

ENVIRONMENT

In a continent where arid zones are prevalent and “boom and bust” environmental conditions alternate at changing temporal scales, the environmental theme will pay particular attention to high-resolution geological archives of past climate change including; outcomes from the IODP, advancement on isotopic techniques and how climatic records can shape our climatic understanding (past and future). The environment theme will also encourage the discussion of the potential effects of increasing energy demands and fast development of coal seam gas and other energy and resources, with particular interest on groundwater quality, quantity and other impacts on the hydrological cycle.

EV01 Understanding Australia's coastal environment

Proponents: James Goff j.goff@unsw.edu.au
Catherine Chagué-Goff c.chague-goff@unsw.edu.au
Jonathan Nott jonathan.nott@jcu.edu.au

Coastal environments are increasingly becoming the focus of climate change research, not only for the study of contemporary processes but also in attempts to better understand past conditions. This focus has drawn out three key themes in recent research. First – that an understanding of past conditions is essential to achieving a better understanding of what can be expected under future climate change environments. Second – that while Australia’s coastline may be dominated by climate-related processes it is essential to differentiate these from tectonic-related activity. Third - that an understanding of coastal processes in different settings can help to better understand the impacts of natural hazards on coastal communities and help reduce risk and promote increased resilience and mitigation. With these points in mind, we welcome submissions that relate to earth science research that attempts to better understand Australia’s coastal environments.

EV02 Hydrogeology, the water within

Proponent: Liz Webb, IAH lwebb@emgamm.com

Groundwater resources within Australia are extremely critical resources for communities, industries and healthy ecosystems. Groundwater is a significant resource and currently makes up 17% of the accessible fresh water resources within Australia (NWC 2012). Knowledge of our geological systems is therefore fundamental in understanding one of Australia’s key precious natural assets, groundwater. Alluvial and recent sedimentary basin provinces are reasonably well known however there is much poorer information available for older sedimentary basins and our fractured rock provinces.

Groundwater extraction for potable supply and agriculture along with interception activities such as mining and coal seam gas extraction, to secure Australia future energy requirements, need to be balanced by environmental water needs for long term ecosystem health and function. There is an ongoing need for robust science and research along with pragmatic policy and integrated water management to achieve a sustainable future. The sustainability of groundwater is often considered in short time steps when compared to the geological record and the role of geological sciences is critical in providing this vision to the broader hydrogeological community. Australia’s precious resource requires the continual attention of our groundwater and geological professionals and the Australian Earth Sciences Convention Hydrogeology Session provides this platform.

EV03 Coal seam gas and groundwater

Proponents: Matthias Raiber Matthias.Raiber@csiro.au
Catherine Moore
David Rassam

During the last decade, exploration for coal seam gas resources has rapidly expanded in many sedimentary basins throughout Australia. Concurrently, there has been growing public concern that activities associated with the production of CSG (e.g. hydraulic fracturing, extraction and disposal of co-produced groundwater) may impact on the quality and quantity of water resources. As a result, the interaction between aquifers and coal seams targeted for unconventional gas resources is increasingly becoming a focus of groundwater research in Australia and overseas.

In this session, we welcome submissions from research and industry on topics such as:

- Numerical simulation of aquifer impacts resulting from CSG production, including:
 - Upscaling of impact assessment models for regional cumulative impact assessments.
 - Modelling dual phase flow at the regional scale.
 - Characterisation of uncertainty and regional aquifer management risks resulting from CSG developments.
 - Characterisation of fault systems in regional-scale models.
- Water chemistry baseline studies, hydrochemical and isotopic characterisation of hydraulic connection between coal seams and aquifers;

- Ecological impacts of coal seam gas activities (e.g. on groundwater - dependant ecosystems);
- Innovative characterisation of groundwater flow dynamics in aquifer/aquitard systems.

EV04 — Oxygen and hydrogen isotopes in hydrological systems

Proponents: ~~Catherine Hughes~~ ~~ceh@ansto.gov.au~~
~~Suzanne Hollins~~ ~~sho@ansto.gov.au~~

~~Improving our understanding of oxygen and hydrogen isotope variability in the hydrological cycle helps to define inputs to hydrological systems (surface water, groundwater) and geological archives. In turn isotope composition of geological and groundwater archives may serve as records of long term hydroclimate variability, and the isotopic composition of more transient hydrological archives can provide insights in to climate processes at shorter time scales.~~

~~This session will review the state of the art in oxygen and hydrogen isotope systematics within the hydrologic cycle, in terms of proxy interpretation, monitoring, and modelling of hydrological, climate and archive systems.~~

EV05 Scientific Results of the Integrated Ocean Drilling Program (IODP) (EV05: Scientific results of IODP)

(Joint session with *Dynamic Planet* and *Living Earth* themes)

Proponent: Neville Exon Neville.Exon@anu.edu.au

The Integrated Ocean Drilling Program (IODP) has been the world's largest academic geoscience program involving scientists from around the world including Australia and New Zealand. It ended in late 2013 and is being replaced by the International Ocean Discovery Program (also IODP). The Newcastle AESC is an excellent venue at which scientists from around the world can present exciting results from the past and exciting proposals for the future. The main elements of IODP. past and future are climate change, deep life, planetary dynamics, and geohazards.

EV06 — Tsunamis and storm deposits in Australia

(Joint session with *Infrastructure, Service & Community* theme)

Proponent: ~~Phil Playford~~ ~~Phil.PLAYFORD@dmp.wa.gov.au~~

~~There has been considerable debate in recent years regarding deposits along the east, west, and south coasts of Australia that have been attributed to either tsunamis or major storms. Furthermore, the causes of tsunamis that may be linked to such deposits are debateable. Some may be associated with neo tectonic activity, others with major slumping of sediments on the continental slope, asteroid impacts, and volcanic eruptions. Even though most of Australia is remote from plate boundaries linked with major tsunamis, there is evidence along our coasts of major deposits that can be attributed to tsunamis and large storms. The origins and frequencies of such catastrophic events is especially important because of their potential impacts on life and infrastructure.~~

EV07 — Advances in geochronology — shedding new light on Earth surface processes and the Quaternary environment (EV07: Geochronology — surface processes and environment)

Proponents: ~~David Fink~~ ~~david.fink@ansto.gov.au~~
~~Kira Westaway~~ ~~kira.westaway@mq.edu.au~~
~~Barry Kohn~~ ~~b.kohn@unimelb.edu.au~~

~~Earth surface landscapes evolve as a result of complex interactions of both exogenic and endogenic processes. Understanding dimensions and timescales over which these processes operate is important in light of potential feedbacks between tectonic activity, structural inheritance, climate change and human impacts. The last decade has seen a remarkable increase in the capabilities, proficiencies and applications of diverse geochronological and geochemical techniques, such as low temperature thermochronometry, in situ cosmogenic nuclides, uranium series isotopes, radiocarbon dating, noble gas spectrometry and optical stimulated luminescence, to provide quantitative measure of the rates of geomorphic processes acting over a wide range of temporal and spatial scales. These technological advances together with stable isotope proxy based paleo climate and paleo environmental reconstructions have contributed to revolutionizing Quaternary research in the study of the Earth's environment over the past few million years. We invite contributions which focus on improvements of analytical techniques (precision, accuracy, sensitivity, reduction in sample size), developing new tools and innovative applications of such techniques to novel questions (basin wide sediment inventories, tectonic versus climatic impacts, exhumation and denudation, passive margin retreat).~~

EV08 Groundwater quality implications of changes in physical water management (EV08: Groundwater quality and physical water management)

Proponents: Martin S Andersen m.andersen@unsw.edu.au
 William Glamore w.glamore@wrl.unsw.edu.au
 Wendy Timms w.timms@unsw.edu.au
 Dioni L. Cendón dce@ansto.gov.au

Groundwater management in Australia has in the past decades focused predominantly on the quantitative aspects of changes to management strategies. In the light of the arid and semiarid nature of much of Australia and recent droughts this is understandable. However, changing fluxes in the water balance of catchments (i.e. between surface waters and aquifers) by groundwater abstraction (or other activities) can change flow paths which in turn can have effects on the water quality by mobilising salts, trace elements, nutrients, organic matter etc. These effects can often be difficult to detect (wells are needed in the right locations and they need to be monitored), and they may have long time lags to points of impact (groundwater flow is slow). This session focuses on (ground)water quality changes caused by the changes in physical water management. The scope could be expanded to include surface water quality if groundwater is too narrow.

Environment: Joint sessions hosted by other themes:

Living Earth:

- LE01 **Recent advances in the evolution of life through the Archean (LE01: Evolution of life through the Archean)**
- LE02 **The Australian Neogene: prelude to the present**

INFRASTRUCTURE, SERVICE & COMMUNITY

The Earth Sciences play a fundamental role in providing critical information to a wide-range of stakeholders within the various levels of government, industry, organisations and the general public, along with a proud history of education and research.

Infrastructure will address a wide range of issues in the general areas of engineering geology/geotechnical services and critically covers that important linkage between the Earth Sciences and Engineering. It will cover geotechnical problems and solutions encountered in recent large infrastructure projects and the role of increasing role of new technologies in investigations. Service and Community will address the geosciences response to distributed grid computing and cloud storage, dissemination of Geoscience information in a high-bandwidth environment, the continuing and evolving role of Geoscience outreach and education, Geohazard studies and their role in protecting the community, the contributions of Geotourism and Geoheritage, and the historical record and influence of Earth Scientists.

ISC01 Catastrophic earthquakes and tsunami: Towards more effective risk reduction **(ISC01: Earthquake and tsunami risk reduction)**

Proponents: Ian Lambert ian.lambert7@gmail.com

Since the disastrous Boxing Day tsunami of 2004, the amount of breadth of research into the processes and complexity of the lithosphere and related issues that lead to catastrophic tsunamigenic events have increased considerably. This session would critically appraise whether more action is needed, including in relation to coordination of research and monitoring activities, systematic field observations (including of paleotsunami deposits), integration of all relevant data, and developing mechanisms to ensure the best possible scientific advice is marshalled and presented in a timely manner to key government decision makers.

ISC02 Geoscience Education: The evolving role of geoscience outreach and education (ISC02: Earthquake and tsunami risk reduction)

Proponent: Greg McNamara geoservices@geoed.com.au

A session that will allow educators from Primary, Secondary and Tertiary education sectors as well as public science communications specialists present their findings relating to new programmes, engagement techniques and emerging challenges.

ISC03 Geological Surveys: geology databases, online data, digital mapping (ISC03: Geological Surveys)

Proponent: John Greenfield john.greenfield@industry.nsw.gov.au

This session provides a forum for geologists to keep up to date with the latest methods, technologies and techniques used by Geological Surveys around the world to acquire, store, and deliver regional geological data. The session will also be looking at new ways of compiling, analysing and interpreting large datasets.

ISC04 Australian Geological Heritage and the National Heritage List; are we being over run by the biologists? (ISC04: Geological heritage and the National Heritage List)

Proponent: Sue White susangwhite@netspace.net.au

As geologists we often discuss the significance of various sites and have developed good protocols and methods for the ranking of sites. However we have not always applied this to specific sites for the National Heritage List (NHL). There has been little involvement by geologists in listing nationally important sites on the NHL. We also often conflate geological heritage with geotourism, a related but not identical area of interest.

This session will discuss the potential for the identification and nomination of sites on the NHL, including some case studies of potential sites.

ISC05 Geotourism - enhancing public appreciation of geoheritage and earth sciences history (ISC05: Geotourism)

Proponent: Angus Robinson angus@leisuresolutions.com.au

Geotourism is emerging as a rapidly growing global phenomenon which fosters sustainable tourism based upon landscapes. Geotourism promotes tourism to geo-sites, helps to conserve our geoheritage, and provides an understanding of earth sciences and its history through appreciation and learning. The core focus of geotourism is that it places an emphasis on landscapes and landforms within which human activity has evolved. Historically the means for enhancing public appreciation of geoheritage and

earth sciences history has been undertaken in a wide range of traditional geosite locations including mined areas, museums, caves, and protected areas such as national parks. However, the recent development and public acceptance (particularly overseas) of the geopark concept and the establishment of 16 iconic National Landscape areas in Australia have created exciting new opportunities for achieving this objective. Moreover, the ever increasing roll-out of digital technologies has identified new mechanisms for delivering geoscience information to a broad range of consumers including tourists and school groups.

ISC06 Rock Art in Australia

Proponent: Erick Ramanaidou erick.ramanaidou@csiro.au

Australian aboriginal rock art is extremely rich. Caring for and protecting our cultural heritage is paramount so future generations can appreciate its significance. The petroglyphs are the cultural interfaces between geology and people; they are the earliest masterpieces. This session will cover both the significance of the rock art and also the complex geological history of underlying rocks by showcasing the latest research findings.

ISC07 Geological challenges on major engineering/infrastructure projects

Proponent: David Och ochd@optusnet.com.au

The application of appropriate geological techniques is a very important approach to minimise potential risks and overall cost on geological challenging engineering projects.

Such applications (e.g. desktop studies, 3D geological and structural mapping, geophysics and site investigation) are often critical when planning, designing, and constructing of the proposed infrastructure, as a lack of geological understanding may fundamentally undermine the project's cost, risk management, constructability and serviceability to the community.

The session proposed, focuses on the application of appropriate geological techniques and its associated innovative ideas that has been applied on the constructed major engineering projects in Australia where constraints (i.e. cultural, heritage, environmental, constructability, population centres etc.) would have otherwise limited the design and construction of the projects.

ISC08 Developing geological models for engineering projects

Proponent: Kurt Douglas k.douglas@unsw.edu.au

The geological model should form the basis of any geotechnical project. It fundamentally provides a method to assess geological uncertainties and hence manage project risks. It forms a basis for site investigations, leads to the assignment of geotechnical parameters for engineering design, and aids in understanding the ground-structure response. Despite their value, there is limited definitive guidance in the literature as to how a geological model should be created, developed and implemented.

Geologists play the key role in developing geological models. This session looks to explore the philosophy and development of geological models and to provide examples of their successful implementation in a range of different geological environments and projects. Submissions are invited from all areas of geotechnical engineering including, but not limited to: civil infrastructure; resource development & extraction; and geohazard studies.

Joint sessions hosted by other themes:

EV06 Tsunamis and storm deposits in Australia

LIVING EARTH

Life has fundamentally influenced the development of the Earth, making it unique with respect to its planetary neighbours. The Living Earth theme will investigate:

- The evolution of life as witnessed in the fossil record;
- Consider novel methods to supplement traditional palaeontological approaches;
- Investigate the major events in the evolution of life, the hydrosphere and atmosphere; and
- Draw contrasts and comparisons with other planets.

LE1 Recent advances in the evolution of life through the Archean

Proponent: Martin van Kranendonk m.vankranendonk@unsw.edu.au

A session in honour of Alec Trendall. Alec's interests were much broader in scope than just geochronology, and he was fascinated with ancient life, both in his beloved Hamersley and in the older rocks of the Pilbara, for example the famous Trendall locality of the 3.35 Ga Strelley Pool Formation, in which he documented perhaps the best-known early Archean stromatolites in the world. This session will also encompass issues arising from analysis of the Hamersley banded iron-formations, as many researchers have suggested that microbes were responsible for their precipitation.

LE2 The Australian Neogene: prelude to the present

Joint session with Dynamic Planet and Environment themes

Proponent: Bob Henderson bob.henderson@jcu.edu.au

Contemporary Australia expresses the outcome of environmental conditioning and change through the Neogene. Paleoenvironmental change through this interval is known to be of dramatic proportions and to be registered with great diversity. Paleoenvironmental settings and their change are variously recorded by marine sediment systems both submerged and exposed adjacent to the coasts, by continental regolith and sediment systems that are ubiquitous in the continental interior and by the development of volcanic landscapes in eastern Australia. The timing and development of widespread aridity during the Neogene and its consequence for change in the Australian biota are further big research questions inviting examination. The toolkits employed in paleoenvironmental research in this interval of time are also rapidly changing, particularly in the geochemical sphere. This session offers a forum to explore the drivers, processes and outcomes of the Neogene past which collectively have shaped our present.

Joint sessions hosted by other themes:

Environment:

EV05 Scientific Results of the Integrated Ocean Drilling Program (IODP)

Resources:

RE15 Geomicrobiology, the nexus between geoengineering and biotechnology

RESOURCES

In an era of increasing demand for mineral resources from the developing Asian economies, and declining rates of discovery of new deposits, new mineral exploration strategies are vital.

Discovery will be stimulated by new technologies, new methods of data interpretation and dissemination, refined and novel understandings of mineral systems and ore environments, and the strength of the pre-competitive geological and geophysical data sector, all addressed under the Resources theme.

RE01 Organic geochemistry of mineral systems

Proponent: Chris Yeats Chris.Yeats@csiro.au

Traditionally, mineral system research has focussed almost exclusively on inorganic geochemistry and mineralogy. However, petroleum basin and modern seafloor hydrothermal vent studies have identified that organic matter can have a significant influence on the behaviour of mineralising fluid and effective integration of organic and inorganic systems knowledge is essential for a proper treatment of ore formation in the organic-rich environments which characterise many of Australia's valuable mineral deposits. This session will present cutting-edge research into organic-inorganic interactions in mineral systems that has the potential to transform traditional ore genesis models.

RE02 Magnetic anomalies and geological interpretation

Proponents: Phil Schmidt phil@magneticearth.com.au
Bob Musgrave robert.musgrave@industry.nsw.gov.au

Magnetic mapping in a 2D sense is a mature method and is usually undertaken before or at least in conjunction with fieldwork. New techniques are providing more quantitative information which is necessary for 3D mapping. Developments have occurred in both software and hardware areas including new inversion approaches and measuring the magnetic gradient tensor in the air and downhole. As interest increases in the framework and structure of the deeper crust, and explorers look at deeper geophysical anomalies, more quantitative methods are needed to extract as much information as possible from survey data.

RE03 Resourcing Future Generations

Proponent: Ian Lambert ian.lambert7@gmail.com

Population growth and the aspirations of developing nations mean it is a priority to secure new mineral, energy and water resources for future generations - post 2030. This session would consider the priority activities and how relevant groups from governments, universities, and companies around the world could collaborate in addressing the challenges through a range of integrated activities, with the main research activities being undertaken through Earth system programs.

RE04 Government Regional Airborne Geophysical surveys as an aid for Regional Mapping and Exploration (RE04: Regional airborne geophysical surveys)

Proponent: Greg Street gstreet@intergeo.com.au

Since the early 1960s the collection of regional airborne geophysical data has almost always resulted in an exploration boom in the area where the data was collected. Examples include the nickel boom in the Eastern goldfields following BMR acquisition of regional airborne geophysics, and the gold boom that followed the acquisition of still higher resolution data. More recent examples include the growth in exploration in South Australia following that state's acquisition of aeromagnetic data as part of their exploration initiative, and regional airborne surveys that have precipitated exploration booms in Namibia, Ghana, Burkina Faso and Nigeria.

It did take some time for these data to be accepted into regional mapping but nowadays nobody would do regional mapping without at least airborne magnetics.

RE05 Gold Mineral Deposits of Siberia and Far East Russia

Proponents: Nikolay Goryachev goryachev@neisri.ru
Steffen Hagemann steffen.hagemann@uwa.edu.au
Franco Pirajno franco.pirajno@uwa.edu.au

This session would present the latest information on gold deposits of this vast region; the deposits to be discussed in this session would cover: orogenic-mesothermal, epithermal, porphyry (with gold) and related tectonic settings.

RE06 Mineralogical Exploration - A session in honour and memory of Keith Scott (RE06: Mineralogical Exploration)

Proponents: Ken McQueen Ken.McQueen@canberra.edu.au

The application of mineralogy and mineral geochemistry to resource exploration was a key interest and passion of Keith Scott. This session on 'Mineralogical Exploration' will highlight contributions to our improved understanding of the use of mineral properties and compositional data in mineral exploration. It also invites papers on new mineral-related techniques for exploration and the broader aspects of geochemical exploration controlled by particular minerals and mineral assemblages, including in the regolith.

RE07 Tectonics and Metallogeny in the Late Archaean

Proponents: Steve Barnes Steve.Barnes@csiro.au
Chris Yeats Chris.Yeats@csiro.au

The late Archaean was a period of extraordinary magmatism and ore deposit formation. Vast volumes of magma, from ultramafic to granitic composition, were generated over a few tens of millions of years, and are associated with some of the world's major ore deposit provinces including gold, nickel and base metals. Was this a once-only cataclysmic event representing a major transition in the thermal structure of the planet? Or was it a combination of plate tectonic processes similar to those in the modern Earth, but accompanied by some additional tectonic component or exceptional preservation? Isotopic mapping of the deep crust is one technique that is bringing exciting new insights, as is a rapidly growing body of data on igneous geochemistry, stratigraphic evolution of greenstone belts and understanding of the ancient sulphur cycle. This session will attempt to bring some of these strands together, and to define some of the critical questions that remain to be answered as we struggle to understand this pivotal event in the evolution of the planet.

RE08 Geological mapping: its power and its future

Proponent: Bill Laing Bill@laingex.com

The application of mineralogy and mineral geochemistry to resource exploration was a key interest and passion of Keith Scott. This session on 'Mineralogical Exploration' will highlight contributions to our improved understanding of the use of mineral properties and compositional data in mineral exploration. It also invites papers on new mineral-related techniques for exploration and the broader aspects of geochemical exploration controlled by particular minerals and mineral assemblages, including in the regolith.

RE09 UNCOVER – Searching the Deep Earth

Proponent: Dean Collett collettd@outlook.com

This session invites papers to specifically addressing the challenges of exploring beneath cover in Australia. Exploration under cover comes at substantially greater expense and risk compared to the traditional exposed geology search space. The UNCOVER initiative recognises that we need to change the way we explore the 80% of the Australian continent that is covered by providing the industry with new insights, methods and tools that make the investment substantially more attractive than it currently is.

To this end, UNCOVER is a call to arms for exploration geoscience researchers and collaborators in surveys and industry. Through new science and better informed data collection programs, the search space needs to increase and our ability to identify and rank prospectivity based on geophysical, geochemical and geological information needs to improve and adapt to this challenge. This will require new understanding in mineral systems and their evolution and preservation. It will also require new methods for interpretation of geochemistry and geophysical signatures informed by the characteristics of the cover sequences as well as better ore deposit and mineral system models. Models for lithosphere scale controls on the localisation of especially tier one mineral deposits have an important role in early ground selection and first pass targeting linked to those geophysical

geochemical and geological data sets that explorers use. Further, there is much opportunity across Australia to update province scale metallogenic evolution models in space and time including where they allow interpolation of trends across poorly explored covered terrains. Vectors to mineralisation and fertility insights across all scales is in many respects a new frontier to exploring beneath cover.

This session invites papers on any of the above subjects that specifically point to application in mineral exploration under cover.

RE10 Reconstructing Precambrian geological processes, palaeogeographic and geodynamic settings, and ore deposits (RE10: Reconstructing Precambrian processes and settings)

Proponent: Patrick Hayman patrick.hayman@monash.edu

Precambrian terrains and their mineral deposits span the bulk of the Earth's history yet our ability to reconstruct and understand their tectonostratigraphic and geodynamic evolution is still developing and many aspects remain controversial. Understanding and reconstructing Precambrian processes and settings requires multi-scale and interdisciplinary research combining field geology, structural geology, volcanology, sedimentology and petrography with cutting-edge analytical techniques including geochemistry, isotope geochemistry and geochronology. In this symposium we solicit contributions documenting stratigraphic, paleogeographic, structural and geodynamic reconstructions of host rock successions, including alteration studies, in both mineralised and unmineralised Archean and Proterozoic terranes with the intent to provide new insights into Precambrian processes and controls on fertilization, mineralisation and exploration targeting.

RE11 Multiscale characterisation of ore forming processes

Proponents: Mark Pearce mark.pearce@csiro.au
Alistair White Alistair.white@csiro.au

To use successfully the wealth of data collected from ore deposits, it is necessary to understand the physical and chemical processes by which they form. These processes range in scale from whole earth geodynamics, to the nanoscale fluid-mineral interactions that occur during deposition. Recent advances in characterisation techniques have allowed ever increasing spatial, temporal and analytical resolution of ore forming processes. It is the intent of this session to bring together these apparently disparate datasets to better characterise ore deposits and their geologic context. Contributions should discuss how datasets may be used to advance the understanding of how ore deposits form and how this may aid exploration. We welcome contributions at every scale using field, experimental and analytical methodologies and that focus on the processes by which ores have formed.

RE12 Optical Sensing for Advanced Mineral Characterisation for Exploration and mining (RE12: Optical sensing for advanced mineral characterisation)

Proponent: Carsten Laukamp Carsten.Laukamp@csiro.au

Optical Sensing Technologies, such as infrared reflectance spectroscopy and Raman spectroscopy, are increasingly applied for routine advanced characterisation of mineral assemblages. A multitude of technologies, ranging from spaceborne sensors to drill core and microscope scanning devices allow a multiscale characterisation of mineral systems. Public pre-competitive mineralogical data, in form of continental-scale mineral maps to drill-core scanning data have become available to the Australian resources sector over the past years, empowering explorers with mineralogy. This session invites presentations that showcase the latest advances in remote and proximal optical sensing technologies and their applications for the resources sector, including data processing and mineralogical interpretation. Case studies of mineral systems, where optical sensing technologies are integrated with other geoscience data are welcome, as well as detailed optical analytical studies of ore and vector minerals.

RE13 3D Geoscience: Methods, Applications and Challenges in Imaging and Analysing Solid Earth systems at different scales (RE13: 3D geoscience: Methods, applications and challenges)

Proponents: Klaus Gessner Klaus.GESSNER@dmp.wa.gov.au
Steven Mickelthwaite steven.mickelthwaite@uwa.edu.au

The three dimensional (3D) geometry and structure of the Earth, at multiple scales, is one of the most fundamental constraints used to help solve many problems within the Geosciences. It typically reflects the physical properties of bedrock, sedimentary basins and regolith cover, and in many cases structure relates to the spatial distribution of mineral deposits and energy resources. 3D structural modelling and imaging techniques can be used to extend, and up-scale, knowledge from known and well understood to inaccessible or data poor parts of Earth's crust and lithosphere.

We invite contributions that present applications and novel approaches of 3D imaging and modelling of Solid Earth including, but not limited to the following topics:

- Nano- to cm-scale models of rocks, minerals, grains, pores and fractures acquired by optical or electronic imaging or by X-ray tomography
- Metre-scale models of rock outcrops, and engineered rock surfaces acquired by laser scanning and photogrammetry
- 100 m to km-scale models of geological structures such as folds and fault zones, mines, petroleum and geothermal reservoirs, and carbon storage sites acquired by geological, geophysical and geochemical mapping and detection methods
- 10 km and larger scale Solid Earth models that image composition and structure of Earth's crust and mantle based on active and passive source seismic data, mineral spectra, potential fields and electrical properties.

RE14 Beginning with the end in mind: exploration and geometallurgy (RE14: Exploration and geometallurgy)

Proponent: Angus McFarlane Angus.Mcfarlane@csiro.au

The common consensus that ore reserves are decreasing in grade and becoming more complex to mine and refine is motivating an increased effort to characterise both the geological and metallurgical properties of the ore. The instrumentation and testing options available for measuring relevant rock properties means high sample support can be achieved for more than just grade, making analysis of 'big data' one of the next challenges. Since geologists have access to the ores long before metallurgists get involved, what role is there for exploration to enhance the transition to an operating mine? Is the geological thinking that guides discovery and expansion of ore deposits also capable of improving the ore-body models which guide business decisions? In this session, we would aim to discuss the opportunities and challenges facing exploration-stage ore characterisation with respect to future ore processing options.

RE15 Geomicrobiology, the nexus between geoengineering and biotechnology (RE15: Geomicrobiology, geoengineering and biotechnology)

Joint session with *Living Earth* theme

Proponents: Frank Reith Frank.Reith@csiro.au
John Moreau jmoreau@unimelb.edu.au
Gordon Southam g.southam@uq.edu.au

Geomicrobiology is a rapidly growing field that deals with microbial transformations of materials composing the earth's crust, including oceans, seas, lakes, bottom sediments, soils, mineral deposits, and rocks, and the geological impact these transformations have had over geologic time and up to the present day. Microorganisms have been actively transforming most organic and inorganic materials at the Earth's surface since the origin of life. While impacts over geologic time have occurred on a planetary scale, biological processes can transform local environments on relatively short time scales, such as the generation of acid mine drainage to the bioremediation of contaminated groundwater. With many mineral resources becoming increasingly scarce, geomicrobiology offers the potential to exploit natural, microbial processes for use in mineral exploration, metal extraction and bioremediation. This session will examine the role of microorganism in catalysing Earth-systems processes from atomic to ecosystem scales, highlighting the unrealised potential to exploit microbial processes that transformation organic and inorganic materials at the Earth's surface.

RE16 The 3rd National Virtual Core library Symposium

Proponents: Alan Mauger alan.Mauger@sa.gov.au
Belinda Smith Belinda.Smith@nt.gov.au

At the AESC in 2010 in Canberra and at the IGC in Brisbane in 2012 there were held respectively the 1st and 2nd National Virtual Core Library Symposia. The community involved in this would like to convene the 3rd National Virtual Core Library Symposium under the auspices of your AESC2014. This symposium series supports the growing community of providers and users of the new pre-competitive data being amassed under the AuScope NVCL program and involves all the State and Territory Geological Surveys, plus their downstream users, and the CSIRO. In 2014 it should also be able to support growing international and private sector providers and the take-up of automated core logging technologies and we would see clear opportunities to invite additional and overseas speakers as we have in the past. The scope will cover the growing use of automated hyperspectral and imaging technologies to extract more value from drilled materials (cores, chips, pulps, etc) and provide the users of these data a place to a) learn about these new techniques, and b) existing users to share their experiences across the diverse geological environments now covered by the activities of all the State and Territory Geological Surveys and increasingly the private sector.