

Australian Regolith Geoscientists Alliance



GSA Specialist Group

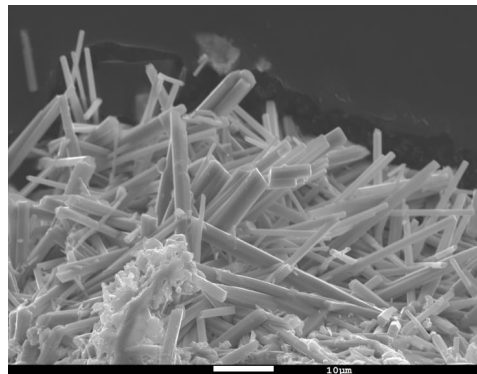


Newsletter

October - December 2023



John Keeling poses next to the Tamala Limestone, foreshore of the Swan River at Peppermint Grove, Perth.



AESC ARGAs Symposium 2022, and Wortupaite crystals



Left and right: Poster highlights from ARGA Symposium – Anna Petts (Left) and Ken McQueen (Right)

AESC ARGA Symposium Fieldtrip



Photo – John Forrest National Park, Railway Reserve Heritage Geotrail. Standing from left to right: Anne Locke, Sue Keeling, Leah Lynham, Ivan Schroder, Baohong Hou, John Keeling, Steve Hill, Bruno Macchioni Pereira, Paul Yildegga, Guillermo Lolino Troncon Guerra, Roberto Loreti Junior and Mike Freeman. Kneeling: Nadir de Souza Kovacs, Graciany da Silva, Lorena de Toledo Queiroz and Mario Iglesias Martinez. (Photo by 'Jim' with Steve Hill's camera)

Australia Regolith Geoscientists Alliance (ARGA) GSA specialist group AESC 2023 Sea to Scarp Excursion

As part of AESC 2023 ARGA Symposium in Perth, ARGA held the Sea to Scarp excursion on the 29 of June 2023. 'Sea to Scarp' was ARGA's first excursion as a GSA specialist group organised by Nadir De Souza Kovacs and Anna Petts, and run in collaboration with retired GSWA geologist Mike Freeman and National Park Ranger Paul Yildegga. The tour took a group of 14 people on a day trip visiting sites of geological, geomorphological, and historical interest from Fremantle to the Perth Hills. The sites visited were the foreshore of the Swan River at Peppermint Grove, Fremantle Round House and Arthur Head, Perth Kings Park, John Forest National Park, Mundaring Weir and Pump Station 1 Coolgardie-Goldfields Water Supply Scheme.

Geologically the Perth region is characterised by two major features: the

Yilgarn Craton and the Perth Basin. The Archean and Proterozoic igneous and metamorphic rocks of the Yilgarn Craton form the Darling Range in the east of Perth City. The Darling Range east of the Darling Fault has an extensive mantle of lateritic material, remnant of an extensive peneplain. In contrast Cretaceous – Paleogene sedimentary rocks of the Perth Basin make-up the flat coastal plain, influencing on the morphology of the Lower Swan River and the choice of construction materials at time of Fremantle and Perth settlement.

Below is Leah Lynham’s review of the field trip.

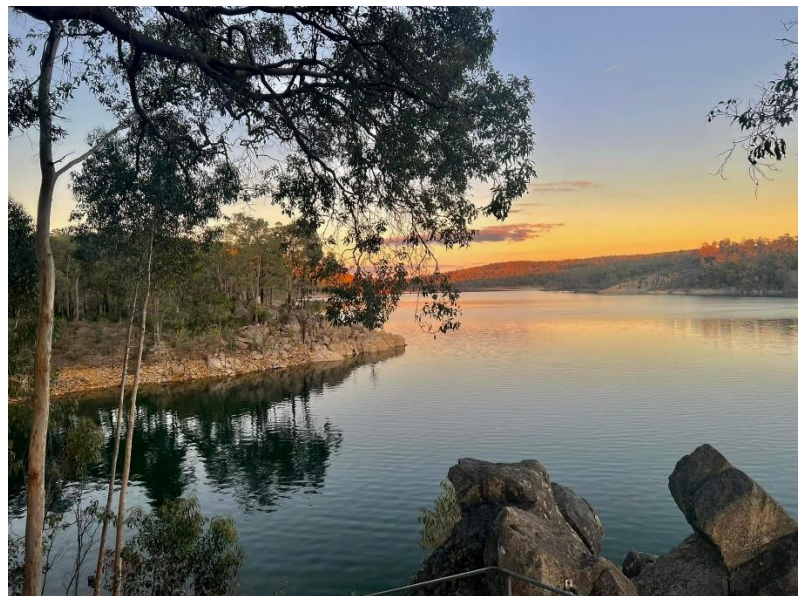
‘What an absolutely fabulous field trip, thank you so much Nadir for organising today and keeping us all on time and in check.

We started in Peppermint Grove having a look at the Tamala Limestone. And what’s not to love. A drainage system? And fossils? Hell yeah. My favourite things. We also checked out the real estate of the local area and the consensus was that even a mine Geo in a boom couldn’t buy one of those houses.

Then we moved to Fremantle, interspersed with some fabulous history and culture we visited another Tamala limestone outcrop, with some amazing cross bedding features.

After this our wonderful driver Malcolm brought us back into the city (we did wave at those of you still in the conference centre!) to have a look at the Swan River and a discussion on my other favourite thing- palaeochannels. Seismic mapping can pick up the palaeochannels and track the movement of the river through geological time!

Lunch in Guildford was a relaxed affair, with various sites selected by the group to wander off and eat.



Photos – Sunset at the Mundaring Weir, Perth Hills. Pump Station 1 - Coolgardie/Goldfields Water Supply Scheme, Mundaring Weir in the Darling Range, Perth, WA. (Photos by Steve Hill)

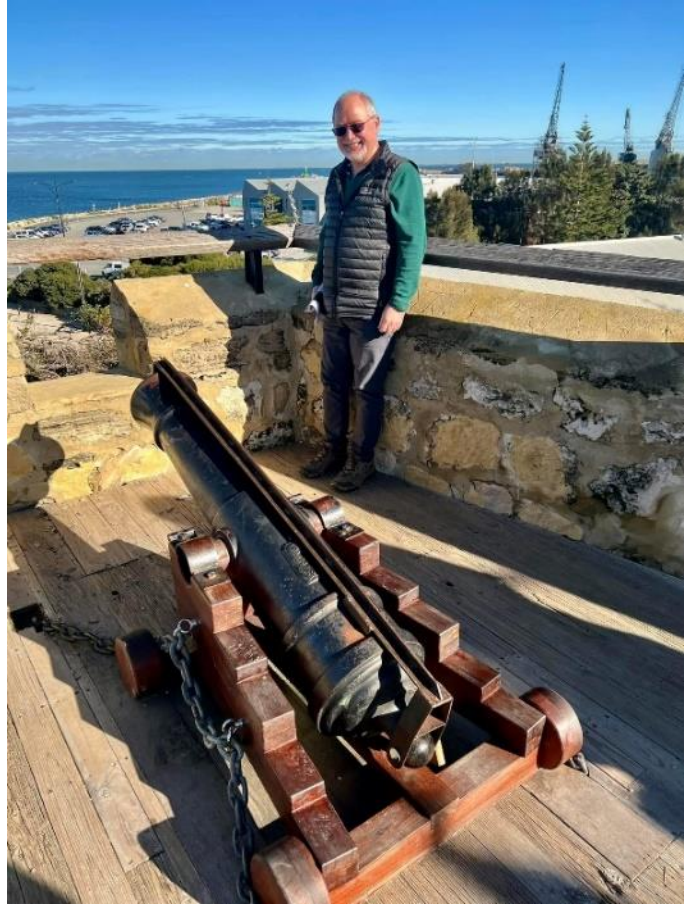
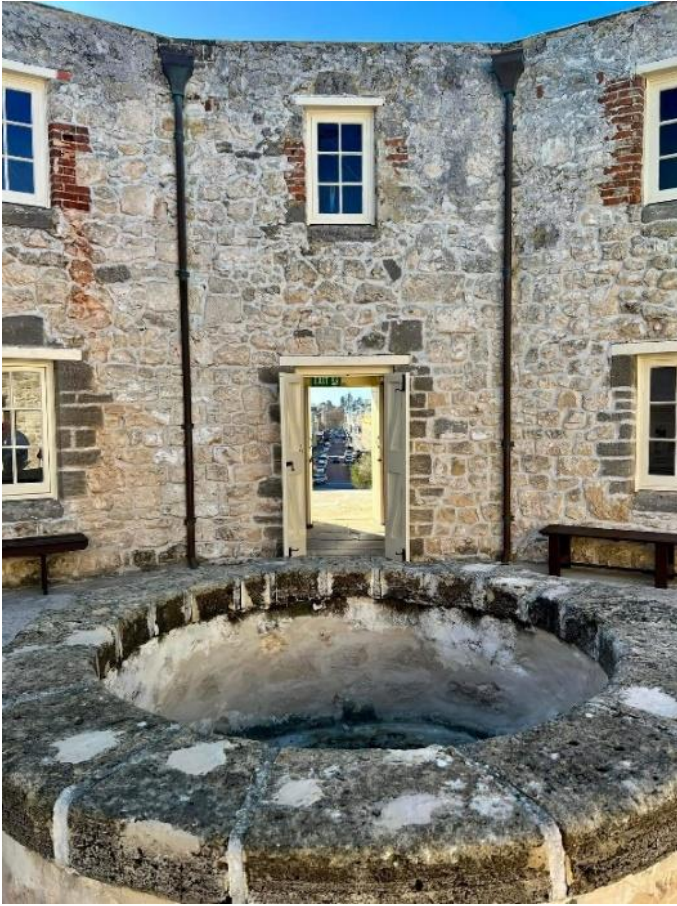
We then made our way to John Forrest National Park where we were met by Mike Freeman, who wrote the [Railway Reserve heritage Geotrail guidebook](#) and he walked us along the trail giving a personalised touch to the geology. Excitingly here we saw slickensides (photo), something I haven't seen since my undergraduate days! We were also joined by Paul Yildega the Park Ranger who was there to make sure we didn't destroy any rocks in the National Park. He admitted that DPAW get very nervous when geologists show- they wonder if any rocks will be left for them to protect!

We finished the day at Mundaring Weir discussing the phenomenal feat of engineering that C. Y. O'Connor achieved, by building the pipeline for water to be pumped from Mundaring to Kalgoorlie to support the growing population as a result of gold discovery and mining. This pipeline is still in use today, and I drink water that's travelled along that pipeline and think it's phenomenal.

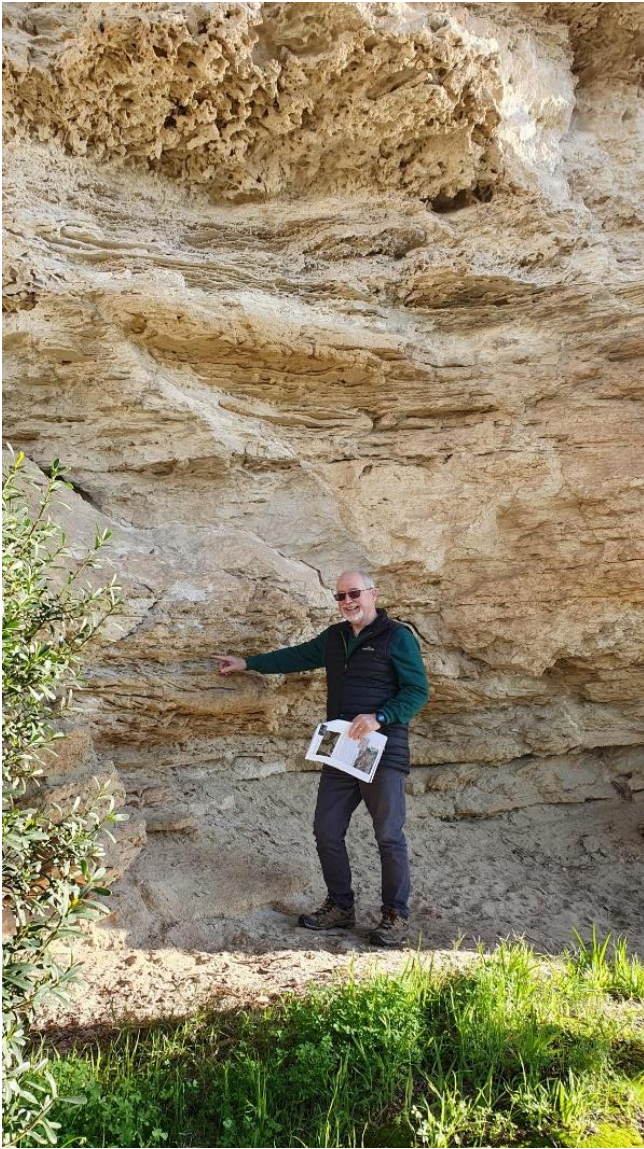
Thank you everyone for coming along, and I can't wait for the next field trip!



Photo - Arthur Head and the Whalers Tunnel, Fremantle. Cliff shows large cross beddings on shallow-marine deposit and cemented coastal sand dune of the Pleistocene Tamala Limestone Formation. Pleistocene marine deposits are extensive along the west coast of Western Australia. In the Perth region Pleistocene limestones form discontinuous pockets and lenses of shelly calcarenite, interbedded with eolian calcarenite of the Spearwood Dune System. The offshore reefs and islands of the west coast of Western Australia including Rottnest Island, Carnac Island, and Garden Island represent sunk coastal sand dunes deposited during periods of lower sea level. (Photo Steve Hill)



Photos - The Roundhouse is the oldest public building in the State of Western Australia. Built with Tamala Limestone blocks quarried from the Arthur Head. Opened in January 1831, just 18 months after settlement, it was built to hold any person convicted of a crime in the settlement and was used until 1886. After it ceased being used as a gaol it became a Police Lock-up until the late 1890s and then was used as accommodation for the Water Police, and afterwards as a storage facility for Fremantle Ports. When threatened with demolition in the 1920s it was saved, and later control went to the State Government before it was deeded to the City of Fremantle. The heritage cannon firing ceremony is performed at 1 pm daily, it was a signal used to assist the mariners at sea to set the correct time for navigation. (Information source <https://www.fremantleroundhouse.com.au>) (Photos Steve Hill)



Photos. John Keeling poses next to the Tamala Limestone, foreshore of the Swan River at Peppermint Grove. Outcrop shows ripple (detail photo), cross and planar bedding displaying the relationship between eolian calcarenites and shelly marine units of the Tamala Limestone. The marine units constitute the type section of the Peppermint Grove Member of the Tamala Limestone that records the continuing retreat of the sea (regression), from a shallow-marine environment to a beach environment. Photo by Steve Hill.





Photos– Mike Freeman takes over as the guide tour and sets the scene for walking up the Darling Scarp along the 3 km Railway Reserve Heritage Geotrail in the John Forrest National Park, Perth Hills (Photos by Steve Hill and Nadir de Souza Kovacs)



Xanthorrhoea (Grass trees), Iron Bark and Jarrah eucalyptus trees growing on shallow 'lateritic soils' paint the typical Perth Hills landscape (Photos by Steve Hill)



Leah Lynham and the slickensides. Steve Hill very excited about a tree (?)

Keith Scott Memorial Award

Australian Earth Science Convention 2023, Australian Regolith Geoscientists Alliance (ARGA) Symposium



Left: Kosuke Tsutsui, Kathleen Vowles, and Andrew Rozefelds recipients of the Keith Scott Memorial Awards during the AESC ARGA Symposium in Perth 2023. Right: ARGA committee members Nadir de Souza Kovacs, Anna Petts, and Leah Lynham.

The AESC ARGA Symposium 2023 presentations were of high quality, and it was difficult for the committee to award the prizes.

So, for best student, as we really couldn't choose, we awarded two prizes!

[Kathleen Vowles](#) from James Cook University for her presentation 'Investigating sedimentary provenance and tectonics through detrital zircon geochronology of modern beach and dune sands of north-eastern Australia. And [Kosuke Tsutsui](#) from University of Adelaide for his presentation on 'Ancient submarine volcanic eruptions revealed by 3D seismic data from the Browse Basin, Australia.

ARGA's Keith Scott Memorial Prize went to [Andrew Rozefelds](#) from the Queensland Museum Network for his presentation 'Borne of fire/Borne by water - The Silcrete floras of Australia: Different florist is assemblages and modes of preservation are evidence of distinct silicification pathways.

Thank you so much to all our presenters for the mind-blowing quality of research and presentations. We hope to see you all at our next symposium.

From the ARGA's Chair



We have held another fantastic symposium as a part of AESC 2023, and now have a fantastic committee made up of regolith fans, new and old! I would like to take this moment to thank all our members for their enthusiasm and support this past year. We managed to hold some fun networking sessions, featuring talks from Anthony Dossetto, Nadir De Souza Kovacs, and just hoping to connect members using the GSA zoom meeting facilities. The ARGA symposium came together so well, and we are very excited to start planning our next symposium – whether it will be at a mini conference, or with other specialist groups, time will tell. We also

held a very successful mid-Symposium field trip, thanks to Nadir de Souza Kovacs! The committee is looking forward to planning excursions within most states and territories where we have members – if you are interested in hosting or helping with a field trip, please contact the committee.

A focus of the committee this coming year will also reach out across institutions and organisations to link together regolith science in Australia. Also, to create international links and partnerships where possible. We hope to highlight the legacy of regolith research in Australia and build up our network and more importantly, promote and publish!

The committee, and members, of ARGA are what make our specialist group so special and unique. No where else in the Geological Society of Australia are there so many diverse research and interests, across a range of disciplines. Now, more than ever, multidisciplinary approaches to understanding the earth and environment are vital for creating a sustainable future. The ARGA Specialist Group is well placed to provide a home and support network for anyone interested in earth and environmental science, critical zone science, regolith, planetary geology, and earth observations, and beyond. I look forward to meeting up with all the ARGA members in coming months and hearing from you how we can improve ARGA and plan for the future!

ARGA's AGM was held on the Tues, 27th June, the afternoon of the first day of the ARGA Symposium. We want to extend our thanks to the outgoing committee for everything they achieved during their term. We would like to welcome the ongoing committee.

[Anna Petts](#) as Chair

[Leah Lynham](#) as Secretary

[John Keeling](#) as Treasurer

[Ian Roach](#) as webmaster

[Nadir De Souza Kovacs](#) as our Newsletter editor

And [Savannah McGuirk](#), [Anthony Dosseto](#), [Juraj Farkas](#) and [Owen Missen](#) as general committee members!

Welcome to the new ARGA committee members!

Dr Owen Missen



Dr Owen Missen is a Research Fellow in the Centre for Ore Deposit and Earth Sciences (CODES), working on the environmental mineralogy and geochemistry of Critical Elements. His research focuses on mineralogy and biogeochemistry in the oxidation zone, favouring a multidisciplinary approach to mineralogical research. He completed his PhD at Monash University in 2022, with his thesis focused on tellurium biogeochemistry. He also worked on cobalt biogeochemistry at Museums Victoria before joining

University of Tasmania. He is passionate about better understanding the regolith, in particular the mobility of rare elements.

Research Fellow in Environmental Mineralogy of Critical Elements

<https://discover.utas.edu.au/Owen.Missen>

CODES School of Natural Sciences

University of Tasmania, Hobart

Recent research:

[Microbial mechanisms to transform the super-trace element tellurium: a systematic review and discussion of nanoparticulate phases](#)



Dr. Missen digging for cobalt,

Dr. Juraj Farkas



Dr. Juraj Farkas is a senior lecture and isotope geochemist at the University of Adelaide with research focuses on biogeochemistry and non-traditional isotopes, and their application to solve problems relevant to earth system sciences and environmental studies. He is specifically interested in the stable isotope systems of alkaline earth metals and redox-sensitive elements, and how these new isotope tracers can be used to further constrain the: (1) the isotope evolution of seawater over geologic time, (2) diagenetic processes in marine carbonates, (3) material cycling in the Earth's outer shell, and (4) paleo-environmental conditions and depositional settings in large sedimentary basins.

He has established the 'Metal Isotope Group' (MIG) whose primary research focus is on stable and radiogenic isotope systems of selected metals, and their application to solve problems relevant to earth system evolution studies, geochronology, metallogenesis and environmental issues. For more details on specific research projects, collaborators, and analytical facilities see also the link below for the MIG webpage: <https://sciences.adelaide.edu.au/physical-sciences/metal-isotope-group>

Senior Lecturer & Isotope Geochemist

School of Physics, Chemistry and Earth Sciences

Faculty of Sciences, Engineering & Technology

The University of Adelaide

Email: juraj.farkas@adelaide.edu.au

Web: <https://www.adelaide.edu.au/directory/juraj.farkas>

MIG Web: <https://sciences.adelaide.edu.au/physical-sciences/metal-isotope-group>

Dr. Antony Dosseto

Founder of the Wollongong Isotope Geochronology Laboratory and fond of isotope geochemistry. Francis Albarede once quoted Karl K. Turekian who said, "No discipline is immune to isotope geochemistry". This is exactly what my research activity is about: using isotopes to study a wide range of geological and biological processes - from the origin of animals, the evolution and the interaction of humans and the Earth's surface, to the role of metals on neurodegenerative diseases.

Professor School of Earth, Atmospheric and Life Sciences (SEALS)

[Anthony Dosseto Profile | University of Wollongong \(uow.edu.au\)](#)

University of Wollongong Australia

Email: tony_dosseto@uow.edu.au

Events and conferences

2023 White Conference Critical Zone Science



[ONLINE ONLY - AAS 2023 White Conference](#)

Discover the latest advances in Critical Zone Science and help develop a research agenda and network for Australia's life-sustaining system.

www.eventbrite.com

The 2023 White Conference aims to bring together leading Australian and international researchers to develop a research agenda and network for Critical Zone Science in Australia. This conference will provide a platform for the exchange of ideas and the development of collaborations to address the grand challenges for Australian Critical Zone Science.

This conference provides a unique opportunity for scientists to develop a collaborative research agenda and network in Critical Zone Science in Australia. Join us to be a part of this exciting event!

<https://www.eventbrite.com/e/online-only-aas-2023-white-conference-tickets-670551967987>

International Geodiversity Day - 6 October



The International Geodiversity Day (IGD) was celebrated under the theme of "*Geodiversity is for Everyone*". The theme reflects that geodiversity is all around us and effects the lives of all people wherever they are in the world. It is also an opportunity to promote widening participation in geoscience education and careers.

Geodiversity is all around us, impacting many areas of society, and IGD is a worldwide celebration to bring people together in promoting the many aspects of geodiversity.

Thinking of running an event next year? [Check out our page with help and resources for event organisers.](#)

Australian Mine Waste Symposium - 6 - 7 February 2024



The Australian Mine Waste Symposium brings together leading experts from different industries to share their perspectives and knowledge on the management of mine waste in Australia. One of the main outcomes of the symposium is to set out a roadmap to help delegates introduce reforms and embrace mine waste valorisation across the country.

This event is organised by The University of Queensland's Sustainable Minerals Institute's WH Bryan Mining Geology Research Centre, in collaboration with the Geological Survey of Queensland.

https://payments.uq.edu.au/UQPCET101/booking?UDS_ACTION_DATA=ZytdBDBGLQFOKSEKREJDBSxTQg06WzcbWOZALQlwVEsJRilc

Seeing beneath the blanket – novel tools for exploration under cover - 26 October 2023, 2:30pm–5:00pm

Hydrogeochemistry, paleotopography, biogeochemistry, mapping of resistate indicator minerals; these are all new, or old-but-new-again techniques to help the perpetual challenge of mineral targeting and exploration under cover.

Join us for the last online seminar of 2023 as we explore new initiatives for undercover exploration.

[GSQ-UQ Webinar Series 2023 - Sustainable Minerals Institute - University of Queensland](#)

IAGS 2024 – Adelaide

Institute of Australian Geographer's Conference



Adelaide has been announced as the location of the 2024 Institute of Australian Geographer's Conference. The conference will be held in July 2024, with dates and registration information to be announced soon.

For more information follow the link <https://www.iag.org.au/conferences-iag2024-conference>

Earth Science Week - 9–13 October



The theme for Earth Science Week this year is Geoscience Innovating for Earth and People

Whether you are a student, teacher, or just someone who is passionate about the world around us, there's something for everyone during Earth Science Week to learn more, discover and celebrate the many ways Earth science impacts our everyday lives. Several organizations are running events during the Earth Science Week, below are some.

Geoscience Australia - <https://www.ga.gov.au/news/earth-science-week>

Virtual excursions Australia - <https://www.virtualexcursionsaustralia.com.au/events/earth-science-week-2023/>

ARGA's Webinars

Upcoming ARGA's Webinars

19 October 2023

Topic TBA

Presenter: TBA

Thursday 14th December

Sedimentary provenance and tectonics through detrital zircon geochronology of modern beach and dune sands of north-eastern Australia.



Presenter: [Kathleen Vowles](#) is a PhD student at James Cook University in Geoscience, examining coastal dunes and beach provenance in northeastern Australia. Including, the sedimentology and provenance of Princess Charlotte Bay (Queensland). In addition, Kathleen is an Academic Tutor in Advanced Marine Geoscience and Earth Evolution at James Cook University.



ARGA Webinars zoom links can be accessed via ARGAs LinkedIn

<https://www.linkedin.com/company/australian-regolith-geoscientists-alliance-arga/>

Regolith Science on the Web

Geologize! How to communicate our science



Dr Haydon Mort presents 'How can we communicate in the geosciences so the public will listen?'

39 views May 17, 2022 Dr Haydon Mort presents 'How to communicate the geosciences' ...more

While not directly regolith related, but definitely something for all regolith scientists to reflect on – can we improve our communication skills to the public, and how can we get started? Check out this inspiring talk by Dr Haydon Mort of Geologize:

DID YOU KNOW - As GSA members ARGA Specialist Group gets FREE access to Geologize? Check out how via the GSA

home page – just log in to your member page. <https://www.youtube.com/watch?v=1eb22UqmYL0>

A brief overview of the isotopic toolbox in the Critical Zone

By Antony Dosseto

May 2023 ARGA meeting - YouTube

[May 23 ARGA Meeting Anthony Dosseto 'A brief overview of the isotopic toolbox in the Critical Zone' - YouTube](#)



Anthony Dosseto (University of Wollongong) presents 'A brief overview of the isotopic toolbox in the Critical Zone' for the May 2023 ARGA Meeting. Biography Anthony Dosseto is a professor and former ARC Future Fellow in the School of Earth, Atmospheric & Life Sciences at UoW. He is also the founder of the Wollongong Isotope Geochronology Laboratory (WIGL). Prof. Dosseto applies chemistry, in particular metal isotopes, to a wide range of

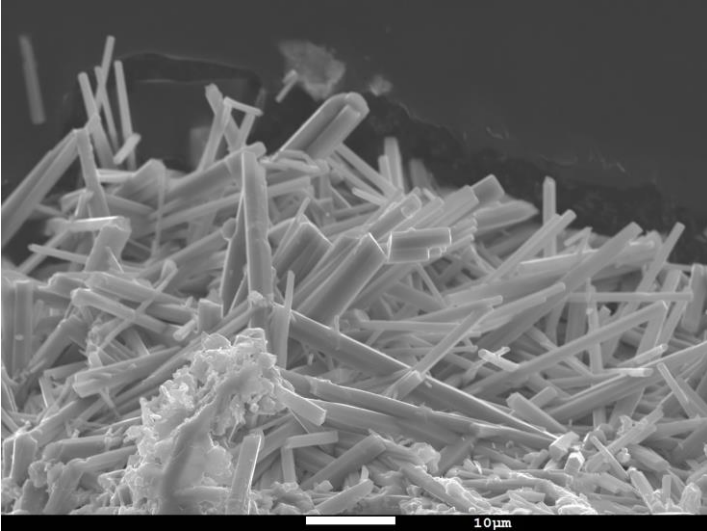
fields: geology, environmental sciences, archaeology, paleontology, ecology, and biomedical sciences.

Current projects include: - investigating changes in ocean chemistry 100's of million years ago and the emergence of complex life - reconstruct past Australian ecosystems and how extinct megafauna participated in these ecosystems - deciphering the links between fire regimes and climate change - assessing the effects of cultural burning on soil and ecosystem health - developing new tools to diagnose diseases, inform on disease progression and improve patient outcome.

What is new?

Wortupaite

A new oxidation zone mineral



Needle-like crystals of wortupaite under electron microscope



Prof Joël Brugger (Monash University) surveys the regolith at Wortupa mine. Flinders Ranges. South Australia.

There are nearly 6000 accepted mineral species, ranging from the most ubiquitous like quartz and hematite to tiny rarities which are found from a single specimen. It is into the latter category that most new minerals form, and wortupaite is no exception. Wortupaite is a magnesium nickel tellurite mineral, formed by the oxidation of melonite (nickel telluride) coupled with dissolution of nearby rocks. Wortupa mine is a small gold mine in the Flinders Ranges of South Australia, with all rocks exposed at surface heavily weathered. The specimens on which the new mineral was found were collected over 120 years ago, and it was only when a Museums Victoria specimen was re-examined that green crystals of a new mineral were recognised. The new mineral was studied, and the name and data were approved by the International Mineralogical Association's Commission on New Minerals and Nomenclature. Wortupaite's description is the first time a new tellurium-oxygen mineral has been recognised in Australia, adding to the ~100 or so known tellurium oxysalt minerals worldwide. A small but important addition to Australia's mineral heritage!



Article details:

Missen, O.P., Mills, S.J., Brugger, J., Birch, W.D., & Elliott, P. (2023) Crystal chemistry of zemannite-type structures: IV. Wortupaite, the first new tellurium oxysalt mineral described from an Australian locality. *Mineralogical Magazine*, in press. <https://www.cambridge.org/core/journals/mineralogical-magazine/article/crystal-chemistry-of-zemannitetype-structures-iv-wortupaite-the-first-new-tellurium-oxysalt-mineral-described-from-an-australian-locality/C19E8F2C534526A303FEE4080F36C8B6>

Regolith studies and archaeology in the Pilbara



Photos left to right: taking HVSr recordings, HVSr acquisition in the rock shelter to determine the depth of the regolith cover for the archeological excavations, and archeological excavations where artefacts are preserved in the



Quaternary river terraces (bottom half). Laterite (ferricrete) overlying the BIF (foreground)

The field of regolith and landscape evolution, though often overlooked by geologists, holds a pivotal role in comprehending concealed geological phenomena, anticipating future mineral prospects, and extending its significance beyond the realm of the mineral industry. This area of study is highly sought after within the environmental sciences, agriculture, groundwater research, and archaeology. Dr. Sara Jakica utilises geophysical data including HVSr passive seismic, AEM and remote sensing images in diverse fields of studies in her research. This data helps address questions related to paleochannel geometry, water table depth, archaeology, agriculture, the minerals industry and critical zone architecture and their implications for landscape evolution. Collaborating with the University of Western Australia on the Australian Research Council Desert People Project, they leverage knowledge of regolith geomorphology and landscape evolution to identify new archaeological targets, document the context of cultural heritage, and estimate potential excavation depths in stratified sites. This aids in distinguishing artifact origins, site integrity, and disentangling landscape processes from past human activity. Stay tuned for more information on this research in the coming years!

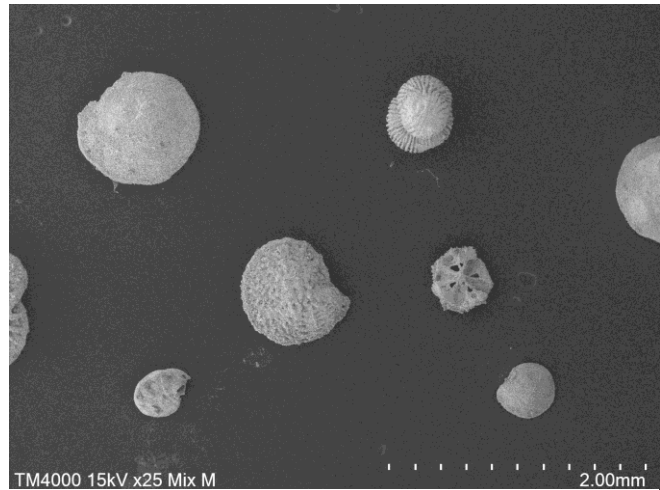
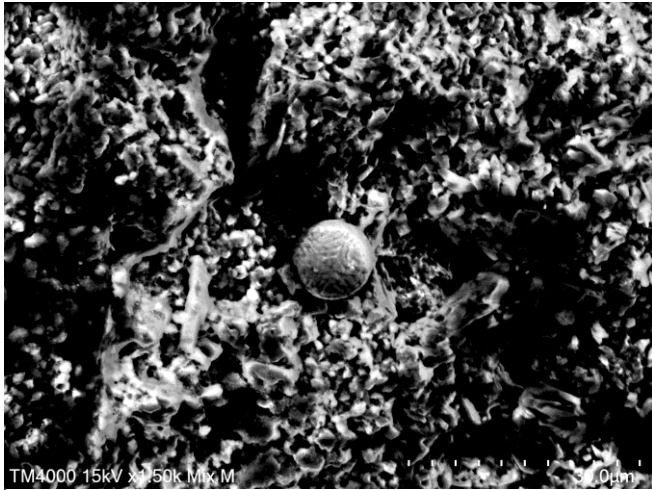


[Sara Jakica](#) completed her undergraduate studies in mathematics and geology, followed by a PhD at the University of Melbourne, focusing on Neotectonics and Landscape Evolution across Australia, examining various scales of geological phenomena. Prior to joining the Geological Survey of Western Australia (GSWA), Sara gained valuable experience through academic and industry roles. This experience involved working on regolith studies and employing reflection seismic techniques to interpret geological formations, ultimately creating 3D geological models tailored for the mineral industry. In 2017, Sara embarked on her journey with GSWA, where her primary role involves acquiring and seamlessly integrating diverse geophysical data map a 3D geometry of the regolith cover, contributing to our comprehensive understanding of the region's geological landscape.

Leah's corner

New Fossils from Old Channels

Research into the Lefroy and Cowan systems is getting exciting! These palaeochannel sediments and fossils have been imaged under the scanning electron microscope for the first time and the results have been amazing! The detail shown has blown my mind and reminded me of why I am so excited to continue researching these novel assemblages and unlocking the secrets of the Yilgarn Cratons.



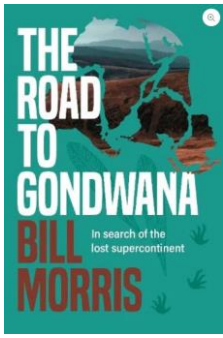
Images: Left: The first known Eocene coccolithophore hanging out on a fragment of Bryozoan from the Yilgarn Craton- validating the link between the Yilgarn and the offshore Eucla Basin, and cool water upwelling. Right: A selection of microfossils from the Eocene of the Lefroy Drainage System

Outreach with CORE learning Foundation



In July I was invited to help out with the CORE learning foundation initiative with Kent Street High School. The year 8 students were bussed to Kambalda where I spent the morning speaking about the importance of the Regolith, utilizing the real-world example of the Lefroy palaeochannel under our feet. I spoke about how the rocks can tell us how the climate has changed, and the fossils are the first known from the area and are also giving us valuable insights into the palaeoenvironment of this area. The students then tried their hand at creating scientific drawings using a selection of rocks and fossils and interpreting environments. After lunch we walked a traverse of the Mount Hunt section, walking over what is effectively an Archean ophiolite. We saw pillow lavas, komatiites, and chemical sediments. The students loved in, and I

am keen to help CORE out more with additional outreach projects.



ARGA Book club.

This month, I am immersed in "The Road to Gondwana" by Bill Morris. A beautiful read, delving into the journey of uncovering Gondwana, showcasing how this ancient supercontinent continues to bridge connections across oceans even today. The book explores various themes, including geology, paleontology, and climate, while also discussing the ultimate fate of Gondwana and the flora and fauna that once thrived there. For anyone fascinated by a century's worth of discoveries, this is a must-read popular

science book.



[Leah Lynham](#) is the ARGA committee secretary, and a PhD student with James Cook University undertaking the project 'Palaeoenvironment and basal channel gold provenance of the Lefroy Drainage System, Western Australia, and its implications for future placer gold exploration.'



It's not just dirt!

By Dr. [Anna Petts](mailto:anna.petts@sa.gov.au)

Anna is the ARGA committee chair, and the Program Coordinator - Characterising South Australia's Cover at Geological Survey of South Australia.

IT'S NOT JUST DIRT! WHY I AM A COVER LOVER

Dr. Anna Petts
anna.petts@sa.gov.au

Hey, *The Dirt* readers, get ready to be converted to love another type of 'dirt' – I will give you a guess. It is an eight-letter word that is very close to you all... in fact, it has been the focus of not one, but TWO federally funded cooperative research centres, and there is even a scholarship awarded every year for any student undertaking postgraduate research in this topic at the University of Adelaide within Geology and Geophysics. Have you guessed it yet? Let me spell it out for you... 'R', because it's 'right under our noses!' 'E', because it is not only on 'EARTH', but is a term used for planetary bodies also! 'G', because 'gee whiz, it's really interesting'. 'O', for 'OH MY, why didn't we learn this at uni!' - said every graduate working in exploration programs everywhere. 'L', for 'land use planning and understanding urban geology'. 'I', for 'integrating with other disciplines to better understand what's below our feet'. 'T', for 'terrific resources

available online' (<http://crclme.org.au>). 'H', for 'HAVE YOU GUESSED IT YET?'

That's right, R-E-G-O-L-I-T-H! Regolith can be very drily described as 'the entire unconsolidated or secondarily re-cemented cover that overlies more coherent bedrock. Regolith includes fractured and weathered bedrock, saprolites, soils, organic accumulations, volcanic material, glacial deposits, colluvium, alluvium, evaporitic sediments, aeolian deposits and ground water' (adapted from Eggleton 2001, p. 101). My elevator pitch to anyone who asks, 'what is regolith?' is that regolith is basically everything between fresh rock and fresh air - Eggleton 2001, p. 101 really knew how to nail it! Regolith is the blanket or cover that has been formed by weathering and erosion of the older material, and by transport or deposition of younger overlying materials. In other words, in a country as old and weathered as Australia – but with ongoing landscape processes and chemical weathering – regolith is pretty important to understand.

This is why Australian geoscientists have spent many years trying to get the science of regolith just right. Regolith geoscience is the science of the regolith and the landscapes in which it occurs. Regolith geology aims to study the interrelationships between the Lithosphere, the Hydrosphere, the Atmosphere, and the Biosphere. Where can we find regolith? In Australia, regolith is everywhere. The Australian continent has been weathering since the Tertiary, but some regolith may be much older (Figure 1). In South Australia, over 70% of the state is covered by regolith materials or has been weathered to become regolith! Regolith varies widely depending on factors such as climate, geological history, vegetation, and human activities.

When regolith geoscientists are describing a regolith profile (Figure 2), exotic sounding terms may be used – such as 'saprock' and

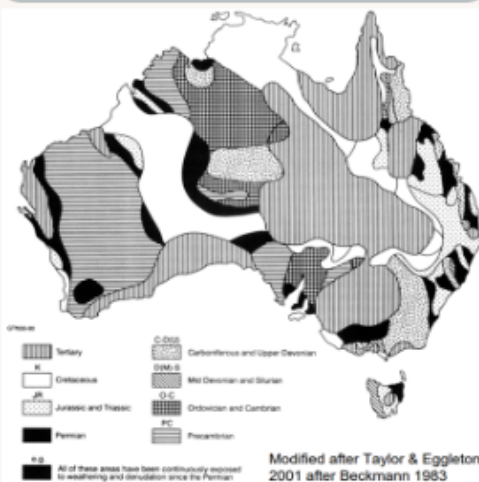


Figure 1: Regolith is formed from weathered rocks – and weathering is pervasive across the Australian continent, across many time scales. Modified after Taylor and Eggleton 2001 (after Beckmann 1983).

'saprolite'. The former of these represents chemically reduced partially weathered rock, where the weathering is restricted to fracture margins. The latter is a chemically weathered rock forming in the lower zones of soil profiles and indicates deep weathering of the bedrock surface. 'Colluvium' and 'alluvium' are also frequently used, where 'colluvium' is the product of erosional processes but has been deposited without ever reaching a perennial stream, and 'alluvium' is sediment deposited on seashores, lake shores, and by rivers. Observing and mapping these broad types of regolith materials, along with landscape setting, can assist in creating regolith-landform relationship models to aid in understanding how our landscapes and landforms have changed over time. This can also help us understand how rocks can decay and erode, and how they can sometimes be turned into spectacular new types of rocks – or even mineral deposits (i.e., clay hosted rare earth elements, or placer gold deposits in ancient rivers).

On Earth, it is not just simple chemical and physical weathering (erosion) which is contributing to the development of regolith – plants, animals, bugs, and microorganisms are all taking rocks and leaching out nutrients, sucking groundwater to surface, digging, nesting, and breaking up basement rocks to saprolite, colluvium and alluvium, and all sorted of cemented materials, in one big endless cycle of bioturbation as well! Even humans have had a role to play with regolith creation and destruction, by our urban constructions, road building, artificial damming of water ways, use of dams and irrigation methods, changing climate and fertiliser use. There is even an emerging research stream for studying the relationship between not only the atmosphere, hydrosphere, and lithosphere but also human impact near surface, in the biosphere – called 'Critical Zone' studies, where the Critical Zone is the 'heterogeneous, near-

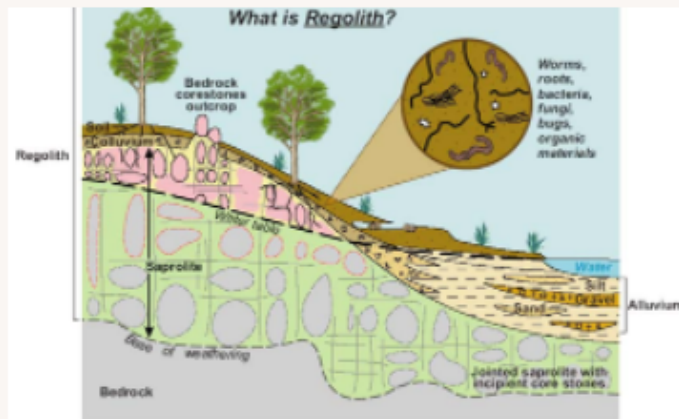


Figure 2: What is Regolith? Modified after Taylor & Eggleton 2001
From Ian Roach presentation, http://cricleme.org.au/Educ/what_is_regolith.pdf

surface environment in which complex interactions involving rock, soil, water, air and living organisms regulate the natural habitat and determine availability of life-sustaining resources.' This is commonly identified as 'the fragile skin of the planet defined from the outer extent of vegetation down to the lower limits of groundwater' (Brantley et al., 2007, p. 307). The Critical Zone is very similar to Regolith Geoscience, however in the Critical Zone research, regolith is merely weathered rock... whereas in Regolith Geoscience, regolith encompasses the cover itself, from rock, to plants, to aquifers, and beyond.

Whatever we choose to call the blanket of rock, soils, water, and plants we can use it to see out the window and understand what we need to live and survive on this planet – it is important to pay attention to Earth's regolith for many reasons, but can include: ecosystem support, agriculture, water management, geological hazards, mineral and resource exploration, land use planning, environmental conservation, and the climate and carbon cycle.

Basically, it pays to be a cover lover because our Earth's regolith is a fundamental component of the planet's geology, ecology, and human activities. Anyone can be a cover lover – by paying attention to the regolith, and by championing sustainable development and exploration by being a member of the [Australian Regolith Geoscientists Alliance \(ARGA\) Specialist Group within the Geological Society of Australia](#).

Educational Resources for Regolith Studies

The internet hosts so many great resources for teachers, communicators, and educators. Here are just a few great regolith-related resources recommended by the ARGA Committee. Think we have missed something? Please send in for inclusion in the next newsletter:

- AusEarthed: Australian Earth Science Education (AusEarthEd) aims to create, produce and deliver innovative, valuable earth sciences experiences; to further the recognition of earth sciences as an integral part of STEM; to improve the quality of the talent pipeline for industry; to increase awareness of the wide range of career opportunities that earth sciences provide; and to emphasise the importance of earth sciences in understanding contemporary issues.
<https://ausearthed.com.au/earth-enviro-science/>



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- TERN ecosystem data for teaching: To help students access and learn more about the data collected by Australia's Land Ecosystem Observatory, TERN has released a selection of its data for use by senior high school students.



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Whilst not collected and developed primarily as educational resources, the data and description of the methods and equipment used are naturally suited to being applied in teaching concepts and skills related to the Australian environment.

<https://www.tern.org.au/tern-ecosystem-data-for-online-teaching/>

Job opportunities

Deep Creek and Ovens River Review
Issued By Northeast Catchment Management Authority

The Northeast Catchment Management Authority (NECMA) requires a suitably qualified consultancy to undertake a detailed review and analysis of the current condition, geomorphic setting and management arrangements for the Ovens River and floodplain near Markwood, Victoria. This investigation will be a pivotal piece of work that will clarify, or potentially re-set the management goals for this reach for the next 30 years.

<https://www.tenders.vic.gov.au/tender/view?id=257723>

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Official Account of the Australian Regolith Geoscientists Alliance (ARGA) Specialist Group of the Geological Society of Australia
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regolith.org.au Joined June 2021

52 Following 31 Followers

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Australian Regolith Geoscientists Alliance @AusRegolith · 2h ...
It's almost #WorldSoilDay and this year the focus is on salt affected soils

Are all salt affected soils a global threat? Find out more here
(fao.org/world-soil-day...)

Would you like to contribute?

Suggestions and feedback to: Anna Petts
annaepetts@gmail.com

You can have a short article on events or topics related to regolith studies appearing as part of ARGA's quarterly newsletter publication. Please allow plenty of time to promote the event. Short article with 400 words and 3 pictures maximum. Please email article to Nadir.DESOUZAKOVACS@dmirs.wa.gov.au
