

ORE SOLUTIONS

NEWSLETTER OF CODES CENTRE FOR ORE DEPOSIT AND EARTH SCIENCES

> SUMMER 2024 No.50

INTO AFRICA: CODES EXPLORES NEW INDUSTRY COLLABORATIONS



Team CODES: The SEG 2024 Conference on the theme of ‘Sustainable Mineral Exploration and Development’ was held in late September in Windhoek, Namibia. Nine CODES students and staff attended. They are (L–R): PhD students Nelao Natukondje Naimbale, Axel Cima, Poliana Vidal Salgado, Angela Costa, Damian Braize; staff members Dr Sheree Armistead and Professor David Cooke; Honorary staff member Dr David Selley and his daughter Frankie Selley, who is a geology undergraduate at the University of Melbourne. PhD student Victor Torres also attended. While in Africa CODES staff undertook field trips to mines and exploration projects.

A group of CODES researchers and PhD students travelled to Windhoek in Namibia in late September to attend the SEG 2024 Conference and showcase CODES’ ongoing research projects. The trip also provided a timely opportunity for three CODES staff to visit an important copper and nickel mining operation in Zambia and to see further exploration projects within the Central African Copperbelt while strengthening ties between CODES and industry players.

Dr Sheree Armistead, Professor David Cooke and Dr David Selley recently had the opportunity to visit the Central African Copperbelt, which stretches across Zambia and the Democratic Republic of Congo. Known for its vast sediment-hosted copper and cobalt deposits, this region plays an important role in meeting the rising global demand for copper and critical metals. The experience provided an opportunity to discuss a new sediment-hosted

Cu research initiative with potential industry partners.

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FROM THE DIRECTOR

Professor David Cooke outlines the achievements of CODES staff and students over the past three months. And he also acknowledges the contributions of our three new lab staff, and welcomes new postdoctoral researcher Zeb Zivkovic.

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Industry links: Dr Subaru Tsuru and Munshya Zimba with Dr David Selley and Dr Sheree Armistead at the First Quantum Minerals exploration site in Ndola, Zambia, to discuss the Fishtie deposit and future collaborations.

CODES is reinvigorating its sediment-hosted Cu research program through two key projects:

- Dr Sheree Armistead's recently announced Australian Research Council Discovery Early Career Researcher Award project, which will investigate the tectonic and climatic controls on sediment-hosted ore deposits in deep time, and
- a new industry-focused project investigating the application of resistate indicator minerals (RIMs) to exploration – a follow-up to the one-year Amira P1206 pilot project undertaken at CODES.

This field trip provided CODES researchers with the opportunity to discuss potential collaboration on both projects.

Prior to the SEG conference in Namibia, Sheree and David Cooke visited First Quantum Minerals' Trident project in Zambia, which includes the Sentinel Cu deposit and Enterprise Ni deposit. FQM geologists Tim Ireland, Ashleigh Ball, George Nkonde, Keith Sikabonga and Rob Sievwright provided an excellent overview of the deposits. Some of the highlights included seeing vaesite

mineralisation (NiS₂) and 'supposedly' hydrothermal kyanite. There was great discussion about the geology and geochemistry of these deposits, and how CODES and FQM may be able to collaborate in the future. Ashleigh works at FQM and is doing a Master of Economic Geology degree with CODES.

Following the SEG conference, Sheree and David Selley visited KoBold's Mingomba project and FQM's exploration projects on the eastern side of the Copperbelt. The high-grade Mingomba deposit provides a good case study to investigate apatite chemistry across zones with different Cu grades. A small sample suite was collected with the aim of providing new apatite chemistry data to build on the RIMs project. The visit to FQM mostly focused on the Fishtie deposit, comprising spectacular examples of the 'Grand Conglomerate', which is the glacial diamictite deposited during the Neoproterozoic Snowball Earth event. Munshya Zimba and Dr Subaru Tsuru provided an excellent overview of the deposit and stratigraphy. An online meeting with other FQM geologists provided another opportunity to discuss CODES' research initiatives.

JOIN US IN THIS RESEARCH

These field trips fostered valuable discussions on CODES' research and how the RIMs project can deliver substantial benefits to potential industry partners. The SEG conference also facilitated engagement with stakeholders, indicating strong support for the project's future. For more information, or to get involved, please reach out to the research team: www.utas.edu.au/codes/sediment-hosted-cu-research-at-codes

VALE 'PROF GREEN': A LIFE DEVOTED TO GEOLOGY

Professor David Headley Green, formerly head of the Geology Department at UTAS, passed away in September. Here, Dr Tony Crawford recalls 'Prof Green's' lifetime of extraordinary achievements, his passion for his subject and his role as mentor to many students.

Professor David Headley Green died peacefully on 14 September 2024 at Queenborough Rise Retirement Village in Hobart, aged 88, and only three months after the death of Helen, his beloved wife of 65 years. By any measure, David was one of Tasmania's greatest scientists, with a formidable list of achievements, awards, highly successful graduate students and post-doctoral fellows, and an international reputation as a leader in the field of experimental petrology, mafic magmatism and the Earth's upper mantle.

David was born on 29 February 1936 on the NW coast of Tasmania, growing up in Penguin, Devonport and Launceston, and one of a happy and close family of five children. School and family trips along the north coast of Tasmania stimulated a life-long passion for Earth sciences and led

David to undertake a BSc degree at the University of Tasmania, majoring in geology, with the Geology Department at the time under the leadership of legendary foundation Professor Sam Carey. Following an Honours project mapping an area around Beaconsfield, David worked for several years with the Commonwealth Government's Bureau of Mineral Resources (a predecessor of today's Geoscience Australia), taking a key role in mapping and studying mafic and ultramafic rocks in Papua New Guinea.

Following a PhD at Cambridge focused on the mafic-ultramafic Lizard Complex exposed along the SW coast of Cornwall in the UK, David was recruited to the staff of the relatively new Research School of Earth Sciences (RSES) at ANU in Canberra. The following 14 years, working with Professor Ted Ringwood, were perhaps the most fertile and productive in David's career. Application of new high-temperature, high-pressure experimental techniques using the piston-cylinder apparatus, and the electron microprobe, enabled David and colleagues to generate a series of



Professor David Green speaking at the University of Tasmania during an event held to celebrate the fiftieth anniversary of the Geology Department in 1996.

landmark papers on the mineralogy of the upper mantle, mantle processes and the controls on the generation and composition of basaltic magmas. David always warmly acknowledged the technical support and expertise of Bill Hibberson and Nick Ware as integral to the success of the RSES experimental petrology group.

The outstanding reputation of the experimental petrology research team at RSES led to an invitation from NASA to work on the petrogenesis of lunar mare basalts from Apollo 12, 15 and 17. In particular, David, Ted Ringwood and others between 1972 and 1975 published important papers on the nature and variation of primary mare magmas, and the depth and pressure of their site of generation/segregation in the lunar mantle.

Following the retirement of Sam Carey, David moved to the University of Tasmania in late 1976 as Professor and Head of Department, and immediately oversaw the construction of a new experimental petrology laboratory. Over the following 18 years, under David's keen guidance and with expert technical support from Keith Harris, this laboratory generated an exceptional research output, covering a broad range of themes to do with processes and products in the Earth, including the effects of different



'Prof Green' with his wife Helen pictured during a Geology Dinner at UTAS.

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volatiles on mantle melting and magma compositions, the generation and nature of low-degree mantle melts and carbonatites, and the petrogenesis of Archaean komatiites, primary island arc and backarc basin magmas, boninites, mid-ocean ridge basalts and ocean island (hotspot) magmas. Many of the UTAS PhD students and post-docs involved in this research have gone on to forge successful research careers around the world, and all attest to the central role David Green played in stimulating their interest, and in supporting them as a friend, teacher, mentor and colleague.

While at the University of Tasmania, David was a driving force in the establishment of IASOS (Institute of Antarctic and Southern Ocean Studies – the predecessor of the current IMAS (Institute of Marine and Antarctic Studies)), and in successfully attracting to UTAS the first Australian Secretariat of the Ocean Drilling Program, the premier global Earth sciences project. He also served as Chair of the Professorial Board, and as a member of the Australian Research Council’s Earth Sciences panel. David also appointed Ross Large to the Earth Sciences staff at UTAS in 1983, and supported Ross through the early days of setting up CODES, initially as a National Key Centre, then a National Special Research Centre, and eventually, as a National Centre of Excellence.

In 1994, David returned to ANU to take up the position as Director of the Research School of Earth Sciences, which he led until 2001, generating another series of quality research outcomes on the Earth’s mantle, mantle melting and primary magmas, and another cadre of post-graduates and post-doctoral fellows drawn from all over the globe. Following retirement, he continued as an active researcher, maintaining a steady stream of influential publications, including significant papers together with UTAS-based former PhD student and post-doc Trevor Falloon. During this period in Canberra, David also served for several years as Chief Science Adviser to the Department of the Arts, Sport, the Environment and Territories, advising the Australian Government on a wide range of matters including climate change and nuclear waste disposal.

His great affection for his home state saw David and Helen move back to Tasmania in December 2008, with David maintaining an office in the School of Earth Sciences and continuing as an active researcher well into his eighties. Several generations of post-graduate students and post-doctoral fellows, as well as a stream of international visiting researchers over some 40 years, experienced the warm hospitality of the Green family of eight, and enjoyed Helen’s vibrant and funny counterpoint to David’s more reserved nature.



Portrait of David Green taken for the CODES newsletter to mark his award of the Società Italiana di Mineralogia e Petrologia-Honorary Fellowship for 2021.

It is fitting to conclude with Lynton Jaques’ words from the scientific eulogy he presented at David’s funeral service at St David’s Cathedral in Hobart – “Thank you, David – Prof Green – for your huge scientific legacy, but equally for your interest in and care for the people whose lives you touched, and for your commitment and leadership in helping to make the world a better place.”

Tony Crawford (with thanks to David’s ex-UTAS ‘mentees’ Lynton Jaques, Greg Yaxley and Trevor Falloon)

CLASS OF 2024: HONOURS STUDENTS

With a small, but very important, cohort of Honours students in 2024, the year has been one of quality over quantity. Sarah Purdom finished mid-year and now works as an exploration geologist for Harmony Mines, while Bryce de Haan and William Grant are finalising their theses and will be moving on shortly to start their careers.



BRYCE DE HAAN

Supervisors: Jeffrey Steadman, Sebastien Meffre

Project title: *Paragenetic and geochemical characterisation of pyrite and magnetite from the E1 Group, Cloncurry district, Queensland*

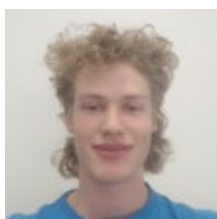
Funding: IOCG³ project

Bryce’s Honours project was focused on the E1 Group, which is a cluster of small iron oxide copper-gold (IOCG) deposits located in the Cloncurry district, NW Queensland. The Cloncurry district hosts multiple world-class

base and precious metal deposits, most notably the Ernest Henry IOCG deposit, which is located 8 km west of the E1 Group. Bryce investigated the petrography and paragenesis of pyrite and magnetite while also characterising their trace element chemistry to enable comparisons (and contrasts) with the published pyrite and magnetite parageneses and compositions from Ernest Henry. His work included the application of laser ablation–

inductively coupled plasma mass spectrometry (LA-ICP-MS), optical and scanning electron microscopy (SEM), and nanoscale secondary ionization mass spectrometry (NanoSIMS). The outcomes of this project will help provide a better understanding of the E1 Group mineralisation, including how it may relate to, or be distinct from, the large copper-gold resource 'next door' at Ernest Henry.

"My time studying at CODES has been a rewarding and enriching experience with exceptionally knowledgeable lecturers and academics, with too many highlights to share both in the classroom and the field! The best thing about studying Honours at CODES is being able to use the instruments that make the micro-scale observations and seeing it come together with the macro-scale observations."



WILLIAM GRANT

Supervisors: Michael Roach, Mark Duffett (MRT)

Project title: *Geophysical investigation into the geometry of dolerite intrusions on North Bruny Island, Tasmania*

Funding: MRT and Geological Society of Australia

Dolerite intrusions dominate the geology of southeast Tasmania; however, the full three-dimensional form of these intrusions is generally poorly understood. Due to their variable forms, traditional geological mapping often struggles to fully resolve their full geometry. Fortunately, however, the strong density and magnetic susceptibility contrasts between the dolerite and the sedimentary country rock mean the dolerites succumb to geophysical techniques. Will conducted a magnetic and gravity survey on North Bruny Island to resolve the geometry of dolerites there. This research will better inform our understanding of how the dolerite magma was emplaced, and may also be used to identify potential natural hydrogen reservoirs in the area.



Will Grant using a DGPS to acquire an accurate position and elevation of a gravity measurement on North Bruny. The sheep look on, confused as always.

"During my Honours year, I have learnt a tremendous amount; not just about dolerite but more broadly about how to do research and be a geologist. I feel privileged to be in the CODES environment, which supports and encourages all aspects of research and understanding."



SARAH PURDOM

Supervisors: Sebastien Meffre, Jeffrey Steadman

Project title: *Genesis of a possible intrusion-related gold system near Stawell, Victoria*

Funding: Waratah Minerals

The White Rabbit Diorite is an Early Devonian intermediate to felsic granitoid intrusion located on the Moyston Fault, a major lithospheric boundary between the Lachlan and Delamerian-Ross Orogens. In 2023 several historic surface prospects in the diorite were drilled revealing extensive hydrothermally altered rocks. These rocks were studied by Sarah Purdom during her Honours project. Sarah used whole-rock geochemistry, U-Pb LA-ICP-MS detrital and magmatic U-Pb zircon dating, and LA-ICP-MS pyrite mapping to investigate the age, crystallisation history, source rocks, mineralisation and the relationship of the Diorite with other Lachlan Orogen granitoids. Her fieldwork consisted of two weeks in

Stawell (Western Victoria) to log and collect samples of the eight diamond drill holes used in the project.

Granitoid intrusions in the western Lachlan Orogen have historically been understudied, and so this knowledge will inform future exploration and the geological history of IRGS systems within the Lachlan Orogen.

Sarah is currently working as an exploration geologist on the Harmony Mines Eva Copper Project in Cloncurry, and loves the variety of rocks and fieldwork available in the area.

"I am incredibly grateful to have been able to study at CODES alongside other incredible students, and to learn from some of the best researchers in the field. This experience has equipped me with the knowledge, skills, and confidence to help me stand out and succeed in my career."



Sarah Purdom undertaking a regional exploration project at her new job as exploration geologist at Harmony Mines (Photo: Dylan Jeffriess, Principal Geologist at Harmony Mines).

MINERAL EXPLORATION: EMPOWERING THE NEXT GENERATION OF ECONOMIC GEOLOGISTS

Senior Lecturer in Economic Geology, Dr Lejun Zhang, outlines a new approach to third-year Earth Sciences teaching in 2024. Taking the students into industry settings is proving popular.

KEA343 Mineral Exploration, one of the foundation third-year units in the Earth Sciences program at UTAS, is designed to introduce students to real-world exploration challenges and equip them with the tools to succeed in the mineral exploration industry. This year, we introduced the cohort to active exploration project-based industry engagement activities in collaboration with Bluestone Mines Tasmania in the Renison Bell tin district on the West Coast.

Through this real-world exploration practical exercise, students gained hands-on experience conducting soil sampling and magnetic, radiometric and IP surveys along exploration lines recently prepared for an electromagnetic survey. These activities provided invaluable insights into the practical aspects of mineral exploration, allowing students to apply their academic knowledge directly to industry practices.

The Bluestone Mines Tasmania team expressed their excitement about the collaboration:



On-site experience: KEA343 students and staff pose for a group photo during a visit to the West Coast of Tasmania to work on real-world exploration exercises in collaboration with Bluestone Mines Tasmania. Dr Lejun Zhang is front row, far left.

"It was inspiring to see Tasmania's next generation of geologists in action! We welcomed the opportunity to offer students on-site experience and insight into how their studies can lead to rewarding careers. We wish them the best of luck with the rest of their studies."

The course also connects students with industry professionals, with guest speakers such as Adi Maryono from J-Resources in Indonesia, Josh Phillips from JP Geoscience, and Andrew McNeill from Mineral Resources Tasmania sharing their knowledge and experience. These opportunities expand students' understanding of career pathways and provide critical networking opportunities.

The future looks bright for this year's cohort. Several students have already secured summer vacation roles with leading companies, such as First Quantum Minerals (FQM), Fortescue Metals Group (FMG), and Bluestone Mines Tasmania. Others will continue their academic journey by pursuing Honours research, setting the stage for impactful careers in both industry and academia.

KEA343 is more than just a course. It is a base for future economic geologists. By combining practical experience, industry exposure, and professional connections, it equips students to transition confidently into the workforce and contribute meaningfully to the future of mineral exploration.

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





New staff for the CODES Analytical Laboratories (L-R): Dr Alice MacDonald, Dr Carlos Carrasco Godoy and Dr Jack Ward in one of the CODES laser ablation laboratories (Lab E) are ready to take on their new roles.

NEW STAFF FOR CODES ANALYTICAL LABS

CODES Analytical Laboratories has recently appointed three new staff members to help tackle the demand for mineral analyses from industry and academia, as well as from our numerous research projects. Dr Jeff Oalmann, Manager of CAL, has been busy conducting lab inductions and familiarising the newcomers with the CODES environment. Each of them here explains a little of their background and what brought them to CODES.

DR CARLOS CARRASCO GODOY **Lead Laboratory Analyst**

I am originally from Chile, where I studied geology at the University of Concepcion and became interested in economic geology and petrology. I did my Honours thesis on the vectoring of a porphyry copper deposit prospect in northern Chile. After this, I continued to work in mineral exploration of porphyry copper, IOCG and exotic copper deposits in the same region. At the end of 2017, I moved to Canberra to do a Masters by

research (MPhil) at the ANU, where I studied the ultra-trace platinum group elements (PGE) geochemistry of the Centinela District in northern Chile. During this time, I learnt many things that were completely new to me: I got into a lab to do wet chemistry and analyse samples in the ICP-MS and SHRIMP, things that I would have never imagined back home. I also got into computer programming, which has been a great tool to get through my research career.

After finishing my Masters, I continued with a PhD, which considered the PGE element geochemistry of the Galore Creek Porphyry copper deposit in Canada, but the COVID-19 outbreak made it extremely difficult to do the field and lab work necessary for that project, so I had to change my research topic. I got very interested in zircon geochemistry applied to ore deposits during my MPhil, so I shifted my PhD in that direction. I compiled a global zircon geochemical and geochronological database which I used to develop methods to calculate

missing data and models to predict zircon fertility. For the last part of my PhD, I tested the models I built on zircons I collected from the Loa River basin, in northern Chile, which includes well-known porphyry copper deposits from different ages and sizes. Surprisingly, I also managed to collect most of the data needed for the Galore Creek project, but it is far from seeing any light yet.

After submitting my PhD thesis, I joined the timescales for mineral system groups at Curtin University for a short time, before moving to Hobart as the Lead Laboratory Analyst at the CODES Analytical Laboratories. I am very excited about starting this position and having the opportunity to develop my career in a state-of-the-art laboratory supported by a great team. I am looking forward to learning, collaborating and supporting all the exciting research done by everyone at CODES and the Earth Sciences department. If you want to know a bit more about me, you can check out my website at <https://cicarrascog.github.io/>

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DR ALICE MACDONALD**Laboratory Analyst**

I grew up in the Northern Rivers, New South Wales, and moved to Canberra where I completed my undergraduate studies at ANU. During this time, I did an Honours research project investigating rare earth element partitioning between garnet and clinopyroxene in the upper mantle, using high-pressure experimental samples in conjunction with peridotites from the Pali Aike volcanic field. Following this, I moved to Brisbane, where I completed a PhD earlier this year at the University of Queensland.

My research investigated how clinopyroxene compositional and textural variations are influenced by magmatic processes, with a particular focus on magma undercooling and sector zoning. I used a combination of experimentally produced crystals and natural samples erupted from Mt Etna, Italy, to explore how crystals with complex zoning can provide crucial insights into pre-eruptive magmatic processes and dynamics. Throughout this project, I used a range of analytical techniques, including LA-ICP-MS compositional mapping, and was involved in developing new methods in the laboratory. Following the completion of my PhD, I briefly worked in the Radiogenic Isotope Facility at the University of Queensland as a casual senior laboratory technician, where I analysed a range of minerals, including carbonates, using LA-ICP-MS and LA-MC-ICP-MS.

Broadly, my main research interests are igneous petrology, geochemistry and volcanology. Specifically, I am interested in how mineral chemistry, textures and compositional zoning can record crystallisation conditions, particularly in active volcanic systems.

In my new position in the CODES Analytical Laboratories, I am looking forward to improving my LA-ICP-MS skills, learning new data reduction techniques, improving and developing analytical techniques, and being involved in the research conducted at CODES.

DR JACK WARD**Assistant Laboratory Analyst**

I grew up in Cairns, Queensland, and completed the University of Queensland's BAdvSc(Hons) program in 2018. I was awarded my PhD (which I also completed at the University of Queensland) earlier this year. For my Honours project, I collected REE data from carbonate successions in the Northern Territory, South Australia and Tasmania to reconstruct secular changes in ocean chemistry, especially those relevant to redox conditions, during Neoproterozoic time. I shifted focus during my PhD to explore how complex subduction processes (such as slab tearing and the interaction of slabs with the mantle transition zone) lead to the formation of spatially and geochemically 'anomalous' volcanoes in arc and intraplate settings, as well as porphyry ore deposits in island arcs. To test my PhD hypotheses, I modelled slab geometry using a variety of geophysical data sets (although I must admit, I have a soft spot for seismic tomography) and assessed mantle source compositions, melting mechanisms, and crustal plumbing system anatomy by evaluating whole rock and mineral chemistry data. I was also fortunate to work at Rio Tinto for a period during my PhD, where I concentrated on IOCG exploration in the Mount Isa Inlier's Eastern Succession.

I am incredibly grateful for the opportunity to join CODES as an Assistant Laboratory Analyst. My short time here has been thoroughly enjoyable, and I have already learned a lot under the guidance of Jeff Oalman and Ivan Belousov. Aside from improving my analytical skills, I look forward to expanding my geoscience domain knowledge by working across the diverse array of research projects active at CODES. The lab group's innovative R&D projects are also fascinating, and I am keen to contribute to technique development and optimisation of analytical approaches.

I have admired CODES' work for many years and am eager to start new research collaborations with (and learn from) CODES personnel.

I have many ideas and future projects that I would like to pursue, and I look forward to discussing these with everybody. I am especially interested in understanding how slab tearing contributes to the genesis of porphyry Cu deposits in island arcs. I have begun applying the geophysical-geochemical method from my PhD to Pliocene-Holocene porphyry systems in Papua New Guinea and the Philippines, and the preliminary results are very promising. I am extremely excited about my future at CODES!

Dr Jeff Oalman, Manager of the Codes Analytical Laboratories, welcomes our new staff and outlines the new techniques and advances the team is looking forward to using.

The CAL team is thrilled to welcome our three new staff members: Carlos, Alice, and Jack. They bring a wealth of analytical and geological expertise and are eager to contribute to the team's success. After being understaffed for much of this year, CAL is once again fully equipped to deliver the high-quality analytical services and fast turnaround times our partners expect.

We are actively implementing and advancing cutting-edge microanalytical techniques, particularly in laser ablation ICP-MS analyses. Automating workflows for our most common analyses has recently become a focus of our efforts. Additionally, we are pushing the boundaries of analytical techniques using advanced technology. Recent advances include rapid elemental mapping of minerals using time-of-flight laser ablation ICP-MS and adding new geochronological techniques to our list of services (e.g., Lu-Hf dating of garnet and apatite and U-Pb dating of tungstate minerals). Developing new reference materials, investigating the fundamentals of laser ablation and mass spectrometry, and refining methods for trace element analyses remain central to our mission of driving innovation in microanalytical services.

As we embark on this next chapter in geoanalysis here in Tasmania, we are eager to collaborate with all of you from UTAS and elsewhere in academia, government, and industry. Providing the analytical support you require is at the heart of what drives our efforts and dedication.

BRINGING HOME THE GOLD AT AusIMM

In September, 12 members of the AusIMM Tasmania Student Chapter attended the AusIMM New Leader's Summit and National Mining Games in Brisbane.

The Summit highlighted key discussions on topics like artificial intelligence, workforce transformation, and sustainable mining practices. It offered members a valuable opportunity to engage with emerging industry trends and to network with fellow mining students from across Australia.

The National Mining Games were also a great success, with the Chapter competing for the first time in almost seven years by sending two teams. They took part in track set, mucking, swede saw, survey, rock identification, panning, airleg and blast face. We were very proud to see our men's team take home gold in rock identification, and



Members of the AusIMM Tasmania Student Chapter, who are drawn from the UTAS disciplines of geology, engineering and geospatial/surveying, pictured with the gold medals they won at the National Mining Games in September. (Photo: Shaun Moon Photography)

our women's team take home gold in track set, and place second overall in the women's division. The teamwork,

camaraderie and spirit of friendly competition made it an unforgettable experience for the Tassie team.

AIG AWARD FOR TONY WEBSTER

In October, CODES-ES honorary staff member Dr Tony Webster was recognised by the Australian Institute of Geoscientists (AIG) Tasmania Branch with a Distinguished Service Award, which was presented to him at an event at the Hope & Anchor Hotel in Hobart.

Vice Chair of AIG-Tas Jane Capp described how Tony's involvement and ongoing commitment to multiple professional groups helped to link them all, particularly through the sharing and cross-promotion of events, which has been very important in a state with small membership numbers compared to Earth sciences and industry colleagues interstate.

Within the AIG committee, Tony has played the role of the 'mentor you have when you don't have a mentor'. He has offered guidance on how professional organisations should run and has



Tony Webster was presented with his AIG Award at the Hope & Anchor Hotel in Hobart. Present were (L-R, back row): John Bishop, Travis Holmes, Josh Phillips, Mark Duffett, Jane Capp (deputy chair, AIG-TAS), Paul Heath (Treasurer, AIG-Tas), Julie Hunt; (front row) Mrs Cartwright, Rhona Cartwright (Chair, Tas-AIG, with baby Eleanora Peggy Mure), Tony Webster and Noel Kemp. (Photo: Zoe Kemp)

played a crucial part in allowing 'newer' committee members to be forward looking, and has played a vital role in changing how the branch does things. Jane went on to say that Tony has been/ is a mentor to UTAS, UQ and WA School of Mines students, as well as to students attending seminars and workshops (particularly the CODES Master of Economic Geology short courses).

Along with Dr John Bishop, Tony has given us the Hobart Exploration Discussion Group (HEDG), which

meets on an ad-hoc basis to explore Hobart's classic pubs and landmarks. It is very popular with many in the industry who just want a beer and a chat. Tony supports the promotion of geoscience within the community with his tours in Hobart, on the Tassie West Coast and at The Rocks in Sydney. On these tours Tony provides an opportunity to learn about early colonial settlement, landscapes, geology, history and mining.

IZZY AND THE SECRET CHAMBER OF ROCKS



Rock Curator Izzy von Lichtan pictured among the thousands of trays of rock specimens held in the compactus section of the Rock Library at Earth Sciences/CODES on the Sandy Bay campus.

Izzy von Lichtan has worked in the Rock Library as its curator for more than two decades...although the library's location isn't exactly secret, it is pretty tucked away and secure. Here she lifts the lid on what she spends her time doing there – and tells us a little about her many and varied interests outside UTAS.

I have been working for Earth Sciences and CODES in the position of curator, managing the rock collection, for almost 21 years. I was in the process of completing my Master of Science from the University of Otago, when I took up the position. My research was on the hot emplacement of giant rafted pumice, the sedimentological responses to the eruption, geohazards, and with the use of palaeomagnetism to prove that they were indeed emplaced hot (only a theory at the time). Since then, I have had to extend my knowledge greatly whilst working at UTAS – especially into palaeontology and ore deposit rocks, to be able to better understand the rocks that I manage.

The Earth Sciences and CODES collections were originally established, in their current location, by Professor Sam Carey and Dr Max Banks in the early 1960s. The total number of catalogued entries is now over 190,000; an entry can have several specimens associated with it. These are all manually catalogued and stored on a rolling compactus system on site, in such a manner that they are easily accessible for a multitude of purposes – research, teaching, loans, display. The type/holotype/and paratype collection is housed separately in a fireproof safe vault room in conditions of constant temperature and humidity. Our collections are sought after worldwide for research purposes and I complete all aspects of obtaining a listing of the required specimens; retrieving, packing and dispatching; follow-up to ensure their return; re-storing, either in the main collection or in the safe vault; and updating the catalogue information.

The collection is a useful tool as it has samples from many locations that are hard to access (e.g., national parks,

Antarctica, places of conflict), or in instances where the areas no longer exist (e.g., from mines that no longer exist). The majority of our collections are submitted by Honours and PhD graduates, postdoctoral fellows, and academic staff, so I liaise closely with them to present all the relevant information for cataloguing.

An integral part of my position as curator has been to network with the wider community, councils and other government departments, the business community, MRT, TMAG, the Museum of Australia, and other museums, schools and colleges, other university departments and other universities, both interstate and overseas.

I also liaise with lecturers about teaching materials that the collection may have to best enhance their teaching themes. Creating displays is also part of my role.

I really enjoy my job as curator, it is very varied and requires me to be multi-skilled. Every day I am not quite sure what will greet me when I come through the door.

VOLUNTEER AND COMMUNITY WORK

I have been a member of the 501st Legion since 2011; this is a worldwide volunteer network that uses movie-accurate Star Wars costumes to help raise awareness and money for various charitable organisations. Most of these are children-focused, such as the Starlight Foundation and Make-A-Wish Foundation.

HOBBIES AND INTERESTS

My current geological interests continue to lie in the volcanological realm, but I am also fascinated by the history and use of mineral and rock pigments with art, very much a blending of my interest of science and arts.

I work in a range of mediums from photography to film, painting, drawing, puppetry and mixed media. Art continues to be essential to me even though I work part-time as a geologist and lecturer. I try to spend much of my free time involved with creative projects.

The most notable projects I have worked on include building three 18-foot scientifically accurate replicas of the Tasmanian cave spider as part of the Bookend Trust's *Sixteen Legs* film



Izzy is well-known for her charity work in which she appears as various Star Wars characters for the 501st Legion. Here she is seen as a Scout Trooper sitting at the Director of CODES' desk. Izzy makes these outfits herself from scratch. The alternative caption for this photo is: 'Dave has called for reinforcements'.

and exhibition program. The exhibition featuring the spiders has toured across Australia, including Dark Mofo and the Australia Museum, and to the USA. The other project is constructing and

puppeteering of a large puppet fern in a local professional film production, *A Green Affair*, which so far has received a number of laurels at a series of international film festivals.



In her spare time Izzy likes to get creative; she is seen here with an 18-foot-long scientifically accurate replica of a Tasmanian cave spider that she made for an exhibition and film.

WHERE ARE THEY NOW?

Peter Willems is living the dream in Western Australia. His BSc majoring in Geology at UTAS has led to geologist roles at Sandfire Resources that include international travel, and he is also one of the movers and shakers behind the Perth Gem and Mineral Show. Now he's going to star in *Outback Crystal Hunters*, a television documentary series that follows treasure hunters in their search for rare crystals and minerals.

HUNTER AND COLLECTOR



PETER WILLEMS

**Senior Technical Geologist,
Sandfire Resources based in Perth**

**Bachelor of Science majoring
in Geology, completed 2014.**

What is your current job/ employment and your work responsibilities?

Senior Technical Geologist based in Sandfire Resources' Perth office. Responsible for managing geoscientific datasets and best practice for 3D modelling of geology and mineralisation, predominantly focused on our Botswanan operations currently.

What are the things you enjoy most about this role?

I enjoy the technical challenges of working toward understanding complex and exotic orebodies, in a company which is supportive of the many ventures and projects that pop up in my personal life.

How did you get there/your past roles and how they shaped your path?

I started out as a Mine Geologist at Sandfire's DeGrussa Copper Mine in 2017, after working in gold mining and exploration for a couple of years post-graduation. At DeGrussa, I had some wonderful development opportunities, including a Geotechnical Engineering secondment, fault and mineralisation modelling, mine-to-mill grade control and reconciliation processes, remnant mining and orebody extension work, and mineral heritage preservation efforts.

As DeGrussa was in its final year of production, I was fortunate to be offered a technical position in Sandfire's corporate office in Perth, providing support to the global exploration teams. Around mid-2023 it was recognised that the geology models at our Botswana operations required some attention, and my work has been focused there since then.

Your career highpoint/greatest achievement to date/source of greatest satisfaction as a geologist?

The greatest satisfaction I achieve from my job is real life reconciliation of 3D geology models. A large part of my job over the past four or five years has been building 3D models and it is fantastic to see these models stand up through follow-up mapping, drilling campaigns and mining. This has included interstate and international travel, most notably several trips to our operations in Botswana.

What did you specialise in at CODES and how did CODES help you to get where you are? What did you enjoy most about CODES?

I completed an undergraduate degree at CODES and as such did not specialise in anything per se. CODES, however, set me up with an excellent foundation of geological understanding prior to entering the mining industry. I look forward to further study at CODES in the (hopefully near) future.



A promotional shot from the *Outback Crystal Hunters* documentary series, in which Peter Willems is featured. This episode was shot in Tasmania while searching for crocoite. (Photo: Courtesy of Prospero Productions)

How has the industry changed since you were at CODES? And how do you see it developing in the future?

At one point when I was graduating, there were three geologist jobs advertised on Seek.com.au. A far stretch from close to 1,000 jobs advertised at times over the past couple of years! The cyclical nature of the industry was discussed through my degree, and it's been interesting to see a cycle in action. It will be interesting to see what the next few years have in store for us!

Words of wisdom for up-and-coming geologists graduating from CODES.

There is no linear or standard career path; say yes to as many opportunities as you can, you never know where one may lead; if you choose not to do Honours, be prepared to work very hard early in your career; try not to hold a firm expectation of what your career will look like – mine looks nothing like I thought it would and I wouldn't change a thing.

Little-known facts about you

In 2020 I led a committee to launch the first large-scale gem and mineral show in Western Australia, on behalf of the Mineralogical Society of Western Australia. Four years and a venue change later we have recently run the fourth edition of the Perth Gem and Mineral Show, at the Perth Convention and Exhibition Centre. The Perth Gem and Mineral Show features gem and mineral dealers, geoscience communicators, and industry professionals and sets out to bring a multitude of different communities together under one roof. Most importantly, the Show aims to inspire the next generation of geoscientists, with typically 20–30% of the ~7,000 show patrons being school-aged kids.

During the Show we run a seminar series, which ranges from academic lectures through to interactive activities for kids. We also run a 'Charity Rocks' sundowner auction. We have raised ~\$15,000 per year for various charities through these auctions. Through Sandfire's involvement in the Show over its first three years, mineral samples from DeGrussa were organised to be sold to members of the public.



Man at work: Peter Willems reviewing mineralisation in a diamond drill hole at Sandfire's Motheo Hub, Botswana, in March 2024.



Peter Willems in the Northern Territory pictured while extracting azurite disc samples hosted in white, kaolinitised siltstone from the small-scale copper mine he runs there. These discs are colloquially known as 'azurite suns'.

Sale of these samples raised ~\$37,000 over the three events, the full sum of which was donated to various charity or remote community initiatives.

In my spare time over the past few years, I have been fortunate to co-run a small-scale underground copper mine in the Northern Territory. Mining focuses on extracting sediment-hosted azurite disc samples, hosted in white, kaolinitised siltstone. Samples from the mine are colloquially known as 'azurite suns'. It was around the campfire at the mine one year that the idea of a

tv series came to life. *Outback Crystal Hunters* was officially launched on the Discovery network in Europe and 7Mate network in Australia this year, where you will see me mining crocoite on the West Coast of Tasmania, and gem tourmaline in the Southern Goldfields of Western Australia.

I have been President of the Mineralogical Society of Western Australia since September 2021 and have chaired the Perth Gem and Mineral Show Committee from inception (June 2020) until the present.

JAPAN: CALDERAS, CULTURE AND CAMARADARIE



CODES and University of Kyushu SEG Student Chapter members pictured at the Kumamoto Earthquake Museum during their tour of geological sites of importance in Japan. Dr Mizuki Ishida (front left, wearing black) is thanked for all the organisational and leadership help she provided for the trip.

CODES SEG Student Chapter President AXEL CIMA recalls highlights from the group's recent field trip to Japan, which saw the students visit several outstanding geological sites in the north and south of the country. They were also able to meet with sister SEG groups from Kyushu University and Akita University as well as former CODES PhD student Professor Andrea Angangi, who is now based in Japan.

Our recent field trip to Japan, organised by the SEG Student Chapter, was an unforgettable experience that expanded our understanding of geology, exploration and Japanese culture. In September 2024, we

embarked on this journey with a group of 11 students, accompanied by Professor David Cooke and seven industry participants from Newmont, Gold Road, AngloGold Ashanti and Lakeside Minerals. Our itinerary included visits to Kyushu Island and the Akita region in Northern Honshu, both rich in volcanic and economic geology sites.

In Kyushu, Dr Mizuki Ishida, a Japanese researcher currently working at the Natural History Museum (UK), along with Dr Akane Ito and Professor Kotaro Yonezu from Kyushu University, helped organise this leg of the trip. We began our journey at Kyushu University, where we met the local SEG Student Chapter

and our co-leaders, and participated in lectures and introductory talks to set the stage for the trip.

The group visited prominent geological sites such as Kagoshima Volcano and Kirishima geothermal pools as well as the giant Aso Caldera and some of its volcano-sedimentary-related limonite deposits. In the Hishikari district we were fortunate enough to visit one of Japan Gold's low-sulfidation epithermal targets which allowed us to understand the exploration approach to this deposit in the field. Additionally, we visited two small high-sulfidation epithermal mines in the south of the island, which provided invaluable

learning experiences. We also explored a geothermal power plant and an earthquake museum, which expanded our understanding of the natural hazards Japan faces and how Japan harnesses geothermal energy. A highlight of this leg was a cultural immersion, where we visited a shochu and sake brewery located in a historic underground gold mine, and experienced sandbathing in geothermally heated sands.

During the Akita leg of the trip, Professor Andrea Agangi from Akita University (a former CODES PhD student) hosted us. We had the privilege of attending a lecture by Professor Yasushi Watanabe and interacting with students from the SEG Akita Student Chapter during our visit to the university, where we also toured their impressive museum. This part of the trip focused on understanding the geological successions where Kuroko deposits were first described back in the 1970s, and we visited some of the remaining abandoned deposits in the area. The visit to active geothermal fields, with fumaroles and mud pools, added a unique dimension to our experience. Professor David Cooke's insights were crucial to understanding the various geothermal and epithermal environments we encountered.

This incredible journey was made possible through the support of our SEG Student Chapter committee and co-organisers Vinicius da Cruz, Arka Sahu and Jaime Osorio. We would also like to extend our gratitude to our Platinum Sponsor, Newmont Australia Ltd; the SEG Wallace Fund; and all our industry participants for their financial contributions.

Lastly, a heartfelt thank you to the outgoing committee members, including Vice President Arka Sahu, Treasurer Giovana Oliveira Pimentel, and Secretary Fuseini Atanga, for their dedication. We look forward to the new ideas and energy the next generation of the committee will bring, and we hope to see many more field trips like this in the future.



Here the trip participants are looking at a geological map of Aso Volcano while standing at the lookout in the volcano's outer caldera.



CODES PhD students Fuseini Atanga, Angela Costa and Damian Braize with Tom (in blue, AngloGold Ashanti) examining the alteration and silica sinter from a Japan Gold project.

ALL IN A DAY'S WORK

In September, several CODES staff and PhD students attended the annual SEG conference, which was held in Windhoek, Namibia. In conjunction with this event, several people carried out fieldwork in Zambia. Staff and students also visited the West Coast of Tasmania, Spain, Africa and the USA for fieldwork.

ZAMBIA

September 2024

CODES researchers Dr Sheree Armistead, Professor David Cooke and Dr David Selley recently conducted fieldwork in Zambia's Central African Copperbelt, a globally significant copper and cobalt mining region. Known for its sediment-hosted ore deposits, the Copperbelt hosts rich copper mineralisation in Neoproterozoic rock formations. The team examined First Quantum Minerals' Trident project, focusing on the Sentinel copper and Enterprise nickel deposits, where they observed unusual features such as vaesite mineralisation (NiS₂) and hydrothermal kyanite. They also visited KoBold's Mingomba deposit, which holds high-grade copper zones, and viewed drill core from First Quantum's Fishtie deposit, showcasing glacial diamictite from the 'Snowball Earth' period. These visits provided opportunities to observe unique mineralisation and discuss potential collaborations.



Fieldwork at the Old Pelion Copper Mine in the Cradle Mountain–Lake St Clair National Park to investigate links between the Proterozoic Tyennan domain and the Rocky Cape Group took place in September.



CODES geologists visited Nevada in October 2024 to carry out fieldwork on an active exploration site text for the Amira P1249 project.

TASMANIA

August 2024

During recent fieldwork at Cradle Mountain–Lake St Clair National Park, UTAS researchers Dr Sheree Armistead, Professor Sebastien Meffre and student Ariann Spencer Washbourne collected samples from the Old Pelion Copper Mine to investigate links between the Proterozoic Tyennan domain and the Rocky Cape Group. After a four-hour hike and overnight stay at New Pelion Hut, the team reached Old Pelion Mine, collecting sulphides from fault zones with galena, pyrite and sphalerite. The folded Mesoproterozoic quartzite, schist, and siltstone host rocks offered insights into the area's complex geology. These findings will help researchers explore potential links between the Tyennan Element and northwest Tasmania, offering clues to ancient tectonic connections. This research forms part of Dr Armistead and Professor Meffre's collaborative research with Geoscience Australia and Mineral Resources Tasmania, to understand the temporal constraints on metallogenesis in Tasmania.

USA

October 2024

In late October, Lejun Zhang, Jamie Osorio and David Cooke spent two weeks in Nevada working closely with

exploration geologists from AngloGold Ashanti (AGA) on an active exploration site test for the Amira P1249 research project. This site test is a variation of our well-established blind site tests, wherein the research team collaborates closely with industry partners to design and implement a sampling and testing program at an active exploration site. The test is designed to provide all project sponsors with a real-world test of the effectiveness of the P1249 Explorer's Toolbox. AngloGold Ashanti is thanked for their very strong support of the field campaign, which involved up to 11 AGA exploration geologists working closely with the CODES researchers to conduct sampling over a large exploration tenement to facilitate detailed testing of sample material to assess its mineralisation potential and to identify the most prospective areas for detailed exploration.

The field campaign was very successful, with a large, well-distributed suite of samples collected now on their way back to Hobart for detailed analysis. AGA's support was hugely beneficial to the achievements of the field campaign and has set us up well for an in-depth testing of the P1249 exploration toolbox. We thank all the AGA team members for their amazing support, hard work in the field, and insights, which all combined to make the field campaign such a success.

END OF AN ERA AT MRT AND CODES

At the end of 2024, two stalwarts of the Tasmanian Government agency Mineral Resources Tasmania (MRT), who both have long associations with CODES, will retire from their roles. David reflects on his work at MRT and collaborations with UTAS, while Andrew explains why he came to work at CODES. Andrew's PhD supervisor at UTAS, Dr Ron Berry, adds a note of appreciation.

DR DAVID GREEN

As part of my PhD in metamorphic petrology at Otago University, I came to Tasmania in 1986 to use (the real) David Green's famous high pressure petrology lab. It was a good first day in Hobart: I met both the girl I later married and my best man (he's in the photo, actually). At UTAS, I particularly enjoyed the tearoom, where staff, graduates and undergraduates mixed in a cacophony of level banter. I still love that tearoom.

On returning to Tasmania in 1992, I spent a couple of years getting lost in the Rosebery mine. It was now decision time: continue in mineral exploration, return to academia with a postdoc in New Zealand's Southern Alps or step sideways into government. I'm glad to say that I've loved government, especially navigating the greyness: there's never a black and white solution. The tensions between public good and government good, between research and service and between efficiency and principle pulled strongly, and I've relished attempting the 'frank and fearless' path.

In working with CODES, I've seen similar tensions, between school and faculty, between teaching and research, and between pure and applied science, and it's been exciting to hail the search for industry's magic bullets. I think that appreciating our differences as much as our similarities has led to consistently valued and



Dr Andrew McNeill (left) will retire from the role of Chief Government Geologist at MRT at the end of this year. And MRT Senior Geologist Dr David Green will also retire from his role. Andrew worked for many years at CODES and David has had a long association with CODES' research projects.

respected cooperation. I once had to document the then current MRT–CODES collaborations, coming up with 62 – and that's just the official ones. I'm sure that level of cooperation has only grown, and I hope it will continue to do so.

MRT and CODES have given me the opportunity to appreciate the incredible integrity of colleagues and scientists, gave me countless opportunities to be delightfully intellectually challenged and the enthusiasm to encourage others.

It's been a brilliant playground, and I thank everyone that I've had the pleasure to share it with.

DR ANDREW MCNEILL

To be honest I never planned, or particularly wanted, to be a geologist – it just happened. I did first-year geology as UTAS because I thought it would be easy. I discovered it was more interesting than the other subjects I needed to do to become a science teacher, and after a very unenjoyable teaching placement, geology started looking like a good option. That I stuck with geology as an undergraduate was largely a result of the enthusiasm of the teaching staff, postgraduate students and postdocs at Earth Sciences and later CODES. They were supportive, if in some cases slightly eccentric, and

encouraged me to do Honours (1985, including a thesis on the metamorphic rocks at Nye Bay) and then, after a break working in industry, a PhD (on mafic rocks).

Choosing geology has led to a very enjoyable and rewarding career, diverse both in geography, from ODP cruises in the East Pacific to fieldwork in Siberia, and the type of work I've done, from studying sulphide melt inclusions in olivines to writing briefings and speech note for the resources minister.

For the past 35 years I have had an involvement with CODES, initially as a PhD student and now as a representative on the Advisory Board. It's been something of a constant in my professional life, and I've really appreciated the resulting broad education and experience, that has opened up opportunities to work not just in industry, but also in academia and government.

The link with CODES has also led to long-lasting friendships and working collaborations –something I've really appreciated, and, like David, I have very fond memories of the banter and discussions in the tearoom. Thanks to everyone one I've worked with, and I look forward to keeping in touch with what's happening at CODES.

CONTINUED ON PAGE 20

COLLABORATION AND NETWORKING THE KEY

Once again, CODES staff and students have been out in force, presenting papers, displaying posters, discussing collaboration and staying abreast of the latest research at conferences across the world. Below are the main events at which CODES has had a presence over the past few months.

2024 INTERNATIONAL NI-CU SYMPOSIUM

6–8 August 2024, Thunder Bay, Canada

This symposium featured three days of technical sessions at Lakehead University. Two CODES PhD students, Giovana Pimentel and Jose Luis Barillas Diaz, were awarded student travel grants to attend. Jose gave a presentation on his research project 'Mineral geochemistry and textural relations of Ni sulfides and Co arsenides ores from the atypical Avebury nickel deposit, western Tasmania, Australia'. The symposium provided an excellent opportunity for both students to connect with other students, researchers, and industry professionals working with Ni-Cu-PGE deposits.

GOLDSCHMIDT

18–23 August 2024, Chicago, USA

The 2024 edition of Goldschmidt wrapped up in style at the Hilton Hotel in downtown Chicago. CODES Senior Research Fellow Jeff Steadman attended and delivered a presentation (co-authored with Mike Baker, Matt Cracknell and Ivan Belousov) on the trace element characteristics of epidote from the Ernest Henry and Hillside IOCG deposits. "It was a very well attended conference, with more than 1,000 registrants," said Jeff. "There were plenty of excellent oral and poster presentations to view, and it was nice to catch up with several former CODES students and staff over drinks."



Goldschmidt 2024 was held at the Chicago Hilton in the USA; here a plenary session is under way. In August Dr Jeff Steadman attended this event, where he delivered a presentation on the trace element characteristics of epidote from the Ernest Henry and Hillside IOCG deposits.



Five CODES researchers and staff members attended the International Geological Congress (IGC) in Busan, Republic of Korea, during late August. Honorary Professor Khin Zaw (left) with PhD student Stephen Cooke, Dr Paula Montoya and PhD student Jose Barillas stand behind the conference signage in the main entrance. The fifth CODES person to attend, Dr Wei Hong, was busy networking when this photo was taken.

INTERNATIONAL GEOLOGICAL CONGRESS

25–31 August 2024, Busan, Republic of Korea

The 37th International Geological Congress (IGC) was held in Busan, Republic of Korea during August, with a theme of 'The Great Travelers: Voyages to the Unifying Earth'. Professor Khin Zaw, Dr Paula Montoya, Dr Wei Hong and PhD students Stephen Cooke and

Jose Barillas attended this great event in person and gave oral and poster presentations to showcase CODES' latest research excellence in the fields of ore deposit characterisation, alteration mineral chemistry, critical minerals, and geodata modelling. Dr Wei Hong said this conference has the broadest range of topics of any that he has attended, with > 40 thematic programs, ranging from Earth history, volcanology, petrology, mineralogy, structural

geology, geochemistry, geophysics, geobiology, geomorphology, to geoeducation, geoheritage, geoparks and geotourism. The IGC 2024 provided a fantastic stage to exchange ideas and expand networking with geologists from diverse background from all over the world. Although the Australian booth was one of the highlights at the venue and attended by many delegates, team Canada beat the UK (Glasgow) and Australia (Melbourne) to win the bid to host the next IGC (2028) in Calgary.

AusIMM CRITICAL MINERALS CONFERENCE

26–28 August 2024, Brisbane

Critical minerals play a vital role in the development of clean energy technologies, and the AusIMM Critical Minerals Conference 2024, held in August, provided a valuable opportunity to engage with the latest developments in this field. As part of the University of Tasmania’s CODES team involved in the Regional Research Collaboration (RRC) project, we presented our recent research on scheelite (CaWO_4) and magnesite (MgCO_3) processing. During the poster session, Dr Mohammad Fathi highlighted the anisotropic effects of different grinding media on the selective separation of scheelite from fluorite, offering insights into advancing mineral processing techniques.

13TH INTERNATIONAL CONFERENCE ON ACID ROCK DRAINAGE

16–20 September 2024, Halifax, Canada

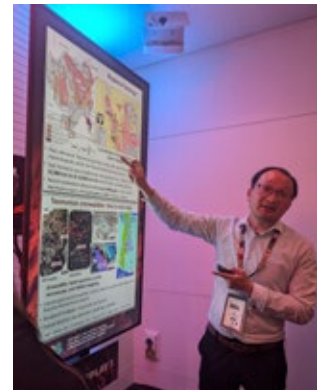
PhD student Chris Allen attended the 13th International Conference on Acid Rock Drainage (ICARD) in Halifax, Nova Scotia. He presented a talk on ‘Electrical geophysics for characterisation of a waste rock dump’ and used the opportunity to engage with experts in the environmental geochemistry field about his ongoing experiments. Following the conference, he attended a field trip to the Montague Gold District, learning of some of the local challenges Nova Scotia faces regarding legacy mine wastes.



Dan Khan (from Build Nova Scotia) describing the local tradition of dirt biking over, and building jumps out of, tailings containing up to 20% As(I) to participants on the Montague Gold District field trip following the ICARD conference in September. CODES PhD student Chris Allen (with beard) looks on attentively.



Dr Mohammad Fathi and CODES PhD students Alfredina Appiah and Emmanuel Dogara attended the AusIMM Critical Minerals Conference in Brisbane during August.



Dr Wei Hong presents his poster at the IAGS conference in Adelaide.



CODES PhD student Nelao Natukondje Naimbale (far left) moderating a panel discussion on the topic of ‘Maximising the power of Industry–Academia collaboration’ during the Student/Early Career Professionals session at the SEG conference in Windhoek, Namibia.



Professor David Cooke gives a talk on breccias in magmatic-hydrothermal environments at the SEG conference in Namibia.



The 30th International Applied Geochemistry Symposium (IAGS) in Adelaide during October was a big occasion for CODES staff and students past and present. They are: (back row, L-R) Wojtek Zukowski, Heidi Pass, Ned Howard, Anita Parbhakar-Fox, Margy Hawke, Ivan Belousov, Dan Layton-Matthews, Scott Halley, Gem Midgley; (front row, L-R) Kit Lai, Matthew Cracknell, Billy Beas, Giovana Pimentel, Vinicius da Cruz and Mark Arundell.

SEG 2024

**27–30 September 2024,
Windhoek, Namibia**

The Society of Economic Geologists 2024 conference is one for the history books. It ignited the true spirit of what conferences are meant to be: learning, re-learning, reconnecting, and forging new friendships through stimulating and innovative geoscientific studies among students and professionals. Throughout the four days, CODES was well represented: chairing the Student/ Early Career Professionals and Talk

sessions, delivering brilliant oral and poster presentations, and engaging with researchers from all over the world. As the saying goes, things are done differently in Africa, and this special edition came with a Namibian Oryx flavour! All roads now lead to Brisbane 2025!

IAGS

14–18 October 2024, Adelaide

The 30th International Applied Geochemistry Symposium (IAGS) was held in Adelaide during October.

IAGS is a conference focused on surface exploration strategies, with attendance by academia, industry and government. CODES sent a large contingent of nine people, with five staff presenting two standalone talks (Dr Matt Cracknell and Dr Ivan Belousov) and two posters (Dr Wei Hong and Dr Owen Missen), plus four students who benefited from student bursaries to travel to Adelaide. There were many excellent opportunities for networking throughout the week, with the gala dinner at Adelaide Oval being a highlight in bringing together many CODES collaborators.

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A note from Andrew's PhD supervisor, Dr Ron Berry:

Throughout his long and distinguished career, Andrew has made an outstanding contribution to the geology of Tasmania.

While in industry he managed extensive exploration programs and supported dozens of BSc (Hons) projects working in western Tasmania. He has been a major driver behind the West Coast Geological Forum for the past 20 years. He has also made a significant contribution to the administration of the Tasmanian

Division of the GSA serving as chair, secretary, treasurer and committee member.

Andrew's work has been especially important in managing the cooperative research programs of the minerals industry, MRT and CODES. He has made a huge contribution to bringing together the research focus of these three groups. It is in the collaborative engagement of the geological community that Andrew has made that is his greatest contribution. However, he also has been an active researcher and explorationist across a

wide range of Tasmanian geological projects perhaps exemplified by his contribution to the MRV project at the start of his career, the high precision dating of the Mt Read Volcanics, the 3D model for western Tasmania and the structural model for the Tyennan domain this year.

Dr Andrew McNeill has been an inspirational collaborator and colleague throughout his career. It has been a delight to work with him and to see all the projects he has initiated and supported across four decades.

STUDENTS ASSESS STAFF AT THE GEO DINNER



The 2024 Geology Dinner was held at the Staff Club on the Sandy Bay campus. The annual song contest was a highlight of the evening, with the Honours team coming out on top. Here students and staff pose for the obligatory group snap towards the end of the proceedings.

Owen Missen, who has a habit of lying down to have his photo taken, summarises the carry-on at this year's Geology Dinner.

The annual Geology Dinner was expertly organised by the UTAS Geology Society, with a strong core of third-year students ensuring a great night for everyone in attendance. Held at the Staff Club for the second year running, highlights of the evening were the awards ceremony and the song contest. Awards included the 'early bird' to the student most likely to run late, the 'night owl' for the student most likely to sleep through a lecture, and an award to the student with the most infectious laugh.

The Honours students took out the song contest, with their lyrics to the tune of Hunters and Collectors' 'Holy Grail' (altered to 'On the trail of porphyry copper') bringing them the glory this year. They were closely followed by the third years in second place, who managed to mention every staff member in their lyrics (see right) to the tune of 'Hello' by Adele.

We also thank Tristan Wells for delivering an excellent Loftus Hills lecture and for judging the song contest.

'Goodbye'

Hello, it's us.

*We've been to all your field trips, yeah, we've learned a thing or two
About rocks, and maps,
And all the stress you put us through, but it's time to say goodbye.*

Hello, it's still us.

*Rob you made us laugh then cry on every mapping task.
Owen, you're so goofy, and tall,
And Rebecca your marking, really stunned us all.*

*There's now no difference between us
Because of the forced bonding.*

*Goodbye from rocks and clays,
You taught us more than we could say.
You might have lost us in your big words, Dave,
But somehow, we still made it through the haze.*

*Goodbye from Room 208,
Sorry, iOGas we'll always hate.
Fran we're sorry, you really tried,
Sheree, your honesty was really sassy at times, but we love you.*

Lejun, and Chris

*Your field trips were insane, we needed a boot camp.
Also, Martin, and Seb,
Why did we climb those cliffs, and where was the snake bite kit?*

*It's no secret, that every field trip,
We almost died.*

*Goodbye from the third-year class,
Matt, you pessimism will always last,
But Izzy, you're why we made it this far.
Everyone's passion really inspired us to pass, sometimes more.*

*Goodbye to your largest class,
We hope that this department lasts.
We'll remember these years with a laugh and a tear,
Goodbye lecturers, it's been a hell of a few years.*

[Sung to the tune of 'Hello' by Adele.]

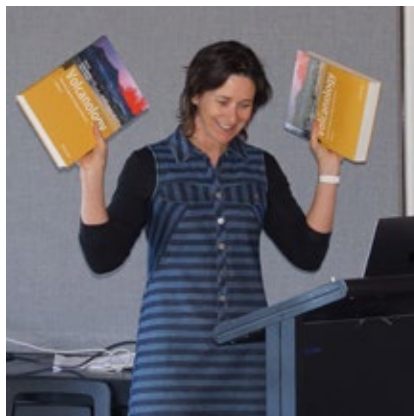
RAY CAS: REVISED EDITION OF MAGNUM OPUS CELEBRATED

Emeritus Professor Ray Cas is one of Australia's leading authorities on volcanology, and has recently published a reference work titled *Volcanology: Processes, Deposits, Geology and Resources*. This is a substantially updated, revised and extended version of his previous book *Volcanic Successions*, which originally appeared in 1987.

Ray has contributed to research conducted at CODES on and off for decades working alongside Professor Jocelyn McPhie, Dr Stuart Bull, Dr Karin Orth, Dr Robert Scott and Associate Professor Rebecca Carey. In recognition of this new publication, CODES hosted a small celebration with Ray on 29 October, in conjunction with his visit to UTAS to collaborate on the ARC Linkage project with Evolution Mining. Around 20 CODES staff, PhD students and honoraries gathered to hear about the history of the book (including a chart showing its increase in physical weight!), amusing anecdotes, and sincere congratulations on Ray's achievements.

Rebecca Carey writes:

"This new book offers comprehensive information on magma properties; fragmentation processes; subaerial and subaqueous lava types and field textures; sub-volcanic intrusions; explosive or pyroclastic eruptions and deposits; surface sedimentary processes; hydrothermal alteration and lithification, and effects on volcanic rock textures; terminology and approaches to describing and



Associate Professor Rebecca Carey with Ray Cas's two-volume *Volcanology: Processes, Deposits, Geology and Resources*. Guido Giordano and John V Wright were joint authors.

mapping volcanic rocks and terrains; geology of volcanoes and facies models; volcanism and tectonic setting; and to conclude, volcanic-hosted resources. It is a highly up-to-date text, presenting a coherent flow of topics, together with excellent visual material to illustrate key points and deposit features.

"The book went out of print in the 1990s, and since has only been accessible via a) stealing it from your supervisor or colleague, or b) purchasing it on eBay for >\$1,000 AUD.

"This new publication is significantly larger, in fact it is two hard copy books, and is available digitally through the UTAS Library. I encourage you to access and look through it. It includes a state-of-the-art summary of the main topics in volcanology, and includes chapters on volcanic-hosted ore deposits. Each chapter has a bibliography, which of



Ray Cas was very touched by the accolades heaped on him by former colleagues and students at the event.

itself provides an incredible resource for those who want to dive into a topic related to volcano science. There are also an amazing 941 figures, most of which include spectacular examples of volcanic facies, ore deposits, and environments."

While he was in Hobart, Ray gave a seminar to CODES staff and students entitled 'Understanding the Early Earth: Did plate tectonics occur during the first half of Earth history based on volcanism, sedimentation and plutonism in the Archean Kalgoorlie Terrane of the Yilgarn Craton WA?' And he also gave a GSA talk called 'Understanding climate change: All the natural and Human causes'.

Details about the book are available at: <https://link.springer.com/book/10.1007/978-3-319-66613-6>



Several speakers reminisced about working with or being taught by Ray during the CODES celebration of the new, revised edition of his landmark work on volcanology. They are (L-R): Professor Jocelyn McPhie, Dr Stuart Bull, Dr Karin Orth (holding the original version of Ray's book) and Dr Sharon Allen.

CHANGING FACES

During November two new PhD students joined CODES to work on separate projects, and in October three new staff members were welcomed into the CODES Analytical Laboratories as well as a new researcher. The CODES family continues to expand!

PHD STUDENT	START DATE	PROGRAM	PROJECT TITLE
 <p>Catherine Lit</p>	4 November 2024	Supervisors: Martin Jutzeler, Rebecca Carey, Ivan Belousov, working on the Program 4 Discovery Project (Volcanology)	Regional tephra geochemical fingerprinting and volcanic facies analysis in the Kermadec Arc/Rangitāhua
 <p>Francisco Cuadra</p>	18 November 2024	Supervisors: Mike Baker, Matt Cracknell, Julie Hunt, working on the Amira P1249 project	Mineral chemistry variance mapping and geometallurgical domaining of the Nautanen IOCG deposit, Sweden

ARRIVALS



Dr Carlos Carrasco Godoy joined the CODES Analytical Laboratories as Lead Laboratory Analyst in early October. He did a Masters by research followed by a PhD at the ANU. Fieldwork for his PhD was interrupted by Covid, so he pivoted his topic and compiled a global zircon geochemical and geochronological database, and developed methods to calculate models to predict zircon fertility.



Dr Alice MacDonald joined the CODES Analytical Laboratories as a Laboratory Analyst in mid-October. She completed her PhD on how clinopyroxene compositional and textural variations are influenced by magmatic processes at the University of Queensland and worked briefly at the Radiogenic Isotope Facility there analysing a range of minerals, including carbonates.



Dr Jack Ward joined CODES as an Assistant Laboratory Analyst in October. His PhD explored how complex subduction processes lead to the formation of spatially and geochemically 'anomalous' volcanoes in arc and intraplate settings.



Zeb Zivkovic, who has just completed a PhD at CODES titled 'Trace element systematics in whole rock analysis of magmatic-hydrothermal ore deposits', has been appointed as a part-time Research Fellow in Economic Geology working with Geoscience Australia.

VISITORS



Emeritus Professor Ray Cas visited CODES in late October to work with Associate Professor Rebecca Carey. Ray was here as a collaborator on the ARC Linkage project that is about to wrap up with Evolution Mining. He also gave two talks and CODES hosted a small celebration to mark the launch of his new publication (see page 22).



Dr Mareen Loesing from the School of Earth and Oceans at the University of Western Australia is an ACEAS postdoc who visited CODES for a few days in mid-November. She is conducting petrophysical measurements on rock samples from the Bunker Hills region in Antarctica to assess their density and magnetic properties, which will help advance our understanding of the area's geological composition.

CHANGING ROLES/PROMOTIONS



Dr Owen Missen's role as Lecturer in Environmental Geology has been made permanent. Congratulations Owen!



A MESSAGE FROM THE CODES DIRECTOR, PROFESSOR DAVID COOKE

The CODES team has been very active globally over the past three months, with team members presenting our latest research results at the SEG annual conference in Namibia, International Geological Convention in South Korea, and International Applied Geochemistry Symposium in Adelaide. Thanks to all our team members who gave excellent oral and poster presentations at each of these events, and a special callout to Nelao Naimbale for her efforts in chairing a session at the Student and Early Career Day at the start of the SEG conference.

Three new staff commenced working at CODES Analytical Laboratories in the past few

months. Carlos Carrasco Godoy, Alice MacDonald and Jack Ward have made immediate impacts, bringing fresh perspectives and great enthusiasm to our team, which has been joyful for us all. Their efforts in helping to ensure that the labs keep generating exemplary analytical data in a timely manner, and their knowledge and skills have provided great new opportunities for growth of our research and analytical capabilities.

We are also pleased to have Zeb Zivkovic join our team as a postdoctoral fellow in November, after finalising the corrections to his PhD. Zeb will be working with Geoscience Australia on developing new mineral system models for VHMS and porphyry deposits over the coming year. Welcome on board, Zeb!

The latest version of our Master of Economic Geology Brownfields shortcourse unit ran in October – November, with the largest number of Masters students enrolling in this unit

for many years. In November, we also opened registrations for the Ores in Magmatic Arcs – Indonesia field course in March 2025, triggering a flurry of registrations as people strive to guarantee a spot on this fantastic and highly popular trip, which visits four +20 Moz Cu-Au porphyry and high sulfidation deposits, including the amazing recent discovery at Onto in Sumbawa.

2025 will see several new recently funded collaborative research initiatives commencing, and we also have several proposals currently in review or about to be distributed to potential sponsors. We'll be showcasing some of these new initiatives in our March 2025 newsletter. Wishing you all the best for the festive season, and a productive and enjoyable new year.

David Cooke

UPCOMING SHORT COURSE

**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.

This training has a strong focus on field observations and hands-on practical skills, supported by an understanding of theoretical aspects. The full spectrum of deposits (e.g., porphyry, high-sulfidation, low-sulfidation) developed in magmatic arc settings will be covered. The presenters have detailed knowledge of the areas and

deposits visited, and are uniquely equipped to deliver the skills and insights needed by participants.

Unit leaders: Professor David Cooke, Dr Lejun Zhang

Delivery mode/location: Face-to-face

For more details look out for the course flyer soon: www.utas.edu.au/codes/masters-short-courses

For further information about short courses for 2025 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

