

ORE SOLUTIONS

NEWSLETTER OF **CODES** CENTRE FOR ORE DEPOSIT AND EARTH SCIENCES

> SPRING 2024 **No.49**

CODES SYMPOSIUM A WINNER



Critical mass: participants in the highly successful CODES Critical and Strategic Metals Symposium, held at UTAS on 10–12 July, photographed outside the Earth Sciences building on the UTAS Sandy Bay campus.

CRITICAL AND STRATEGIC METALS SYMPOSIUM

10–12 July 2024

Organised by CODES, the Centre for Ore Deposit and Earth Sciences
Sandy Bay campus
University of Tasmania

Critical and strategic minerals are important for Australia's modern technologies, economy and national security. The Australian Government has identified a diversity of minerals that it considers vital to Australia's transition to net zero emissions, advanced manufacturing, defence technologies and capabilities, and that have broader strategic applications.

In response to this emerging national priority, CODES staff and students delivered a highly successful three-day **Critical and Strategic Metals Symposium** on the Sandy Bay campus from 10–12 July. The symposium was delivered in-person, with 97 on-campus participants from Australia, the USA, China and Indonesia, and an additional 37 participants online from Australia, Canada, China, Japan, Namibia, Peru and the USA.

An array of invited speakers from academia, industry and government – many of them world leaders in their field – provided three days of new insights into lithium, tin-tungsten, rare earth elements, cobalt-copper and nickel-PGE resources, and many

participants shared their recent research findings through poster presentations. Participants also had the option of joining a post-symposium field trip to western Tasmania from 13–15 July, and a drill core viewing session at Mineral Resources Tasmania in Mornington on the morning of 13 July.

IN THIS ISSUE

ARC Future Fellowship for Associate Professor Rebecca Carey	4
ARC DECRA funding for Dr Sheree Armistead	6
The class of 2024: PhDs	8
Fieldwork photos	16
Prizes and accolades	18

FROM THE DIRECTOR

Professor David Cooke outlines recent CODES success stories – in particular Rebecca Carey's ARC Future Fellowship and Sheree Armistead's ARC DECRA funding – and looks forward to a busy schedule for the rest of 2024, including the recruitment of more staff members.

➔
P24

CODES CONTACTS

CODES DIRECTOR

David Cooke
Ph: +61 3 6226 7605
d.cooke@utas.edu.au

MANAGER, CODES Analytical Laboratories

Jeffrey Oalman
Ph: +61 6226 1775
Jeffrey.Oalman@utas.edu.au
CODES Analytical Laboratories:
CODES.Labs@utas.edu.au

LEADERS, PROGRAM 1

Ore Deposits and Mineral Exploration
Mike Baker and Lejun Zhang
Ph: +61 3 6226 7210/7211
Michael.Baker@utas.edu.au
Lejun.Zhang@utas.edu.au

LEADERS, PROGRAM 2

Geometallurgy, Geoenvironment and Mining
Julie Hunt and Owen Missen
Ph: +61 3 6226 5705/7620
Julie.Hunt@utas.edu.au
Owen.Missen@utas.edu.au

LEADERS, PROGRAM 3

Sedimentation, Tectonics and Earth Evolution
Robert Scott and Jeff Steadman
Ph: +61 3 6226 2786/5554
Robert.Scott@utas.edu.au
Jeffrey.Steadman@utas.edu.au

LEADERS, PROGRAM 4

Magmatic and Volcanic Processes
Rebecca Carey and Martin Jutzeler
Ph: +61 3 6226 2987/2406
Rebecca.Carey@utas.edu.au
Martin.Jutzeler@utas.edu.au

LEADERS, PROGRAM 5

Analytical Research
Ivan Belousov and Jeffrey Oalman
Ph: +61 3 6226 7489/1775
Ivan.Belousov@utas.edu.au
Jeffrey.Oalman@utas.edu.au

LEADERS, PROGRAM 6

Geophysics and Computational Geosciences
Matt Cracknell and Paula Montoya
Ph: +61 3 6226 2481/0491 978 404
M.J.Cracknell@utas.edu.au
Paula.MontoyaLopera@utas.edu.au

NEWSLETTER EDITOR

Caroline Mordaunt
caroline.mordaunt@utas.edu.au

CODES – Centre for Ore Deposit
and Earth Sciences
University of Tasmania
Private Bag 79, Hobart
Tasmania 7001 Australia
Ph: +61 3 6226 2472
utas.edu.au/codes
CODES.info@utas.edu.au



Group dynamic: several panel discussions took place during the symposium. Here panel members (L-R) Dr Jeffrey Steadman, Dr Owen Missen, Dr David Selley, Dr Carmen Krapf (Geological Survey of South Australia), Dr Indrani Mukherjee (UNSW) and Dr Sheree Armistead (moderator) take questions from the audience.

In addition to the extensive list of speakers, the symposium also included several panel discussions, which allowed participants to further explore issues of particular interest. A symposium dinner was held on the Thursday evening, and there was plenty of opportunity for essential networking during the morning and afternoon breaks.

Director of CODES, Professor David Cooke, was extremely heartened by the symposium's success. He said it had been widely praised by attendees: "Feedback from the participants has

been universal in their praise of the high calibre of presentations and discussion sessions, the collegiality of the scientific discourse and the opportunity to see the excellent research and training being conducted by the UTAS team members in the Critical Minerals Regional Research Collaboration project".

Professor Cooke also wanted to extend a big thank you to all the CODES staff and students who worked so hard and went that extra mile to put on a great show.

CODES received much praise for the highly successful symposium with many comments, such as those below, being made by those who attended both in-person and online:

PABLO FARIAS, PROJECT GEOLOGIST, NORTHERN TERRITORY GEOLOGICAL SURVEY:

Reflecting on an incredible experience at the CODES Critical and Strategic Metals Symposium!

Grateful for the opportunity to immerse myself in enriching discussions and insights into the world of critical metals. The geology of western Tasmania is incredibly diverse, continuing to serve as an excellent natural laboratory for geoscientists to deepen their understanding of ore deposit genesis, metallurgy, and environmental processes.

A big thank you to the organizers for putting together such a fantastic event. I'm also deeply grateful to all the participants who shared their knowledge and perspectives—it was a truly collaborative learning experience.

RACHAEL MORGAN, CRITICAL MINERAL R&D HUB LEAD, GEOSCIENCE AUSTRALIA:

Thank you for inviting and hosting us. It's been fantastic to listen to and learning from some great experts doing really valuable work in the critical minerals space.

THE SYMPOSIUM IN PICTURES



A post-symposium field trip to western Tasmania was well attended, and participants embraced the challenging West Coast weather.



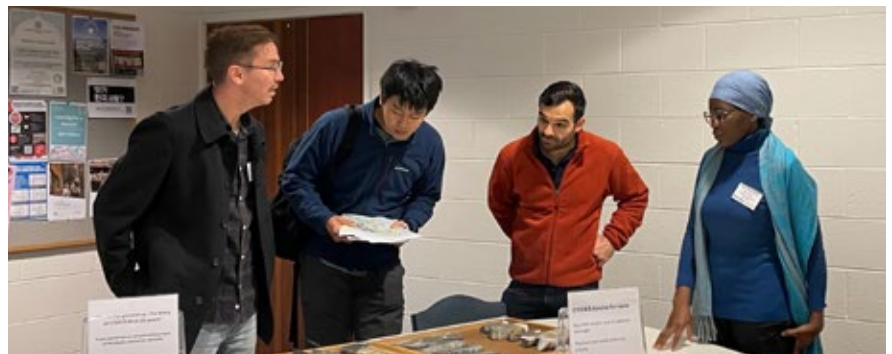
Former CODES Honours student Erik Fabreschi (left) with Pablo Farias, Project Geologist, Northern Territory Geological Survey.



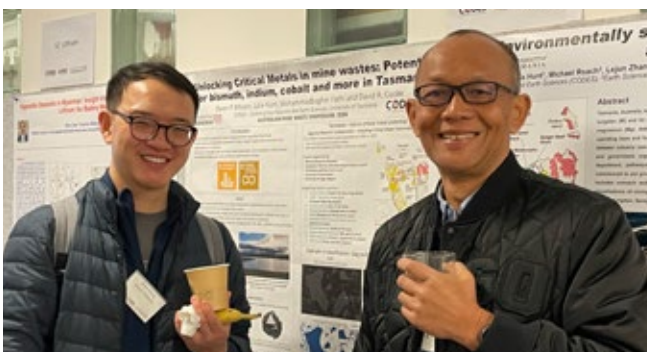
Speakers' corner: Ignacio Gonzalez Alvarez (CSIRO), Dr Carmen Krapf (Geological Survey of South Australia) and Simon Jowitt (Director of the Ralph J. Roberts Center for Research in Economic Geology and the Arthur Brant Chair of Exploration Geology at the University of Nevada, Reno, USA).



Dr Kathy Ehrig (from BHP) presenting a paper on the first day of the symposium.



CODES PhD Student Nelao Natukondje Naimbale (right) with symposium attendees checking out rock samples before the first session of the day.



Dr Zhen Wang (left) from Monash University and Adi Maryono from J Resources.



CODES PhD students (L-R) Alfredina Appiah, Vinicius da Cruz and Pratichee Mondal at a morning tea session.

FUTURE FELLOWSHIP SUCCESS FOR CODES RESEARCHER!!



In the field: Rebecca Carey pictured in May 2015 on the Stromboli volcano, Italy. She is recording explosions from Stromboli with high-speed video cameras in order to understand how magmas ascend and fragment in the upper parts of volcanic conduits. The Future Fellowship funding will allow her to expand her research into the field of magma plumbing systems of submarine volcanoes.

Associate Professor Rebecca Carey from CODES/Earth Sciences has been awarded an ARC Future Fellowship with funding of \$1,174,308, for her project entitled 'Decoding risks and unlocking rewards of oceanic volcanism'. This funding will enable her to carry out research into submarine volcanoes and examine both the degree to which they pose potential hazards and develop refined models for sub-surface metal ore exploration. Her Future Fellowship will provide funding for four years to research this topic.

Future Fellowships are one of the most prestigious individual grants awarded by the ARC, and are extremely difficult to win. Rebecca's success is testament to her stellar performance with regards to sustained and impactful research excellence and science communication throughout her



Huge success: Rebecca Carey (second from right) celebrates her Future Fellowship grant with colleagues at CODES: Professor David Cooke (left), and Honorary staff members Dr Karin Orth and Dr David Selley.

career, and we are all thrilled for her achieving this well-deserved accolade.

Everyone in the CODES/Earth Sciences community passes on their congratulations to Rebecca for this huge achievement.

Rebecca is understandably very pleased and excited about her Future Fellowship, and writes:

"Thanks to everyone for their support in the preparation and submission of the Future Fellowship proposal. I'm excited about the opportunity to

A PERSPECTIVE FROM THE VICE-CHANCELLOR, PROFESSOR RUFUS BLACK

"Having enjoyed conversations with Rebecca over the years about her fascinating work it was terrific to learn that she had received an ARC Future Fellowship Grant for the project 'Decoding risks and unlocking rewards of oceanic volcanism'. By focussing on explosion mechanisms, which open up opportunities for minerals exploration, especially for minerals the world urgently needs, while helping to mitigate risks to our Pacific neighbours, Rebecca's work has the potential to improve economic, environmental, social and geopolitical conditions across the region. It is a benchmark of what great science looks like and, as a University, we are proud of her accomplishments and leadership."



conduct really impactful research in my disciplinary area of volcanology, but also have the opportunity to learn about how deeper magmatic plumbing systems can be destabilised and drive volcanic eruptions, or mineralise critical metals.

"The Future Fellowship also provides me with the opportunity for Australian scientists to take the lead on research that we conduct in Tonga with the RV *Investigator*. Had that funding not been available, much of this science would have been outsourced and led by researchers in international institutions.

"The exceptionally powerful Hunga-Tonga eruption in 2022 was a surprise, and is a blind-spot in both our understanding of volcanism on Earth and the hazards that submarine volcanoes pose to Australia's neighbouring Pacific Island nations. This eruption has revolutionised thinking about how large eruptions may be fundamental to the origins of some of the world's largest resources of Cu, Au and critical metals.

"This Future Fellowship enables me to build a diverse disciplinary team to link the magmatic and volcanic systems and understand the role of water in oceanic volcanism. I am looking forward to working with DFAT and the Australian Government to embed Tongan scientists and students into this program of research.

"This Future Fellowship is important to me because it contributes to the resilience of our Pacific Island

THE STATS

Dr Karin Orth, honorary UTAS Earth Sciences researcher and chair of the Tasmanian branch of the GSA, acknowledges the success of Earth scientists at UTAS including Rebecca Carey and Jo Whittaker from IMAS. Karin has also put together a few stats on Future Fellowships, and we reproduce those here, with her permission:

Congratulations Future Fellows

Well done Rebecca Carey (CODES/Earth Sciences) and Jo Whittaker (IMAS) for successful Australian Research Council (ARC) Future Fellowship Funding. The grants secure nearly 2.5 million dollars to support their research for the next 4 years. Only 100 such fellowships are available to all researchers across all disciplines in Australia (excluding medicine). The success rate is only 17%! Three fellowships were granted to researchers at the University of Tasmania this year and two of them are Earth scientists. Our geoscience researchers are enhancing knowledge as well as bringing funding, prestige and accolades to our State.

GSA takes this opportunity to congratulate our fellow members and wish them well in their endeavours.

neighbours from the threat of volcanic eruptions, tsunamis and sea level rise, and will contribute to moving our nation towards a sustainable energy future. It will allow me to learn

new fields of Earth science, and to collaborate and work with a diverse set of new collaborators in academia, industry and government to achieve the Future Fellowship research goals."

EARLY CAREER RESEARCHER AT CODES RECEIVES ARC DECRA FUNDING



Dr Sheree Armistead with Dr Dave Selley looking at maps of the Central African Copperbelt in the CODES thesis library. Sheree will be collaborating with Dr Selley on her new ARC DECRA project, 'The interplay of tectonics and climate on critical minerals in deep time'.

Dr Sheree Armistead has been awarded an Australian Research Council Discovery Early Career Researcher Award (DECRA) of \$487,886 for her innovative project aimed at unravelling the formation of sediment-hosted copper and critical mineral deposits over the past billion years of Earth's history. Titled 'The interplay of tectonics and climate on critical minerals in deep time', this project will integrate plate tectonic models, ore deposit data and geochemical analysis to explore how Earth's tectonics and climate have influenced ore deposit formation. The findings could help discover new critical minerals in Australia, supporting the country's move to sustainable energy.

The main drivers for the transport and formation of metals in sedimentary basins are not well understood and will be addressed in this project. Sediment-hosted ore deposits, which are significant sources of metals like cobalt and copper, typically form in tectonic rift settings. However, the compressional forces of mountain ranges may also play a crucial role in metal mobility. Saline brines, essential for the circulation of metals and sulphur, are known to form in desert belts where evaporation exceeds rainfall.

Yet, the precise conditions under which evaporites form – whether primarily influenced by latitude or tectonic settings such as behind mountain chains – remain a subject of debate.

Understanding these conditions is vital for predicting the locations of ancient ore deposits.

The Central African Copperbelt, home to the world's largest sediment-hosted copper-cobalt deposits, provides a fascinating case study. These deposits are hosted by rocks dating back approximately 700 million years, a period marked by one of Earth's most extreme climatic events known as 'Snowball Earth.' Whether this timing is coincidental or if extreme climate conditions played a role in mineralisation is a question this project seeks to answer. Interestingly, similar mineralisation styles and glacial rock formations are found in the Adelaide Superbasin in South Australia and the Rocky Cape region in northwest Tasmania. This similarity suggests

that there may be untapped potential for new discoveries of copper-cobalt resources in Australia.

To bridge critical knowledge gaps in understanding ore deposit formation, this project will use global plate tectonic models and datasets. These tools are essential for pinpointing where ore deposits have formed over geological time and for identifying the tectonic and climatic settings that were active during their formation. For the first time, such comprehensive models are now available – models which have been developed with significant contributions from Sheree. By combining these models with more local- to regional-scale data, the project aims to provide new insights into the conditions that led to the formation of sediment-hosted copper and critical mineral deposits, paving the way for more targeted and efficient exploration strategies.

Although the DECRA is awarded to a single researcher, this project would not be possible without the extensive support Sheree has received from researchers in CODES, IMAS, Mineral Resources Tasmania and globally. Dr Rebecca Carey was Sheree’s mentor in developing the proposal, providing significant guidance in developing a project attractive to the Australian Research Council.

Sheree will benefit from the mentoring of Dr David Selley (CODES) on sediment-hosted ore deposits, Dr Simon Williams (IMAS) on global-scale plate tectonic modelling, as well as her collaborators from the University of Adelaide,

the University of Saskatchewan and Geoscience Australia. Other collaborators include Dr Jacqueline Halpin (IMAS), Dr Jo Whittaker (IMAS), Professor David Cooke, Professor Sebastien Meffre, Dr Jeff Oalman and

the broader CODES research group. Sheree will also be recruiting a PhD candidate as part of the project, so please get in touch if you know anyone who may be interested: sheree.armistead@utas.edu.au

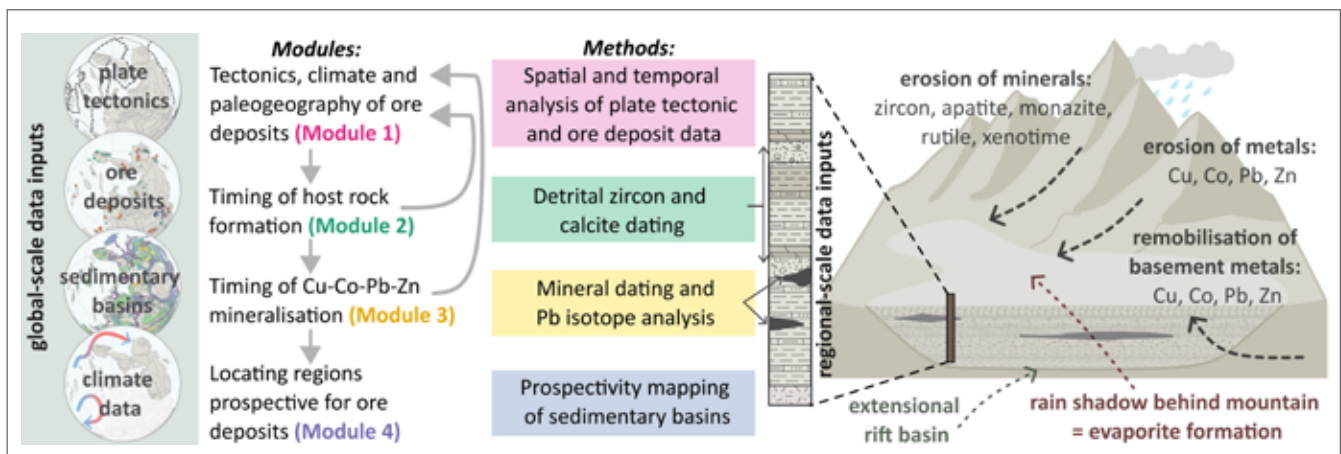


CODES DIRECTOR PROFESSOR DAVID COOKE WRITES:

“The ARC DECRA scheme is designed to accelerate the research careers of the most innovative and creative early career researchers (ECR). These fundamental research grants are awarded annually to 50 ECRs across all disciplines and are extremely competitive with success rates of around 17%.

“Sheree’s success in winning a DECRA this year is a major achievement. It establishes her as one of Australia’s leading early career researchers in the Earth sciences. Sheree did a fantastic job in conceiving and writing her proposal, and an important part of that was her commitment to networking and collaborating, which helped her to build a stellar proposal that met the ARC’s very high standards across all four of the scheme’s assessment criteria (Investigator/Capability; Project Quality and Innovation; Benefit; and Feasibility).

“Sheree’s project will improve our understanding of the origins of sediment-hosted Cu-Co deposits by investigating the plate tectonic and climatic processes that influenced the formation of the giant Neoproterozoic mineral systems of the Central African Copperbelt, and also the time-equivalent sediment-hosted Cu deposits of the Adelaide Superbasin and the apparently barren Neoproterozoic basin of northwest Tasmania. Sheree’s success provides a major foundation for CODES’ plans to reinvigorate our sediment-hosted Cu research program, and will open up exciting new research opportunities for Sheree, her collaborators and future students. Well done, Sheree! We are all very proud of you!”



This graphic illustrates the conceptual workflow of Dr Sheree Armistead’s DECRA project.

THE CLASS OF 2024: PHD RESEARCH POWERS AHEAD WITH PROMISING RESULTS FOR INDUSTRY

Our large cohort of PhD students, drawn from across the world, has been busy at field sites and in the lab this year. Summaries of new students' projects, and those students who were not included in last year's roundup are below:



BILLY BEAS CACERES

Supervisors: David Cooke, Lejun Zhang, Rebecca Carey

Project title: *Characteristics and geological evolution of the E44 Au-Cu deposit in the Ordovician island-arc at Northparkes district, NSW*

Funding: Amira P1249 project

Billy's PhD research is part of the Amira P1249 project related to exploring, characterising, and optimising complex orebodies. He is investigating the E44 Au-Cu deposit located in the southern part of the Northparkes district in the Macquarie Arc at NSW, Australia. The main objectives are to define the stratigraphy of the system in the district and define the alteration and mineralisation phases related to the Au, Cu and base metal mineralisation stages; determine the white mica chemistry and halogen abundances within the system; and determine how

the carbonate chemistry is related to the Au-bearing carbonate-base metal veins. The research program will define a geological model for the E44 deposit, propose vectoring tools to the high-grade mineralisation areas within the system, and resolve geometallurgical questions regarding mineral processes.

Billy has undertaken two major fieldwork campaigns and conducted petrographic analysis, electron probe, Terraspec and FT-NIR spectroscopy and UV-fluorescence, on drill core samples. LA-ICP-MS and isotopes analysis will be conducted to contribute to the understanding of the alteration and mineralisation chemistry at E44.

"I am really excited with the outcomes that I have from the project, and the invaluable support of my supervising team. This journey is and will be very challenging but highly rewarding at the end."



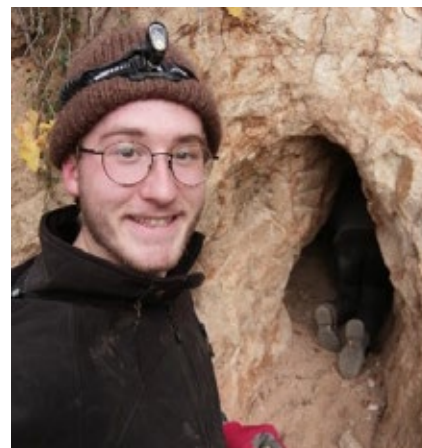
DAMIAN BRAIZE

Supervisors: Jeff Steadman, Sebastien Meffre

Project title: *Geochemistry and geochronology of hematite and chlorite in the Tennant Creek IOCG district*

Funding: Emmerson Resources Ltd, Geoscience Australia, Northern Territory Geological Survey

Damian's PhD project, initiated in March 2024, focusses on the geochemistry and geochronology of the Tennant Creek iron oxide-copper-gold (IOCG) deposits in the Northern Territory, Australia. This Proterozoic mineral field has historically been a significant producer of gold and



Damian Braize prospecting for baryte crystals in Auvergne, France, before moving to Tasmania to commence his PhD at CODES.

copper, as well as an important source of bismuth and selenium. Despite its considerable potential, the Tennant Creek district remains underexplored and requires further investigation.

The research investigates the trace element chemistry of chlorite and hematite in the ironstones that host all the deposits in the area, aiming to develop vectoring and fertility tools for exploration. Additionally, the project will focus on the geochronology of datable minerals to better constrain the timing of mineralisation events. Damian is about to conduct his first fieldwork at Tennant Creek this year, while also working on samples from the CODES and Northern Territory Geological Survey collections. This promising multidisciplinary project has the potential to provide a better understanding of the complex architecture of IOCG deposits while opening new doors for mineral exploration in the Tennant Creek region.

"My first few months in Tasmania have been incredibly enriching. I am thrilled to be part of this world-class research centre, learning a lot from my supervisors and colleagues. I am now looking forward to my first fieldwork and contributing to impactful research, without forgetting some great hikes in Tasmania!"



Billy Beas examines drill core at Evolution Mining's Northparkes mine site, near Parkes in NSW during a fieldwork trip earlier this year.



VINICIUS DA CRUZ

Supervisors: David Cooke, Lejun Zhang, Rebecca Carey

Project title: *Characterisation of the complex orebodies in the Rosebery Middle Mine*

Funding: RRC project, MMG

Vinicius’ project aims to characterise the geology, mineralisation, mineralogy and potential for critical metals at complex massive sulfide lenses from the southern part of the Rosebery volcanic-hosted deposit in western Tasmania. These lenses have been hydrothermally altered by fluids related to the tin and tungsten granitoid of western Tasmania which differentiates mineralisation styles in the southern part of the mine from the more well-documented northern end, adding both significant economic potential and also potentially creating processing difficulties. Currently he aims to build the orebody knowledge of the southern part of the mine and understand the by-product critical metal potential for the main minerals produced. He employs a combination of detailed logging and mineralogical characterisation with trace elements laser-ablation mass spectroscopy of sulfides and other mineral phases.

“I am enjoying my time at CODES as it has given me great exposure to research and industry experts across a range of fields in geology.”



Vinicius da Cruz presenting the findings of his research at the CODES Critical and Strategic Metals Symposium, which was held on 10–12 July at the Sandy Bay campus.



Pratichee Mondal collecting waste samples from B-dump waste, Savage River deposit, northwestern Tasmania, in January.



PRATICHEE MONDAL

Supervisors: Julie Hunt, Owen Missen, Lejun Zhang

Project title: *Recovery of critical metals from ores, tailing streams, legacy mine wastes and waters: Savage River magnetite deposit, northwest Tasmania*

Funding: RRC project, Grange Resources

Pratichee’s project is looking at the Savage River magnetite deposit. The deposit occurs at the eastern margin of the Proterozoic Arthur Metamorphic Complex hosted within the Arthur Lineament, a high-strain zone that is 5–10 km wide and 110 km long, in northwestern Tasmania. The magnetite deposits at Savage River represent the largest of a series of discontinuous NE–SW striking lenses that extend for approximately 20 km. As part of the RRC project that focusses on the environmentally sustainable production of critical metals from western Tasmania, Pratichee’s PhD examines: (1) the evaluation of critical metal potential, their deportment studies across ores and various waste material types to identify potential opportunities; (2) recovery of critical metals from tailings, waste (ground) waters including waste dump seeps;

and (3) evaluation of cobalt and vanadium recovery from Savage River ores and wastes.

This study will combine field-based mapping, core logging, detailed petrography, and representative sampling of ores and wastes; these field data will provide a sound lithological framework for subsequent laboratory investigations. Sampling of tailings at plant discharge to establish deportment of critical minerals within typical waste streams and systematic water sampling of drainage channels reporting from waste rock piles (and/or detailed analysis of historical multi-element data) will be carried out. Analytical methods like SEM/AMICS, SWIR, TIR, ICP-MS, and static and kinetic testing will be used to achieve the project’s goals. Pratichee visited the Savage River deposits in January. She logged and collected samples from two drill holes of the Eastern wall assemblages of the deposit and the B-dump seep and waste rock piles. Preliminary analysis with pXRF shows potential for vanadium recovery from the ore zones, although a significant amount of Ti is seen to be present as well, which can be problematic for V extraction. Further microanalysis, such as AMICS and SEM, is in progress with selected laser mounts to identify the identity and chemical composition of major critical metal-bearing minerals.

“Being an international PhD student at CODES has been a great experience with wonderful people around, truly rocking!!”

CONTINUED OVER PAGE



NELAO NATUKONDJE NAIMBALE

Supervisors: David Cooke, Wei Hong, Robert Scott

Project title: Controls on fluid flow and mineralisation at the Heemskirk Tin Project, Zeehan, western Tasmania

Funding: RRC project, Stellar Resources

The Heemskirk Tin Project is located within the Zeehan mineral field, which has been a site of Pb-Ag mining since the 1880s. The project comprises four Devonian granite-related Sn deposits: Severn, Queen Hill, Montana and Oonah. Nelao’s PhD research is primarily focussed on Severn and Queen Hill, aiming to enhance orebody knowledge through detailed geological, mineralogical and geochemical characterisation, ultimately to aid near-mine exploration.

Since the commencement of fieldwork in June 2023, the primary focus has been on detailed core logging to understand the stratigraphy and controls on tin localisation. During this stage, Hylogger and TerraSpec were used to assist in mapping alteration, revealing distinct vertical boundaries in the distribution of white mica, chlorite, siderite-ankerite-calcite, kaolinite-dickite, topaz, and tourmaline, with

the latter two occurring strictly proximal to mineralisation. The current stage involves: (1) petrographic and SEM work to enhance and refine the paragenetic sequence; and (2) redefining the stratigraphy at Severn and Queen Hill. With a new drilling program underway at the Heemskirk Tin Project, Nelao is looking forward to returning to the field this summer.

“CODES is a melting pot of scientific knowledge from all corners of the world. My highlight so far has been the application of hyperspectral techniques to mineral exploration. Fascinating!”



GIOVANA OLIVEIRA PIMENTEL

Supervisors: Mike Baker, Matthew Cracknell, Pete Hollings (Lakehead U)

Project title: Rock characterisation of Platreef-style PGE mineralisation

Funding: Amira P1249 project

Giovana’s PhD research, part of the Amira P1249 project, aims to establish a reliable workflow for mineralogical characterisation at predetermined intervals for Ni-Cu-PGE mineralisation. This is achievable by integrating data from various fields: geochemistry, petrography, mineral chemistry and



Giovana Pimentel checking hyperspectral data during sampling at the Anglo American core yard facility in Mokopane, South Africa, earlier this year.

vibrational spectrometry, from the Sandsloot deposit of the Platreef, located in the Northern Limb of the Bushveld Complex in South Africa.

The mining industry routinely analyses thousands of rock samples. These datasets, collected over several years and through different analytical methods, can sometimes yield conflicting results. Giovana’s research addresses this issue by processing and comparing a comprehensive dataset and further validating it with new analytical work. Data processing began in the early stages of the project in October 2023 and guided a field campaign that took place from April to May 2024 at the Platreef in South Africa. Another key objective of Giovana’s research is to understand the substantial fluid-rock interaction due to the assimilation of dolomitic country rocks by the Platreef magma during emplacement, as well as the alteration products of mafic minerals. These are crucial for the advancement of mineralogical characterisation and ore processing at the deposit.

“Studying at CODES has been a fantastic experience. My project is a complicated puzzle, and I feel I have many extraordinary minds and tools to help me put the pieces together.”



Nelao Natukondje Naimbale working at Stellar Resources’ core yard in Zeehan during fieldwork in January.



OLIVE LUCAS PONYALOU

Supervisors: David Cooke, Lejun Zhang, Owen Missen

Project title: *Geology, genesis, and exploration significance of Cu-Au veins and altered rocks in the Kainantu Cu-Au district, PNG*

Funding: K92 Mining Research Scholarship, Max Banks Research Scholarship in Earth Sciences

Olive is researching the Kainantu Cu-Au district within the mid-Miocene Maramuni Arc, Papua New Guinea. The main objective of her research is to characterise the geology and Cu-Au mineralisation of the Kora, Judd, and Irumafimpa veins within Kainantu mine and the Arakompa quartz-sulfide vein system based on mineralogy, geochemistry, geochronology and structural controls to understand their genesis and define potential vectors to additional orebodies. The analytical methods being used in the first year of study include optical microscopy, SEM-based cathodoluminescence (CL) and automated mineralogy (AM) studies, LA-ICP-MS, and whole rock geochemistry of selected samples from Kainantu and the wider arc region. The Kainantu mine and surrounding prospects are owned by K92 Mining Inc, the primary sponsor of this project. Olive previously worked at Kainantu in 2011–2012 as a graduate geologist. She is currently modelling the geological, geophysical and geochemical assay data from the company database noting zonation patterns, pathfinder element



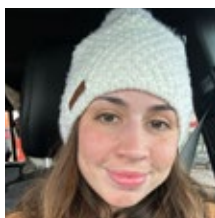
Olive Poyalou (second from right) at the K92 Mine in 2012 in PNG with Barrick Gold geologists, while working as a graduate geologist.



Poliana Salgado in Spain standing in front of an outcrop near the contact where the PQ Group overthrusts the VSC rocks near Sandfire's Aguas Teñidas and Magdalena mines.

anomalies and lithogeochemical signatures for mapping lithology and hydrothermal alteration. The deposit styles in Kainantu include porphyry Cu-Au, high sulfidation, and low sulfidation epithermal gold, and an orogenic gold style was previously proposed by Espi et al. (2005). Zircon and quartz crystals will be studied under CL and LA-ICP-MS to determine their microtextures, ages, trace element geochemistry and fertility indicators. Other silicate, sulfide, phyllosilicate, sulfate, carbonate, phosphate and gold minerals will also be studied for the purposes of determining ore genesis and exploration implications. Olive and her supervisors will be conducting the first field trip to Kainantu mine in December.

"I am looking forward to using the microanalytical techniques at CODES and CSL for textural analysis, mineralogical mapping, geochronology and trace element studies. The data generated will give us new insights into the origin and genesis of the auriferous veins of Kainantu."



POLIANA VIDAL SALGADO

Supervisors: Mike Baker, Yamila Cajal, Jeff Steadman

Project title: *Characterisation and paragenesis of the Magdalena VHMS deposit, Spain*

Funding: Amira P1249 project

The Iberian Pyrite Belt (IPB) has long been known for its rich volcanic-hosted massive sulfide (VHMS) deposits, with a history of mining that spans over two millennia. Despite this extensive exploration, the recent discovery of the Magdalena deposit in southwest Spain has unveiled new potential for VHMS mineralisation in the northern IPB. Located near other significant deposits like Rio Tinto and Aguas Teñidas, Magdalena's impressive resource highlights the ongoing promise of this region.

This project is part of the P1249 Amira project and aims to delve into the detailed paragenesis of the Magdalena deposit to enhance our understanding of its mineralisation and alteration processes. By analysing the mineralogical, textural and geochemical features of Magdalena, we seek to develop advanced methods for deposit characterisation using hyperspectral imagery and geochemical data. This will not only help refine mine planning but also establish effective tools for future exploration of VHMS deposits in the northern IPB, potentially unlocking further mineral wealth in this prolific region.

"CODES is a world of opportunities for the curious mind. Alongside a team of top professionals in various fields and cutting-edge laboratory facilities, developing this project with the commitment to advancing industry and societal improvements, are what inspire me the most. This has undoubtedly made the challenge of relocating to Tasmania and researching the Magdalena deposit much more exciting. I am eager to contribute to P1249 and see where our collective efforts will lead."

CONFERENCES ON FOUR CONTINENTS



Dr Martin Jutzeler (orange jacket) attended the IODP3 Workshop in March, held at Nachikatsuura in Japan. Field trips were an important aspect of the trip: here ANZIC representatives are standing on blocks detached from a rhyolite dyke by a tsunami; the rhyolite dyke forms the large, jagged peaks in the background.

Since our last newsletter, CODES researchers have again been travelling the globe to take part in conferences and workshops that are a vital element of the research collaboration and networking process. Here is a selection of these events:

IODP3 WORKSHOP

**18–22 March 2024,
Nachikatsuura, Japan**

Dr Martin Jutzeler participated in the 'Workshop on the Future of Scientific Ocean Drilling: Toward submission of drilling proposals for IODP3' in the small town of Nachikatsuura

in southern Honshu, Japan. This important workshop was organised to inform and plan for the next steps of scientific ocean drilling now that the *JOIDES Resolution* vessel has been decommissioned after more than 40 years of service to the scientific community. The workshop gathered Japanese, European and Australian scientists for three days of meetings and discussions followed by two days of field trips in southern Honshu. Martin was generously funded by the Australian and New Zealand International Scientific Drilling Consortium (ANZIC) to attend this meeting, where he presented preliminary plans for drilling submarine volcanoes in the Kermadec Arc. The

field trips consisted of two days of visits to geological outcrops (including igneous intrusions, Neogene accretionary complexes and forearc basin sediments) in UNESCO heritage-listed sites and geoparks.

ANNUAL GEOSCIENCE EXPLORATION SEMINAR

**16–17 April 2024,
Alice Springs, Northern Territory**

This gathering was held at the Alice Springs Convention Centre where Senior Research Fellow Dr Jeffrey Steadman and CODES PhD student Damian Braize attended an excellent series of presentations on the latest exploration results in the Northern Territory. The seminar was a good opportunity to network and discuss ongoing research with those involved in mineral exploration in the Tennant Creek Province.

IODP398 POST-VOYAGE WORKSHOP

18–25 April 2024, Santorini, Greece

CODES PhD student Acacia Clark writes:

'In late April, I attended the one-year post-voyage workshop for the International Ocean Discovery Program



PhD student Damian Braize photographed at Alice Springs in April at the Annual Geoscience Exploration Seminar, which he attended with Dr Jeff Steadman.



IODP Expedition 398 scientists on Kameni island, Santorini, Greece. CODES PhD student Acacia Clark (third from left in front row) was among the scientists who spent a few days in the field after the one-year post-cruise meeting (held on Santorini).

Expedition 398, held on the island of Santorini. The workshop lasted three days during which onshore and offshore scientists presented their findings on data collected during the expedition. There were also several discussions on future research directions, and a visit from local school students who asked about the volcanic nature and risks of their home (Santorini). Post-workshop, we visited several sites to examine in-situ deposits. It was striking to see the differences between the on-land deposits and those we extracted from the seafloor during the expedition.

SYMPOSIUM ON MINERAL EXPLORATION METHODS THEORY AND APPLICATION

10–12 May 2024, Guangzhou, China

In recent years, the demand for mineral resources has surged globally, highlighting the importance of advanced technologies in mineral



Dr Lejun Zhang giving his keynote address to a large audience at the Symposium on Mineral Exploration Methods Theory and Application in Guangzhou, China, in May.



On the way home: Professor David Cooke with PhD students Emreca Yurdakul, Angela Costa and Stephen Cooke in Newry, Maine, following the Geochemistry of Mineral Deposits Gordon Research Conference and Seminar in June.

exploration. From 10–12 May, the first Symposium on Mineral Exploration Methods Theory and Application was successfully held at a conference centre in Guangzhou. The event featured prominent guests, including Academicians from the Chinese Academy of Sciences and the Russian Academy of Sciences. Over 130 representatives from 17 universities, national geological institutes and mining companies attended. The symposium focussed on integrating mineral exploration methods with geological and geochemical analyses, aiming to enhance exploration strategies and critical metal recovery. CODES Senior Lecturer in Economic Geology Dr Lejun Zhang gave an invited keynote address on the new

advances and new techniques in the mineral exploration field. The symposium was highly praised for its timely relevance and contribution to strategic exploration initiatives, fostering collaboration between academia and industry.

GEOCHEMISTRY OF MINERAL DEPOSITS GORDON RESEARCH CONFERENCE AND SEMINAR

23–28 June 2024, Newry, Maine, USA

The theme of this year's events was 'Geochemistry of Ore Deposits for a Low Carbon Society'. CODES PhD student Emreca Yurdakul writes:

'This year the Gordon Geochemistry of Mineral Deposits Conference and Seminar (GRC-GRS) were held in Maine,

CONTINUED OVER PAGE

USA. The two events took place over a week, starting with the early career researcher seminar followed by the research conference. As a CODES team, we presented three posters that attracted researchers' interest from all over the world; we also exchanged knowledge and learnings with them. We have a team member missing from the photo, Dr Yamila Cajal Contreras, who could not make it to the conference at the last minute, but still contributed with an excellent poster. The "smiling face" photo of our team is from the last day of the conference, and reflects the happiness of another successful representation of CODES on an international platform'.

37TH IAS INTERNATIONAL MEETING OF SEDIMENTOLOGY

25–27 June 2024,
Aberdeen, Scotland

CODES PhD student Shannon Frey travelled to Aberdeen, Scotland, for the 37th International Meeting of Sedimentology. She presented two posters and a talk covering research and outcomes from the first two projects of her PhD. She was able to meet and connect with other sedimentologists and volcanoclastic specialists from around the world and plan for future collaboration as well as explore new outreach possibilities. Her poster titled 'Large-scale single-event sediment waves; Insights into cyclic step/antidune deposition and eruption-fed density currents' received a price for best student poster in her topic area.

16TH EUROPEAN WORKSHOP ON LASER ABLATION

2–5 July 2024, Ghent, Belgium

Dr Ivan Belousov presented a paper and Dr Jeff Oalman a poster at this workshop in Ghent. Ivan's talk was entitled: 'Deconvolution of mixed LA ICPMS signals and quantification of trace element compositions of microinclusions in minerals'. The gathering was a great opportunity to discuss laser ablation developments with collaborators from across the globe, and to catch up with past CODES staff and alumni.



Where's Lejun?: Participants at the Symposium on Mineral Exploration Methods Theory and Application in Guangzhou, China. Lejun is wearing dark glasses and a blue shirt!



Participants of the 16th European Workshop on Laser Ablation; the event took place in Ghent, Belgium, on 2–5 July and was attended by CODES staff Dr Jeff Oalman and Dr Ivan Belousov (Photo: Delphine Losno).



The NVCL-ANU Hyperspectral Mineralogy Workshop was held in Canberra in early July, and was attended by Dr Paula Montoya, along with PhD students Damian Braize, Nelao Natukondje Naimbale and Giovana Pimentel, at the invitation of the CSIRO.

HYPERSPECTRAL MINERALOGY WORKSHOP

2–4 July, Canberra, ACT

In July, CODES research fellow Dr Paula Montoya and three CODES PhD students attended the 'Hyperspectral mineralogy from the drill core to nano scale' workshop at the Australian National University in Canberra, held in collaboration with the

AuScope National Virtual Core Library (NVCL) and CSIRO. Over three days, they learned about hyperspectral techniques and their applications in geoscience through a combination of lectures and hands-on exercises. The workshop provided valuable insights into applying hyperspectral methods to their own research. Attendance was made possible thanks to the travel support from the AuScope NVCL.

INDUSTRY IMPACT IS IN CODES' DNA



Ned Howard from Evolution Mining talks to CODES staff and students in March about the company's work in the critical metals space.

The year to date has been busy with numerous meetings and collaborations with industry geologists and exploration managers both on-site at mining facilities in Australia and overseas – and here in the CODES offices.

EVOLUTION MINING

Ned Howard, Manager Geoscience at Evolution Mining, visited CODES on 18 March to talk to students about the scope of the company's geoscience activities and career opportunities for graduates.

AMIRA GLOBAL

Dr Anil Subramanya gave a presentation to CODES staff and HDR students during his visit to CODES for the Advisory Board Meeting on 17 April. He was generous in his praise for CODES, and reiterated Amira's ongoing support for the research that CODES initiates and carries out, with his presentation titled 'The global impact of CODES'.



Global impact of research

- 30+ years of collaborative research for the global mining industry
 - Topical research on understanding and discovery of metal deposits globally
 - Alumni from CODES spread across industry and academia globally in positions of influence
 - Global collaboration leading to better outcomes
 - Continuing to feed a much-needed pipeline of talent both to industry and academia
 - One of a handful of premium research institutions globally known for its contributions to ore body knowledge
 - Developing new techniques and tools for discovering and understanding complex ore bodies
 - Contributing to the much-needed supply of material needed for the future of humanity as we strive towards an energy transition and green economies
 - Unearthing knowledge on mineralisation in leading mineral jurisdictions around the globe
 - Intimate partnerships with leading global players in exploration
 - A significant player in satisfying the global community's need for critical and energy transition metals.
 - One of the most valued Master's degree in Economic Geology

PowerPoint slide taken from Dr Anil Subramanya's presentation at CODES in April outlining the important impact that CODES has had over more than 30 years of research for the global mining industry.

AMIRA P1249 SPONSORS' REVIEW MEETING

The Amira P1249 Sponsors' Review Meeting (SRM) was held on 12–13 June. As well as giving sponsors updates on progress to date, it provided an opportunity for CODES

students and staff who were not presenting at the SRM with a fantastic networking opportunity and a point of focus for industry sponsors to get to know more about the breadth of research and activities being carried out here.

CODES INDUSTRY PARTNERS 2024

By becoming a CODES Industry Partner your company will be contributing to important ongoing minerals research and will have access to significant research benefits. If you would like to join us, please contact Professor David Cooke (d.cooke@utas.edu.au) or Helen Scott (helen.scott@utas.edu.au).

PLATINUM



RioTinto

GOLD



SILVER



WORLDWIDE EXPLORATION

In the past few months fieldwork and exploratory meetings for CODES projects have continued apace with students and staff working in multiple countries. In addition to the countries featured here, research and preliminary meetings were also carried out in Ghana, the USA, Greece, Portugal and several locations across Australia. This trend is set to continue for the rest of the year.

INDONESIA: WETAR ISLAND

June 2024

Dr Owen Missen visited Wetar Island, Indonesia, for ten days in June to conduct mineralogical and volcanological research on the copper deposits there. Merdeka Copper Gold operate the site, Indonesia's only known volcanogenic-hosted massive sulphide (VHMS) deposit. This project stemmed from Associate Professor Rebecca Carey's Linkage project on exploration targeting in volcanological systems, with an additional focus on critical metal potential of this geologically young deposit. Whilst Wetar Island is close to Australia geographically, and just 125 km from Dili (Timor-Leste), access to the island is by an eight-hour ferry from West Timor, Indonesia (some four flights and a bus ride from Hobart just to the ferry terminal)!

ICELAND: TORFAJÖKULL

June–July 2024

Associate Professor Rebecca Carey and new PhD candidate Catherine Brown (yet to officially start at CODES) were in Iceland in June–July to conduct fieldwork on and around the volcano Torfajökull in the country's southeast. This project is being undertaken with collaborator Professor Thorvaldur Thordarson at the University of Iceland, and Associate Professor Jess Trofimovs at the Queensland University of



Indonesia: Dr Owen Missen (wearing orange top) with the Merdeka Copper Gold core shed and exploration geology team on Wetar Island, Indonesia. Wulandari Mandradewi (Geoscience Manager), the main contact for the trip, is the lady standing to the right of, and slightly in front of, Owen as viewed in the picture.



Iceland: Associate Professor Rebecca Carey (left) with new PhD student Catherine Brown standing on the new lava flow field on the Reykjanes Peninsula during fieldwork to Iceland in June–July this year. Catherine will be officially joining CODES shortly.

Technology. Torfajökull is the largest and oldest active silicic central volcano in Iceland with eruption activity that began in the mid-Quaternary (1.3 Myr ago). It is a highly dissected volcano and hosts highly active hydrothermal and geothermal systems. Catherine's PhD research will focus on how rock properties influence volcanic eruptions, in particular driving transitions between explosive and effusive behaviour. In this field season Catherine was able to examine and sample the 870 AD eruption products of Torfajökull, an eruption that occurred at the time of the Viking settlement of Iceland.

Unfortunately, the late opening of the highlands roads in Iceland made the caldera inaccessible until the last few days of the field season. Those few days were exciting though, with the opportunity to visit and collect samples from the proximal deposit sequence and the obsidian lava dome associated with this eruption. Next field season we intend on examining the caldera more fully, including sampling a suite of the altered silicic and mafic volcanic successions to quantitatively analyse physical rock properties to understand the role of alteration in modulating explosive vs. effusive transitions.

Catherine and Rebecca also had the opportunity to visit the 2024 lava flow field on the Reykjanes Peninsula. The eruption had stopped prior to their visit. Driving through the abandoned town of Grindavik (original population 5,000) was shocking and eye-opening. The seismic activity has damaged most buildings, and buildings on the edge of the town have been inundated with lava. The last eruptions on the peninsula were ~800 years ago (The Reykjanes Fires) and lasted 40 years. Hopefully future eruptions occur in regions where they do not impact any further residential areas and critical infrastructure.

SPAIN: IBERIAN PYRITE BELT

May 2024

In May, Dr Yamila Cajal and supervisor Dr Mike Baker travelled with PhD student Poliana Vidal to Sandfire Resources-MATSA Magdalena VHMS mine and facilities for fieldwork. Poliana is working on the characterisation and paragenesis of this deposit.

SOUTH AFRICA: MOKOPANE

April–May 2024

Earlier this year, CODES PhD student Giovana Pimentel embarked on her first field trip to her research site in Mokopane, South Africa. This three-week field campaign took place at the Anglo American Northern Limb Regional Exploration Geology Core Yard. Giovana was supported by her supervisors, Professor Pete Hollings and Dr Michael Baker, who each spent a week in the field with her. Together, they examined drill cores from Sandsloot farm, one of the open pits and soon-to-be underground operations of the Mogalakwena Mine Complex, the largest open-pit platinum mine in the world, established in 1993.

TASMANIA: NORTHWEST

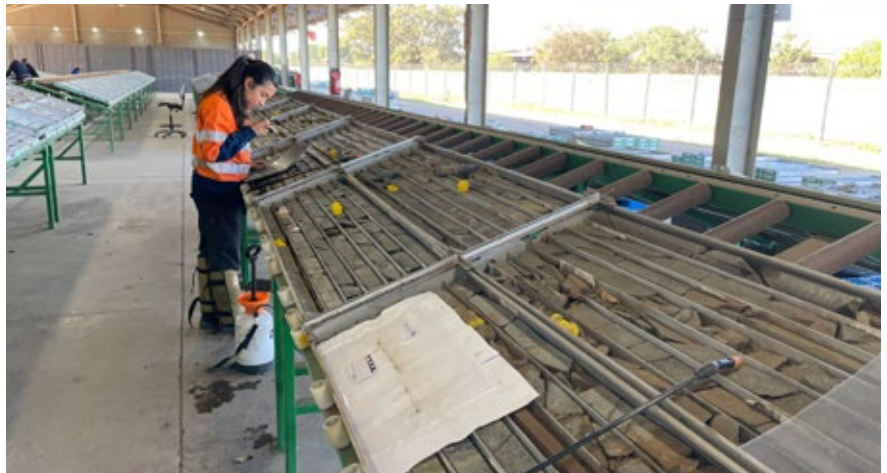
June 2024

In June, PhD student Alfredtina Appiah undertook fieldwork at the Prospect Ridge exploration tenement to look at the new drill cores being extracted by GWR for the first time. PhD supervisor, Dr Mohammad Fathi, and PhD student Chris Allen also visited the site.

The drill cores were mostly hard white magnesite cores from the Arthur River magnesite deposit with other



Spain: CODES PhD student Poliana Vidal working on core from the Sandfire Resources-MATSA Magdalena VHMS deposit in the Iberian Pyrite Belt, Spain, during a field trip to the region in May.



South Africa: CODES PhD student Giovana Pimentel sampling core from the Anglo American Platreef Ni-Cu-PGE deposit from the northern limb of the Bushveld Igneous Complex, South Africa.



Northwest Tasmania: ongoing drilling activity at the Prospect Ridge magnesite project; L–R: Dr Mohammad Fathi, Mick Wilson, executive director of GWR (sponsoring company of Prospect Ridge project), and PhD students Alfredtina Appiah and Chris Allen.

carbonate veins (dolomite). These cores will be sampled for future processing work, mostly flotation to upgrade the magnesite by separating it from other gangue minerals such as dolomite, quartz and talc. Chris Allen

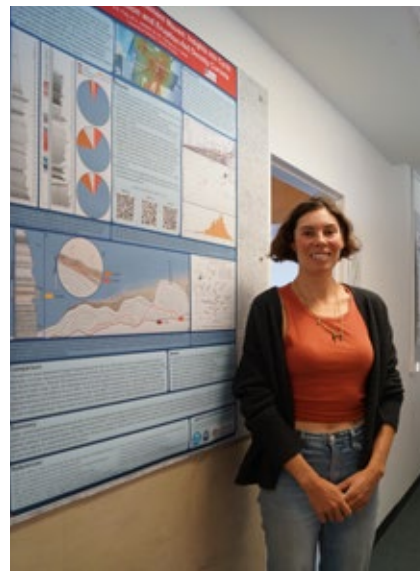
had worked on the deposit previously and had some knowledge of the drilling, so he was able to share some useful information with Mick Wilson, executive director of GWR and in charge of the drilling activity.

FUNDING AND PRIZES FOR CODES PHD STUDENTS

CODES PhD students have again been successful in gaining funding and prizes for their research. We acknowledge the following students and congratulate them on their achievements. In addition, PhD student Malai Ila'ava's article in the *Australian Journal of Earth Sciences* is – as we go to press – the most-read article published in the last 12 months. It is entitled '3D modelling of subsurface ancient volcanic successions: a workflow developed during regional reconstructions of the Cowal Igneous Complex in the Ordovician Macquarie Art of NSW, Australia'. Well done Malai!



PhD student Angela Costa (right) and CODES Research Fellow Yamila Cajal conducting regional mapping across the Sandblow Granodiorite at Colliers Beach, King Island, in 2023.



Shannon Frey pictured at CODES with her prize-winning poster outlining research into cores taken from volcanic sediment waves.

ANGELA COSTA

SEG Student Research Grant – Hugh E. McKinstry Fund

Amount: USD \$5,000

Angela's grant proposal focussed on assessing the fertility of Carboniferous intrusions related to the Grassy tungsten (W) skarn deposits on King Island, Tasmania. This study will utilise state-of-the-art analytical techniques for whole-rock characterisation and U-Pb zircon dating and trace element acquisition via LA-ICP-MS at the CODES research facilities.

Angela writes:

"Our research team aims to enhance the understanding of the relationship between the multiple intrusions at Grassy and their fertility for W-Mo and potentially other metals. Additionally, we will advance knowledge about the timing of the intrusions' emplacement and their relationship with Western Tasmania granites, as well as define

the crustal signature of intrusions near Grassy. Notably, no geochemical or geochronological studies have been conducted along the western flank of Sandblow Granodiorite, which hosts several scheelite occurrences with estimated resources of 0.2 Mt at 0.47% WO₃ and 0.14% Mo for Investigator 21, or along the Bold Head granite, which is potentially a segment of the Sandblow Granodiorite separated by the Grassy River Fault.

"I am extremely pleased and honoured to receive this funding, which supports a crucial part of my PhD research on tungsten deposits and related intrusions. I would like to express my sincere gratitude to the SEG and the Hugh E. McKinstry Fund for making this possible."

SHANNON FREY

At the 37th International Meeting of Sedimentology, held in June in Aberdeen, Scotland, CODES PhD student Shannon Frey won a prize for the best student poster in one of

the sessions she attended. Her poster was titled 'Large-scale single-event sediment waves; Insights into cyclic step/antidune deposition and eruption-fed density currents'.

JAVIER GIL RODRIGUEZ

SEG Student Research Grant – Hugh E. McKinstry Fund

Amount: USD \$5,000

Javier is working on the Regional Research Collaboration – Critical Metals project. He is planning to spend this grant on geochemical analyses, such as boron and oxygen isotopes in tourmaline, deuterium and oxygen isotopes in quartz and hydrated silicates, and chemical analyses in quartz on rock samples from his research project at the Renison Bell tin deposit, northwestern Tasmania. He feels very grateful to the SEG Foundation for this opportunity and very excited about the new and interesting data that he is going to collect.

JAIME OSORIO

SEG Student Research Grant – Hugh E. McKinstry Fund

Amount: USD \$2,500

Jaime writes:

"I am delighted to have received an SEG Student Research Grant from the McKinstry Fund for 2024. This grant will provide funding for oxygen and hydrogen stable isotope analyses of silicate minerals such as alunite, quartz, dickite, and white mica within the epithermal and porphyry environments. The objective is to document isotopic zonation, composition, and the source of fluids within the different alteration assemblages that are spatially associated with high-sulfidation mineralisation both within and beneath the lithocap. The analysis will be carried out at the GNS Stable Isotope Lab in New Zealand in collaboration with Kevin Faure. I am indebted to the SEG Foundation as I have received three grants, including one for my MSc and two for my PhD."

Co-author on a prizewinning paper

Jaime is also a co-author of the manuscript that won the SEG's Brian J. Skinner Award for 2024. The Brian J. Skinner Award is presented annually to the author(s) of an outstanding paper published in a single volume (8 issues) of *Economic Geology*. The paper is selected by the members of the Editorial Board of the journal and ratified by the SEG Council. The paper was titled 'A reevaluation of the timing and temperature of copper and molybdenum precipitation in porphyry deposits', by Federico Cernuschi, John H. Dilles, Jaime Osorio, John M. Proffett and Kalin Kouzmanov. It addresses a longstanding controversial topic in porphyry deposits and provides examples of deposits formed at shallow, intermediate and deep depths.

Jaime said: *"My contribution to the paper was providing the example of the system formed at intermediate depth (the Encuentro deposit), which was part of my MSc research at Oregon State University. All the credit for this award goes to Fede Cernuschi, who is the first author and conceptualised the paper, and to John Dilles, who supervised Fede's PhD and my MSc at OSU. The paper went through*



CODES PhD student Jaime Osorio is the recipient of funding from the Hugh E. McKinstry Fund and a co-author on the paper that was awarded the 2024 Brian J. Skinner Award. He is pictured finishing his surface alteration map at Valeriano, Chile, in December 2023.



CODES PhD student Peerapong Sritangsirikul (left) receives an award for the best oral presentation at the 1st Mahidol University International Geoscience Conference (Session 3 Geological Resources), which was held 9–16 January 2024, Kanchanaburi, Thailand.

several challenging rounds of review, but fortunately, it had the best possible outcome. It was a great experience to be part of a truly collaborative effort, where all the co-authors contributed substantially to the research and its subsequent publication".

GIOVANA PIMENTEL

SEG Graduate Student Fellowship

Amount: USD \$5,000

Giovana was awarded an SEG Graduate Student Fellowship for 2024. This fellowship is awarded annually to students worldwide who are pursuing graduate studies in economic geology. The funds can be used to cover eligible first-year graduate study expenses, and she plans to allocate these funds towards her living costs during her first year in Tasmania.

"This additional financial support during the first year of my PhD brings

me peace of mind. This is a life-changing period, and the SEG Graduate Student Fellowship is providing crucial support as I settle into life in Tasmania. I feel incredibly fortunate to have been selected," said Giovana.

PEERAPONG SRITANGSIRIKUL

CODES PhD student Peerapong Sritangsirikul was granted the best oral presentation at the 1st Mahidol University International Geoscience Conference (Session 3 Geological Resources) held on 9–16 January 2024 in Kanchanaburi, Thailand. The title of his presentation was 'Porphyry fertility assessment using zircon chemistry, Loei and Truong Son fold belts, Laos region'.

Sritangsirikul, P., Meffre, S., and Khin Zaw, 2024. The 1st Mahidol University International Geoscience Conference (MUIGC2024), 9–16 January 2024, Kanchanaburi, Thailand.

BUSY OUTREACH SCHEDULE FOR CODES AND EARTH SCIENCES

Community engagement activities have been running hot at CODES/Earth Sciences in recent months with a host of different types of events being offered by staff and students to raise awareness of STEM topics. This is an increasingly important task, given the falling numbers of students enrolling in STEM subjects nationally – we hope the genuinely fun and interactive opportunities for hands-on involvement and learning will spark the interest of potential future scientists.

GALLEY MUSEUM, QUEENSTOWN APRIL 2024

Dr Owen Missen ran the CODES/Earth Sciences stall at Queenstown's Galley Museum Open Day in April, which saw around 100 visitors, across all age groups, spend some time looking at rocks. CODES Rock Curator Izzy von Lichtan should be acknowledged for loaning the impressive Tasmanian rock samples on display for the day. Owen emphasised that Izzy went to great trouble to "wrap very different sized samples up and package them in a way that will allow for hours of transport across Tasmania".

Owen's enthusiastic stewardship of the stall enabled visitors to gain an insight into the research work that CODES and Earth Sciences do, and why it is important. UTAS Regional Learning Officer (West Coast) Belinda Martin was instrumental in organising and coordinating the UTAS aspects of it.

AGFEST, CARRICK 2-5 MAY 2024

As the saying goes, a good day was had by all at this year's Agfest, held over four days in May and with a large contingent of UTAS stalls included. PhD students Pratiche Mondal, Alex Cima and Markus Staubmann did a sterling job



Dr Owen Missen at the Galley Museum in Queenstown where he hosted the CODES/Earth Sciences stall at the museum's Open Day in April.

of hosting the CODES/Earth Sciences stall and overseeing a large number of young people who had come to search for trilobites in the sand. Thank you to all those who volunteered!

FESTIVAL OF BRIGHT IDEAS 16-17 AUGUST 2024

The annual Festival of Bright Ideas (FoBI) took place again this year in mid-August down at Princes Wharf on the Hobart waterfront with around 1,000 people of all ages making their way around the many science-related displays. Once again Earth Sciences/CODES was represented; PhD students Damian Braize and Poliana Vidal Salgado were among those running the stall and showing off some amazing rock specimens to the passing throng.

MINI MAKERX 25 AUGUST 2024

Professor Sebastien Meffre took part in this National Science Week event run by UTAS at Burnie on the Cradle Coast campus. Mini MakerX was a one-day expo which aimed to raise awareness of STEM activities in the community and promote interest in UTAS's strong STEM offerings. There were plenty of hands-on events for all ages.



Digging for trilobites was a popular choice for many younger patrons at Agfest in May, where CODES/Earth Sciences had a large presence among the UTAS stalls.



Professor Sebastien Meffre explains how to recognise minerals under the microscope to budding geologists at the National Science Week event called Mini MakerX, held at the Cradle Coast campus in late August (photo: Natalie Cesar Procopio).

STRAHAN PRIMARY SCHOOL FIELD EXCURSION

27 AUGUST 2024

CODES Lecturer in Environmental Geology, Dr Owen Missen, and PhD student Pratichee Mondal braved the elements on Tasmania's West Coast to demonstrate water quality testing to a class of Strahan Primary School students. This event was organised by Belinda Martin, the UTAS Regional Learning Officer (West Coast), in conjunction with the Cradle Coast Authority (CCA). The students learnt a lot and, according to Jason Cullen from CCA:

"It was wonderful to see all the primary school students so engaged with the water quality testing and similarly how knowledgeable and enthusiastic they are about the aquatic life in the local waterways."



CODES PhD students Damian Braize and Poliana Salgado were among volunteers who ran the CODES/Earth Sciences stall at the 2024 Festival of Bright Ideas on 16–17 August down on the waterfront.



Dr Owen Missen and Pratichee Mondal pictured in August at Strahan teaching a group of students from Strahan Primary School the principles of water quality testing.

NEW EQUIPMENT WILL MAXIMISE RESEARCH INTO CRITICAL MINERALS PROCESSING AT CODES

CODES Research Fellow Dr Mohammad Fathi outlines recent new ore processing equipment purchases by CODES and how they will improve research outcomes for our projects investigating mineral separation.

In mineral processing, the essential steps of comminution and concentration are fundamental to transforming raw ore into valuable products. Comminution involves the crushing and grinding of ore to liberate valuable minerals, a critical process that ensures the efficient release of minerals from the waste rock. Following this, concentration employs various techniques to separate these valuable minerals from the remaining waste material, significantly impacting the purity and quality of the final product.

In our Regional Research Collaboration (RRC) project, under Element 2: Pathways to Critical Metals Processing, these steps are crucial, as critical



Dr Mohammad Fathi with the newly acquired spiral, set to be installed in the geology lab area at CODES. This equipment will be utilised for gravity separation-based preconcentration processes, specifically for scheelite.

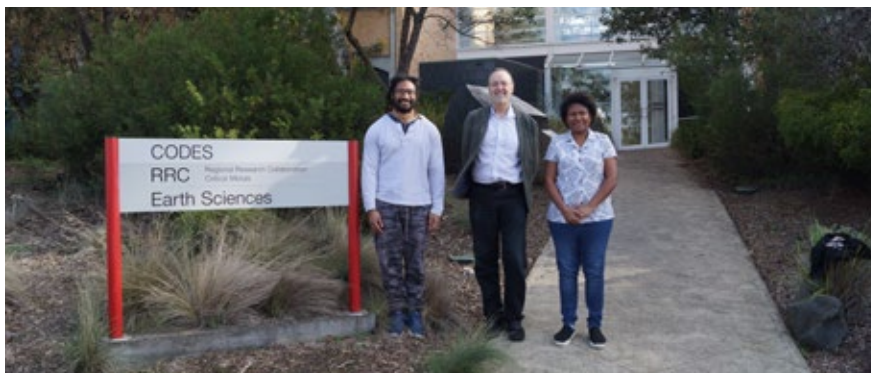
minerals – often present in complex orebodies – demand advanced processing techniques for efficient extraction and high-quality output. At CODES, we have recently enhanced our capabilities with a comprehensive suite of processing equipment tailored to these needs. Our new comminution tools, including crushers and ball/rod mills, are essential for the precise reduction of ore particle size, which is vital for unlocking the potential of critical minerals. To improve preconcentration, we've invested in shaking tables and spirals, which

are crucial for effectively separating valuable minerals based on density. Additionally, the new magnetic separators for both dry and wet conditions, along with the cyclonic separator, will significantly enhance the efficiency of mineral separation. The flotation cell further supports our project by enabling effective concentration of critical minerals. These equipment upgrades are designed to maximise recovery rates and support the successful processing of critical minerals, aligning with our project goals and advancing our capabilities in this field.

CODES & EARTH SCIENCES PAST AND PRESENT

AUSTRALIA'S NORTHERN NEIGHBOURS

Director of CODES Professor David Cooke with two of our PhD students from Papua New Guinea, Malai Ila'ava (left) and Olive Ponyalou (right). Malai is close to finishing his PhD entitled 'Volcanic architecture of the Cowal Igneous Complex', while Olive started her PhD, on the geology, genesis and exploration significance of Cu-Au veins and altered rocks in the Kainantu Cu-Au district, PNG, in December last year.



GARRY DAVIDSON FONDLY REMEMBERED ONCE AGAIN

This year's Garry Davidson Memorial Touch Football match took place on the Sandy Bay oval on 27 May. Pictured above are the student and staff teams with Karin Orth holding the white fluffy unicorn, the prized trophy, which was retained by the staff team once more. Match report by Karin Orth:

It was a sunny May afternoon when the students and staff faced off for the Garry Davidson Memorial touch football match. With a hiatus last year, the match was back with both teams vying to win. The staff were outnumbered by an enthusiastic student team keen to learn the game and get on the field. The staff began well, pushing the ball to their goal area but students held a strong defence. There was toing-and-froing across the field until eventually staff broke through with a goal. Students answered and managed a goal before the break for half time. One-all was the score as teams broke from play.

In the second half, a new ploy was instigated by kicks from Owen Missen for staff and Colin Smith for students. In both cases the ball was touched by their opponents before they reached the ball, but this element of play added to the excitement of the match. Staff wrangled a second goal to cheering from staff fans on the bleachers. The final minutes of the match increased in intensity and although the ball finished near the staff end, no more goals were realised. The staff won the unicorn prize again in 2024 with the final score of 2-1. Players, observers and friends joined in a post-match BBQ provided by the Student Chapter of the SEG.



Thanks to Gareth Jones of the UK for sending the photo in to UTAS, and to June Pongratz for filling in some of the names.

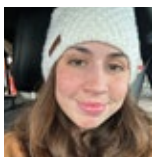
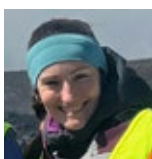

THE WAY WE WERE...

This photo showing the entire staff of the University of Tasmania Geology Department was taken in the 1950s and was sent to UTAS by the son of the lady in the white blouse – she is Grace Winifred Hawley, secretary to Professor Carey, the department's founding professor. Grace is now 98 years old. Next to her in the dark blouse is June Reeve, who worked for Professor Carey doing cartography. The front row also shows (from L-R) Henry Bartlett and Doris Banks (Ingram). The lady with the embroidered sleeves in unknown, as is the man on the far right.

In the back row Alan Spry is second from the left...the man who is second from the right may be Max Banks. The photo may have been taken by Professor Carey, which accounts for him not being pictured. The Geology Department was located near the present sports fields here at the Sandy Bay campus.

CHANGING FACES

In this issue we farewell two of our staff members, acknowledge recent role changes and welcome another three new PhD students, bringing our total number of PhDs to 35 including the four who are currently under examination.

PHD STUDENT	START DATE	PROGRAM	PROJECT TITLE
 Poliana Vidal Salgado	11 May 2024	Supervisor: Mike Baker, working within the Amira P1249 project	Characterisation and paragenesis of the Magdalena VHMS deposit, Spain
 Catherine Brown	2 September 2024	Supervisors: Rebecca Carey, Jeff Oalmann and Jess Trofimovs (QUT), working on understanding how volcanic rock properties influence gas and fluid escape during magma ascent.	Volcanic rock properties
 Shouchun Yu	4 September 2024	Supervisor: Jeff Steadman, working on the IOCG ³ project	Mineral geochemistry of IOCG deposits

VISITORS



Jason Dyer is a Masters student from Lakehead University in Canada who was at CODES for three months between June and August. He was here to complete analytical work with the P1249 team; he is working on the McFinley Au deposit on the Red Lake Belt, Ontario.



Nafiu Sulyman is a Masters student from Lakehead University, Canada, and is part of the Amira P1249 project. He is using pyrite mineral chemistry to create mineralisation vector and test fertility indicator tools at Red Lake Belt, Ontario. He worked with Dr Ivan Belousov and Dr Lejun Zhang between June and August here at CODES using our laser ablation facilities.



Chase Turner is a visiting Masters student from Lakehead University, who was here to complete analytical work with the P1249 team between June and August. He is working on the NW Expo lithocap in British Columbia.

PHDS MOVING ON UP

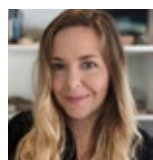


Hannah Moore has submitted her PhD thesis entitled 'Reconstructing eruption and transport processes of the 1886 Basaltic Plinian eruption at Tarawera Volcano, New Zealand' for examination. She is currently working at Australian Earth Science Education as Lead Educator (Primary Engagement) and is based in Perth, WA.

DEPARTURES



Maxwell Morissette resigned from his role as a Laboratory Analyst in the CODES Analytical Laboratories in June, and has moved to WA to work as a laboratory analyst at Glencore's Murrin Murrin facility.



Dr Valerie Yuleridge has temporarily left the CODES Analytical Laboratories to work at James Cook University, but is planning to return to work at the CAL labs in Hobart in the near future.

CHANGING ROLES/PROMOTIONS



Dr Jeff Oalmann has been confirmed in the role of Manager, CODES Analytical Laboratories following the departure of Dr Paul Olin in February. Congratulations Jeff!



Dr Jeff Steadman has been promoted to a Level C Academic (Senior Research Fellow) position with effect from 1 July 2024. Congratulations Jeff!



A MESSAGE FROM THE CODES DIRECTOR, PROFESSOR DAVID COOKE

Since the last newsletter, there have been many reasons to celebrate at CODES. The Critical and Strategic Metals Symposium in mid-July was designed to bring together key researchers across academia and government, as well as industry geologists, to stimulate discussions that moved beyond articulating society's urgent need for critical and strategic metals, and to progress the conversation into the origins, characteristics and exploration strategies for these deposits, as these are the critical issues facing our industry if we are to deliver on the demand for these new resources in order to meet the transition to a low carbon energy future. A huge thank you is owed to our keynote speaker Simon Jowitt and all of our invited presenters, who provided three days of stimulating and informative discourse that moved the conversations forward. Enormous gratitude is also owed to our early- and mid-career researchers who organised

this fantastic event – Yamila Cajal, Owen Missen, Sheree Armistead, Wei Hong, Paula Montoya and Lejun Zhang, and to our students and staff who gave oral and poster presentations, and who helped with organising the logistics of the event – your efforts were hugely appreciated!

As outlined elsewhere in the newsletter, our staff and students have been extremely successful over the past few months in winning grants and prizes. The major achievements of ARC funding success by Rebecca Carey and Sheree Armistead are stunning and very rare achievements that we are extremely proud of. I would also like to express my personal congratulations to CODES PhD students Angela Costa, Shannon Frey, Javier Gil, Giovana Pimentel, Jaime Osorio and Peerapong Sritangsirikul for their personal successes in winning SEG grants and conference prizes. Congratulations also to Jamie Osorio for his co-authorship of the prizewinning paper that was awarded the 2024 Brian J. Skinner Award by the SEG for the best paper published in *Economic Geology* in 2023. Also, kudos to Malai Ila'ava, whose recently published paper in *AJES* is currently the most viewed paper in that journal for the past 12 months, despite having been published only two months ago – well done Malai!

Although we had many successes over this period, I would also like to thank all of our staff and students who were unsuccessful in their grant applications – your efforts are greatly appreciated.

The rest of 2024 looks to be a very busy time for our team, with major participation by our staff and students at the SEG Conference in Namibia planned for late September, and for IAGS in Adelaide in October. There are a couple of major research initiatives in development, and our industry partners will be hearing from us very soon with regards to determining their interest in supporting these programs. Within our Masters program, the Brownfields Exploration course is coming up in October–November, and we will shortly distribute the flyer for the 2025 Ores in Magmatic Arcs – Indonesia field excursion, to be run in mid-March. Three new staff members are joining CODES Analytical Laboratories in the next month, and we should soon be advertising for a new Professor/Associate Professor in Economic Geology/Geochemistry/Geodata Science.

It looks like exciting times ahead for our team!

David Cooke

SAD NEWS: As we go to press, we have heard of the passing of Professor David H. Green; a full obituary will appear in our next newsletter.

UPCOMING SHORT COURSES

EXPLORATION IN BROWNFIELD TERRAINS (KEA710)

28 OCTOBER–2 NOVEMBER AND 18–22 NOVEMBER 2024

The compilation of large datasets that are common in areas of significant previous exploration can present a challenge for any geologist. This unit is lab-based and looks at exploration in and around mine sites where there is often abundant data. This unit will cover GIS applications, and the interpretation of geochemical and geophysical data at various scales. This information will be enhanced by practical exercises involving the integration of multiple datasets from world-class mineralised districts.

Unit leader: Dr Robert Scott

Delivery mode/location: Blended delivery (face-to-face and online)

ORES IN MAGMATIC ARCS (KEA707) 9–22 MARCH 2025 (INDONESIA)

A field-based unit, which includes visits to world-class deposits, studies of the regional and local geology, and detailed evaluations of ore deposit characteristics, mineralisation styles and genetic models. Exploration techniques are discussed and evaluated.

Unit leaders: Professor David Cooke, Dr Lejun Zhang

Delivery mode/location: Face-to-face, Indonesia

FUNDAMENTALS OF ECONOMIC GEOLOGY (KEA716)

APRIL–MAY 2025

This unit teaches the fundamental skills needed by all economic geologists. Key geological concepts, mineralogy, paragenesis, geochemistry and geophysical characteristics of ore-

forming environments, and the impact of these datasets on ore genesis and exploration are taught. The unit focusses on identifying and using key tools to recognise the sequence of events that have impacted ore-forming environments, and how these tools can be best used in an exploration context to solve exploration, mineral processing and environmental problems.

Unit leader: Professor David Cooke

Delivery mode/location: Online

For more details of all these courses: See the course flyers at: www.utas.edu.au/codes/masters-short-courses

For further information about short courses in general, please email: CODES.Info@utas.edu.au OR Master of Economic Geology Program Co-ordinator, Dr Robert Scott: Robert.Scott@utas.edu.au