ARC CRITICAL RESOURCES FOR THE FUTURE

# ACTIVITIES 2025 Q2

THE UNIVERSITY OF WESTERN AUSTRALIA

THE UNIVERSITY of ADELAIDE

Australian National University

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

# Introduction

Welcome to the second edition of our quarterly newsletter from the ARC Training Centre in Critical Resources for the Future.

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# Our Team

## Team updates

### Directors Update

It is incredible to see how far we have come in the first nine months of the Centre. I've been genuinely inspired by the depth of expertise, diversity of backgrounds, and ambitious research already underway across our nodes. It is a privilege to be part of this team and to watch it grow. As we prepare for our first in-person Centre-wide meeting in September, the leadership team has already started laying the groundwork by meeting with our current—and soon-to-join—Research Fellows and PhD candidates. This early kick-off session was an energising opportunity to welcome our growing cohort from the University of Adelaide, UWA, ANU, and UQ.

These introductions gave us an exciting glimpse into the diverse expertise within the Centre, spanning the full spectrum of critical resources research—from exploration and geochemical modelling to data analytics, mine waste reprocessing, and sustainability. It is clear that we are building a powerhouse of future-ready researchers who will play a pivotal role in advancing Australia's capabilities in critical minerals.

You can read more reflections from A/Prof Anita Parbhakar-Fox on LinkedIn [LinkedIn here](#).

## Research Fellows

### Research Fellows Update

In Q1, we introduced **Olivia Mejías González**, our first Research Fellow.

We are pleased to share that Olivia officially joined the Centre in June and hit the ground running — spending her first week at the Australian Synchrotron conducting beamline experiments using XFM and XANES techniques to characterise mineral phases in REE ores.

She has also been collaborating closely with the Directors to coordinate our inaugural Annual Workshop in Brisbane. Read more about her Synchrotron visit here

**This quarter we are pleased to welcome two new research fellows to the Centre.**

**Dr Yihao Ding**, just joined the Centre at the start of July, based at the University of Western Australia.

Yihao is a computer scientist and data researcher with specialist expertise in multimodal machine learning, document intelligence, and geospatial data science. He has held key research positions at the University of Melbourne and the University of Western Australia, where his work focused on translating advanced AI models into practical, industry-relevant solutions.

His diverse research experience includes leading interdisciplinary projects in multimodal technologies, developing domain-specific natural language processing systems and datasets, and building 3D geological models and WebGIS platforms to support mining applications in China.

Yihao joins A/Prof Wei Liu and Prof Eun-Jung Holden on a strategic project to enhance data-to-knowledge integration across the mining value chain. His expertise in data interoperability and AI-driven discovery will play a critical role in supporting the Centre's efforts to build more connected, accessible, and intelligent data systems — and in training the next generation of geoscientists in big data science.

**Dr Chris Gonzalez** will join the Centre this month, based at the University of Western Australia. Chris is a computational geoscientist with expertise in numerical modelling, deep Earth processes, and mineral systems, with a strong interest in applying geoscience to real-world challenges such as carbon cycling, hydrogeology, and resource exploration.

Chris brings experience from UWA, Monash University, the Centre for Exploration Targeting, and the Minnesota Geological Survey, and is passionate about using technology to advance Earth science and sustainability research.

Chris joins A/Prof Wei Liu and Prof Eun-Jung Holden on a strategic project to develop scalable, cloud-based platforms for managing and analysing complex geoscientific datasets. His work will focus on enhancing data infrastructure, interoperability, and analytics to support more integrated research across academia, industry, and government.

**In August we will be joined by**

**Dr Stefan Loehr**, based at the University of Adelaide. Stefan is an Earth Scientist with a strong background in geochemistry, sedimentary geology, and environmental science. His current research focuses on surface weathering processes and the potential for clay-hosted critical mineral deposits, particularly rare earth elements (REEs), in Australia.

Stefan brings deep expertise in reconstructing environmental change using high-resolution sedimentary and geochemical records. His work combines field studies, microbeam analytical techniques, and experimental approaches to better understand how REEs accumulate in weathering profiles — insights that are directly relevant to the Centre's focus on critical mineral resources.

**Dr Lillian Kendall-Langley** will also join the Centre in August based at the University of Western Australia. Lillian is a mineral systems geologist with a decade of experience spanning academia and industry, including leading SQM's global lithium targeting team.

Her work focuses on LCT pegmatites and critical metal systems, with expertise in melt evolution, fertility indicators, and crustal architecture. At the Centre, Lillian will contribute to two projects on LCT pegmatite fertility and expression in the critical zone. Her research will help develop predictive tools for exploration and support training in geochemical and mineralogical techniques.

## PhD Candidates

In Q1, we introduced a talented group of PhD candidates who are making strong progress in their research:

**Australian National University**

- **Jemi Ahnaf**, supervised by Prof John Mavrogenes, investigating the formation conditions of LCT pegmatites in Western Australia.
- **Melika Mostafavi,** supervised by Dr Samantha McGaughey, Dr Anna Kaksonen and Dr Ka Yu Cheng, investigating the bioleaching of hyper-enriched black shales.

**University of Western Australia**

- **Matthew Demmer**, supervised by Prof Marco Fiorentini, A/Prof Wei Liu, and Dr Isra Ezad, researching the petrogenesis of the Gonneville Ni-Co-PGE deposit.
- **Michael Wawryk**, supervised by Prof Tony Kemp and A/Prof Nicolas Thebaud, focusing on hyperspectral-geochemical mineralogy and alteration footprints in collaboration with GSWA.
- **Rachel Jones**, supervised by Prof Marco Fiorentini and Dr Isra Ezad, investigating quantitative exploration of spatiotemporal metasomatic mantle sources of metals.
- **Rachman Fauzi**, supervised by Prof Marco Fiorentini and Dr Ria Mukherjee, unveiling the cryptic relationship between Ural-Alaskan PGE systems and Cu-Au porphyries.

**University of Queensland**

- **Le Xi K'ng**, supervised by A/Prof Anita Parbhakar-Fox, researching pyrite to pyrrhotite transformations during roasting.
- **Collins Adoko**, supervised by A/Prof Anita Parbhakar-Fox, building geospatial models to inform critical mineral extraction from mine waste — towards a new industry standard.

**University of Adelaide**

- **Cooper Ferguson**, supervised by Prof Carl Spandler, exposing a new rare earth element mineralisation province in the western margin of the Pine Creek Orogen, Northern Territory.

We are pleased to share that **Chang Wang**, our next PhD candidate based at the University of Adelaide, has recently had her visa approved and is expected to commence in July. Chang's research will support the Centre's focus on Geological Evolution and Critical Mineral Potential, with a particular emphasis on REE, Li, U, and Co in the Curnamona Province, South Australia.

Her project will investigate the geological history and mineralisation potential of the Olary Domain, a largely underexplored but highly prospective region. The outcomes will help improve strategies for critical mineral exploration not just in South Australia, but in similar Proterozoic terranes across the country.

More information on all of our PhD projects is available on our website

# Research Activities

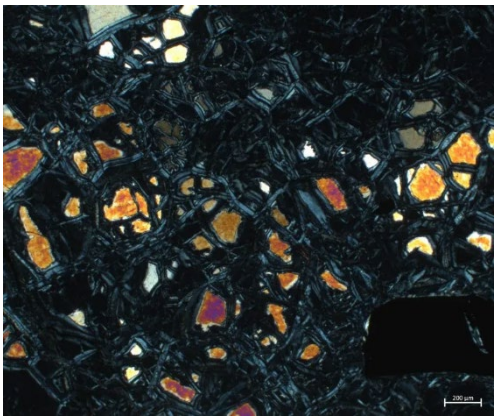
## PhD Research Updates

Our Centre's research continues to evolve with exciting new projects addressing critical challenges in resource exploration, processing, and sustainability. Here is a snapshot of what our PhD candidates, who commenced in the first half of 2025, are currently working on:

### EXPOSING A NEW REE MINERALISATION PROVINCE - WESTERN MARGIN OF PINE CREEK OROGEN

**Cooper Ferguson** (University of Adelaide, supervised by Prof Carl Spandler) is investigating the geology and formation of recent rare earth element (REE) discoveries—Quantum, and Spectrum—in the Pine Creek Orogen. His project explores the geological evolution of the region, styles of REE mineralisation, and key processes that concentrate these elements. His work aims to boost Australia's REE resource potential and contribute to the global supply of critical minerals vital for high-tech and clean energy industries.

### UNVEILING THE CRYPTIC RELATIONSHIP BETWEEN URAL-ALASKAN PGE SYSTEMS AND CU-AU PORPHYRIES

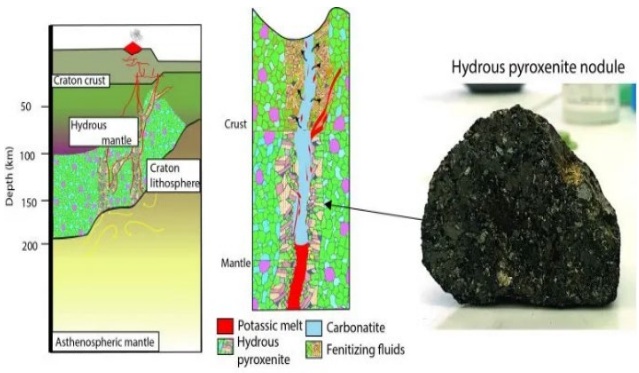


**Rachman Fauzi** (University of Western Australia, supervised by Prof Marco Fiorentini, A/Prof Tony Kemp, Dr Maria Cherdantseva and Dr Ria Mukherjee) is investigating how large-scale Earth processes—from deep mantle to surface—create and concentrate mineral deposits in convergent plate boundaries.

Focusing on the Meratus–Bobaris Complex in Southeast Kalimantan (Indonesia), Rachman's research aims to improve exploration models for platinum group elements (PGEs), copper, gold, and diamonds in complex tectonic settings.

He recently presented his research proposal, titled *"Assessing Mineralisation Potential in a Convergent Setting Using a Mantle-to-Crust Continuum Approach"*, for acceptance at UWA and is now entering the next phase of his project.

## QUANTITATIVE EXPLORATION OF SPATIO-TEMPORAL METASOMATIC MANTLE SOURCES OF METALS




**Rachel Jones** (University of Western Australia, supervised by Prof Marco Fiorentini and Dr Isra Ezad) is studying how chemical changes in the Earth's mantle—specifically through metasomatism—can mobilise and concentrate critical metals like platinum, nickel, and copper.
Her research focuses on the Yilgarn Craton in Western Australia, a region known for its rich mineral deposits. By combining natural rock samples with high-pressure experiments and nanoscale imaging, Rachel aims to unlock new exploration methods to locate deeply sourced metal systems that are currently difficult to trace.

## PYRITE TO PYRRHOTITE TRANSFORMATIONS DURING ROASTING

**Le Xi K'ng** (University of Queensland, supervised by A/Prof Anita Parbhakar-Fox and supported by the Sustainable Minerals Institute) is researching how different types of pyrite—a common mineral found in ore deposits—change during roasting, a process used to extract metals. By understanding how pyrite texture and chemistry affect this transformation, her work will support more efficient and environmentally sustainable mineral processing methods.
Le Xi brings prior experience from her role as a Senior Research Assistant at SMI, where she worked on characterising mine waste. She also recently completed a six-week placement at MMG's Rosebery mine in Tasmania. Read more about her placement experience on SMI's website. A 6-week work placement at MMG Rosebery, West Coast Tasmania - Sustainable Minerals Institute - University of Queensland

## BUILDING GEOSPATIAL MODELS TO INFORM CRITICAL MINERAL EXTRACTION FROM MINE WASTE

**Collins Adoko** (University of Queensland, supervised by A/Prof Anita Parbhakar-Fox) is developing advanced methods to model how critical minerals are distributed in mine waste. His work seeks to improve how we map and manage these underutilised resources—key for future mineral recovery and sustainability.
By contributing to new industry standards for spatial modelling, Collins' research supports more responsible and efficient mineral extraction practices.
He began his PhD with a visit to Perth to meet industry collaborator Kerry Turnock and attended the **AusIMM Mineral Resource Estimation Conference 2025**. Collins shared his experience and reflections on the importance of coding and automation in mineral resource workflows on LinkedIn

# Workshops Delivered

## Workshops Delivered

### TIMA INTRODUCTORY WORKSHOP

This quarter, our Centre offered a valuable hands-on workshop focused on the TESCAN Integrated Mineral Analyser (TIMA), designed to strengthen practical skills in mineral identification and data interpretation. The workshop brought together PhD candidates from both Perth and Brisbane campuses, along with postgraduate students from the Centre for Exploration Targeting and a committee member from our Centre.

We are grateful to **Melissa Narbey** **AXT PTY LTD** , for coordinating the session and to Dr **Jing Li** for providing expert instruction. Participants also benefited from a tour of the BHP TIMA facility, kindly arranged by to **Rebecca Pohrib** and the logistical support from Alexandra Suvorova at the Centre for Microscopy Characterisation and Analysis (CMCA) who secured the venue on short notice.

This introductory workshop laid the groundwork for a series of upcoming training events aimed at enhancing mineral analysis capabilities among our researchers and partners. The Centre values these opportunities to build technical expertise and foster collaboration across our research community. We look forward to expanding these skill-building initiatives throughout the year.

# Centre Activities

## Centre Activities

**Communication & Outreach**

### WONDER PODCAST SERIES

On April 7, 2025, Prof Marco Fiorentini and Prof Carl Spandler, together with Dr. Isra Ezad and Dr. Ross Chandler, launched a new podcast series through Geo Co.'s Wonder platform, exploring the science behind critical resources and the deep Earth.

In the first episode, Professor Marco Fiorentini takes listeners through the story of Australia's ancient rocks and their relevance to the search for critical minerals—highlighting how some of the world's oldest geological formations are shaping our resource future.

In the latest episode, Dr. Isra Ezad, explores what happens deep within the Earth's mantle. From recreating high-pressure conditions in the lab to uncovering how metals behave far beneath the surface, Isra unpacks how this research helps us better understand mineral systems and their origins.

We are proud to support this series in collaboration with Holly Cooke and Anthony Reid as part of our mission to share research that sits at the intersection of deep earth science and critical resource futures.

Tune into both episodes and more at: www.thegeoco.com.au

### THE PROJECT – RARE EARTH MINERALS

On April 24, 2025, Professor Carl Spandler (University of Adelaide) appeared briefly on *The Project* to discuss the growing importance of rare earths in the global economy and Australia's role in securing these strategic minerals. His contribution helped raise public awareness about what rare earths are, the challenges and opportunities in rare earth element exploration and development.

**Watch the segment**: https://www.youtube.com/watch?v=Mxp_Wgsf1vc

### ABC RADIO NATIONAL – REAR VISION

On June 8, 2025, Professor John Mavrogenes was featured on ABC Radio National's Rear Vision program, discussing global rare earth supply tensions. The 29-minute segment explored the complex geopolitics of rare earth element supply, ownership, and strategic leverage, emphasizing Australia's critical role in the global supply chain. The episode presented by Ros Bluett, can be streamed on ABC Radio National's website and podcast platforms

### THE RADIO NATIONAL HOUR – AUSTRALIA'S CRITICAL MINERALS POTENTIAL

On June 10, 2025, Professor **John Mavrogenes** joined journalist **Fran Kelly** on *The Radio National Hour* to discuss the Australia's ability to take a leading role in critical mineral supply. The conversation explored the meaning of rare earths and critical minerals and why Australia, despite having significant reserves, is yet to fully capitalise on its potential. Professor Mavrogenes highlighted the strategic importance of developing Australia's own rare earth supply chain and the challenges still to be overcome. You can listen *segment on: ABC Listen*.

### FUTURE SCIENCE TALKS

Professor Marco Fiorentini participated in a Q&A session at the Future Science Talks: Comedy Edition in Perth, where he humorously addressed misconceptions about geology, emphasising its scientific rigor and importance, you can watch Marco on youtube.com

### SCIENCE COMMUNICATION AND BUILDING AN ONLINE RESEARCH

On May 1, 2025, A/Professor Anita Parbhakar-Fox delivered a session on science communication and building an online research presence.
She shared practical advice on:

- Using LinkedIn effectively as a researcher
- Sharing project progress to build visibility and engagement
- How strong science communication can boost the impact and uptake of research findings.

This insightful session offered valuable strategies for researchers looking to enhance their professional profile and science outreach. Coffee chats - Science Communication with Anita Parbhakar-Fox

**Conferences & Forums**

### REECON-UK – RARE EARTH ELEMENT FORUM

On June 6, 2025, Professor John Mavrogenes co-chaired REECON-UK: Rare Earth Element Forum at the Oxford Martin School. The forum brought together leading voices from academia, government, and industry to tackle the challenges surrounding rare earth elements, focusing on the entire supply chain from resource discovery to environmental implications. The event underscored the need for global collaboration in securing responsible sourcing and processing of critical minerals. oxfordmartin.ox.ac.uk

### EIT RAWMATERIALS SUMMIT 2025

In May 2025, Professor Marco Fiorentini represented the Centre at the EIT RawMaterials Summit in Brussels. He participated in a panel discussion on attracting and retaining talent in the raw materials sector, highlighting the Centre's contributions across the critical resources value chain, and reinforcing its role in addressing Europe's raw material security goals. eitrmsummit.com

### MINI-SPARK STEM CONFERENCE

On June 25, 2025, A/Professor Anita Parbhakar-Fox delivered a keynote at the Mini-Spark Conference hosted by the University of Queensland. Anita highlighted the urgent need to rethink mining waste—not as a byproduct, but as a national challenge that demands multidisciplinary solutions. Drawing on her leadership of the MIWATCH (Mine Waste Transformation through Characterisation) Group, she showcased how tools traditionally used for ore discovery are now being repurposed to assess and repurpose mining waste. Her work is helping to uncover valuable rare and critical minerals, support site rehabilitation, and drive greener mining technologies. She also emphasised the importance of training a new generation of environmentally-conscious geoscientists and engineers to lead this transformation.

**Facilities & Research Infrastructure**

### NEW HIGH-PRESSURE LAB FACILITY

The Centre has established a new experimental facility equipped with two rapid quench piston cylinder apparatus, among only three worldwide.

This facility simulates the pressures and temperatures found inside Earth, enabling advanced research in petrology, cosmochemistry, and metallogeny. Dr. Isra Ezad led a video tour of the facility, showcasing its capabilities.

# Up and coming events

## Up and coming events

### 2025 - PLENARY LECTURE AT THE 18TH SGA BIENNIAL MEETING (SGA 2025)

A/Prof Anita Parbhakar-Fox will deliver a plenary lecture at the 18th SGA Biennial Meeting 2025. This conference will bring together geoscientists worldwide to discuss the latest research in mineral exploration and geology. The lecture will highlight cutting-edge findings and their potential impact on the mining industry.

### 2025 - KEYNOTE AT THE AEGC IN PERTH (AEGC 2025)

A/Prof Anita Parbhakar-Fox and Dr Margaux Le Vaillant will both giving keynote address at the Australian Earth Sciences Convention (AEGC) in Perth as part of AEGC 2025. During this session, A/Prof Parbhakar-Fox will share insights into Earth science advancements and the future of technology in the industry. Margaux as the lead for the Orebody Geoscience Group will give insights on her research is focused on improving our understanding of polymetallic ore systems (Ni, Cu, Co, PGEs, V, Ti) hosted in mafic-ultramafic rocks and key genetic processes at play, and using this knowledge to then develop practical prospectivity and vectoring tools for the exploration industry.

### 2025 – MRIWA RESEARCH SHOWCASE PRESENTATION

Marco Fiorentini will present at the MRIWA Research Showcase *23 September 2025 – Perth, WA* 2025, highlighting the ARC Centre in Critical Resources for the Future and its role in training the next generation of geoscientists.

Marco's talk will focus on:

- Understanding ore deposits and their critical mineral potential
- Developing innovative geoscience techniques for exploration and processing
- Building Australia's capacity to sustainably develop its mineral wealth

This national collaboration, led by UWA's Centre for Exploration Targeting, is part of a broader initiative to ensure Australia remains globally competitive in the future resource landscape. Don't miss this opportunity Register your ticket here.

## 2025 - CCRF ANNUAL WORKSHOP – CENTRE MEMBERS ONLY

The CCRF Annual Workshop will be held on Wednesday 24 September 2025 in Brisbane, ahead of the SEG 2025 Conference (26–28 September).

This internal event is exclusively for members of the Centre for Critical Resources for the Future, including PhD candidates, Postdoctoral Fellows, Chief Investigators, and Partner Investigators.

The day will feature research presentations, interactive workshops, and opportunities to strengthen collaboration across our multidisciplinary community.

## 2025 - SEG 2025 CONFERENCE

Hosted by the University of Queensland, the SEG 2025 Conference *26–28 September 2025– Brisbane, QLD* will bring together global leaders in economic geology. Several CCRF researchers will be participating and presenting, including Dr Marco Fiorentini, who will deliver a talk on "Disruptive Thinking and Transformational Research to Shape the Future Resource."

This event offers a key platform to share the Centre's innovative research and engage with international experts shaping the future of critical mineral exploration and development. Check this link for details on how to register for the Conference Registration | SEG 2025 Conference in Brisbane, Australia

## 2026 AUSTRALIAN EARTH SCIENCES CONVENTION (AESC 2026)

The ARC Centre of Excellence in Critical Resources for the Future will host a dedicated symposium at the Australian Earth Sciences Convention (AESC), taking place in Melbourne from 3–6 February 2026.

Led by CI Dr. Lucy McGee, who is a member of the AESC 2026 organising committee, the symposium will explore CCRF's contributions to critical minerals research and innovation. AESC 2026 is shaping up to be a forward-looking event, addressing global challenges such as the transition to renewable energy, the application of AI and Big Data in geosciences, and the integration of geoscience with disciplines such as engineering, archaeology, and space research.

Learn more and submit an abstract**:** https://aescgsa.com.au/pages/program/call-for-abstracts

## 2026 - GORDON RESEARCH CONFERENCE (GRC)

Geochemistry of Mineral Deposits
Gordon Research Conference

2026 - Professor Marco Fiorentini, Director of the ARC Centre in Critical Resources for the Future, will be chairing the 2026 Gordon Research Conference (GRC) on Geochemistry of Mineral Deposits. The GRC will be held in Castelldefels, Barcelona Spain on 24-29 May 2026 . Information on scientific program and conference logistics are available on the website (https://www.grc.org/geochemistry-of-mineral-deposits-conference/2026/). /). Save the date! It is recommended that interested parties should reserve their spot as soon as possible as places are limited

## 2026 – THE 11TH INTERNATIONAL SYMPOSIUM ON GRANITIC PEGMATITES (PEG 2026)

2026 – The 11th International Symposium on Granitic Pegmatites (PEG 2026) will be hosted by UWA on 16-17 August 2026. Led by an organising committee involving Professor Tony Kemp, the event will be the first international scientific meeting on granitic pegmatites held in Australia, with 150-200 delegates expected, including global experts, academics, and industry members. The program will feature presentations, poster sessions, exhibitor displays, and field trips in WA, with Centre researchers actively participating. You can register now - PEG2026: 11th International Symposium on Granitic Pegmatites.

# Future Opportunities

## Opportunities we are pursuing.

Continuing from initiatives outlined in our Q1 newsletter, several high-impact opportunities remain in progress:

### UNLOCKING INDIUM IN MINE WASTE

A/Prof Anita Parbhakar-Fox and Olivia Mejías González, in collaboration with CSIRO's Dr Thomas Jones, are progressing a Synchrotron-supported project to assess indium recovery from complex tin-rich mine wastes. The initiative could lead to sustainable remining strategies aligned with national critical minerals priorities.

### MINERAL CHEMISTRY BIG DATA FOR AI REGIONAL MINERAL POTENTIAL ASSESSMENT

We continue to explore AI-driven approaches to regional mineral potential assessment using large geochemical datasets. Discussions with UWA and Geoscience Australia are ongoing, and we welcome broader stakeholder input.

### TRANSPORTABLE CHARACTERISATION LAB PILOT PROJECT

We are in active talks with AXT, GA, and research partners to develop a mobile lab for onsite mineralogical and geochemical analysis. This initiative aims to improve field decision-making and reduce infrastructure costs in remote exploration areas.

### RAW MATERIALS WORKFORCE REVOLUTION – BUILDING ON SUMMIT SUCCESS

Following Professor Marco Fiorentini's invited presentation at the EIT RawMaterials Summit 2025 in Brussels, we are now pursuing a deeper engagement with the EIT Academy, including the potential for the Centre to become a formal partner. The success of this year's summit—Europe's largest on raw materials—has opened the door for a continued role in shaping the global conversation on skills, sovereignty, and innovation. We have been invited to participate in the 2026 Summit (19–21 May, Brussels) and are exploring how CCRF can contribute to and amplify its mission through high-level international collaboration and policy engagement.

### WORKFORCE FUTURES FOR CRITICAL MINERALS – RESEARCH COLLABORATION

The Centre is currently collaborating with **Rohini Anant**, a PhD candidate at the University of New South Wales, whose research explores how workforces for critical mineral production are assembled and regulated. This project directly aligns with the Centre's strategic focus on securing not just material, but also **human resources** critical to the future of the sector.

Rohini's work investigates how industry, policy, education, and immigration systems intersect to shape workforce readiness in the energy transition. She is currently seeking insights from industry partners via short, confidential interviews (30–45 minutes) to help map skills pathways and workforce gaps in the critical minerals landscape.

This research presents a valuable opportunity to generate policy-relevant insights and support the Centre's broader goals in capability-building. If you or your team would like to contribute, we would be pleased to facilitate a connection with Rohini.

For more information, please visit our website on ARC Centre in Critical Resources for the Future

**criticalresources.org.au**

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