations must be notified in writing to the Secretariat.

Cancellations received:

- Before 30 May 2014 will incur a A\$135.00 cancellation fee.
- Before 30 June 2014 will receive a 50% refund of fees paid.
- After 30 June 2014 there will be no refund.
There will be no refunds for workshops or field trips after the 30 May

INSURANCE

Whilst the ASEC 2014 committee carries appropriate insurance for the Convention, neither the Geological Society Australia or the Convention Secretariat will accept any liability for damages of any nature sustained by participants or their accompanying persons or for loss or damage to their personal property. It is recommended that you take out appropriate travel & medical Insurance before travelling to the convention.

PARTNERSHIP OPPORTUNITIES

There are a number of packages available for AESC 2014 and organisations are invited to contact the Secretariat on telephone 02 4973 6573, fax 02 4973 6609 or email: aesc@willorganise.com.au for further information. Information can also be found on the website www.aesc2014.gsa.org.au.

DRESS CODE

Sessions: Convention attire/neat casual

Ice Breaker: Convention attire/neat casual

Convention Dinner: Smart Casual

ACCOMMODATION

Please complete the accommodation section of the registration form. The Secretariat will then book your room and send confirmation of reservation.

- Accommodation at the hotels listed has been secured by the Secretariat at advantageous rates for delegates. Only bookings made through the Secretariat with your convention registration will secure these rates.
- Rates are quoted in Australian Dollars, on a per room per night basis, including GST and do not include breakfast unless otherwise noted.
- A tax invoice for your accommodation will be issued by your hotel on checkout.
- Distances indicated are between the main convention venue and the hotel/motel.
- “Double” = two persons sharing one bed; “Twin” = two persons sharing a room with two separate beds; “Single” = 1 person/1 bed
- Refunds in cancellations received within 30 days of your arrival date will be at the discretion of the hotel concerned.

Deposit: To secure your accommodation booking, a credit card guarantee or a deposit of at least one night’s tariff must accompany your registration. Your credit card details or deposit will then be passed on to the hotel to secure your booking. If a credit card guarantee is supplied, the hotel in question may then charge an amount equivalent to one night’s accommodation to your

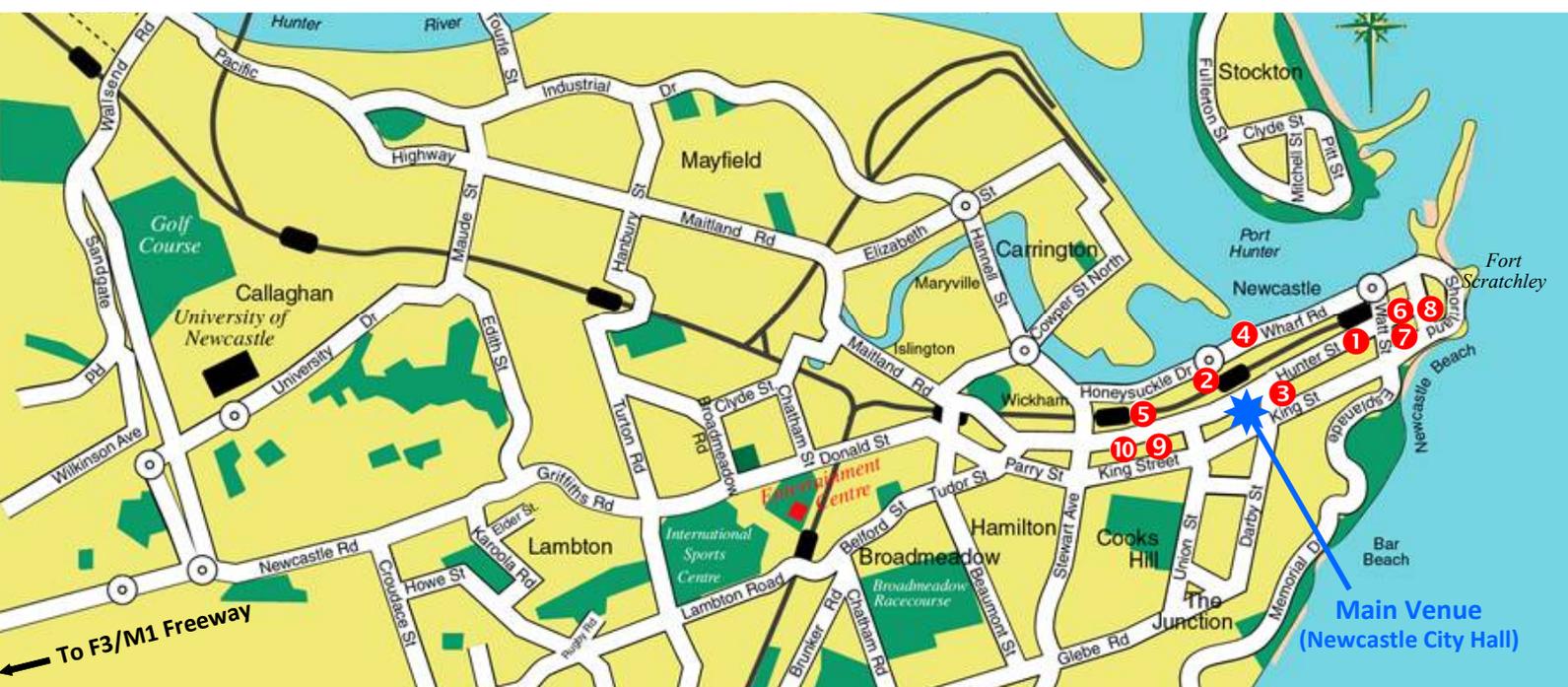
credit card, prior to your arrival. You will be responsible for settling the balance of your account with the hotel on check out. No accommodation booking can be confirmed until a deposit or credit card details have been received. By providing your card details, you are also providing authorisation for the hotel to charge this card if you fail to arrive at the hotel on the date indicated.

Tax Invoice: No GST is deducted by the convention Secretariat for accommodation as any payment made to the convention in respect of accommodation is a deposit on a service supplied by another service provider (i.e. the hotel). All deposits are forwarded to your hotel and when you check out a tax invoice will be supplied for the full amount of the accommodation costs, including any deposit paid.

Change of Booking: Any alterations to your reservation must be made in writing to the Secretariat, not directly to the hotel.

Late/Early Arrivals: Please indicate under “Special Requirements” if you will be checking in to your hotel after 1800 hours/before 1100 hours. Failure to do so could mean that your room will be released/not ready for occupation respectively.

Fare Free Zone: All the hotels listed below and the convention venue are located within the CBD ‘Fare Free Zone’ whereby any public bus can be used at no cost to passengers travelling within the zone between the hours of 0700 - 1800 daily.



Note: Map not to scale

HOTEL	DESCRIPTION	DISTANCE FROM VENUE	STAR RATING	RATES
Chifley Executive Suites 111 Scott Street., Newcastle Map Ref 1	Opened in 2011, this executive-style serviced apartment hotel is located in the cosmopolitan inner-city, close to harbour, beaches, and a wide selection of restaurants and bars. All apartments are fully self-contained. Parking - \$18 per night	1.2km	4½ stars	1 bedroom apartment: \$185 2 bedroom apartment: \$265
Chifley Hotel Apartments Newcastle 14 Honeysuckle Drive, Newcastle Map Ref 2	The Chifley Hotel Apartments offer a modern & spacious alternative to traditional hotel accommodation. Located in the Honeysuckle precinct approx. 300m from harbourside restaurants and bars and a short 5 minute walk from the convention venue using an overhead bridge across the city's railway line. Parking - \$18 per day.	0.5km	4½ stars	1 bedroom apartment: \$185
Clarendon Hotel 347 Hunter Street, Newcastle Map Ref 3	Located in the heart of the CBD and adjacent to the main convention venue, this unique boutique hotel has excellent stylishly decorated rooms over a beautifully restored 1920's pub. Restaurant & Bar. Complimentary wi-fi. Parking - \$15 per night.	Next door	4 star	Standard room: \$175
Crowne Plaza Newcastle Cnr Merewether Street & Wharf Road, Newcastle Map Ref 4	Newcastle's largest hotel is located overlooking Newcastle Harbour and a 3 minute walk from the main convention venue. Facilities include the award winning Seasalt restaurant, bar, 24 hour room service, business centre, cable TV, valet parking, swimming pool & gymnasium. This will be the main convention hotel. Parking \$28 per night.	0.4km	4½ star	City Suite: \$209 Harbourside Suite: \$239
Ibis Hotel, Newcastle 700 Hunter Street, Newcastle West Map Ref 5	Located in the west end of the CBD, approx 10 minute walk from the convention venue. Restaurant & bar; parking - \$18 per night.	1km	3 star	Standard room: \$134
Newcastle Beach YHA 30 Pacific Street, Newcastle Map Ref 6	Situated close by Newcastle Beach, the heritage building features a ballroom with chandeliers and an open fire. A variety of room styles are available from dormitory style to twin share. Approx 15 minutes walk from convention venue.	1.3 km		All bookings are to be made direct with the YHA by calling 02 4925 3544 or E: newcastle@yha.com.au
Novotel Newcastle Beach 5 King Street, Newcastle Map Ref 7	Opened in 2010, Novotel Newcastle Beach is one of Newcastle's newest hotels. It is located nearby Newcastle beach in the historic east-end of the City. A large selection of restaurants and bars and picturesque beach and heritage walks are all easily accessible. Hotel facilities include restaurant & bar, 24 hour service. Parking \$10 per day. The convention venue is approx. 15 minutes walk.	1.2km	4 star	Superior Studio: \$219 Superior Oceanside Studio: \$229 Superior Harbourside Studio: \$249 Superior Oceaniew Balcony Studio: \$259
Quality Hotel Noah's on the Beach Shortland Esplanade, Newcastle East Map Ref 8	Located directly overlooking the magnificent Newcastle Beach - in the historic east end of the city, this boutique hotel's facilities include the renowned restaurant Jonah's on the Beach & bar. It is close to shops & the harbour foreshore. Complimentary off-street parking. Approx 15 minute walk to the convention venue.	1.7km	4 star	Single: \$239 Dbl/Twin: \$259 (rates include buffet breakfast)
Quest Serviced Apartments 575 Hunter Street, Newcastle Map Ref 9	Located in central Newcastle & a short 8 minute walk to the convention venue, shops & restaurants, this excellently appointed apartment hotel offers apartments with fully equipped kitchens, laundry & private balconies. Other facilities include an indoor pool and gymnasium. Parking - \$25 per night (1 car per apartment, subject to availability).	0.7km	4 star	1 bedroom apartment: \$245 2 bedroom apartment: \$345
Travelodge Newcastle Cnr King & Steel Street, Newcastle West Map Ref 10	Located in the heart of the city a short walk to the main convention venue. Facilities include Sienna café & bar, swimming pool, gymnasium, internet kiosk, 24hr reception & room-service, guest laundry & Foxtel. Parking \$15 per night.	1.5km	4 star	Standard room: \$159

SOCIAL PROGRAM

Ice Breaker

Date: Sunday, 6 July 2014

Time: 1800 - 1930

Venue: Newcastle Museum

Dress: Convention attire/neat casual

Cost: One ticket to the Ice Breaker is included in full convention and symposium registration. Additional tickets for day attendees or accompanying persons can be purchased for \$60 per ticket.

Join us for the ice breaker and the opening of the convention.

Convention Dinner

Date: Wednesday, 9 July 2014

Time: 1830 - 2300

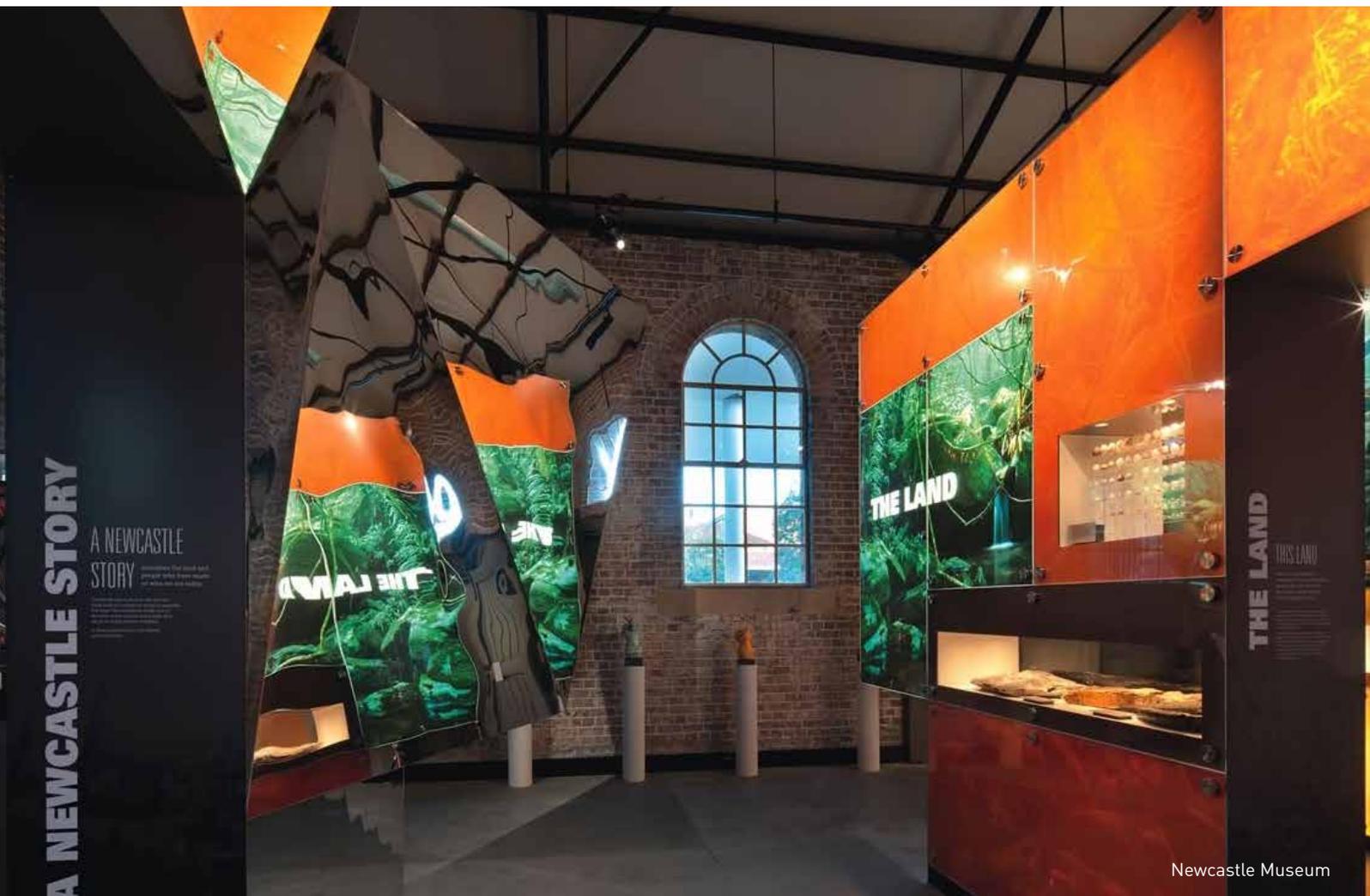
Venue: Fort Scratchley/Civic Theatre

Dress: Smart casual

Cost: \$120 per person (price includes a three course dinner, beverages and transport to/from Fort Scratchley)

This roving dinner will begin at this historic site of Fort Scratchley, where delegates will be given the opportunity to tour the underground tunnels before pre-dinner drinks and canapés are served. We will make our way by bus to have dinner on the stage of one of Australia's great historic theatres, Civic Theatre. Delegates will be exposed to some wonderful entertainment and have the opportunity to try some local produce and wine.

* This is a ticketed social event.



Newcastle Museum

AESC 2014 REGISTRATION FORM

The information below will be reproduced in the delegate list at the convention and be used for all mailings. All registrations where possible should be completed online at www.aesc2014.gsa.org.au. Alternatively complete this form and submit to the Convention Secretariat via fax; 02 4973 6609, post; PO Box 180, Morisset NSW 2264 or email; aesc@willorganise.com.au. An emailed confirmation will be sent to you within one week of submission.

A. CONTACT DETAILS

Title: (Dr./Prof/Assist Prof/Mr/Mrs/Ms etc):..... Given Name:.....

Surname:

Organisation:.....

Position:

Postal Address:.....

Suburb:..... State:..... Postcode:

Country:.....

Tel: ()..... Mobile: ().....

Email:.....

Preferred Name on Badge:.....

Special Needs (dietary, access etc):.....

If you do not want details included in the delegate list provided on site, please tick

ACCOMPANYING PERSON DETAILS

Given Name:..... Surname:

Special Needs (dietary, access etc):.....

B. REGISTRATION FEES (these include GST) – Please Circle

	Early Bird On or before 4 April 2014	Standard On or before 30 June 2014	Late After 30 June 2014
Member^o	\$780	\$880	\$990
Non Member	\$990	\$1100	\$1220
Student/Retired/Unemployed	\$295	\$365	\$445
One Day Member*^o	\$395	\$445	\$505
One Day Non Member*	\$495	\$550	\$615
Two Day Member*^o	\$595	\$655	\$725
Two Day Non Member*	\$795	\$865	\$945

*Please circle which day you would like to attend: Monday Tuesday Wednesday Thursday

^oPlease circle which Association you are a member of: GSA IAH CGC

SUB-TOTAL REGISTRATION FEE: A\$ _____

C. PROGRAM

Event	Cost	No. of tickets	TOTAL
Public Forum	\$10 Single		
	\$20 Family (2A + 3C)		

Symposia	Sydney Basin Symposium	<input type="checkbox"/> No I will not be attending
		<input type="checkbox"/> Yes I plan on attending
	Circum-Pacific Orogens Symposium	<input type="checkbox"/> Yes I plan on attending
		<input type="checkbox"/> No I will not be attending

D. FIELD TRIPS

Name	Cost	No. of tickets	TOTAL
Pilbara, WA Field School 2014	\$3000 p/p		
Geology & Mineral systems of the New England Orogen	\$750 p/p Twin Share		
	Twin share accom only available in Nundle \$900 p/p Single		
Hunter Valley Coal: From the exploration site to the Coal Ship	\$110 p/p		
Blue Mountains World Heritage Area/Jenolan Geotourism	\$395 p/p Twin Share		
	\$495 p/p Single		
Geology of the Gloucester Basin	\$165 p/p		
Geology and Wines of the Lower Hunter Valley	\$120 p/p		
Geology, surf and scenery of Newcastle: a sunrise coastal walk	\$40 p/p		
Geological History of the lower Hunter Valley	\$95 p/p		
Indigenous Sites of the Hunter Valley	\$160 p/p		
Geodiversity, Geoheritage and Geotourism of Port Macquarie	\$300 p/p Twin Share		
	\$350 p/p Single		
Geology & mineral systems of the Lachlan Orogen	\$1250 p/p Twin Share		
	\$1500 p/p Single		

SUB-TOTAL FIELD TRIPS: A\$ _____

E. WORKSHOPS

Name	Cost	No. of tickets	TOTAL
Hydrothermal Alteration	\$1400 p/p		
Geological Interpretation of Aeromagnetic Data	\$930 p/p		
Regional Geochemical Mapping – Principles & Practicalities	\$370 p/p		
Technology to Improve Gold Exploration and Ore Characterisation	\$400 p/p		
Interpretation of Hylogger data to Exploration & Mining	\$715 p/p		
Establishing and Defining Stratigraphic Units	\$100 p/p		
Smart Mapping	\$600 p/p		
Coal Quality Assessment for Geological Purposes	\$435 p/p		
Physical Volcanology	\$910 p/p		
Salt Lake Potash Resources	\$200 p/p		
Sulfur Isotope Record	\$250 p/p		
Remote Sensing and Field Spectroscopy	\$570 p/p		

SUB-TOTAL WORKSHOPS: A\$ _____

F. ACCOMMODATION

All rates include GST. One night's deposit or credit card guarantee must be given to secure your booking.

I do not require the Secretariat to book accommodation for me.

HOTEL	Room Type	Cost per room per night	Check in date	Check out date	Amount Enclosed (Chq only)	OR Use credit card details as guarantee (Please tick)
Chifley Executive Suites	1 bedroom apartment	\$185	/07/2014	/07/2014	A\$	<input type="checkbox"/>
	2 bedroom apartment	\$265	/07/2014	/07/2014	A\$	<input type="checkbox"/>
Chifley Hotel Apartments	1 bedroom apartment	\$185	/07/2014	/07/2014	A\$	<input type="checkbox"/>
Clarendon Hotel	Standard room	\$175	/07/2014	/07/2014	A\$	<input type="checkbox"/>
Crowne Plaza Newcastle	City Suite	\$209	/07/2014	/07/2014	A\$	<input type="checkbox"/>
	Harbourside Suite	\$239	/07/2014	/07/2014	A\$	<input type="checkbox"/>
Ibis Hotel, Newcastle	Standard room	\$134	/07/2014	/07/2014	A\$	<input type="checkbox"/>
Novotel Newcastle Beach	Superior Studio	\$219	/07/2014	/07/2014	A\$	<input type="checkbox"/>
	Superior Oceanside	\$229	/07/2014	/07/2014	A\$	<input type="checkbox"/>
	Superior Harbourside	\$249	/07/2014	/07/2014	A\$	<input type="checkbox"/>
	Superior O/View Balcony	\$259	/07/2014	/07/2014	A\$	<input type="checkbox"/>
Quality Hotel Noah's on The Beach (rate includes buffet breakfast)	Single	\$239	/07/2014	/07/2014	A\$	<input type="checkbox"/>
	DbI/Twin	\$259	/07/2014	/07/2014	A\$	<input type="checkbox"/>
Quest Serviced Apartments	1 bedroom apartment	\$245	/07/2014	/07/2014	A\$	<input type="checkbox"/>
	2 bedroom apartment	\$345	/07/2014	/07/2014	A\$	<input type="checkbox"/>
Travelodge Newcastle	Standard room	\$159	/07/2014	/07/2014	A\$	<input type="checkbox"/>

Please tick: Single Twin Double

I wish to share my room with:

Please note – the Convention Secretariat does not organise share accommodation – if you wish to share, you must find someone to share with.

SUB-TOTAL ACCOMMODATION: A\$ _____
Only complete if paying by chq (1 night deposit)

G. SOCIAL FUNCTION TICKETS

Event	Cost (inc GST)	No. of Tickets	TOTAL
Ice Breaker - Sunday 6 July 2014	Included for registered persons Additional Tickets: \$60 each		A\$
Convention Dinner - Wednesday 9 July 2014	Ticket: \$120		A\$

SUB TOTAL SOCIAL FUNCTIONS: A\$ _____

H. PAYMENT

(All prices include GST where applicable)

Section B	Registration Fees	A\$
Section C	Program	A\$
Section D	Field Trips	A\$
Section E	Workshops	A\$
Section F	Accommodation (only complete if paying by cheque)	A\$
Section G	Social Functions	A\$
	Total Fees Enclosed	A\$

I have read and agree to all the conditions outlined in this registration brochure

Please find enclosed cheque/money order payable to Australian Earth Sciences Convention (AESC)

OR

Please charge the total amount above to the following credit card

MasterCard Visa Card

Credit Card Number _____ Expiry Date

Name on card.....

Signature..... Date.....