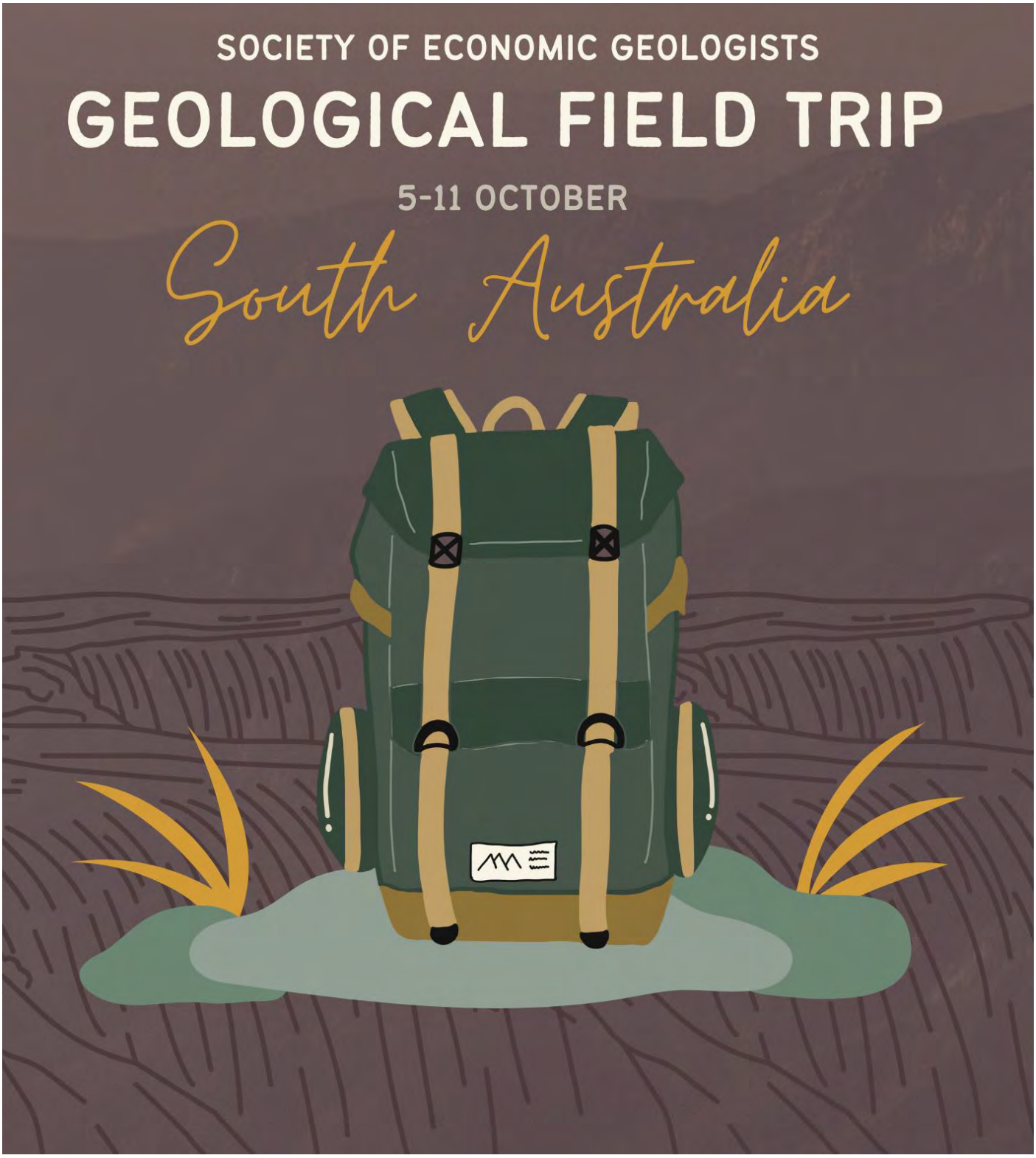
SEG Geological Field Trip to South Australia's IOCG Mineral Systems in Olympic Dam Domain, and Cu-Au Mineralisation at Kanmantoo

5 -11 October 2023

Hosted by: South Australia & Tasmania SEG Student Chapters



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Introduction

The SEG Geological field activity to South Australia presented a unique and invaluable opportunity for geology-major students and early-career professionals to explore and gain insights into the world-renowned metallogenic belt in South Australia. This region hosts some of Australia's most significant and economically valuable mineral deposits, including the Olympic Dam, which is one of the largest deposits globally. The field work was primarily focused on understanding the geological context, mineralisation, and mineral systems in this belt, with specific emphasis on Olympic Dam Iron Oxide Copper Gold (IOCG) and Kanmantoo Cu-Au mineral deposit.

Objective

The primary objective of this field work was to provide participants, especially SEG students from the CODES and South Australia chapters, with hands-on experience and education regarding the geological complexities and mineral systems present in South Australia. During the visit to the Kanmantoo Mine, the focus was on the Kanmantoo mineral system, whereas the Olympic Dam Mine and Prominent Hill Mine were pertinent to understanding the IOCG systems in the Gawler craton of South Australia. Participants were guided through the different geological features, with detailed explanations on mineralisation processes, geological findings, and the economic significance of the deposits. There were also discussions on the geophysical anomalies and the techniques used in exploration and mining.

Additionally, it aimed to foster collaboration and networking between academic institutions, professional societies, and industry experts. The venture was also envisioned to lay the groundwork for an annual event that would encompass all SEG student chapters in Australia.

Event Organisers

This trip was organised by executive members from South Australia and Tasmania Student Chapters.

Renzo Ocampo
Industry Liaison of SA-SEG

Shannyn Pope
President of SA-SEG

Axel Cima
President of CODES SEG

Angela Costa
Social Media of CODES SEG

Acknowledgements and Sponsorships

We would like to thank the generous support from our industry sponsors and partners, as well as professional societies and experts who made this geological field trip possible. Special thanks were extended to the trip organizers and leaders who selflessly volunteered their time and effort to manage all the logistics of this trip, ensuring a smooth and enriching experience for all participants. We were indebted to many industry professionals who allowed us to visit their mining operations and offered invaluable resources and expertise, which greatly enriched the experience of the participants by bridging the gap between academia and industry.

South Australian SEG
Event Organiser

CODES SEG
Event Organiser

Society of Economic Geologist
(Stewart R. Wallace Fund)
Platinum Sponsor

BHP
Host Partner

Hillgrove Resources
Host Partner

Fleet Space Technologies
Host Partner

First Quantum Minerals Ltd.
Diamond Sponsor

Department for Energy and Mining
Government Partner

Australian Institute of Geoscientists
Gold Sponsor

Dynamics G-Ex
Field Equipment Sponsor

University of South Australia
Event Partner

Resolution Minerals Ltd
Bronze Sponsor

Datarock
Event Partner

Geosynth
Event Partner

Field Trip Participants

The final list with the 21 participants is displayed below. Most were students and members of the SEG student chapters from South Australia and Tasmania. We also counted with academic and industry participants that enriched the experience and networking between industry and academia.

	Initial_Name	Surname_Name	Associated University	Degree/Major	Organisation
1	Renzo	Ocampo	University of Adelaide	BSC Mineral Geoscience	SA SEG
2	Shannyn	Pope	University of Adelaide	BSC Mineral Geoscience	SA SEG
3	Michelle	Galea	University of Adelaide	BSC Mineral Geoscience	SA SEG
4	Chloe	Smythe	University of Adelaide	BSC Mineral Geoscience	SA SEG
5	Jie	Yu	University of Adelaide	PhD	SA SEG
6	Britney	Russell	University of Adelaide	BSC Mineral Geoscience	SA SEG
7	Adrian	Fabris	DEM / GSSA	Industry	SA SEG
8	Alicia Caruso	Hand	DEM / GSSA	Industry	SA SEG
9	Axel	Cima	CODES	PhD	SEG CODES
10	Angela	Costa	CODES	PhD	SEG CODES
11	Zebedee	Zivkovic	CODES	PhD	SEG CODES
12	Bryce	De Haan	CODES	BSC Mineral Geoscience	SEG CODES
13	Victor	Pacheco	CODES	PhD	SEG CODES
14	Alex	Farrar	CODES	PhD / Industry	SEG CODES / First Quantum Minerals
15	Yvette	Chan	CODES	BSC Mineral Geoscience	SEG CODES
16	Javier	Gil Rodrigues	CODES	PhD	SEG CODES
17	Arka	Sahu	CODES	PhD	SEG CODES
18	Isaac	Brown	CODES	PhD	SEG CODES
19	Will	Leonard	CODES	Industry	First Quantum Minerals
20	Ashleigh	Ball	CODES	Industry	First Quantum Minerals
21	Jeffrey	Steadman	CODES	Research Fellow	SEG CODES

Field Trip

Field trip itinerary in South Australia.

(Underground and Open-Pit Mine Visits, Social and Networking, Workshops)

SUN	MON	TUES	WED	THURS	FRI	SAT
1	2	3	4	5	6	7
			CODES Students Arrival	Fleet Space Technologies Site Visit at Beverley SA with Networking Breakfast and Complimentary Bus Transportation IOCG Workshop & Core Viewing Session with AR/VR Technology at the South Australia Drill Core Reference Library, Tonsley SA South Australian AIG Geopub: A Geoscience Research Seminar with CODES Students	Bus Transportation to Olympic Village	Olympic Dam IOCG Mine Site Visit (BHP)
			Accomodation for CODES in Adelaide		Olympic Village Accommodation	
8	9	10	11	12	13	14
Bus Transportation to Prominent Hill Camp	Prominent Hill IOCG Mine Site Visit (BHP)	Bus Transportation to Adelaide	Kanmantoo Cu-Au Underground Mine Site Visit (Hillgrove Resources) SEG Networking Evening hosted by SA SEG	CODES Students Departure		
Prominent Hill Accommodation		Accommodation for CODES in Adelaide				

Day 1 (Thursday 5th October)

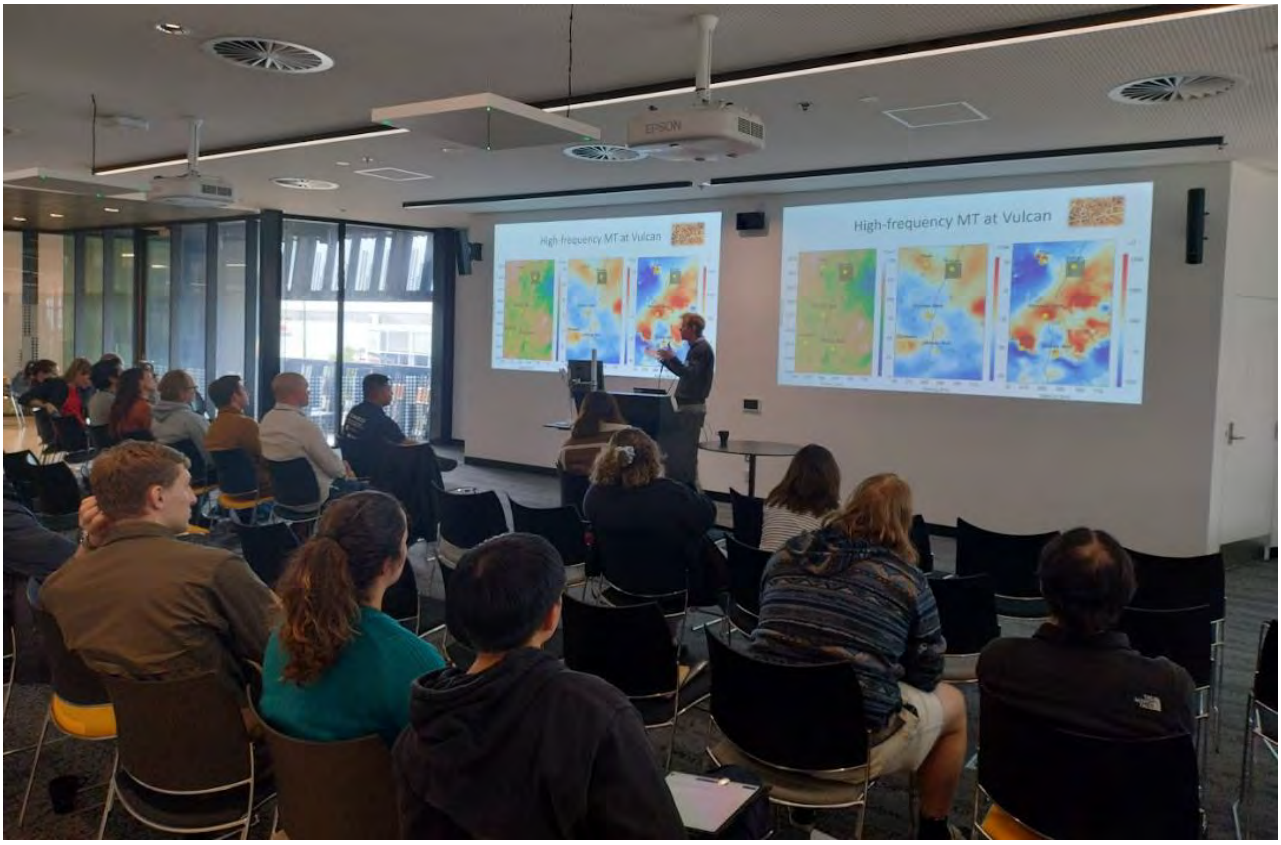
The visit to Fleet Space Technologies headquarters in Beverley, South Australia began with a networking breakfast, offering attendees the chance to interact with space geophysics and geodesy experts. This was followed by a presentation from Jose Hernandez, who provided an overview of the company's mission, achievements in space technology, and introduction to manufacturing site and cutting-edge ExoSphere solution. Next, Stephen Barber discussed the use of Fleet Space Technologies' Geodes for Ambient Noise Tomography in seismic studies, highlighting their ability to map subsurface geological features without active seismic sources. The tour finished up with a showcase of their incredible metal 3d printing facility of which is effectively used to design and manufacture their constellation of satellites.

Fleet Space Technologies site visit group picture

SASEG members getting the chance to hold the incredible Geode seismic sensors

The day continued at the South Australian Drill Core Library in Tonsley, South Australia, where we hosted a Geoscience and Technology Symposium. The symposium featured an Iron Oxide Copper Gold (IOCG) workshop, which included an interactive session for viewing IOCG drill cores with expert guidance. Additionally, the event showcased the application of emerging Augmented Reality/Virtual Reality (AR/VR) technology for the visualization of drill hole data, offering a dynamic and immersive way to understand geological information. This part of the field trip provided valuable hands-on experience and insights into current technological advancements in geoscience. The following is the timetable of speakers and events at the symposium.

Time	Activity
9:30 AM	**Dale Groom (GSSA, Program Coordinator)**: South Australia Drill Core Reference Library Tour with Dale
9:50 AM	**Georgina Gordon (GSSA, Senior Spectral Geologist)**: Introduction of Hyperspectral Hylogger Machine
10:20 AM	**SEG Field Trip Organisers**: Welcome Presentation
10:25 AM	**Adrian Fabris (DEM, Principal Geologist)**: Olympic Cu-Au Province: An Introduction
10:55 AM	**Anthony Reid (Geosynth, Geology Consultant)**: Cryptic Legacy or Archean Lithosphere in the Gawler Craton
11:05 AM	**Claire Wade (GSSA, Senior Geologist)**: Magmas, Metals and Metasomatism: Mapping the Mantle Through Time
11:30 AM	**Tom Raimondo (University of South Australia, Professor)**: Towards Exploration Metaverse
12:00 PM	Lunch Break prepared by SA SEG
12:45 PM	**Dr Rian Dutch (Datarock, Head of Applied Data Science)**: Machine Learning (ML) in Mining and Exploration
1:15 PM	**Jie Yu (University of Adelaide, PhD)**: New Cu Systems in the Northern Gawler Craton: Evidence from Multiple Geochronology
1:30 PM	**Professor Graham Heinson (University of Adelaide):** Geophysical Exploration of a Gawler Craton IOCG Mineral System from Source to Deposit.
2:10 PM	Closing Remarks
2:15 PM	Core Viewing with IOCG Specialist + UniSA AR/VR Technology
3:30 PM	Afternoon Break & Networking (run at the same time as core viewing)



Geoscience Symposium workshop on Magneto Telemetry with Professor Graham Heinson

Jack Fraser (UniSA) showing students how to visualise geochemical assay and trends using their AR/VR technology

Georgina Gordon discussed the Data Metallogenica, which is the world's largest mineral deposit database, and showed rock samples from world-class mineral deposits globally

Group participants getting hands-on experience with AR/VR tech from UniSA

The first day of the field trip concluded with an evening at the South Australian AIG Geopub, where a geoscience research seminar was held. Here, several CODES students presented their current research projects, providing insights into their latest findings and methodologies. The seminar was followed by a networking event with members of the local AIG SA community chapter. This session offered a platform for further discussion, knowledge exchange, and the fostering of professional relationships within the geoscience community.

Time	Activity
6:00 PM	AIG Networking - open bar drinks (venue/sponsor TBA)
6:30 PM	**Peter Hill (Australian Institute of Geoscientists, Director)**: Welcome Introduction
6:35 PM	**Jaime Livesey (Australian Institute of Geoscientists, CEO)**
6:40 PM	CODES SEG Introduction
6:45 PM	**Isaac Brown (CODES, PhD):** Geology of the Havieron breccia hosted Au-Cu deposit.
7:00 PM	**Vinicius da Cruz** & **Angela Costa (CODES, PhD)**: Regional Research Collaboration for Critical Metals in Tasmania
7:15 PM	**Zebedee Zivkovic (CODES, PhD)**: Trace element composition from whole rock analysis
7:30 PM	**Alex Farrar (CODES, PhD)**: Are translithospheric faults real? A journey from industry to academia and back again
7:45 PM	Peter Hill: Closing Remarks
7:50 PM	AIG Networking - pizza and drinks
8:55 PM	AIG Clean-up (end time 9pm)

Members of AIG SA enjoying presentations given by CODES students during the monthly AIG Geopub event

CODES PhD students presenting their research project during AIG Geopub

Day 2 (Friday 6th October)

Road trip from Adelaide to Olympic Dam

Day 3 (Saturday 7th October)

For the Olympic Dam site visit, BHP provided internal transport to the mine office and a short introduction to the geologists and staff that would be guiding us during the day. Our group was split into two due to the limits for the underground visit. Below a short summary regarding the main activities for each area:

1. **Core shed review:** We had a 40-minute introduction to Olympic Dam mine geology by senior geologist Max Verdugo, followed by the logging of two drilling from different sectors of Olympic Dam. One was more focused on the typical alteration towards the mineralisation zone (hematite breccias and chalcopyrite -> bornite -> chalcocite), the second one displayed great intervals of preserved texture for the host rocks (granite) as well as sedimentary wall rocks. A small exercise was focused on estimating the copper grade for a specific interval, which later resulted in an award for the best guess to CODES PhD student Alex Farrar.
2. **Underground mine visit:** We were split into two mine cars which initiated the visit through the north part of the deposit where the students had a chance to see the relation of mafic dykes (diabase) with the host rocks. We also could observe the zonation from a richer chalcopyrite + pyrite hematite-breccia zone towards a transition to bornite and finally chalcocite. The second spot was focused on understanding the effect of faulting on the deposit, including a strong percolation of later salts along the faults.

Left: Alex Farrar and his award for best copper grade guess. Right: Students looking at the core during the afternoon

Fieldtrip participants and Olympic Dam Geology Superintendent Chris Booth in the site office

Day 4 (Sunday 8th October)

Road trip from Olympic Dam to Prominent Hill

Day 5 (Monday 9th October)

For the Prominent Hill site visit, BHP provided internal transport to the mine office. First, senior geologist Matthew introduced the geology of Prominent Hill deposit, followed by a morning tea. Also in the morning, our group visited the lookout in the Prominent Hill open pit where we had the chance to understand the relation of the copper ore with the different host rocks, we also could observe the contact with the skarn south from the open pit. Finally, we had a stop in an ore stockpile before returning to lunch in the mine office.

After lunch, our group was split in two to facilitate a tour along the processing plant. During this visit we had the opportunity to follow the whole process of extraction of copper from the ore in Prominent Hill, starting through the comminution supported by SAG mills, followed by the chemical extraction through flotation cells and the final product (concentrate) where we even watched the concentrate shipment. In the end of the afternoon, geologist Matthew also guided us through the logging of some mine drilling and explained the variations of hematite breccias and different copper ore minerals.

Students on Prominent Hill open pit lookout

Second stop on the mine to collect some rocks from an ore stockpile

One of the groups visiting the processing plant, behind the crusher stockpile at Prominent Hill

Third-year students from Adelaide looking at the mine drilling at Prominent Hill

Day 6 (Tuesday 10th October)

Road trip from Prominent Hill to Adelaide

Day 7 (Wednesday 11th October)

The group visited Hillgrove Resources' Kanmantoo IOCG (Iron Oxide Copper Gold) copper-gold mine, located in the Adelaide Hills. The visit included a detailed presentation by Caitlin Rowell, who explained the deposit's characteristics and the style of mineralization. The attendees also received a comprehensive tour of the mining site. This tour included an overview of the mine's operations and its significant role in the local community, providing valuable insights into both the technical and socio-economic aspects of mining in the region. This visit offered a practical understanding of mining processes and community engagement in the mining sector. The visit also featured an ore estimation exercise for the group with Yvette taking home the prize.

Left: Group participants enjoying a presentation about the Kanmantoo deposit by geology manager Caitlin. Right: Yvette won the ore estimation competition

The field trip wrapped up with a networking evening at The Elephant British Pub in Adelaide. This event brought together a diverse group of professionals from various sectors including industry, academia, and government, along with students from the University of Adelaide. The gathering provided an excellent opportunity for attendees to connect and exchange ideas. Additionally, the South Australian Society of Economic Geologists held its annual general meeting during this event, offering a recap of the year's activities and achievements. This final gathering was a fitting conclusion to the field trip, encapsulating a blend of professional development, knowledge sharing, and community engagement.

Day 8 (Thursday 12th October)

Before returning to Tasmania, CODES students had the opportunity to visit the South Australian Museum and the geology facilities in the University of Adelaide. PhD student Cecilia and industry liaison Renzo were happy to show the university, the minerals and rocks museum and some laboratory facilities for sample preparation.

CODES student visiting the South Australian Museum

Third-year CODES student Yvette looking at the minerals from University of Adelaide collection

Cecilia Loyola giving a tour at the Mawson Building and the geological laboratories for sample preparation

CODES Fieldtrip budget

A final balance from CODES Student Chapter for the field trip is listed below, the South Australian Student Chapter will submit separately their final balance. SEG Stewart R. Wallace funding covered most of our expenses with accommodation in Adelaide and flights from Hobart to Adelaide, additional funding was provided by First Quantum Minerals (industry sponsor) who participated on the fieldtrip counting with 03 industry professionals.

Revenue (USD)	
SEG Stewart R. Wallace R1 grant 2023	$ 3,000
Industry funding - First Quantum Minerals	$ 1,300
Total	$ 4,300

Expenses (USD)	
Accommodation Adelaide 04 nights (9 students + 1 academic advisor)	-$ 2,500
Flights Hobart <-> Adelaide (9 students + 1 academic advisor)	-$ 1,800
Total	-$ 4,300

Final balance	**$0.00**

Results and future plans

The student chapters from CODES and University of Adelaide are extremely happy with the outcomes from our first SEG student field trip together, resulting in networking and the opportunity to visit some of Australia's most famous deposits and world-wide renowned copper resources from Olympic Dam IOCG mineral system. We are looking forward to planning more events and field trips together, we are in contact to expand the opportunity to the student chapters from Western Australia University and Monash University.