Australian National University

MERCURY AUSTRALIA SYMPOSIUM 2025:

INTERDISCIPLINARY PERSPECTIVES ON A PERSISTENT POLLUTANT

Event Booklet



ACKNOWLEDGEMENTS

ACKNOWLEDGEMENT OF COUNTRY

The workshop organisers acknowledge and celebrate the Ngunnawal and Ngambri people on whose land we meet. We pay respect to Elders past and present, and extend that respect to all First Australians attending our event.

SPONSORS

We would like to thank our sponsors for their contributions

MERCURY AUSTRALIA

Mercury Australia is a network of Australian university researchers investigating the historical and contemporary uses and impacts of mercury. The group conduct research in Australasia to identify potential adverse effects of mercury on the environment and human health, as well as ways in which to mitigate those risks.

Prior to Mercury Australia, research on mercury in the Australasian region had been being pursued separately in different universities and research centres. Our team has arisen to unite these research efforts, aiming to create new collaborations and, crucially, to translate the research results into publicly accessible information (through www.mercury-australia.com.au).

Mercury Australia is dedicated to providing independently verified research into the sources and impacts of the commercial uses of mercury without bias from vested interests or pressure groups. Our combined many years of experience in researching mercury and related topics in the Australasian region allows us to provide highly credible and reliable findings.

SCIENTIFIC COMMITTEE

This year, we are fortunate to have a dedicated Scientific Committee whose expertise and commitment have been instrumental in shaping the programme. The committee has worked tirelessly to review submissions, provide thoughtful feedback, and curate a programme that reflects both the breadth and depth of current research and practice in the field. Their collective efforts have ensured that the sessions are not only scientifically rigorous but also engaging and relevant to our diverse community of participants.

Scientific Committee Members:

- A/Prof Larissa Schneider – Australian National University (ANU)
- Dr Simon Apte – Australian National University (ANU)
- Dr Tom Cresswell – Australian Nuclear Science and Technology Organisation (ANSTO)
- Prof Jenny Fisher – James Cook University (JCU)
- Dr Darren Koppel – Australian Institute of Marine Science (AIMS)

The committee is also deeply committed to diversity and inclusion. They have taken deliberate steps to ensure broad participation across disciplines, institutions, and career stages. With the generous support of our sponsors, the symposium has once again been made free of charge, removing financial barriers and enabling a wider community to engage with the event.

These values are embedded in our work and are guided by the Mercury Australia Diversity and Inclusion Plan 2025, a copy of which is available at: www.mercury-australia.com.au/symposium .

The Scientific Committee's vision, dedication, and inclusivity have been central to making this year's symposium a success. We extend our sincere thanks for the time, effort, and expertise they have contributed.

ANU SCHOOL OF CULTURE, HISTORY & LANGUAGE

The School of Culture, History and Language (CHL) is a community of researchers dedicated to investigating and learning with and about the people, languages, and lands of Asia and the Pacific. CHL remains the core of expert Australian knowledge on the Asia Pacific Region within the College of Asia and the Pacific at the Australian National University. The College of Asia and the Pacific is unique at ANU in transdisciplinary and interregional foundation and the School exemplifies this outlook. Our research is organised around research themes of Culture, History, Language, and Environment which include the discipline areas of: Anthropology; Archaeology and Natural History; Gender, Media and Cultural Studies; Languages; Linguistics; and Pacific and Asian History.

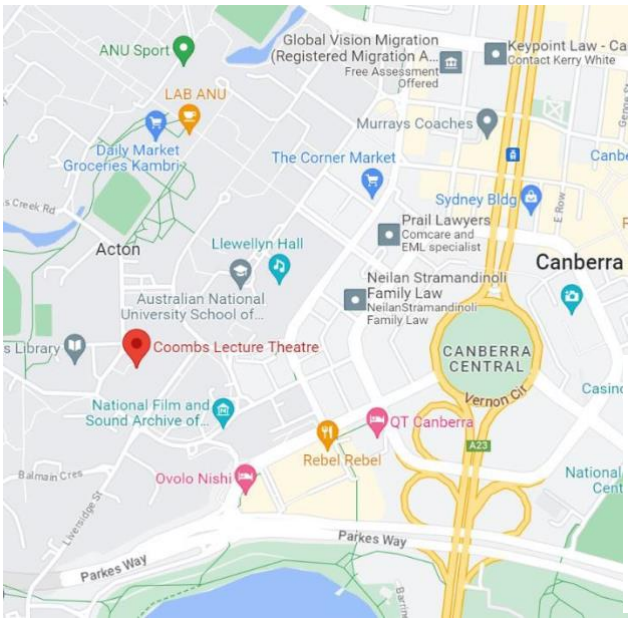
We create knowledge that is specialised, critical, engaged with current discourses and debates within the many disciplines incorporated into our structure. The School's structure is diverse and inclusive. We embrace and relish diversity as a core strength. From this diversity comes the complexity necessary to support a research environment which supports innovative and influential teaching and research.

INFORMATION FOR GUESTS

SYMPOSIUM VENUE

The Mercury Australia Symposium 2025 will be held in Seminar Room G in HC Coombs Building 9, Fellows Rd, ANU, Acton ACT 2601.

Seminar Room G is room number 3.314. Coombs can be difficult to navigate, so please keep in mind that the first number denotes which HEXAGON the room is in (Seminar Room G is in hexagon 3). The second number denotes which floor the room is in (Seminar Room G is on the 3rd floor). The last two numbers denote the room number (Seminar Room G is room 14).





HC Coombs Building 9, Fellows Rd

Seminar Room G 3.314

Watch this video for step-by-step directions to the Symposium venue:
https://youtu.be/MjtUfimQwNs

The HC Coombs Building is on the southern side of the ANU campus and is around a 10–15-minute walk from the main Kambri precinct, and around a 25-minute walk from Canberra's CBD. Transport options are provided below.

The Coombs Building is around 5 minute walk to Canberra's New Acton precinct, with hotels, restaurants, bars and cafes in that area.

Parking around HC Coombs is limited – see transportation note below.

The closest cafe on campus to our symposium is The Gods Cafe in the Hedley Bull building (next to HC Coombs), or the café in the National Film and Sound Archive behind Coombs.

ACCOMMODATION

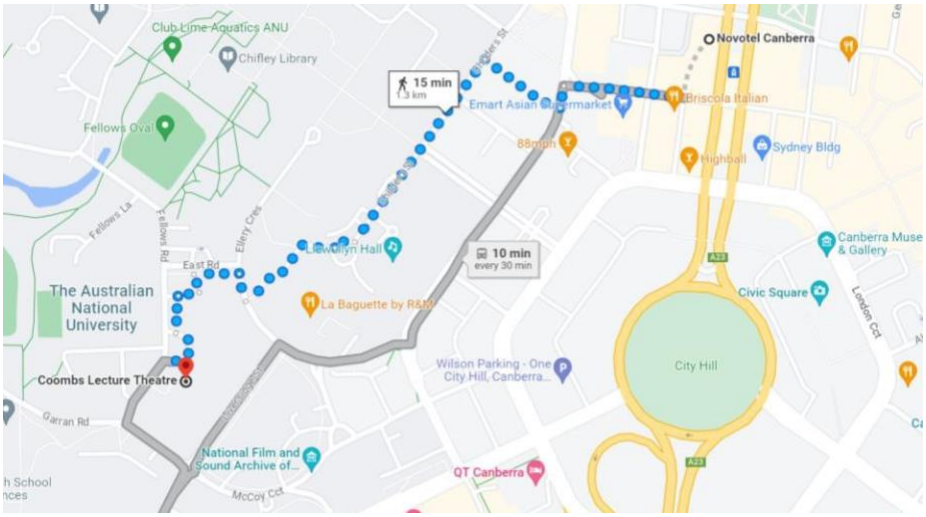
There are many accommodation options close to Canberra's city centre, the Australian National University and as well as restaurants and cafes.

- The Novotel Canberra – (02) 6245 50000
- Ovolo Nishi – (02) 6287 6287
- Peppers Gallery Hotel - +61 466 025 013
- QT Canberra – (02) 6247 6244

Alternatively, there are many other accommodation options around the Canberra CBD area, New Acton precinct near ANU, or Airbnb options throughout the city. Take a look at Booking.com, Agoda and Last Minute for more options.

TRANSPORTATION OPTIONS

Walking: It is approximately a 15-minute walk from The Novotel and the Canberra CBD across to the HC Coombs Building. Bring a coat, grab a coffee on your way and take in the crisp Canberra morning air!



Scooters: There is a network of Beam Mobility and Neuron Mobility e-scooters available in Canberra's CBD, with rental scooters readily available by The Novotel. More information available here.

Public Transport: Acton Bus Route 53 departing from Alinga St near The Novotel will drop you behind the HC Coombs Building at the corner of Liversidge St and Ellery Crescent. Guests will need to purchase a MyWay travel card to use to tap on and off the bus before travel (these can be purchased and topped up at the convenience store just next to The Novotel. Top ups can also be made at other convenience stores and at any light rail stop). Alternatively single use tickets can be purchased from the bus interchange in the city.

Driving: Paid parking is available at ANU- for more information, please see ANU Parking. Our symposium will coincide with graduation ceremonies, so we do not recommend driving if possible.

INFORMATION FOR PRESENTERS

Each presenter in the normal panel sessions will have a maximum of 15 minutes to deliver their presentation. The chair for each session will be time-keeping to ensure everyone has a chance to present.

- At the end of each session the chair will open the panel for a Q&A discussion for around 5 minutes.
- If you are presenting in person, please ensure you have sent your slides to Margot (Margot.Schneider@anu.edu.au).
- Online presenters will use the 'share screen' function in Zoom to share their PowerPoint slides with the audience over Zoom. Please ensure your PowerPoint slides are prepared well in advance, and please send a copy of your slides to Margot at least 24 hours before your session. This is important to ensure that we are able to share your slides in the session in case the 'share screen' function does not work at your end.

FOR OUR ONLINE PARTICIPANTS

This symposium is being delivered in hybrid mode, and many people will be attending online via Zoom. Welcome!

There is a single Zoom Link for both days. All presentations will be accessible via the Zoom app or your browser. We will be using the waiting room function, so please bear with us when you sign in.

Please keep an eye out for an email from Larissa.Schneider@anu.edu.au or Margot.Schneider@anu.edu.au with the Zoom link for this symposium.
If you have any issues connecting, please WhatsApp message:

- Jalene Nalbant: +61 430 354 056; or
- Margot Schneider: +61 473 487 450; or
- Larissa Schneider: +61 429 088 813

  and we can help you connect.

For our guests who are presenting online, please note the following:

i. Please prepare the presentation using PowerPoint or as a PDF file using a 16:9 (international standard) aspect ratio
ii. Your presentation time includes 5 minutes of questions
iii. Have your presentation loaded and be ready to share your screen
iv. Please ensure your font and diagram size are appropriate
v. Please test your slides, microphone and webcam in the speaker breakout room at least 10 minutes before your scheduled presentation
vi. Each presenter will have a maximum of 15 minutes to deliver their presentation
vii. There will be 5 minutes at the end of each presentation for Q&A

For further assistance regarding sharing a PowerPoint over Zoom, please click.

CATERING, COFFEE & SYMPOSIUM DINNER

Catering is provided for our symposium morning tea, lunch and afternoon tea each day. If you are registered for in-person attendance, please ensure you have filled in the google form sent to your email with any dietary restrictions.

If you're looking for a good coffee to kickstart your day, we recommend the following cafes around Canberra's CBD: Tonic Espresso; Harvest; Two Before Ten; The Cupping Room. And the best coffee on campus is at: Coffee Lab and Rex Espresso in the Kambri precinct, Dom's in the National film and Sound Archive, and The Gods Cafe in the Hedley Bull Building (NB: The Gods Cafe is the closest cafe to HC Coombs Building).

Our symposium dinner will be held on Wednesday 26 November, 6:30pm (for a 7pm start), at nearby La Bicicletta Restaurant. This is approximately a 10 minute walk from our symposium venue, and a 5 - 10 minute walk back to The Novotel/ Canberra CBD. All the menu options at the dinner can be tailored to meet halal, vegan, vegetarian, gluten free and other dietary requirements. The dinner is to be paid by delegates. If you would like to join the dinner but have not yet filled in the online form above to RSVP, please do so ASAP!

STAYING HEALTH CONSCIOUS

We are committed to the wellbeing of all delegates at the Mercury Australian Symposium, and will be following the ACT Health's latest health protocols. This includes the following advice for all guests:

Do NOT attend in person if you:

- Are feeling unwell with any symptoms, and/or
- Are feeling unwell in general

Reducing risk in indoor settings

- Participants are encouraged to wash/disinfect hands regularly during the day including on arrival and departure. Hand sanitiser will be available free of charge at the venue
- Practise cough/sneeze etiquette (cough or blow your nose into your elbow/tissue)

Rapid Antigen Testing (RATs)

- RATs are readily available in chemists, convenience stores and supermarkets in the Canberra CBD and on campus. If you are feeling unwell at any stage throughout the workshop, we strongly encourage you to self-administer a RAT test at your accommodation and wait for the results.

EXPLORING CANBERRA

There is lots to see and do in Canberra outside the ANU! Some of our favourites include the nearby New Acton precinct; the Australian Institute of Aboriginal and Torres Strait Islander Studies; The National Gallery of Australia; The National Museum of Australia; The National Library of Australia; Drill Hall Gallery; The National Portrait Gallery; and the National Arboretum. If you're looking to stretch your legs, take in a stroll around Lake Burley Griffin, wander through the Botanic Gardens near ANU, or head up Mt Ainslie for sweeping Canberra views.

For more inspiration, see Visit Canberra, Atlas Obscura, Her Canberra, and Broadsheet; or just ask us!

MEET THE HOSTS!



Mx Jalene Nalbant	Associate Professor Larissa Schneider	Ms Margot Schneider
Environmental Archaeology	Environmental Scientist	Environmental Scientist
PhD Candidate, ANU School of Culture, History and Language	ANU School of Culture, History and Language	PhD Candidate, ANU School of Culture, History and Language

PROGRAM DAY 1, WEDNESDAY 26TH NOVEMBER 2025

Time	Title	Presenter
9:00 – 9:05	Acknowledgement of Country	A/ Prof Larissa Schneider
9:05 – 9:10	Welcome & Opening	Prof Matt Tomlinson – CHL Director
9:10 – 9:15	Housekeeping	Margot Schneider & Jalene Nalbant
KEYNOTE SPEAKER		
9:15 – 10:00	Fire, Earth, Water, Air: The FEWALab's interdisciplinary approach to understanding Hg biogeochemical cycling in vegetated terrestrial systems	Dr David McLagan
A word from our sponsors		
10:00 – 10:10	PS Analytical	Teodor Andron
10:10 am Morning Tea (30 mins)		
Theme 1 – Mining Impacts		
10:40 – 11:00	Tracing the environmental history and legacy of cinnabar mining in the Wide Bay Creek catchment, Queensland.	Duncan Cook
11:00 – 11:20	Modelling Mercury Transport in Legacy Mining Catchments in Victoria, Australia	Aung Kyaw Kyaw
11:20 – 11:40	Understanding the post-extraction histories of legacy mine waste	Susan Lawrence
11:40 – 12:00	Archaeological Evidence of Pollution from Historical Gold Mines	Sasan Seyedein
12:00 pm LUNCH BREAK (1 hr)		
13:00 – 13:20	Environmental Impact of Artisanal Gold Mining: Mercury Contamination Study in Côte d'Ivoire	Dominique Bally Kpokro
13:20 – 13:40	Mercury and methylmercury in seafood from Maluku, Eastern Indonesia and New South Wales, Australia – considering food risk and trophic levels.	Amanda Reichelt-Brushett

Theme 2 – Atmospheric Mercury/Natural Archives		
13:40 – 14:00	Five decades of mercury in tuna and mesopelagic fishes: global patterns and policy implications	Heidi Pethybridge
14:00 – 14:20	Assessing Hg accumulation in offshore oil and gas pipelines to understand the risks associated with decommissioning activities	Lhiam Paton
14:20 – 14:40	A reliable synthetic method for a metacinnabar radiotracer to assess risk of residual mercury in decommissioned subsea oil and gas pipelines	Alexandra Boyd
14:40 AFTERNOON TEA (30 mins)		
15:10 – 15:30	Establishing an Australian model organism for studying microbial mercury methylation in the Australian marine environment	Caitlin Gionfriddo
15:30 – 15:50	Mercury In Offshore Oil and Gas Infrastructure; Informing Ecological Risk Assessments For Decommissioning	Tom Cresswell
15:50 – 16:10	Prioritising Data Needs for Mercury Bioaccumulation Modelling Through Large-Scale Sensitivity Analysis	Daniel Tan
16:10 – 16:30	Mercury Baselines for Environmental Risk Assessments in Australia's North-West Marine Region	Darren Koppel
Dinner at Bicicletta Restaurant		

PROGRAM DAY 2, THURSDAY 27TH NOVEMBER 2025

Time	Title	Presenter
9:00 – 9:05	Recap and housekeeping	Larissa Schneider & Margot Schneider
KEYNOTE SPEAKER		
9:05 – 9:50	Fates of mercury in estuaries from sources to sediments	Prof. Celia Chen
A word from our sponsors		
9:50 – 10:00	Milestone	Camillo Pirola
10:10 am MORNING TEA (30 mins) & GROUP PHOTO!		
Theme 3 – Terrestrial Environments		
10:40 – 11:00	Mercury and methylmercury analysis in the legacy Rum Jungle Mine in the Finniss River, Northern Territory, Australia.	Isabel Ely
11:00 – 11:20	Predicting continental-scale soil mercury concentrations in Australia to refine global frameworks	Larissa Schneider
11:20– 11:40	Analysis of Mercury (Hg) Uptake and Deposition Fluxes within Eucalyptus sideroxylon	Elizabeth Elphick
11:40 – 12:00	Pollution history and colonial induced increase in the transport of mercury from Australia to Sub-Antarctic islands: using mercury isotopes to trace the source	Margot Schneider
12:00 pm LUNCH BREAK (1 hr)		
ANNOUNCEMENTS!		
Theme 4 – Atmosphere		
13:00 – 13:20	Studying pre-industrial mercury deposition processes by performing GEOS-Chem sensitivity tests, with focus on the 50S-60S band	Paolo Sebastianelli
13:20 – 13:40	Atmospheric mercury (Hg0) monitoring from Kennaook/Cape Grim (KCG): Insight into concentration, variation, and source attribution	Bakhat Rawat
13:40 – 14:00	Long term monitoring of mercury in ambient air in the Australian region	Jennifer Powell
14:50 – 15:00 Discussion About MA-related Activities & Closing Remarks		

WELCOME!

On behalf of the Australian National University, the organising committee would like to extend a warm welcome to everyone attending the Mercury Australia Symposium 2025. We are fortunate to be able to organise a mixed event with face-to-face and virtual presentations.

It is our pleasure and delight to offer keynote presentations from Dr David McLagan (Queen's University, Canada) and Professor Celia Chen (Dartmouth University, US).

We, the organising committee, would also like to thank our sponsors of this year's symposium: the School of Culture History and Language (ANU), National Decommissioning Research Initiative (NDRI), Metrohm Australia, and PS Analytical.

We kindly ask that you make yourself familiar with the contents of this handbook. It contains the code of conduct, symposium program, and information about the speakers. We have also included information about Mercury Australia and our facilities. We hope that you find the symposium engaging, thought-provoking, and a valuable resource for your future research.

Organising Committee

- Larissa Schneider
- Margot Schneider
- Jalene Nalbant

Scientific Committee:

- A/ Prof Larissa Schneider – Australian National University (ANU)
- Dr Simon Apte – Australian National University (ANU)
- Dr Tom Cresswell – Australian Nuclear Science and Technology Organisation (ANSTO)
- Prof Jenny Fisher – James Cook University (JCU)
- Dr Darren Koppel – Australian Institute of Marine Science (AIMS)

For In-Person Guests:

Wifi Guest username: MercuryAustralia2025

Wifi Guest Password: Muchachas2025

Please also note that the dinner on Wednesday 26th November at La Bicicletta (https://www.bicicletta.com.au)

CODE OF CONDUCT

Recording, taking photos, or screenshots of the presentations is strictly prohibited unless explicit permission have been granted by the presenter(s).

All participants are expected to treat each other with curtesy and respect at all times. Personal attacks, harassment, intimidation, or discrimination directed towards other participants will not be tolerated. Disruption of presentations will also not be tolerated.

Unacceptable conduct includes, but is not limited to, verbal comments relating to gender, sexual orientation, disability, physical appearance, body size, race, religion, national origin, inappropriate use of nudity and/or sexual images in Zoom meetings or presentations, and threatening or stalking any participant.

Consequences for Violating the Code of Conduct: Anyone requested to cease unacceptable behaviour will be expected to comply immediately. Symposium organisers may take any action deemed necessary and appropriate, which includes removing an individual from the symposium. ANU Mercury Australia symposium organisers may also ban individuals for violating this code of conduct at any future meetings.

Reporting Violations of the Code of Conduct: If you are the subject of unacceptable behaviour or have witnessed any such behaviour, please immediately notify us via the Chat function on Zoom or by writing to Larissa at Larissa.schneider@anu.edu.au

KEYNOTE SPEAKERS

DOCTOR DAVID MCLAGAN

Atmosphere-vegetation exchanges of mercury (Hg) are a critical component of the global Hg cycle. Trees predominantly take up Hg from the atmosphere via stomatal assimilation of elemental Hg (Hg(0)) in gaseous form. Hg is oxidised in foliage and transported to other tree anatomy including stem/bole where it can be stored for years to centuries. While these uptake, translocation, and storage processes enable us to use dendrochronologies to reconstruct historical atmospheric Hg levels, they can also present human exposure risks when farming meets Hg sources, as can be the case with Artisanal and Small-scale Gold Mining (ASGM).

It is well known that Hg is a pollutant of Global concern; yet Hg science (research and monitoring networks) remains biased towards the Global North. This is a concern as the impacts of Hg are often more acute in the Global South and demand for products that cause Hg emissions in their lifecycle are biased towards the Global North. Hence, I will present some of the interdisciplinary, accessible, and internationally collaborative approaches our research group (The FEWALab) takes to assessing and addressing Hg biogeochemical cycling in terrestrial systems. Work that includes topics such as the impacts of ASGM-derived Hg, dendrochronological studies of historic atmospheric Hg levels, and Hg fluxes from wildfires.



Bio: Dr. David McLagan is the PI of the Fire, Earth, Water, Air Contaminant Biogeochemistry Lab (FEWA Lab) and Assistant Professor, jointly appointed in the Dept. of Geological Sciences and Geological Engineering and the School of Environmental Studies at Queen's University. Dr. McLagan won both a Governor General's Innovation Award (2023) and a (PhD level) Governor General's Gold Medal (2018) for his PhD. thesis work at the University of Toronto (UofT), which focussed on the development, testing, application, and commercialisation of the mercury passive air sampler (MerPAS). MerPAS is now an established, accessible technology used across the world in atmospheric Hg science. Dr. McLagan was also awarded the Emerging Research on Mercury as a Global Pollutant in 2024. Dr. McLagan has Bachelor of Science (Environment) with first-class honours from Griffith University (Australia) as well as postdoctoral positions at Environment and Climate Change Canada (ECCC), the Technical University of Braunschweig, as well as an adjunct position at UofT. The FEWALab uses a total systems approach to improving our understanding of contaminant (particularly Hg) biogeochemical cycling in the environment with a focus on developing novel, accessible technologies that produce direct, tangible impacts on science, society and the environment. Apart from studying Hg biogeochemistry, Dr. McLagan and the FEWA Lab also research multidisciplinary wildfire science, particularly wildfire emissions (smoke).

Affiliation: Department of Geological Sciences & Geological Engineering, Queen's University (Kingston, ON, Canada)

Contact: david.mclagan@queensu.ca

PROFESSOR CELIA CHEN

Dr Chen's talk at the Symposium will focus on the fate of mercury in estuaries from sources to sediments and water to bioaccumulation in estuarine food webs. The talk will cover mercury processes in different types of estuaries both on the east and west coast of the US ranging from pristine to contaminated systems. Her talk will include the research of her lab and collaborators as well as the related studies of others. She will contrast estuarine processes in the Northern Hemisphere with those in the Southern Hemisphere that may impact the fate and bioaccumulation of mercury focusing mainly on ecosystems in the US and Australia.



Bio: Celia Chen is a Research Professor in the Department of Biological Sciences at Dartmouth College and a faculty member in the Ecology, Evolution, Environment, and Society Graduate Program. She has studies the environmental fate and bioaccumulation of mercury and methylmercury in freshwater and marine environments over the last 30 years. Her current research has also included the fate and bioaccumulation of per- and polyfluorinated alkyl substance (PFAS) in aquatic ecosystems.

Affiliation: Department of Biological Sciences, Dartmouth College, Hanover, NH USA

Contact: celia.y.chen@dartmouth.edu

TRACING THE ENVIRONMENTAL HISTORY AND LEGACY OF CINNABAR MINING IN THE WIDE BAY CREEK CATCHMENT, QUEENSLAND

Duncan Cook[1], Patrick Moss[2]

[1] *School of Arts and Humanities, Australian Catholic University, Brisbane, QLD, Australia*.

[2]*School of Earth and Atmospheric Sciences, Queensland University of Technology, Brisbane, QLD, Australia*

The mining of metalliferous minerals in the Wide Bay Creek catchment of southeast Queensland was underway by the 1850s. Gold deposits were the initial focus of mining, but cinnabar (HgS) and other metal ores were discovered shortly afterwards. Mining, processing and mercury production swiftly followed. The post-Contact history of cinnabar and mercury industrialisation in the upper reaches of Wide Bay Creek remains to be established in detail, but what is clear is that peaks and crashes in cinnabar mining continued into the 20th century. Some cinnabar mining leases remain active today. With incomplete historical and archaeological data for this catchment, we turn to soil and sedimentary records of past mercury use to help uncover the chronology, scale, and environmental legacy of early cinnabar mining. In this presentation, we discuss preliminary results of our research on the geological context, history, and fate of anthropogenic mercury in the Wide Bay Creek catchment.

Bio: Dr Cook is a geoscientist conducting research on environmental histories of the Common Era. His work applies techniques from soils, sedimentology, geochemistry and geochronology to understand how ecosystems have responded to climate shifts and human actions over historic timescales. He leads the multidisciplinary Maya Mercury Project reconstructing the 2000-year history of mercury use by the Maya of Central America. In Australia, his research focuses on the impact of early mining and agriculture on the environment. Prior to joining ACU, he held research positions at the Smithsonian Institution, Georgetown University, the University of Glasgow, and The University of Sydney.

Affiliation: Australian Catholic University

Contact: Duncan.Cook@acu.edu.au

MODELLING MERCURY TRANSPORT IN LEGACY MINING CATCHMENTS IN VICTORIA, AUSTRALIA

Aung Kyaw Kyaw[1], Anna Lintern [1], Fiona H.M. Tang [1], Larissa Schneider [2], Sasan Seyedein [3], Susan Lawrence [3] and Peter Davies [3]

[1] *Department of Civil and Environmental Engineering, Monash University, Clayton, VIC, Australia*

[2] *Department of Archaeology and Natural History, Australian National University, Canberra, ACT, Australia*

[3] *Department of Archaeology and History, La Trobe University, Bundoora, VIC, Australia*

Mercury from historical gold mining continues to impact Victorian catchments, yet its transport, transformation, and fate remain poorly understood. This study investigates mercury dynamics in the Upper Goulburn catchment using a coupled hydrological, hydraulic, and water quality modelling framework. Field campaigns collected water, sediment, and soil samples across upstream reference sites and downstream impact zones to capture spatial variability, while in situ measurements of pH, turbidity, temperature, dissolved oxygen, and conductivity, combined with total mercury analysis, support model calibration and validation. The integrated framework links HEC-HMS, HEC-RAS, and WASP 8.4 to simulate mercury behaviour under seasonal variation and extreme flow events. Preliminary observations reveal heterogeneous mercury distributions, with elevated concentrations downstream of legacy mine sites. Early modelling highlights the role of hydrology, sediment dynamics, and seasonal variability in controlling mercury mobility and bioavailability. This work provides a foundation for understanding contaminant dynamics and guiding future remediation strategies.

Bio: Aung is a second-year Ph.D. candidate in the Department of Civil and Environmental Engineering at Monash University, contributing to the ARC Discovery Project “Lost Mines: The Troubled Legacies of Former Mining Landscapes.” His research examines the impacts of historic gold mining on mercury contamination in Victorian river systems. He is developing an integrated hydrological and water quality model to simulate mercury transport and transformation from legacy mine sites. His work is part of an interdisciplinary collaboration with archaeologists, environmental historians, and biochemists from La Trobe University and the Australian National University, aiming to improve understanding of mercury dynamics and support sustainable management of mining-impacted catchments.

Affiliation: Monash University

Contact: aungkyawkyaw@monash.edu

UNDERSTANDING THE POST-EXTRACTION HISTORIES OF LEGACY MINE WASTE

Susan Lawrence[1], Pacian Netherway[2], Peter Davies[1] and Larissa Schneider[3]

[1]*Department of Archaeology and History, La Trobe University, Bundoora, VIC, Australia*

[2]*EPA Science, Environment Protection Authority Victoria, Centre for Applied Sciences, Ernest Jones Drive, Macleod, Melbourne, Victoria, 3085*

[3]*Archaeology and Natural History, Australian National University, Canberra, ACT, Australia*

Legacy gold mines in Australia are known to have used and released large quantities of Hg but the ongoing environmental consequences are poorly understood and under-researched. The analysis of current Hg levels in legacy mine waste in Bendigo, VIC, contributes to addressing this gap. Legacy mines represent complex socio-environmental systems, and their environmental impacts require a multidisciplinary approach if robust and contextually informed interpretations are to be achieved. Interpreting the results of environmental testing also relies on understanding human engagement with mine waste following the initial mining period. Integrating total Hg analysis of soil samples from tailings sites across Bendigo with historical and archaeological research demonstrates a variety of post-extraction processes that have shaped the current morphology and structure of legacy mine waste deposits. This has implications for the management of contaminated sites and for modelling the distribution of contaminated sites that have not yet been identified.

Bio: Professor Susan Lawrence teaches archaeology at La Trobe University, Melbourne. She has decades of experience in industrial archaeology in Australia and has written over 100 refereed publications. Her research includes investigations on the archaeology of gold mining, water use, rivers and environmental change. Her monograph *Sludge: Disaster on the Victorian Goldfields* (Black Inc 2019), co-authored with Peter Davies, was shortlisted for the Prime Minister's Literary Awards. Since 2021 Prof. Lawrence has been leading the multidisciplinary ARC-funded Lost Mines Project which is investigating legacy mercury in Victoria associated with nineteenth-century mining activities.

Affiliation: La Trobe University

Contact: S.lawrence@latrobe.edu.au

ARCHAEOLOGICAL EVIDENCE OF POLLUTION FROM HISTORICAL GOLD MINES

Sasan Seyedein[1], Larissa Schneider[2], Peter Davis[1], Aung Kyaw Kyaw[3], Anna Lintern[3] and Susan Lawrence[1]

[1]*Department of Archaeology and History, La Trobe University, Bundoora, VIC, Australia*

[2]*Department of Archaeology and Natural History, Australian National University, Canberra, ACT, Australia*

[3]*Department of Civil and Environmental Engineering, Monash University, Clayton, VIC, Australia*

Nineteenth-century gold mining in the Loddon River catchment, Victoria, left a legacy of elevated mercury (Hg) concentrations in soils, although the extent and distribution of this contamination remain poorly understood. This study integrates Direct Mercury Analysis (DMA-80) of collected soil samples with archaeological evidence and historical mining records to directly associate Hg levels with specific sites and ore processing facilities. This research evaluates mine-specific variations in ore type, extraction techniques, and re-processing methods, and their association with Hg distribution in soil. The combined use of archival, archaeological, and geochemical datasets establishes spatial patterns of Hg residues and their association with operational activities. These findings emphasise the significance of historically informed, site-specific analyses for understanding nineteenth-century mining legacies and their enduring imprint within the landscape.

Bio: Sasan is a graduate researcher in the Department of Archaeology and History at La Trobe University and a member of the ARC Discovery Project Lost Mines: The Troubled Legacies of Former Mining Landscapes. Their research explores soil pollution from mercury released during the 19th-century Victorian Gold Rush in the Loddon River Catchment, north-central Victoria. With a background in archaeometallurgy and natural resources engineering, they combine historical and scientific methods to examine how different ore extraction techniques and mining technologies contributed to pollution in gold-mining-impacted landscapes.

Affiliation: La Trobe University

Contact: S.Seyedein@latrobe.edu.au

ENVIRONMENTAL IMPACT OF ARTISINAL GOLD MINING: MERCURY CONTAMINATION STUDY IN CÔTE D'IVOIRE

Dominique Bally KPOKRO[1], Jenny Fisher[2], Larissa Schneider[3], Clare Murphy[1], Attilio Nacarrato[4];, Francesca Sprovieri[4]

[1]*School of Science, University of Wollongong. Wollongong, NSW Australia*

[2]*College of Science and Engineering, James Cook University, Australia*

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This research assesses mercury contamination in soils, tailings, and sediments at informal artisanal and small-scale gold mining (ASGM) sites in Côte d'Ivoire, focusing on four locations (Djekanou – Centre, Koutouba – East, Diawala – North and Touba – West. Soil samples were collected from two horizons (A: 0-5 cm; B: 20-25 cm). Tailing samples were obtained from processing centers in Djekanou and Diawala, while sediment samples were collected from rivers near Koutouba and Touba. Mercury analysis revealed elevated levels in soils (0.12-311.61 mg kg-1), tailings (0.23-874.38 mg kg-1), and sediments (0.27-18.37 mg kg-1). Surface soils in Diawala showed higher mercury concentrations compared to Touba and Koutouba. The analysis of organic matter provides insights into mercury migration within ASGM regions. This study reveals severe mercury contamination in informal ASGM sites in Côte d'Ivoire, with concentrations among the highest in sub-Saharan Africa, emphasizing the need for improved management to protect environmental and public health.

Bio: Dominique Bally Kpokro is a Research Fellow at the School of Science, University of Wollongong. An internationally recognized expert in environmental chemistry and artisanal gold mining formalization, he contributes to atmospheric chemistry research. He has led programs reducing mercury emissions across 20 African nations, aligning with the Minamata Convention and Sustainable Development Goals. His collaboration with UN agencies has provided leadership in mercury inventories and regulatory frameworks, facilitating mercury-free gold practices under planetGOLD and influencing legislation on lead paint and heavy metals management.

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MERCURY AND METHYLMERCURY IN SEAFOOD FROM MALUKU, EASTERN INDONESIA AND NEW SOUTH WALES, AUSTRALIA – CONSIDERING FOOD RISK AND TROPHIC LEVELS

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Consumption of fish is one of the main sources of Hg for humans and is currently regulated to reduce the risk of health effects from Hg exposure. Local Hg sources such as artisanal and small-scale gold mining (ASGM) may exacerbate the risk of exposure through locally sourced food. Seafood from fish markets in locations with no known direct Hg sources (NSW, Australia -20 species) were sampled along with two fish markets with variable known sources related to ASGM (Ambon -14 species and Namlea -12 species, Maluku Province, Indonesia). We investigated total Hg and methylmercury (MeHg) in the muscle and skin and showed that species of higher trophic levels (TL) tended to be those with the highest Hg concentrations, although there was no relationship between TL and Hg or MeHg concentration. Average Hg in the muscle of black tip sharks (*Carcharhinus limbatus*) (1377 ng/g ww) and silver gemfish (*Rexea solandri*) (809 ng/g ww) from Australia exceeded Maximum Levels (MLs) for seafood consumption, along with barred queenfish (*Scomberoides tala*) (982 ng/g ww), and grunter (*Terpon theraps*) (601 ng/g ww) from Namlea fish markets, although variability between individuals was high in some species.

Bio: My international research profile is focused on enhancing our understanding of sources, fate and consequences of contaminants in our environment and includes several subthemes: ecotoxicology, risk assessment, environmental management and ecosystem restoration. I have over 30 years of experience in academia, invested in undergraduate teaching and postgraduate training. I am the proud Editor and co-author of a 2023 textbook published by Springer titled “Marine Pollution - monitoring, management and mitigation”, an open-access textbook available online and hard copy. I am currently President of the Society of Environmental Toxicology and Chemistry (SETAC) World Council.

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USING RADIOISOTOPE TRACERS TO STUDY MERCURY ACCUMULATION IN MARINE CRUSTACEANS.

Heidi Pethybridge[1], Anais Medieu [2], Anela Choy [3], and the IMBeR-CLIOTOP *Task Team on mercury and isotopes in tuna and mesopelagic fishes*

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Mercury contamination in marine food webs poses serious ecological and human health risks, yet major knowledge gaps remain in deep and open ocean. This talk will present work quantifying mercury biomagnification in oceanic and deep-sea sharks and fishes from eastern Australia, together with findings from a global synthesis of mercury and stable isotope data in tuna and mesopelagic fishes, led through the IMBeR-CLIOTOP Task Team. Historical reconstructions spanning five decades include over 5,000 tuna and mesopelagic fish Hg records. Despite declining atmospheric mercury from reduced emissions, tuna mercury concentrations have remained largely unchanged, reflecting the ocean's inertia. These datasets reveal regional and global patterns in mercury concentrations in oceanic seafood. The work has been selected as a case study for the Minamata Convention's first effectiveness evaluation and is a temporal reference series for mercury in marine organisms.

Bio: Dr Heidi Pethybridge is a Senior Research Scientist and Team Leader at CSIRO, specialising in marine trophic ecology, seafood nutrition, ecotoxicology, and ecosystem modelling. Her research focuses on energy flow and mercury contamination in marine food webs, including studies on sharks, tunas, and mesopelagic fishes across Australia and the Pacific and Indian Oceans. She co-leads the global IMBeR-CLIOTOP program analysing mercury and isotope data in mesopelagic fishes. Her work informs national and international science-policy, including research supporting Australia's commitments under the Minamata Convention.

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ASSESSING Hg ACCUMULATION IN OFFSHORE OIL AND GAS PIPELINES TO UNDERSTAND THE RISKS ASSOCIATED WITH DECOMMISSIONING ACTIVITIES

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Mercury (Hg) is a known contaminant in oil and gas processing and has been found to accumulate in offshore infrastructure, such as pipelines. This has significant implications for upcoming decommissioning activities which must assess whether structures can be left in-place, or if they should be extracted and handled onshore. There is limited data available which can be used to confidently predict total Hg or species-specific concentrations. We aimed to identify to what degree Hg, and its species, may accumulate in pipelines, and which factors are critical to this process. To achieve this, model pipeline samples and samples of a decommissioned pipeline were analysed using mass spectrometry and synchrotron-based techniques. These analyses found that a mixture of Hg species can be present, resulting in concentrations of up to 1 g Hg·m-2 in subsea pipelines. Data generation in this area is critical to promote suitable and practical regulatory limits which will preserve marine environments.

Bio: Lhiam Paton is an analytical chemist whose research focuses on the fate of metal species in the environment. Lhiam was recently awarded an Erwin Schroedinger Fellowship bringing him from the University of Graz, Austria to the Environmental Research and Technology Group at the Australian Nuclear Science and Technology Organisation (ANSTO) as a postdoctoral researcher. Lhiam will employ ANSTO's unique radiotracer capabilities to investigate the potential risks associated with Hg species which may be released into marine environments because of offshore O&G decommissioning.

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A RELIABLE SYNTHETIC METHOD FOR A METACINNABAR RADIOTRACER TO ASSESS RICK OF RESIDUAL MERCURY IN DECOMMISSIONED SUBSEA OIL AND GAS PIPELINES

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Globally, there is an increasing burden as oil and gas infrastructure reach the end of their production life, requiring decommissioning. In Australia, full removal of this infrastructure is required unless it can be demonstrated that there is a net environmental benefit by leaving it in situ. Mercury is a contaminant that can become concentrated in these pipelines, with mercuric sulfide (β-HgS) being the predominate species. The interaction of β-HgS with seawater, sediments, and biota requires investigation to determine whether mercury released from corrosive breakthrough of in situ pipelines pose a risk to the marine ecosystem. Using a β-HgS radiotracer allows for the mercury to be rapidly tracked and detected in laboratory studies. This presentation describes the development of a reliable synthetic method for β-[^{203}Hg]HgS production and presents results of seawater solubility experiments using the bespoke radiotracer to guide risk assessment of mercury contaminants that can accumulate in these pipelines.

Bio: Alexandra Boyd is a Radioecologist working in the Contaminant Impacts Program within ANSTO, and has been investigating the environmental impact of contaminants in decommissioned offshore oil and gas pipelines over the past four years. In her varied role, Alexandra performs experimental and analytical work for ANSTO projects, external collaborations, and commercial industry partners. Alexandra also facilitates projects for research students by managing procurement processes and assisting with visiting scientist/student training.

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ESTABLISHING AN AUSTRALIAN MODEL ORGANISM FOR STUDYING MICROBIAL MERCURY METHYLATION IN THE AUSTRALIAN MARINE ENVIRONMENT

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Decommissioned oil and gas infrastructure may act as a significant source of mercury (Hg) in the Australian marine environment, yet the microbial processes influencing Hg mobility and transformation remain poorly understood. This project investigates the potential for marine microbes to methylate residual Hg from pipeline scale, producing methylmercury (MeHg), a neurotoxin that bioaccumulates in food webs. One impediment to assessing risk is the lack of Australian Hg methylators in microbial culture collections. To address this gap, we have enriched and identified Hg-methylating bacteria from marine sediments using genetic screening for Hg methylation genes (*hgcAB*). To establish an Australian model organism for Hg methylation, we performed whole genome sequencing, growth kinetics and metabolic characterisation, and Hg methylation assays. These isolates will be contextualized within the broader marine microbiome using environmental metagenomics. This work will advance understanding of microbial Hg transformation in offshore environments and inform risk assessments for pipeline decommissioning.

Bio: Dr Caitlin Gionfriddo is an environmental microbiologist and biogeochemist, and an ARC Industry and Early Career Research Fellow at La Trobe University. Her research explores how microbes influence the form and fate of mercury (Hg) in aquatic environments. Since completing her Ph.D. at the University of Melbourne in 2017, Caitlin has held research positions at Oak Ridge National Laboratory and the Smithsonian (USA), where she developed and applied molecular and meta-omic techniques to study Hg biogeochemistry across diverse ecosystems. Her current work is focused on modelling microbial mercury transformations in Australian marine and freshwater environment.

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MERCURY IN OFFSHORE OIL NAD GAS INFRASTRUCTURE; INFORMING ECOLOGICAL RISK ASSESSMENTS FOR DECOMMISSIONING

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There is increasing global focus on strategies to decommission offshore oil and gas infrastructure. To enable informed environmental risk assessments, research is required to determine the bioavailability of residual mercury retained in abandoned subsea pipelines during decommissioning. This presentation summarises two studies that investigated the mercury bioaccumulation from diet to marine invertebrates (snails and shrimp), utilising radiotracers of mercuric chloride, mercuric sulfide (as metacinnabar) and methylmercury. Pulse-chase dietary radiotracer experiments confirmed that mercury speciation significantly influences its bioaccumulation and trophic transfer. Metacinnabar demonstrated minimal bioavailability (likely due to its reduced solubility) in contrast to the highly bioavailable methylmercury, which was well retained by both snail and shrimp following a depuration period. Further studies should focus on potential long-term changes to metacinnabar solubility and methylation potential in the marine environment, especially within anoxic continental shelf sediments, to inform long-term risk.

Bio: Tom is a Principal Research Scientist with a passion for understanding how humans impact our environment. He studies how pollution interacts with living organisms in freshwaters through to open oceans. Tom's position at ANSTO allows him to use nuclear techniques (radioisotope tracers) to precisely study how quickly contaminants get into a living organism, where it goes within the tissues and then how quickly they are removed from the tissues if the source of contamination is removed. Tom is currently working with the offshore petroleum industry to providing a scientific basis for their decommissioning planning.

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PRIORITISING DATA NEEDS FOR MERCURY BIOACCUMULATION MODELLING THROUGH LARGE-SCALE SENSITIVITY ANALYSIS

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Modelling mercury levels in fish is essential for fisheries, pollution, and public health management. Ecopath with Ecosim (EwE) is an ecosystem wide, energy balance model and has been extended by Ecotracer to model contaminant dynamics. Ecotracer and EwE, allow for significant flexibility in the scenarios and systems that can be modelled but face the consequences of over-parameterisation, including parameters for processes that are rarely measured.

A sensitivity analysis of an East Bass Strait Ecotracer model was performed to identify parameters that induce the most change in model outputs. The sensitivity analysis indicated that migration rates and predator-prey relationships of species that directly absorb contaminants from the environment dominate results. This suggests that understanding environmental concentrations, direct mercury absorption and migration rates in a quantitative manner is important in risk assessments for mercury releases.

Bio: Daniel Tan is an Ecosystem Analyst in the Decision Support team at the Australian Institute of Marine Science, focusing on ecological modelling of the Great Barrier Reef. His recent work involves contaminant modelling using Ecopath with Ecosim's Ecotracer extension to understand pollutant dynamics in marine ecosystems. Daniel holds a Bachelor of Mathematical Sciences from the Australian National University. He is interested in developing flexible, user-friendly ecosystem analysis tools and improving the understanding of uncertainties in ecological modelling to support evidence-based decision-making in marine conservation.

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MERCURY BASELINES FOR ENVIRONMENTAL RISK ASSESSMENTS IN AUSTRALIA'S NORTH-WEST MARINE REGION

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Understanding existing mercury levels in marine organisms and sediments is essential for monitoring the effectiveness of the Minamata Convention on Mercury and supporting environmental risk assessments for future mercury releases from blue economy activities. However, significant knowledge gaps remain regarding mercury concentrations in marine fish and sediments across Western Australia.

This presentation outlines efforts to address these gaps through both opportunistic and targeted sampling campaigns. Mercury concentrations in commercially important demersal fish and offshore marine sediments from the north-west marine region are presented, alongside relevant ecological data such as fish age, trophic position, and diet. The application of these data to improve environmental risk assessments for potential mercury releases from offshore oil and gas activities is also discussed.

Bio: Dr Darren Koppel is a Research Scientist at the Australian Institute of Marine Science (AIMS) in Perth. Darren works closely with industry, regulators, stakeholders, and rights holders to inform decision-making for blue economy activities through an understanding of contaminant risk. This is achieved with research encompassing field, laboratory, and modelling studies, incorporating environmental chemistry, toxicology and ecological endpoints.

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MERCURY AND METHYLMERCURY ANALYSIS IN THE LEGACY RUM JUNGLE MINES IN THE FINNISS RIVER, NORTHERN TERRITORY, AUSTRALIA

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The Finniss River in northern Australia carries a legacy of contamination from the Rum Jungle uranium–copper mine, which has caused extensive ecological damage and continues to impact water quality despite rehabilitation efforts. Mercury is of particular concern because it can be converted into methylmercury, a toxic and bioavailable form that biomagnifies through aquatic food webs, threatening both wildlife and human health. Tropical floodplain systems are especially vulnerable to mercury methylation under low oxygen conditions, yet little research has examined the dynamics of water-borne mercury in northern Australia. Given the cultural and socio-economic importance of freshwater resources, especially for Indigenous communities, understanding mercury pathways is critical. This study investigates mercury and methylmercury bioaccumulation in the Finniss River food web using stable isotopes ($\delta^{13}C$, $\delta^{15}N$), and mercury analyses. Results show increasing mercury with trophic level, with mussels and barramundi exhibiting elevated concentrations. These findings highlight risks to ecosystems and food safety, informing management and community health.

Bio: Isabel is a Biologist with 20+ years of experience in environmental consultancy and academic research, specialising in animal biology and ecosystem assessment and rehabilitation. Currently, she is a PhD candidate at Charles Darwin University, investigating how toxic metals bioaccumulate through the food web and impact the river health. Isabel has worked in tropical systems across the Amazon (Brazil) and northern Australia, developing expertise in survey design, ecological sampling, and data analysis. With experience in remote fieldwork and Indigenous engagement, she is committed to applying science to improve ecosystem quality, guide pollution management, and support restoration.

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PREDICTING CONTINENTAL-SCALE SOIL MERCURY CONCENTRATIONS IN AUSTRALIA TO REFINE GLOBAL FRAMEWORKS

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Current knowledge of the global mercury (Hg) cycle is skewed toward the Northern Hemisphere. Australia provides a contrasting setting, with its arid landscapes, ancient soils, fire-adapted ecosystems, and unique biota. We analysed 2,396 soil samples from 1,141 catchments (5.84 million km², ~76% of Australia) to identify environmental predictors of Hg concentrations. Using boosted regression trees and random forests, we found ferrosols to be the strongest predictor, especially in south-eastern temperate forests. Soil organic matter (loss on ignition), nitrogen, leaf area index, and nickel and lead concentrations were also positively associated, while electrical conductivity and water availability were negative predictors. A high-resolution (0.005° × 0.005°) Hg distribution map was generated from spatially explicit models. Unlike elsewhere, Hg in Australia is highest in ferrosols and relatively nitrogen-rich soils rather than podosols or oxisols. These results highlight regional gaps in Hg research and the need for broader global datasets.

Bio: Larissa's research on mercury focuses on terrestrial environments, identifying the main drivers of Hg distribution in soils and sediments and establishing background concentrations against which modern contamination can be assessed. She is particularly interested in understanding how colonisation in Australia, and its associated activities, have altered the natural mercury cycle.

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ANALYSIS OF MERCURY (Hg) UPTAKE AND DEPOSITION FLUXES WITHIN EUCALYPTUS SIDEROXYLON

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The uptake of Hg by vegetation is one of the largest sinks for atmospheric Hg. Previous studies have constructed a global flux model for Hg dry deposition to land to better simulate the rate of transfer of atmospheric Hg to the soil via litterfall. This global model does not include any data on Australian flora. This project seeks to contribute to the global model for Hg vegetation uptake flux by investigating the yearly rate and fluctuation of litterfall for *E. sideroxylon* and the concentration of Hg within that litterfall. We have examined seasonal trends in litterfall deposition in order to better understand Eucalyptus leaf deposition. The Hg content of the litterfall has been analysed, providing a preliminary picture of the magnitude of Hg vegetation uptake within Australian flora.

Bio: Elizabeth Elphick is an undergraduate student in her fourth year at the Australian National University. She has a background in chemistry and earth science and has undertaken this work as an undergraduate research project within the Research School of Earth Sciences.

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POLLUTION HISTORY AND COLONIAL INDUCED INCREASE IN THE TRANSPORT OF MERCURY FROM AUSTRALIA TO SUB-ANTARCTIC ISLANDS: USING MERCURY ISOTOPES TO TRACE THE SOURCE

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Mercury (Hg) is a volatile toxic metal with a strong capacity for atmospheric transport, making its biogeochemical cycle highly sensitive to climate change. A major challenge in Hg research is distinguishing natural climate-driven change from anthropogenic influences. This study investigates how colonisation and climate change have shaped Hg contamination in the Australia–Pacific region. Previous work has identified Hg in remote environments of Australia, the Southern Ocean, and Antarctica, with deposition increasing since the colonial period. Here, we apply a multi-proxy approach, including Hg isotopes, to sediment records from Southern Australia and sub-Antarctic islands (Macquarie and Campbell). This approach distinguishes between long-range transport, anthropogenic emissions, invasive animal impacts, and climate drivers. By integrating isotopic and geochemical data, we aim to quantify Hg sources and accumulation rates, providing new insights into the processes controlling Hg behaviour in lacustrine ecosystems under changing climate conditions.

Bio: Margot Schneider is a third-year PhD candidate in biogeochemistry at the Australian National University, supervised by A/Prof Larissa Schneider, Dr. Krystyna Saunders, Professor Simon Haberle, Dr. James Latimer, and Dr. Alan Griffiths. Her research investigates long-range toxic metal contamination, particularly mercury, using lake sediment records from southeastern Australia, Campbell Island, and Macquarie Island. By integrating geochemistry, paleoclimatology, and environmental history, she examines how anthropogenic activity, climate variability, and atmospheric circulation shape mercury deposition. Margot values interdisciplinary research, drawing on diverse scientific fields to better understand mercury cycling and environmental change. She is supported by an AINSE postgraduate research scholarship.

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STUDYING PRE-INDUSTRIAL MERCURY DEPOSITION PROCESSES BY PERFORMING GEOS-CHEM SENSITIVITY TESTS, WITH FOCUS ON THE 50S-60S BAND

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Since 1950, the intensification and shift of the Southern Hemisphere Westerly Wind (SHW) poleward has made the Southern Ocean region more vulnerable to the transport of toxic metals, such as mercury, towards parts of the globe previously considered 'pristine'. To quantify long range toxic metal contamination and examine its sources we analysed lake sediments from Macquarie Island, which act as a sink for atmospheric Hg deposition and provide a long-term archive of past atmospheric Hg flux. The results revealed pre-industrial fluctuations in Hg deposition, which, for future studies, must be clarified to distinguish natural from human-caused variations. To this end, we used the chemical transport model GEOS-Chem model to perform a series of sensitivity tests in pre-industrial setting, with particular attention to the 50S-60S band. Here we show the candidate process (e.g., emissions, transport, local or remote chemistry) that most significantly affect mercury deposition. This multidisciplinary approach is crucial for developing effective mitigation strategies and controlling metal pollution in these sensitive regions.

Bio: Paolo Sebastianelli is an interdisciplinary scientist and educator. His background in Chemistry and Physics allowed him to explore various domains of the modern science, leveraging interdisciplinary approaches to elucidate processes in Environment and Erath Science, Atmospheric Physics, Computational Chemistry, Combustion, and Materials Science. At the moment, he is employed as a Research Fellow at the Australian National University, supervised by Pro. Larissa Schneider and Dr. Alan Griffiths.

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ATMOSPHERIC MERCURY (Hg0) MONITORING FROM KENNAOOK/CAPE GRIM (KCG): INSIGHT INTO CONCENTRATION, VARIATION, AND SOURCE ATTRIBUTION

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Understanding the relative contribution of atmospheric mercury (Hg^0) from the ocean is essential for accurately assessing the global mercury budget. Here we assess the concentration, seasonal variability, and source attribution of Hg^0 at an ocean-influenced southern hemisphere mid-latitude site (Kennaook/Cape Grim, KCG). The 2017-2022 mean Hg^0 concentration at KCG was 1.05 ± 0.05 ng m^{-3}, more consistent with Southern Hemisphere background. The trend over this period was constant or slightly increasing at 0.01 ng m^{-3} y^{-1} ($p < 0.1$). Periods of enhanced Hg^0 at KCG are associated with increased wind speeds from the south to west, indicating that the Southern Ocean is likely an important source of Hg^0. We use radon in the range 30-50 mBq m^{-3} to identify oceanic contribution and performed a Generalized Additive model (GAM) to predict observed Hg^0 variability. This model predicts 37% of the observed Hg^0 variability, with temperature becoming the dominant influencing factor. Our results suggest that further mechanistic and modelling studies, combined with additional observational variables such as ozone, sea surface temperature, and chlorophyll are needed to explain variability in ocean-influenced Hg^0 concentration and improve global estimates of air-sea exchange.

Bio: Bakhat Rawat is an M.Phil. Student at School of Science, University of Wollongong (UOW). He has a background in atmospheric mercury measurement in Nepal and China and is exploring long-term records of atmospheric mercury measurements from across Australia to understand mercury distributions and changes in the Southern Hemisphere.

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LONG-TERM MONITORING OF MERCURY IN AMBIENT AIR IN THE AUSTRALIAN REGION

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The Minamata Convention is a global treaty whereby signatory countries, including Australia, have committed to reducing anthropogenic emissions of mercury. The effectiveness of the convention will be evaluated by measuring mercury concentrations in media, one of which is air. Long term observations of mercury in ambient air at the Kennaook / Cape Grim Baseline Air Pollution Station and the Northern Territory Baseline Air Pollution Station are currently being used in this process. Both sites are impacted by both continental and marine airmasses and are among only a handful of sites in the Southern Hemisphere with observations for more than 5 years. In this presentation I'll provide an overview of our long-term measurements and how they are being used in the effectiveness evaluation process and our participation in regional and global networks. I'll also highlight how Australian measurements can provide insights into mercury cycling in the Southern Ocean and tropical regions.

Bio: Jenny is an experimental scientist for the Australian Science agency CSIRO with expertise in air quality. She undertakes sampling of atmospheric mercury at a number of sites in Australia, with a focus on understanding trends and cycling of mercury in the region.

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