7 July 2017

Discussion Paper

Future of the Australian Regolith Geoscientists Association (ARGA)

THE PROPOSITION

The ARGA Committee seeks a mandate to facilitate the future promotion and growth of regolith geoscience in Australia. The Committee's preferred course of action on the basis of the information available is to establish ARGA as a Specialist Group of the Geological Society of Australia (GSA). However, the ARGA Committee endorses a ballot of its members to decide the future of the organisation. The ballot will present the options outlined previously.

Should a majority of ballot responses from a poll of current ARGA members support the idea of a merger (in whatever form) the ARGA committee will engage with the appropriate organisation to identify a process and timing for the transition. Timing of any proposed merger is flexible, however the most logical implementation would be following the April 2018 ARGA conference - this event could be used as the last official conference for the organisation.

INTRODUCTION

The Australian Regolith Geoscientists Association (ARGA) is an incorporated organisation which draws together geoscience professionals from government, academia and industry, with a strong collective interest in regolith geoscience. The members of ARGA are building upon the legacy of several decades of Australian regolith research, and are looking for ways to promote and further enhance the important role that regolith science plays in Australia. Regolith geoscience is critical in the Australian context as over 70% of the continent is covered by transported material, while areas of bedrock outcrop can be strongly weathered.

A SHORT HISTORY OF REGOLITH GEOSCIENCE IN AUSTRALIA

CSIRO Land Research Surveys (Land Systems mapping)

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) led the development of regolith landform mapping in Australia (see http://www.publish.csiro.au/nid/289.htm). Immediately after World War II, CSIRO embarked on a plan to systematically map northern Australia and Papua New Guinea, commencing in 1946, with the final report being delivered in 1977. The Land Research Surveys mapped "land systems", which are composite units exhibiting similar soil, topographic and vegetation attributes. This mapping was intended to underpin the agricultural (and other) development of many parts of northern Australia, and was the forerunner to the regolith-landform and soil-landscape mapping techniques used today.

The results of the Land Research Surveys are now freely available from the CSIRO through: http://www.publish.csiro.au/nid/289/issue/5812.htm.

Centre for Australian Regolith Studies (CARS)

The Centre for Australian Regolith Studies (CARS) was a joint venture between the Australian National University and the University of Canberra. The Centre introduced a joint undergraduate and postgraduate teaching program between the two universities, the only one of its kind in Australia at that time. In the several years of CARS' existence five Occasional Publications were produced, including monographs on weathering, the influence of organic matter and fire on regolith and soil erosion, abstract volumes on the Monaro Volcanic Province (NSW), and new developments in regolith mapping.

The Centre's activities were subsumed into the Cooperative Research Centre for Landscape Evolution and Mineral Exploration (CRC LEME) in 1995. The Centre was not renewed after CRC LEME was discontinued in 2008.

The Centre's publications are available for free download via the ARGA web site: (http://regolith.org.au/publications.html).

Cooperative Research Centre for Landscape Evolution & Mineral Exploration (CRC LEME)

The Cooperative Research Centre for Landscape Evolution and Mineral Exploration (CRC LEME 1; 1995-2000) and the Cooperative Research Centre for Landscape Environments and Mineral Exploration (CRC LEME 2; 2001-2008) are collectively referred to as CRC LEME.

The CRC LEME 1 core parties included:

- The Australian National University
- CSIRO Exploration & Mining/Land & Water
- Geoscience Australia
- The University of Canberra

The CRC LEME 2 core parties included:

- The Australian National University
- The Bureau of Rural Sciences (withdrew 2001)
- CSIRO Exploration & Mining/Land & Water
- Curtin University of Technology
- Geoscience Australia
- Minerals Council of Australia
- New South Wales Department of Primary Industries (GSNSW)
- Primary Industries and Resources South Australia (GSSA)
- The University of Adelaide
- The University of Canberra (withdrew 2001)

The activities of CRC LEME primarily focused on research facilitating mineral exploration within and through the regolith, development of models of landscape evolution for Australia, assessing Australia's groundwater potential and understanding environmental geohazards such as dryland salinity and acid sulphate soils.

CRC LEME's activities have left a significant and enduring legacy of skilled researchers from its honours and postgraduate student cohort (117 and 81 completions respectively). Many of these

ex-students are now working in the Australian and international mining industry or as research scientists within Geoscience Australia, State and Territory geological surveys, CSIRO and universities. CRC LEME also produced a huge volume of data and information in the form of monographs, reports, articles, maps and educational material which continues to be freely available via the CRC LEME website (http://crcleme.org.au). CSIRO has agreed to continue to host the CRC LEME website into the foreseeable future. Additionally, many of the maps are also now available for free download and print-on-demand (on a cost-recovery basis) from respective State/Territory geological surveys and Geoscience Australia.

CURRENT REGOLITH GEOSCIENCE ACTIVITIES

The breadth of regolith geoscience research currently undertaken in Australia is not systematically captured, owing to the number and diversity of organisations involved in such activities. The examples below provide a sample of key programs to which regolith geoscience contributes.

The UNCOVER agenda

As part of the National Mineral Exploration Strategy (http://www.coagenergycouncil.gov.au/publications/national-mineral-exploration-strategy-december-2012), the Australian Academy of Science conceived the UNCOVER initiative (http://www.uncoverminerals.org.au/) – a program aiming to encourage increased investment in mineral exploration in Australia. UNCOVER identifies four key geoscience themes:

1. Characterising Australia's cover – the National Cover Map
2. Investigating Australia's lithospheric architecture – the National Map of the Deep Crust and Upper Mantle
3. Resolving the 4D geodynamic and metallogenic evolution of Australia – the 4D Metallogenic Map
4. Characterising and detecting the distal footprints of ore deposits – the National Distal Footprints Map.

ARGA represents many scientists working on the UNCOVER program across government (particularly Geoscience Australia), university and private industry. Members of ARGA are directly involved in themes 1 and 4 above, and are providing advice to others working on themes 2 and 3. Four of the top ten priority focus areas of the UNCOVER Roadmap are captured in the Characterising Australia's cover theme and these priorities are strongly linked to regolith science.

Exploring for the Future

The Australian Government's initiative to boost Australia's attractiveness as a destination for investment in resource exploration is manifested in a 4 year program targeting improved understanding of mineral, energy and groundwater resources in northern Australia. Geoscience Australia, in conjunction with State and Territory agencies, are employing regolith geoscience to contribute to the identification and characterisation of potential mineral, energy and groundwater resources concealed beneath the surface.
http://www.ga.gov.au/about/projects/priority-projects/exploring-for-the-future

Water for Food (WA)

Water for Food is a $127.5 million Royalties for Regions State Government program delivering fifteen projects with the aim of significantly increasing irrigated agriculture across Western Australia. http://www.waterforfood.wa.gov.au/

The primary objective of Water for Food is to identify water and land resources, as well as irrigation technologies, that can enable Western Australia's fresh food and animal protein production to increase its contribution to regional economies. Regolith geoscience is being employed to identify and characterise potential groundwater resources and assess land suitability.

Australian Soil Resource Information System (ASRIS)

The Commonwealth, State and Territory governments each conduct soil mapping at a variety of scales for agricultural and natural resource management purposes. Soil maps consider the upper part of the regolith, the *pedolith*, and the landscape, climate and vegetation that influence its formation. Soil maps are published as individual map sheets and at various scales of the Australian map series, together with accompanying reports, and are collated in the Australian Soil Resources Information System (ASRIS http://www.asris.csiro.au/). This is an ongoing collaboration between CSIRO and State/Territory agencies, and brings together soil mapping and other data at all scales from across Australia.

National Exploration Uncover School (NExUS)

The new initiative "National Exploration Uncover School" (NExUS) was established in 2016 by Graham Heinson and Richard Lilly at the University of Adelaide. The program aims to expose 3rd year undergraduates, honours students and recent graduates to the opportunities and challenges facing the exploration and mining industry as search areas move under cover. NExUS includes several regolith geoscience mapping and sampling components to address the lack of regolith in the current university earth science curriculum around Australia.

CONTRIBUTORS TO REGOLITH GEOSCIENCE IN AUSTRALIA

A number of organisations, several of whom had involvement in one or more generations of CRC LEME, have regolith geoscience expertise.

Universities

- Australian National University
- Curtin University
- Monash University
- University of Adelaide
- University of Canberra
- University of South Australia

Geological Surveys

- Geological Survey of New South Wales
- Geological Survey of South Australia

- Geological Survey of Western Australia
- Northern Territory Geological Survey

At GSSA and GSWA all geologists within the regional mapping team have been trained in regolith mapping over the last couple of years in internally-run courses. Regolith mapping has now been fully integrated into regional mapping and geological map compilation.

CSIRO

CSIRO Land & Water and CSIRO Mineral Resources in particular are substantially involved in regolith research. Regolith geoscience has strong relevance to a number of National Research Flagships, including:

- Energy
- Food Futures
- Minerals Down Under
- Sustainable Agriculture
- Water for a Healthy Country

Geoscience Australia

Geoscience Australia (GA) is currently playing a key role in the Australian Academy of Science's UNCOVER initiative as part of the National Mineral Exploration Strategy and current and future research focusing on key areas of UNCOVER. Exploring for the Future (EftF) has multiple projects in northern Australia in both the mineral and groundwater space. Geoscience Australia maintains expertise in regolith geology and geochemistry, hydrogeology, hydrogeochemistry, regolith mapping and near-surface geophysics.

Companies and other individuals (many ex-CRC LEME)

Ian Robertson (http://aquashutterbug.net.au/_Work/Index.html)
Lisa Worrall – Protean Geoscience (http://proteangeoscience.com/)
Greg Shirtliff – Toro Energy
Michael Holzapfel – OM Manganese
Michael Whitbread – Rio Tinto
Kathryn Fitzsimmons – Max Planck Institute (Germany)
Chris Gunton –Arcadis Environmental Services
Shawn Laffan – Associate Professor University of NSW
Matthew Lenahan – Principal Geochemist AECOM
Alistair Usher – Australian Academy of Science
Toshi Fujioka - Australian Nuclear Science & Technology Organisation

CHALLENGES IN REGOLITH GEOSCIENCE

The general slowing of the mineral exploration industry has affected the way that the industry operates. Industry is now more conservative in terms of operations and, together with decreasing staff numbers, has led to an increased emphasis on trusted methods such as drilling. Industry would like to see a better understanding of cover (regolith) and minerals systems in terms of both geochemistry and geophysics. This includes improvements in dealing with large datasets which can support to better decision-making for the tools and data used in exploration.

The State and Territory Geological Surveys undertake work in regolith science in response to requests from industry. The products that have been generated to date by the State Surveys are being well utilised. However, the challenges in the State Surveys are linked to limited staff numbers available to undertake regolith science work, and geoscientists who have a limited understanding of regolith science which can be linked to a lack of training in universities. The State Surveys are required to provide regolith data by staff trained in generating regolith data. However, there are very few graduates who have regolith mapping skills with an in-depth understanding of regolith and its importance.

At CSIRO, there was an expansion in regolith geoscientists to a peak of approximately 30 scientists in the mid-2000s with CRC LEME. However, since the closure of CRC LEME, there has been a steady decline in the number of regolith geoscientists, largely related to the retirement of key researchers. CSIRO maintains a strong capability in geochemistry and hydrogeochemistry.

Funding is an overarching challenge for CSIRO, GA, the State and Territory Surveys and the universities, and has required creativity and collaboration. Some successful examples include:

- UNCOVER initiative which presents a united geosciences community including CSIRO, GA and State and Territory Surveys
- Capricorn Distal Footprint research: a collaboration between GSWA, UWA, Curtin University and has been awarded $17 million over three years

Similarly, recruitment freezes and caps on the number of permanent staff in government and universities have affected the knowledge base in these organisations.

From the environmental perspective of regolith science, funding for projects is largely sourced from inter-disciplinary collaborations focusing on water quality and natural resource assessment. Other projects such as those related to coal seam gas development and monitoring have developed techniques to mitigate environmental problems.

Regolith science teaching at universities is largely contingent on individuals and is constrained by a lack of specialists in the field and increasing pressure to reduce the diversity of courses on offer. As a result, there is little continuity in teaching regolith science.

WHERE ARE WE NOW?

ARGA member numbers are currently officially listed at 38, of which no communication has been received from more than 60% since the last ARGA conference, and 4 of which appear to have invalid contact details (i.e. emails bounce; no forwarding information). Failure to invigorate the organisation may result in member numbers and activity declining to a point where the association ceases to function effectively.

A number of suggestions were discussed at the 2014 ARGA biennial conference in Bunbury to address these challenges:

- Forming a specialist group within the Geological Society of Australia (GSA). However, it was noted that this may restrict membership to only those who come from a geoscience background within ARGA, and exclude those not from a geoscience background.
- Forming a regolith geoscience-focused CRC. Deep Exploration Technologies CRC (currently in operation until 2018) has moved towards a technology focus, rather than geology and regolith science, creating a potential opportunity for a new earth science-focused CRC.
- Contribution to the National Curriculum in the earth sciences. There is the opportunity to train not only new regolith scientists, but also new science teachers.
- Internships, cadetships and summer scholarships provide an opportunity for industry and government organisations to link with universities. This can potentially address the limited number of graduates with limited training in regolith science. Industry links are valued by students.
- Establish a list of guest presenters who could give lectures or short courses in regolith science. Students can then see the value in applying regolith science to their discipline, e.g. the application of regolith knowledge in land management, geography, ecology, etc., and let students know that regolith science is not just about mineral exploration. This also means that an entire course in regolith science does not need to be established and a core of regolith scientists/ARGA members can facilitate regolith training at universities.
- Establish a database or list of theses at all levels which are related to regolith. A substantial proportion of regolith science research is conducted by students and is under-utilised. AMIRA has successfully established a database for all geology-related theses.
- Provide a forum for increased collaboration between groups and organisations, and to attract competitive funding grants.
- Forming of a LinkedIn group for regolith science, which could potentially be a more useful alternative to the Facebook Group as more professionals are likely to use it.

The importance of presenting a regolith science perspective and a united front to the wider geoscience, exploration and mining community was noted. There has been a marked increase in collaboration between State Surveys, GA and CSIRO, with crossover occurring between states and institutions largely credited to the relationships formed from CRC LEME.

During ARGA's Annual General Meeting in February 2017 the idea of forming of a specialist group within the Geological Society of Australia (GSA) was again raised due to the concern of declining membership, dwindling numbers of postgraduate students taking on regolith-related topics, and the lack of regolith science courses at universities (resulting in decreasing numbers of students with regolith knowledge entering mining and related industries).

WHAT ARE THE OPTIONS?

The options for ARGA's future can essentially be summarised as follows:

Wind-up

This is obviously the least desirable option – the organisation ceases to exist.

Status Quo

Continue on the current path, with possible changes to membership rules to permit options such as '$10 for 10 years'. Continue to run a biennial conference and occasional short courses; attempt to generate interest through symposia at other conferences or seek joint conferences.

Merge with Soil Science Australia (SSA)

The option of a 'merger' with Soil Science Australia has been floated, and was discussed at the 2017 AGM. Investigation into the purpose, rules and structures of the SSA suggest that this does not represent a viable option, for the following reasons.

- SSA's dominant interests and activities are heavily tied to soils and agriculture - anything below the top 1 m is 'out of scope' and overlap into the 'landscape' space is limited.
- SSA does not have the organisational structures and processes in place to incorporate specialist groups.

Vanessa Wong (SSA National Committee member) explains that if ARGA sought to engage with the SSA then ARGA would essentially have to stay as a separate entity, and 'interact' with SSA in the same way as other groups such as the Australian Clay Minerals Society. This is somewhat equivalent to the Status Quo option above.

Merge with the Geological Society of Australia (GSA)

Under this option there are several possible permutations. These all require people to become members of the GSA (noting that around 30-40% of existing ARGA members are also GSA members).

(1) Form a Standing Committee
(2) Join an existing Specialist Group
(3) Form a new GSA Specialist Group

Refer to Appendix 1 for information about the differences between a Standing Committee (SC) and a Specialist Group (SG).

What would ARGA bring to the GSA?

- A diverse group of active professionals in regolith geoscience, who are working to improve understanding of a significant part of Australia's geology which has traditionally been of secondary interest to explorers, but which is becoming increasingly critical.

- Linkages to complementary sciences e.g. soil science, geomorphology, hydrogeology, ecology.
- Further diversification of the GSA.
- Skills base to support training and education to bridge the gap in regolith knowledge in Australia.
- Potential to attract new members to GSA, particularly from industry.

What does GSA offer ARGA?

- Stronger engagement with the geoscience community, and in particular with industry, which has historically benefited directly from regolith research (e.g. CRC LEME).
- A platform to increase visibility and demonstrate the relevance of regolith science to the broader geoscience community through established communication channels such as newsletters, journals, etc.

(1) On the basis of the information in Appendix 1 regarding the definition, rules and activities of Standing Committees this is not considered a viable option.

(2) Joining an existing group, such as the Environmental Engineering & Hydrogeology Specialist Group (EEHSG), is possible. Existing funding transferred from ARGA would be incorporated into the SG's funding pool. ARGA would need to ensure the positioning of regolith-centric people on the Committee of the SG to enable influence of the SG's activities.

(3) Forming a new SG under the GSA would give access to a range of mechanisms and tools that this larger professional society offers. A regolith-centric SG would provide the autonomy to promote and grow regolith geoscience.

APPENDIX 1 - Clarification of Geological Society of Australia Standing Committees versus Specialist Groups (compiled from correspondence with Caroline Tiddy and Sue Fletcher)

Standing Committees

The members of the Standing Committee must be GSA members [and hence pay an annual membership]. Standing Committees have varying degrees of activity, but do not hold a regular event such as a conference. Standing Committees do not have their own funding.

The terms of reference for each Standing Committee are established by the Governing Council and are regularly reviewed. A Standing Committee reports to the Governing Council on a regular basis. The role of a Standing Committee is to generally provide advice to the Governing Council. They do not have the delegated authority for independent actions (unlike a Division or Specialist Group). Committee members (which can be from 4-15 in number) must be GSA members and are approved by the Governing Council. A Standing Committee cannot operate outside its Terms of Reference. The Standing Committees receive no funding and their Terms of Reference do not provide a mechanism for them to receive income. They have no constitutional authority to purchase or receive revenue. If they have a funding request, a submission to the Governing Council is considered as part of the annual budget process, and may (or may not) be approved.

The GSA has a number of Standing Committees as listed below.

- Geoheritage Standing Committee
- Geotourism Standing Committee
- National Awards Standing Committee
- Australian Stratigraphic Commission (Standing Committee)
- Ethics Standing Committee
- Accreditation Standing Committee (soon to be established)
- Finance and Risk Standing Committee

Specialist Groups

All members of a Specialist Group must be full members of GSA and then subscribe to the Specialist Group for a small additional fee (e.g. $10). The Specialist Groups undertake a range of activities such as field trips, regular conferences etc. Each Specialist Group has its own pool of money that is held within the GSA Investment Portfolio - this ensures good investment is returned. The amount of returned investment is proportional to the percentage invested. Note that although the money is held within the GSA portfolio, it is easy to access, auditing is simple, and the Treasurer's job is made a lot easier. The amount charged by the Specialist Group is determined by the Specialist Group. The full subscription rate is 'owned' by the Specialist Group and sits in a consolidated bank account or, if a large amount, sits in the Investment Portfolio. Each month a Balance Sheet and Profit & Loss/transaction report is sent to the Division/Specialist Group so they have a current financial report. The GSA manages the GST, all invoicing, receipting of revenue and payment of expenses. During the audit we undertake a GST acquittal for the Divisions and Specialist Group. Subject to the size of the conference/symposia, the office assists with the conference registrations. If ARGA was to become part of the GSA, we would have a memorandum of understanding about the ARGA funds belonging to ARGA.