



THE UNIVERSITY OF  
**SYDNEY**

# Geosciences Honours Projects and Profiles

Honours project topics and supervisors  
available for 2022

Faculty of Science, School of Geosciences



<https://sydney.edu.au/science/schools/school-of-geosciences.html>



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# Contents

(**E**: Environmental Studies, **G**: Geography, **GG**: Geology & Geophysics, **M**: Marine Science)

DR NAAMA BLATMAN ( <b>G</b> ) .....	2
ASSOC PROF ELEANOR BRUCE & DR KEVIN DAVIES ( <b>E, G</b> ) .....	3
DR VASILIS CHATZARAS ( <b>GG</b> ).....	6
DR REBECCA CROSS ( <b>E, G</b> ).....	8
DR ADRIANA DUTKIEWICZ ( <b>GG</b> ).....	9
DR TOMMY FELLOWES ( <b>E, G, GG, M</b> ) .....	10
DR BOB FISHER ( <b>E, G</b> ).....	11
DR JO GILLESPIE ( <b>E, G</b> ).....	12
DR RYAN HOLMES ( <b>GG</b> ).....	13
ASSOC PROF KURT IVESON ( <b>G</b> ).....	14
DR BEN MATHER ( <b>GG</b> ).....	16
PROFESSOR PHIL MCMANUS ( <b>E,G</b> ).....	17
DR BREE MORGAN ( <b>E, GG</b> ) .....	18
PROFESSOR DIETMAR MÜLLER ( <b>GG, M</b> ) .....	19
DR JEFF NEILSON ( <b>E, G</b> ) .....	20
ASSOCIATE PROFESSOR DAN PENNY ( <b>E, G, GG, M</b> ).....	21
PROFESSOR BILL PRITCHARD ( <b>E, G</b> ) .....	22
DR PATRICE REY ( <b>GG</b> ).....	23
DR TRISTAN SALLES ( <b>GG, M</b> ) .....	24
DR MARIA SETON ( <b>GG, M</b> ) .....	25
ASSOC PROF ANA VILA-CONCEJO ( <b>E, G, GG, M</b> ).....	26
DR SOPHIE WEBBER ( <b>E, G</b> ) .....	28
DR JODY WEBSTER ( <b>E, G, GG, M</b> ) .....	29
ASSOC PROF DEREK WYMAN ( <b>GG</b> ) .....	31
DR SABIN ZAHIROVIC ( <b>GG</b> ).....	32

# Dr Naama Blatman

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
	YES		

## Who am I?

I am a lecturer and postdoctoral fellow in urban geography. My research looks at the ways that settler colonialism has impacted cities in terms of land and housing infrastructures, Indigenous rights and activism and urban political economies. Most of my work is based on ethnographic and archival research in Australia and in Israel/Palestine (where I'm from). I carry out and am also happy to supervise comparative research.



## Why you should talk to me about Honours

I have been mentoring students with very different kinds of projects, from urban focused research through the political and legal geography space. The students I work with usually take interest in Indigenous peoples, knowledges and rights and the ways these can and should be embedded in any type of geographical research, regardless of the specific field or region of study. In supervising Honours students, I bring together my different interests and skills from historical geography, political geography and urban geography and encourage students to think holistically and critically about their projects. I place great attention on ethical practice and mixed methods in geography.

### HONOURS FOCUS AREAS:

Broadly, I am interested in working with students whose work touches on issues of cities and colonialism, including but not limited to structures and dynamics of racial capitalism, gentrification and housing inequalities, dis/possession and politics of place-making and reclamation efforts by Indigenous peoples and their allies.

Specific projects I'm currently involved in that might be of interest to Honours students are:

- The Aboriginal estate in Western Sydney (i.e. infrastructure projects on Aboriginal land, eco-housing and property, The Parramatta Gaol)
- Gentrification in Redfern (including cultural and green gentrification)
- The history and political economy of the NSW Railway system and its impacts on urban development in Sydney

Please get in touch if you have any questions about these projects or would like to propose a different one.



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# Associate Professor Eleanor Bruce & Dr Kevin Davies

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
YES	YES		YES

## Who are we?

**Eleanor:** I am a physical geographer with expertise in the use of GIS, spatial modelling and Earth observation for understanding environmental change. My research focuses on understanding the complexities of coastal system response to climate variability. This involves studying the geographical dimensions of coupled human environment systems and underlying biophysical processes. I use multiple exploratory tools including spatial modelling, emergent remote sensing technologies (CubeSats and UAVs) and in situ field observation to research key drivers of coastal change.



**Kevin:** My research focuses on the use of satellite remote sensing, geospatial analysis, and GIS to improve our understanding of geographical issues. My current research includes satellite-based land use mapping and geospatial data collection for improving livelihoods and natural resource management in the Pacific Islands. I also investigate the use of CubeSats for landscape monitoring as part of the University's SpaceNET project.

## Why you should talk to us about Honours

**Eleanor:** I co-lead a large inter-disciplinary research project on coastal landscape livelihoods in the South Pacific involving collaborations with research partners and stakeholders in Fiji and Tonga. The project examines methods for integrating spatial modelling, remote sensing and local knowledge to understand environmental livelihood security (ELS). This work also considers how biophysical processes and existing ecosystem service flows result in differentiated risks of climate stressors within coastal communities.



Through the ARC Training Centre for CubeSats and UAVs ([CUAVA](#)), we are developing new approaches for monitoring environmental landscape system change. The Centre provides opportunities to collaborate with researchers and industry partners involved in the design and development of satellite-based sensors.

**Kevin:** Kevin's research focuses on the use of satellite remote sensing, geospatial analysis, and GIS to improve our understanding of geographical issues. Kevin's current research includes satellite-based land use mapping and geospatial data collection for improving livelihoods and natural resource management in the Pacific Islands. Kevin also investigates the use of CubeSats for monitoring of coastal ecosystems and estimating blue carbon as part of the University's Centre for CubeSats, UAV's and their Applications ([CUAVA](#)).

## HONOURS FOCUS AREAS:

- Coastal ecosystem services
- Spatial monitoring and modelling of blue carbon habitats (mangrove, saltmarsh and seagrass)
- Maritime boundaries and climate change in the South Pacific (co-supervision with Ana Vila-Concejo)
- Investigating socio-economic disparities in COVID-19 impacts using spatial analysis (co-supervision with Dale Dominey-Howes)

## POTENTIAL TOPIC DESCRIPTIONS:

- **Monitoring blue carbon coastal ecosystems**

**Supervisors:** Eleanor Bruce and Kevin Davies

Mangrove, saltmarsh and seagrass are major sources of organic carbon (blue carbon) and considered important ecosystems for mitigating carbon emissions. Global degradation and loss of these critical ecosystems have reduced organic carbon stocks potentially increasing release of CO<sub>2</sub> into the atmosphere. In urban environments, such as Sydney, coastal squeeze resulting from development pressures reduces the lateral space (accommodation space) for transgression of mangroves and other intertidal ecosystems under changing sea levels.

Working with Arbor Carbon (CUAVA Industry Partner), this research project would contribute to methods for characterising spatio-temporal variability in biomass estimates in saltmarsh, seagrass and/or mangrove communities in the Sydney Harbour and Parramatta River using ultra high-resolution UAV data, satellite imagery and field survey.

Research partners: ARC Training Centre for Cubesats, UAVs and Their Applications (CUAVA), Arbor Carbon, UWA Oceans Institute & Australian Institute of Marine Science (AIMS). [CUAVA](#)

- **Coastal ecosystem services in the South Pacific**

**Supervisors:** Eleanor Bruce

Susceptibility to climate variability and extremes is acutely felt by many natural resource-dependent coastal communities of the South Pacific. Livelihood and food security in these environments are inextricably linked with coastal ecosystem health. Focused on coastal ecosystems, this project could involve the use of Earth observation data to examine the influence of biophysical interactions operating in inter-tidal environments on local livelihood and food security South Pacific coastal communities. This would potentially involve integrating remotely sensed indicators of ecosystem status and qualitative information on subsistence usage patterns, fishing activities and land use practices, to investigate key socio-ecological system interlinkages and beneficiaries of coastal ecosystem services.

- **Mapping coastal seagrass ecosystems using high resolution remote sensing**

**Supervisors:** Eleanor Bruce and Kevin Davies

Extensive meadows of seagrass in shallow coastal waters provide important ecosystem services that directly or indirectly benefit human needs, particularly in the stabilisation of nearshore sediments and as nursery grounds for commercial fish species. Previous research has shown that the spatial patterning and species present within seagrass meadows can influence the ecosystem service flows from these environments. For example, do well established meadows vs. areas comprising smaller colonising species provide habitat characteristics that support commercially important fish or stabilise sediments? Spatial modelling and remote sensing-based research on these coastal seagrasses can provide valuable insight on species composition, benthic substrates and other variables that influence the ecosystem service contributions.

- **Remote sensing of vulnerable coastal based point features in the South Pacific under climate change**

**Supervisors:** Eleanor Bruce, [Ana Vila-Concejo](#) and Kevin Davies

The UN Convention on the Law of the Sea (UNCLOS) is the international agreement that establishes a relationship between land and sea. It defines types of natural features and the maritime zones they can generate. As recognised in the Framework for a Pacific Oceanscape (FPO), setting maritime zones under UNCLOS, enables Pacific countries to maximise rights over critical resources, including fisheries.

The land and natural maritime features used in the Pacific islands to generate maritime zones often consist of low elevation islands, sand cays, rocks, and their associated reef systems. The permanence of these features, and their ability to generate maritime zones are at risk due to climate change. The major hazards, or change drivers, are sea level rise, erosion of land, ocean acidification, extreme events, loss of habitat and decreasing biodiversity. The compounding impacts of these hazards may lead to features disappearing or decreasing in their persistence over time in the same location. Losses of or changes to those land features may ultimately deflate Exclusive Economic Zones (EEZs). This project could involve investigating spatio-temporal patterns of change in 'at risk' coastal features that define maritime zones.



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# Dr Vasilis Chatzaras

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
		YES	

## Who am I?

I am a geologist specializing in the study of the structure, rheology, and physical properties of Earth materials. The question that drives my research is how rocks deform in various scales, rates, conditions, and tectonic settings. I hold a PhD in structural geology and tectonics from the University of Patras in Greece, and I have undertaken various research positions at Boston College (USA), University of Wisconsin-Madison (USA), and Utrecht University (Netherlands), before joining the University of Sydney in 2018 as a lecturer in geology. My work focuses on a range of themes. I am interested in understanding how the rheological structure of the lithosphere affects earthquake processes along plate boundaries; what controls the structure and anisotropy of the upper mantle and lower crust; how subduction zones initiate and how forearc lithosphere forms and evolves; the



paleogeographic configuration and tectonic evolution of ancient continents and oceanic basins. My work takes place in lots of interesting places around the world including Australia, New Caledonia, New Zealand, USA, Mexico, Antarctica, Europe, Turkey, and Oman.

## Why you should talk to me about Honours

Talk to me if you are interested in studying rocks in the field and/or the laboratory, at scales ranging from the kilometre down to the nanometre, and by using various microanalytical techniques to characterise the rock fabric (e.g., X-ray microscopy), microstructure (e.g., electron microscopy), and composition (e.g., electron microprobe, Raman and infrared spectroscopy). Contact me if you would like more information for any of the following projects, or if you have your own ideas for projects in the area of structural geology and tectonics that you would like to discuss.

### HONOURS FOCUS AREAS:

#### – Sydney fault zones and fracture networks

In an urban environment, faults and fractures pose a range of environmental, engineering and hazard issues that need to be understood to be mitigated. These structures facilitate the underground diffusion of surface contaminants that may corrode infrastructures, they weaken the strength of the geological framework that supports surface and underground infrastructures, and they may be at the origin of seismic activities. These industry embedded projects will constrain the structure, geometry, geochemistry and mechanics of fault and fracture networks in Sydney Metropolitan Area, documenting their geohazard consequences. Co-supervisors: Patrice Rey (USyd), David Och (WSP Australia).

#### – Geological Evolution of Southwest Pacific: Field-Based Studies in New Caledonia

These funded mobility projects include the involvement of USyd students in a unique international research collaboration with researchers and professionals in the Geological Survey of New Caledonia (GSNC) based in Noumea. Indicative research projects include: 1) Strategic minerals potential of Massif du Sud with implications to sustainable mineral exploration; 2) Formation and evolution of the mantle-crust transition; 3) Seismic properties of the deep lithosphere. Co-supervisors: Julien Collot (DIMENC), Derya Güler (UQ).

– **Geophysical and geological mapping of deep Australia**

The future of the green economy lies in the deep Earth. This project will enhance the geological interpretation of geophysical models of the lithosphere, by mapping the petrophysical and mechanical properties of the uppermantle. The aim is to facilitate mapping mineralized fluid pathways at lithospheric scale and predict deposits in the accessible crust. Co-supervisors: Patrice Rey (USyd), Olivier Alard (MQ).



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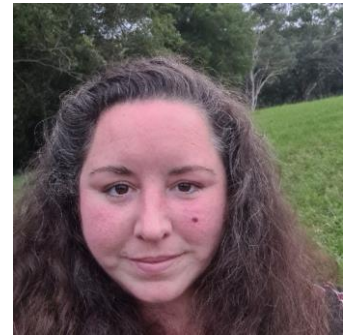
# Dr Rebecca Cross

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
YES	YES		

## Who am I?

I am a lecturer in rural and environmental geography. My research focuses on socio-ecological systems, specifically, sustainable and regenerative transitions in land management and agriculture including Indigenous agriculture. This further entails a focus on grassroots or bottom-up innovations, local and Indigenous knowledges and local socio-cultural dynamics. I also investigate the on-ground impact of payment for ecosystem services (PES) schemes. Most of my work is qualitative and participatory with elements of action research.



## Why you should talk to me about Honours

Talk to me if you are broadly interested in sustainability and natural resource management in rural/remote areas or new/alternative/regenerative agricultures that both integrate production and conservation whilst improving livelihoods and wellbeing. The socio-cultural dimensions of place and belonging in rural Australia including First Nations, sub-cultural, settler-colonial, and gendered relationships are also areas of interest through the lens of land management. I collaborate with a wide range of stakeholders from government, non-government and local organisations including the Department of Primary Industries, Landcare, Local Land Services and Local Aboriginal Land Councils. I am also involved in international projects based in Cambodia on intensification and diversification in rice production and on gender and social inclusion in small ruminant farming in Fiji and Samoa. If you are interested in talking with people at the 'coalface' to understand the dynamics of change in different and emerging rural industries and contexts, drop me a line!

### HONOURS FOCUS AREAS:

Below are some options to work with me on existing projects, however I am happy to meet with you to discuss your ideas and to help you develop your own project.

- Carbon farming – specifically investigating landholder collaboration, risks and co-benefits of soil carbon for climate change adaptation and mitigation.
- Indigenous Grasslands for Grains – investigating the potential for an Indigenous-led native grains industry from paddock to plate (for more please see <https://www.sydney.edu.au/science/our-research/research-areas/life-and-environmental-sciences/indigenous-grasslands-grain.html>)
- Regenerative agriculture – working with Landcare to understand socio-cultural perceptions of regenerative agriculture
- Fisher's local knowledge – investigating long-term local knowledges of river and fish health in NSW



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# Dr Adriana Dutkiewicz

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
		YES	

## Who am I?

I am a sedimentologist and have worked on a variety of sedimentary rocks and sediments ranging in age from Archaean to Quaternary. My current research is focused on the synthesis of large sedimentological and geochemical datasets in order to provide new insights into fundamental processes underpinning the composition of marine sediments, ocean chemistry, and the global carbon cycle. All of my research is multi-disciplinary and combines traditional sedimentology with an aspect of cutting-edge technology such as machine learning.



## Why you should talk to me about Honours

I have just commenced a 4-year research project funded by the Australian Research Council entitled “The deep-sea carbon reservoir through geological time”. Central to this project is constraining the deep-sea sedimentary carbonate, which to this day remains the least-known component of the long-term carbon cycle. The aim of your Honours project will be to rigorously reconstruct the carbonate compensation depth in one of the main ocean basins (e.g., Indian/Pacific Ocean) using scientific ocean drilling data, ocean basin reconstructions, and Python workflows. Your reconstruction will provide insights into the carbon cycle as well as global and regional climatic and oceanographic perturbations since about 80 million years ago. As an Honours student you will have ample opportunity to undertake courses teaching sought-after programming and scripting skills at the Sydney Informatics Hub, and you will apply these skills to your Honours research.

This project is perfectly suited to Covid-19 and post-Covid-19 times because: 1) it relies on an enormous wealth of existing analytical data that is underutilised by almost the entire geological community, meaning that it is novel as well as low risk should the world suddenly go into lockdown (no field work, no lab work), and 2) it uses data analysis methods and computer coding that can easily be applied to fields outside of geosciences.

After completion of the project you will have acquired the following skills: an understanding of deep-sea drilling data (sedimentological and geochemical); compiling and quality control of large, complex datasets; programming and scripting skills; using open-source software such as GPlates and GMT; scientific writing and presentation skills; a global and multi-disciplinary research outlook.

### HONOURS FOCUS AREAS:

marine sedimentology, deep-sea sediments, computational sedimentology, global carbon cycle



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# Dr Tommy Fellowes

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
YES	YES	YES	YES

## Who am I?

I am a marine geoscientist and coastal geomorphologist. I completed a PhD at Macquarie University in 2020 that focused on embayed beach morphodynamics and storm responses. In 2015, I completed a Master of Marine Science and Management at Sydney University that focused on the geomorphology of coral reefs and used fossil foraminifera shells as proxies of sediment transport pathways. My research is always multidisciplinary and uses a range of field and remote sensing techniques. I am currently a postgraduate research associate on a project funded by Geoscience Australia. This project looks at the susceptibility and instability of coral reef islands to anthropogenic climate change at locations that extend Australia's maritime jurisdiction (e.g., Coral Sea Marine Park). This project is multidisciplinary and links biological, chemical and physical reef processes with legal perspectives.



## Why you should talk to me about Honours

I am a member of the [Geocoastal Research Group](#) and [Marine Studies Institute](#). My research focuses on tropical and temperate coastal landscapes. This area of research aims to provide a better understanding of the processes that shape and modify coastal systems. Only with a solid understanding of these processes can we then think about how coasts might respond to anthropogenic climate change (e.g., SLR, increase storminess). This research will provide you with transferable skills (e.g., GIS and code-based analytical experience) that will help you go further in academia or secure you a job in government or industry.

### HONOURS PROJECTS:

#### - Morphological susceptibility of low-lying coral reef islands

**Supervisors:** Tommy Fellowes & Ana Vila-Concejo

Coral reefs are increasingly susceptible to anthropogenic climate change. Coral reef islands are low-lying and morphologically active on storm through to geological timescales. They are controlled by biological, chemical and physical processes and are supplied with carbonate sediments derived from the reef. It is uncertain if coral islands will persist into the future (and on what timelines). This project will start off by looking at the Coral Sea Marine Park which is east of the Great Barrier Reef and covers an area of 989,836 km<sup>2</sup> (size of South Australia). It has 34 coral reefs with a total of 56 coral island, cays and islets. A number of these islands are ecologically important breeding sites for seabirds and sea turtles, while they also have international significance as legal baselines extending Australia's maritime jurisdiction. This project has room to grow and evolve to include other coral reef islands or regions (e.g., NW Australian Shelf). This project will use aerial and satellite imagery to analyse yearly to decadal evolution in relation to wave climates, storms, marine heatwaves and sea-level rise. **\*\*\*This project can be completed remotely.**



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# Dr Bob Fisher

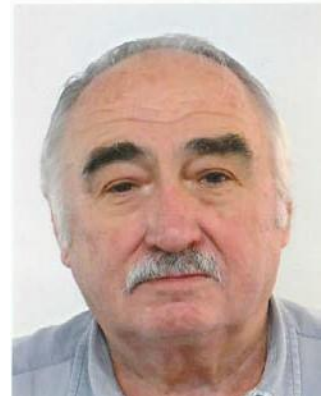
Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
YES	YES		

## Who am I?

I specialise in social and political ecological aspects of natural resource management, particularly involving community forestry. My PhD research (in anthropology) was a study of human ecology, focusing on strategies for adapting to drought in the Thar Desert in Rajasthan. After working in Nepal with the then Nepal-Australia Forestry Project in the late 1980s, I taught at the University of Western Sydney, Hawkesbury, before becoming Deputy Director of the Regional Community Forestry Training Center in Bangkok. For several years I was an advisor to IUCN's global Livelihoods and Landscapes project, focusing on tenure issues.

My career has been a mixture of academia and international development work. I have carried out research or consultancies in a wide variety of countries, including Nepal, India, Mozambique, Iran, Kyrgyzstan, Mongolia, Papua New Guinea, Pakistan, Thailand, Laos, Vietnam, Cambodia, Liberia and Ghana.



My research interests are:

- Applied anthropology and geography
- Community-based natural resource management (especially community forestry)
- Landscape approaches to conservation and development
- Poverty, livelihoods and conservation
- International development and rural development
- Farming systems and agricultural extension

## Why you should talk to me about Honours

If you are interested in the relationships between human behaviour and environment/conservation or if you are interested in development studies we could talk about projects that fit your interests. While it would be ideal to develop honours projects that involve international fieldwork, that's obviously not possible at present due to COVID-19. There are alternatives. For example, there are opportunities to look at how COVID-19 has affected the way international NGOs manage and fund their development work or the priorities people place on international aid when there are real local problems with poverty. Have aid agencies changed their priorities? Have they shifted focus from international to local needs? How can they manage their international projects and activities without travel? We could also talk about any ideas of your own that fit into my research interests.

**HONOURS FOCUS AREAS:** social aspects of natural resource management (especially forests), REDD+, development geography, SE Asia, Africa or PNG, international development



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# Dr Jo Gillespie

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
YES	YES		YES (depends on topic)

## Who am I?

I am an environmental legal geographer interested in the complex intersection of geography and law. My research investigates environmental protection conservation regimes/practices throughout Australia and the Asia-Pacific region.



## Why you should talk to me about Honours

My research delves into the complexities of human/non-human-place-law connections. Using the skills of a human geographer, I untangle the ways in which environmental regulations perform in different contexts. My research work is interested in discovering how people-place-law dynamics enable or disable environmental management policy solutions.

My research covers:

- Examining the efficacy of environmental law and governance regimes
- Exploring the role of Environmental NGOs in environmental litigation
- Understanding the role of conservation regimes, especially protected areas, with a focus on world heritage and wetland places
- Applying different conceptual ideas and approaches, including environmental/ecological justice, legal geography, political ecology; and
- Environmental ethics, environmental (human/non-human) rights and human/nature binaries.

**HONOURS FOCUS AREAS:** Environmental law & management, biodiversity protection, conservation, protected areas, national parks, world heritage, wetlands; environmental NGOs; environmental human rights, non-human (more-than-human) rights, ecological justice, stewardship ethics.



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# Dr Ryan Holmes

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
		YES	YES

## Who am I?

I am a physical oceanographer interested in ocean physics, ocean modelling and climate variability. My research focuses on how processes acting on smaller scales, such as ocean turbulence, instabilities, fronts, jets and eddies, impact the large-scale ocean circulation and modes of climate variability such as the El Niño-Southern Oscillation. My toolbox includes numerical models of ocean circulation ranging from idealized box and one-dimensional models through regional models all the way up to fully-realistic global General Circulation Models (GCMs). I use these models to better understand interactions across scales in the ocean to improve our ability to predict and project how circulation and climate may change in the future.



## Why you should talk to me about Honours

An Honours project is a great opportunity to get your hands dirty with an independent research project. Physical oceanography is a field ripe for exploration, with a wide range of unsolved problems and interesting processes with real world implications.

I am interested in working with Honours students with a passion for exploration and for understanding a problem in depth. Programming skills, some physics knowledge and experience with a data analysis package such as python or Matlab would be beneficial. The numerical modelling focus of my research means that your project can be done from anywhere with an internet connection and will not be interrupted by Covid-19.

### HONOURS FOCUS AREAS:

I would be happy to design a physical oceanography or modelling project around your interests. Specific focus areas are:

- **Ocean modelling using ACCESS-OM2**

I am a chief investigator in the Consortium for Ocean and Sea-Ice Modelling in Australia (COSIMA, <http://cosima.org.au/>) who are developing Australia's next-generation global ocean model, ACCESS-OM2. ACCESS-OM2 is ideally suited for a first foray into global ocean modelling. I have a range of projects available using ACCESS-OM2 to study problems such as ocean heat uptake under climate change forcing, global overturning circulation dynamics and the cause of model biases.

- **Equatorial ocean dynamics and El Niño**

The El Niño-Southern Oscillation has significant impacts on Australian rainfall and climate extremes. However, our ability to predict El Niño events ahead of time is limited due to deficiencies in coarse-resolution models. I have a range of projects available using ocean models or analysis of observational data to understand the impact of ocean eddies and turbulence in the Eastern Tropical Pacific on the dynamics of El Niño events.



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# Associate Professor Kurt Iveson

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
YES	YES		

## Who am I?

I'm an urban geographer, with a particular interest in how we can make our cities more just and sustainable. I've written books on topics like the politics of urban public space and everyday multiculturalism in cities, and am currently working on a book about different strategies that urban residents are using around the world to build and use people power to make their cities better. I also do my best to contribute academic research to public discussion and debate – I've been doing a fortnightly radio show on Radio FBi about urban environmental issues for a few years, and am a semi-regular contributor to The Conversation and newspaper opinion pages.



## Why you should talk to me about Honours

One of the things I most love about being an urban geographer is that the city that I live in, and the cities that I visit, are my 'field'. Whatever you see going on around you in your everyday urban life, you can study it from an urban geographical perspective. So, if you have any interests in things going on in your city – no matter how obvious or obscure – I'd be really happy to talk about your ideas and help you develop a great project. While there's a list below of honours projects that I'm particularly interested to supervise right now, I'm open to topics beyond that list.

I'm also co-convenor of the 'Urban Crew' here in Geosciences – it's a network of urban researchers in and beyond the School that meets every week to talk about our on-going work. So, if you pursue urban geography for your Honours, you'll be part of a lively crew of people to support (and **maybe even publish**) your work.

**HONOURS FOCUS AREAS:** Urban environmental issues; urban informality; urban public space; urban social and environmental movements.

### HONOURS PROJECTS:

- **Urban Informalities in Sydney**  
Over the years, I've supervised several theses on aspects of urban informality in Sydney. While we often associate informality with mega-cities in the Global South, through those projects we've made the case that Sydney is also a site of informal practices and places. So, whether it's informal work, housing, sport, food production or some other activity, there's plenty of scope for great projects in this area.
- **Retrofitting cities**  
There's a lively debate going on globally, inspired by recent discussions of the 'Green New Deal', about how urban infrastructures could be retrofitted in ways that address uneven vulnerabilities to environmental hazards while also creating work and livelihoods. It's a great time to be doing research on the nitty-gritty details of what sector-based retrofit strategies would look like.
- **Tunnelling as 'sediment transport': where does all the waste go?**  
The construction of tunnels for freeways, trainlines, and other flows like water, electricity and data must deal with the pre-existing geology of the city. But tunnelling could itself be considered a 'geo-social' process – that is, a

human process of transporting Earth materials from one place to another. This project will critically examine the nature, volume and relocation of earth that was removed in a specified tunnel from both geological and geographical perspectives. (We'd have colleagues from geology like Vasilis and Patrice to assist with any geological knowledge required.)



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# Dr Ben Mather

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
		YES	

## Who am I?

I am an environmental legal geographer interested in the complex intersection of geography and law. My research investigates environmental protection regimes and human environment geographies throughout Australia and the Asia-Pacific.



## Why you should talk to me about Honours

You should talk to me about honours if you are interested in unravelling the origins of ancient volcanoes. Volcanoes provide a fundamental insight into the composition of the Earth's interior, however, there are thousands of volcanoes which have unknown origins.

In addition, I have ongoing projects exploring the dynamics of groundwater flow. Groundwater is a crucial resource in Australia yet flow patterns from recharge to discharge zones, and between different aquifers, is poorly understood. These projects involve numerical modelling of groundwater flow in large sedimentary basins, such as the Great Artesian Basin.

During your honours project, you will learn transferable skills in Python, a programming language that is in high demand, spatial data and analysis (GIS), critical thinking and problem solving.

**HONOURS FOCUS AREAS:** Geology and geophysics; global plate tectonics; numerical geodynamics; volcanoes in eastern Australia; hotspot volcanoes; crustal heat flow; groundwater modelling



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# Professor Phil McManus

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
YES	YES		

## Who am I?

I am a Professor of Urban and Environmental Geography. I am a human geographer with interests in sustainable cities, environmental issues and human/animal relations. I am interested in Urban Political Ecology and its theoretical development and application to a range of issues.



## Why you should talk to me about Honours

My current research focuses on sustainable cities, transport Infrastructure (particularly mega-projects, including WestConnex) and representations of nature in the construction of a range of environmental issues. Within the area of sustainable cities I am researching the use of metrics such as Ecological Footprints and migration issues such as the tree-change phenomenon in Australia. My research on nature includes human/animal relations, particularly thoroughbred breeding and the uses of nature.

**HONOURS FOCUS AREAS:** urban sustainability; transport infrastructure; Human-nature interactions (particularly in the thoroughbred industry).



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# Dr Bree Morgan

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
YES		YES	YES

## Who am I?

I am an environmental geochemist. I lead a research team and laboratory in the Geocoastal Research Group. I completed my double major in Land and Water Management and Zoology at the University of Western Australia before working for several years as an environmental officer for the Department of Water, W.A. I was lured back to research to investigate the anomalous accumulation of monosulfides (minerals that sponge up contaminants from water) in the sediments of a eutrophic estuary. I was hooked! I completed my PhD on the topic, following which I worked as a postdoctoral fellow at CSIRO, investigating CO<sub>2</sub> sequestration and storage security in minerals, and as a lecturer and researcher at Monash University, before joining The University of Sydney in 2017.



## Why you should talk to me about Honours

My research program is at the intersection of chemical sedimentology, aqueous geochemistry and mineralogy. It teases apart biogeochemical signatures to understand how matter and energy cycles through the Earth's surface, and how this delicate balance is impacted by humans. I combine fundamental and applied science to assess the sustainability of modified landscapes, address climate change, coastal acidification and eutrophication, and assist in the rehabilitation of contaminated sites and mines. I have extensive field experience in a range of environmental settings and most of the Honours projects I supervise have the potential to incorporate in a field component. My students receive expert training in the collection, processing and analysis of environmental samples (sediments, porewaters, soils, surface waters, etc).

My interests are broad and projects can be tailored to suit the interests of students. Some specific themes include: Assessing the impact of land use change and climate drivers on contaminant mobility and natural element cycling; CO<sub>2</sub> sequestration, storage and security in minerals; acid sulfate soils and the impacts of coastal acidification; fingerprinting environmental processes and anthropogenic impacts using trace elements; valorization of mine wastes.



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# Professor Dietmar Müller

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
		YES	YES

## Who am I?

My work crosses geology and geophysics and is focused on Earth system evolution, understanding the interplay between plate tectonic and geodynamic processes with climate change. A major application of this work is understanding the formation and preservation of geological resources through time, especially mineral deposits. My career started out at the University of Kiel in Germany where I studied geology and geophysics. I completed my PhD in Earth Science at the Scripps Institution of Oceanography at the University of California, San Diego, before moving to the University of Sydney where I built the [EarthByte Research Group](#). My group is constructing a virtual Earth laboratory, an activity kick-started by an ARC Laureate Fellow from 2009 to 2014. My work is focused on computer-based analysis and synthesis of data and Earth models, including the application of machine learning to geodata, a widely sought-after skill in industry covering a large range of applications across the resources and environmental management sectors.



## Why you should talk to me about Honours

Post-COVID-19, world demand for metals and minerals — especially industrial metals such as steel, copper and aluminium — will grow exponentially. The shift to lower emissions will also drive increased demand for other metals used in renewable energy and batteries. Using our [GPlates and pyGPlates software](#), we are developing new techniques to fuse multidimensional geological and geophysical data and models, integrating plate tectonic models with data from the ocean basins and continents. Spatio-temporal data mining holds the prospect of advancing our capability to understand subduction-related mineral deposits, as well as sediment-hosted base metal deposits in plate interiors. Industry knowledge gaps in this area lie in a lacking capability of data analysis through geological time, a poor integration of tectonic, geodynamic and climate models with observational data, and insufficient knowledge of the role the time-dependent subduction conveyor belt plays in ore deposit formation. I work closely with the [Sydney Informatics Hub \(SIH\)](#), a core research facility offering a wide range of courses and research support services in data science, programming and applied statistics. [Dr Ben Mather](#), an SIH geophysicist, is part of the EarthByte Group, and will co-supervise 2021 Honours projects on spatio-temporal data analysis.

**HONOURS and MASTERS FOCUS AREAS:** mineralization along subduction belts through time, metal deposits in plate interiors, applying machine learning to unravel Earth evolution through space and time



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# Associate Professor Jeff Neilson

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
YES	YES		

## Who am I?

I am a geographer whose research focuses on economic geography, environmental governance and rural development, with a regional focus on Southeast Asia. I am particularly interested in how developmental processes and outcomes are influenced by the way different places are integrated into the global economy. My current areas of research include issues of food security and food sovereignty, the global coffee industry, the global cocoa-chocolate industry, agrarian reform movements, sustainable livelihoods and the role of sustainability standards alternative measures of well-being, agroecology, and environmental governance. I have spent much of the last 25 years living and conducting research in Indonesia and I'm an active member of the Sydney Southeast Asia Centre. I am a fluent Indonesian language speaker and maintain broad research interests in the country that include cultural change, landscape history, politics, history, the environment and literature.



## Why you should talk to me about Honours

I am currently leading a five-year research project examining the livelihood impacts of sustainability standards and certification programs in the Indonesian coffee sector, and we have opportunities for student researchers to get involved in a project that is changing the way coffee companies are sourcing their coffee around the world. I am open to various honours research projects on topics that I find exciting, but some possible projects for 2021 include:

- Exploring recent trends in sustainability governance in the global coffee sector,
- Conducting research on economic and social change in Indonesia based on the recent 2020 National Census,
- Examining the impacts of Covid-19 on rural development and livelihoods in Southeast Asia,
- Understanding environmental governance in the Queensland sugar industry,
- Analysing the effects of Covid-19 on regional trade networks and supply chains.

**HONOURS FOCUS AREAS:** Global value chains; Environmental governance; Economic geography; Environment and development in Southeast Asia; The future of the global coffee and chocolate industries.



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# Associate Professor Dan Penny

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
YES	YES	YES	YES

## Who am I?

My research is focused on environmental histories and reconstructions. My work takes place in a variety of contexts throughout the global tropics, particularly mainland Southeast Asia, central America and Australia. A key emphasis of my work is to understand the response of human communities to environmental change.



## Why you should talk to me about Honours

In my research work I utilise the past to learn more about long-term patterns and processes and how to manage these into future. Through environmental reconstructions we can better understand many current environmental challenges. I apply expertise in palaeo-botany and sedimentology to document the response of ecosystems to climatic variability and human activities over long periods of time. The aim of this research is to reveal the complex mechanistic interaction between the biosphere (including humans) and the atmosphere in order to better understand the Earth System.

### HONOURS FOCUS AREAS:

- Palaeobotany, palaeoecology, micropalaeontology
- Stratigraphy, sedimentology, geochemistry
- Geochronology and the dating of earth materials
- Geoarchaeology, environmental archaeology
- Environmental history, conservation biogeography
- Quaternary environments and environmental change



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# Professor Bill Pritchard

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
YES	YES		

## Who am I?

I am Professor of Geography and Head of School, specialising in agriculture, food and rural places. What drives me is an interest in the ways that global and local processes are transforming places, industries and people's lives. I did my PhD at the University of Sydney looking at the ways that rural communities were coping with the restructuring of food processing industries and after a period of time working for a community organisation and in the NSW Premier's Department, I re-joined the University of Sydney as a lecturer. My work transcends several complementary key themes. I'm interested in understanding the globalisation of food systems by using global value chain methods to document processes of social and environmental change across sites of agricultural production and sites of food consumption; the changing patterns of rural land ownership and use in Australia, and the impacts of rapid socio-economic and ecological change on systems of food production and consumption within India.



## Why you should talk to me about Honours

Talk to me if you have an interest in the ways that we are changing our uses of the planet for agriculture, and how this impacts on people and communities. I have a major research project currently in partnership with the NSW Department of Primary Industries on the issue of who is buying and selling rural land in the State, and what this means for rural communities. I also have strong ongoing research interests in India, especially relating to food systems, food security and climate change. But I'm also open to topics beyond my funded research activities. If you have interests broadly in the area of human geography with a focus on the interplay of economic and environmental systems, talk to me.

**HONOURS FOCUS AREAS:** Any geographically-relevant issue relating to India; rural change in Australia; global value chains and economic geography.



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# Associate Professor Patrice Rey

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
		YES	

## Who am I?

Research is built through collaboration with other researchers, some I was inspired by, some have guided, and from whom all I have learnt. My research profile was forged through involvement in eleven research institutions across the world, in France, Germany, the USA and Australia. As a chronicler of Earth's stories, my toolbox covers a broad range of trades from structural geology to tectonics, from tectonics to geodynamics, and from tectonics to geomorphology and beyond. With my hammer and my terminal window, I engage with field-based research and computer-based geoscience. At the interface between disciplines I prefer to be, sometimes providing solutions to known problems, sometimes fishing for problems to match new solutions.



My contribution to Earth Sciences includes the development of new ideas on the initiation of plate tectonics on Earth, on the emergence of early continents from a largely flooded planet, on planetary surface weathering under acidic conditions and its by-product from precious opal to Banded Iron Formation, and new ideas on the structure of the continental crust, and on the dynamics of tectonic processes from continental rifting to collision. Through a focus on the landscape-biodiversity nexus, my research over the next 10 years will aim at mitigating the collapse of biodiversity, as well as promoting the use of Virtual Reality technology for communication.

## Why you should talk to me about Honours

Because you are curious of the world: its origin, its present state and where it is heading. Because you sense that the boundaries between science disciplines are artificial, and the idea of a science continuum appeals to you. Because you know the world is far more interconnected than we think it is, because you want to tackle big issues and be an agent of change and make a difference.

**HONOURS PROJECTS:** (feel free to bring your own project and ideas)

- **Landscape and biodiversity**  
Biodiversity is being lost at an unprecedented rate. To avoid a collapse from which there will be no recovering, we need new perspectives and approaches. Can biodiversity be assessed based on landscape's geomorphological attributes?
- **Initiation of plate tectonics on Earth**  
Plate tectonics is essential to life, but how did plate tectonics become the dominant mode of convection on our planet?
- **Continental rifting, fluid-flow and ore-deposits**  
In the next 40 years, the world will need more copper than it has consumed since the birth of humanity. This project is associated to an ARC-Linkage Project: Rift basins and mineral systems.



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# Dr Tristan Salles

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
		YES	YES

## Who am I?

My research areas revolve around sediment transfer from source-to-sink, sedimentary systems, landscape evolution, carbonate platforms and ocean dynamics. My main activities consist in the design and implementation of **open-source numerical codes** that improve our understanding of the complex interactions between sedimentary systems, climatic & tectonic forcing, and the physical processes that erode, transport, and deposit sediments.



## Why you should talk to me about Honours

My current research is focused on global scale evolution of surface processes and I am open to help you design an Honours project that will align with your research interests.

**HONOURS FOCUS AREAS:** global scale landscape evolution and sedimentary basins formation, relationships between landscape complexity and biodiversity; feedback between climate, tectonic and carbonate platforms across scales.



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# Dr Maria Seton

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
		YES	YES

## Who am I?

I am a marine geoscientist with expertise in plate tectonics and marine geology and geophysics. I conduct research that focusses on plate kinematics and the marine record to understand how ocean basins formed and developed, how the Earth's deep interior modulates the evolution of the earth's surface and how tectonics has influenced the changing nature of Earth's long-term climate. While I explore global scale problems, I have a particular interest in the evolution of our backyard, the SW Pacific and the submerged continent of Zealandia.



## Why you should talk to me about Honours

You should talk to me about honours if you are interested in working on jigsaw puzzles and/or ancient volcanoes! I have several projects available on reconstructing the various pieces of the plate tectonic puzzle that make up the submerged continent of Zealandia and the back-arc basins of the SW Pacific, and on understanding the relationship between ancient hotspot-related volcanoes in the seas off eastern Australia and plate motions and plate boundary development. However, I am happy to co-design a project with a student based on their particular area of interest.

If you do honours with me, you will gain a suite of transferrable skills centred around spatial data and analysis (GIS), basic programming, critical thinking and problem solving. There may also be the opportunity to conduct fieldwork related to your honours project or gain experience on a marine research expedition as part of your honours coursework.

**HONOURS FOCUS AREAS:** Marine geology and geophysics; global plate motions; tectonic and geodynamic evolution of the SW Pacific and Zealandia; evolution of back-arc systems in the SW Pacific; eastern Australia hotspot-related volcanism.



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# Associate Professor Ana Vila-Concejo

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
YES	YES	YES	YES

## Who am I?

I am a Marine Scientist specialised in Marine Geosciences with a PhD in Oceanography. What I do is called different things in different universities/countries, it can be called Marine Geoscience, Physical Geography, Geophysics, Geomorphology, that is why I can offer projects in the 4 disciplines. My research is about coastal zones in temperate and tropical environments. I study different time and spatial scales, from instantaneous to Holocene scales. Some examples include beach evolution including storm erosion and recovery or the how coral reefs protect the adjacent coast from incoming waves. I study how climate change is impacting those processes.



I co-lead the Geocoastal Research Group at the School of Geosciences and am co-Director of the Marine Studies Institute at Sydney University. I co-chair the international network for Women in Coastal Geoscience and Engineering and am Deputy Director of One Tree Island Research Station. I am also Honours sub-Coordinator for Marine Science. I am originally from Spain and did my PhD in Portugal; I collaborate with many researchers nationally and internationally. Since 2020 I have been part of a team organising international fortnightly research seminars Coast2Coast; and, in 2021 we launched a science podcast called Coast2Cast.

## Why you should talk to me about Honours

You should talk to me about honours if you are interested in coastal evolution and how our tropical and temperate coasts will respond to climate change. You should definitely talk to me if you love beaches and waves! You should talk to me about honours if you are interested in acquiring (or improving) skills that will increase your employability or facilitate a research career pursuing a PhD. Most honours students joining me learn some coding and data analysis skills, ARC-GIS, and some also learn numerical modelling and fieldwork techniques. My projects often involve fieldwork, but they are also covid safe and most can be undertaken remotely. Here are some projects I am interested, but feel free to talk to me about other projects you may have in mind.

### HONOURS PROJECTS:

- **Beaches in estuaries and bays [BEBs]**

Supervisors: Ana Vila-Concejo with [Tommy Fellowes](#)

Despite the ubiquitous distribution of beaches in estuaries and bays, little is known of the short to long term morphodynamics of these systems when compared to open coast environments. The fact is that they are often taken as small-scale versions of their oceanic counterparts. However, recent research shows that they behave in different ways and that the key to their behaviour seems to reside on the ratios of the different types of energy (swell waves; wind waves; infragravity energy; tidal currents) that they receive. In this project, the student will survey the hydrodynamics and topography of estuarine beaches in the Sydney region, including Sydney Harbour, Kamay (Botany Bay) and/or the Pittwater estuaries and will determine the processes inciting geomorphic change and evolution of these systems.

\*\*\*This project includes fieldwork but can also be completed remotely.

– **What will happen to Sydney's beaches with climate change? How can we prepare?**

**Supervisors:** Ana Vila-Concejo with Tommy Fellowes

This project involves monitoring of beaches on selected Sydney Eastern suburbs including Bondi Beach. The student will measure the topography of selected beaches monthly and after storms. One question relevant to 2019 is why do the beaches have so much sand? The students will analyse topographic and video data from 2015 until present to quantify the processes that control sediment deposition. Analyses of longer data series of wave climate will allow to compare those years with past erosive states like, for example 2011. Where is the sand coming from? Where will it go? And what are the conditions that will trigger erosion again? Most importantly, this research aims to quantify sand management approaches to adapt to climate change.

\*\*\*This project includes fieldwork but can also be completed remotely.

– **Estuarine beaches of Sydney Harbour: what's going on in Rose Bay?**

**Supervisors:** Ana Vila-Concejo with Tommy Fellowes

In a new collaboration with Woollahra Council (2019), we are initiating a study of the estuarine beaches in Sydney Harbour. We will survey the Woollahra beaches on the harbour, deploying wave sensors to understand the hydrodynamic controls of those beaches. We are also analysing the case of Rose Bay where there is an abnormal sediment accumulation around a storm water drain that is encroaching on properties that front the beach.

There are at least two honours projects that can be developed from this new research. The students will get fieldwork and laboratory skills as well as data analysis skills such as coding and GIS.

\*\*\*This project includes fieldwork but can also be completed remotely.

– **Morphodynamics of spurs and grooves**

**Supervisor:** Ana Vila-Concejo & Tristan Salles

Spurs and grooves are mysterious fingerlike formations on the fore reef. During recent years, the GRG has led investigations into their formation and their function. This project uses numerical modelling to further understand the function of spurs and grooves, and their relationship with island formation and evolution. This project also proposes to analyse how the hydrodynamics will change with climate change and what will be the implications for coral reef islands and other areas protected by the coral reefs.

\*\*\*This project includes fieldwork but can also be completed remotely.

– **Biomorphodynamics of oyster reefs**

**Supervisor:** Ana Vila-Concejo & Bree Morgan

This research is part of exciting collaborative research with Marine Biology through an ARC Linkage Project. Natural oyster reefs were extinct from NSW estuaries in the late 20th century. But some of them survived and are still going. While scientists still don't understand why some reefs have survived, we suspect that the physical and sedimentary processes exert control in whether they survive or not. Oysters are being used all over the world to remediate contaminated estuaries. With our research we want to understand the following:

- i. What ranges of physical and sedimentary processes, allow oyster reefs to thrive
- ii. What are the effects that oyster reefs have on the sediments
- iii. What are the effects that oyster reefs have on physical processes such as wave and current attenuation

\*\*\*This project includes fieldwork but can also be completed remotely.



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# Dr Sophie Webber

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
YES	YES		

## Who am I?

My name is Sophie, and I am a Lecturer in Geography. I grew up on the lands and waters of the Kulin nation. After studying and working in North America for almost a decade, I happily returned to Australia in 2017 to work at the University of Sydney as a guest on Gadigal land.

My research is about the political economies of climate change and international development assistance, principally in South East Asia and the Pacific regions. I draw from environmental, economic and urban geography. Recently, I have been researching market- and finance-based approaches to achieving urban resilience and adaptation in some of the world's most vulnerable sites. I am interested in the failures and contradictions of these models, and how they might be reworked towards more socially and economically reparative ends.



## Why you should talk to me about Honours

Doing an Honours year can be a rewarding experience that launches you into a life as an inquirer into the world around – whether as a researcher or other career path. My previous Honours students have worked with me on a wide range of projects related to climate change adaptation and resilience, finance, coastal governance, energy transitions and anti-poverty policy. Since graduating they have gone on to work in activism and advocacy, local and international government policy, environmental observation, and consulting/finance.

I am interested in working with Honours students on a broad range of environmental, climate, and economic/development topics. What's most important is that the student has passion for their subject of study, and is willing to work with me to operationalise it! More specifically, I am keen to supervise students on topics related to climate change adaptation and resilience, the provision and form of climate infrastructures, the politics of climate science and climate finance, market-based environmental governance and policy, international development including evidence-based policy making, and Southeast Asia and the Pacific regions.

**HONOURS FOCUS AREAS:** Climate change adaptation and resilience; The provision and form of climate infrastructure; The politics of climate science and climate finance; Market-based environmental governance and policy; International development, including evidence-based policy in international development; SE Asia and Pacific regions.



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# Professor Jody Webster

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
YES	YES	YES	YES

## Who am I?

My research in sedimentology and stratigraphy focuses on carbonate sedimentology, climate change, and tectonics and it tends to take me to all the beautiful places in the world (e.g. the Great Barrier Reef, Tahiti, Hawaii, Papua New Guinea, Seychelles, Brazil).

I am particularly interested in coral reef and carbonate platform systems, both modern and ancient, and their associated sedimentary systems; as tools to address fundamental questions in paleoclimate variability and tectonics, and in turn the influence of these factors on the geometry, composition and evolution of these sedimentary systems.



## Why you should talk to me about Honours

My research focuses on how climatic and other environmental changes, past and future, impact reefs and their associated sedimentary systems. I am Co-Coordinator of the [Geocoastal Research Group \(GRG\)](#), a dynamic and inclusive research group in the School of Geosciences. My research is multidisciplinary in nature, encompassing traditional sedimentology and stratigraphy, combined with the novel use of marine geology and geophysics, paleoecology, geochemistry and numerical modelling. I am also heavily involved in the International [Ocean Discovery Program \(IODP\)](#) that is focused on recovering sediment cores from the seabed to understand past sea level, climate and environmental changes.

### HONOURS PROJECTS:

- **Paleoecology of the Great Barrier Reef over the past 9,000 years in response to environmental changes**  
**Supervisors:** Jody Webster & Helen McGregor (UOW)  
Funded by new ARC Discovery project you will investigate the links between environmental stress/disturbance, climate, and coral reef composition, diversity and structure by investigating episodes of reef growth and demise over the past 9,000 years. We will use fossil reef cores from across the GBR. Major changes and/or hiatuses in reef growth will be identified down core, and between adjacent cores, as major time gaps and changes in the reef communities. High-precision U-Th dates will pin down their precise timing and will be used to accurately calculate accumulation rates for the reef successions. We will measure reef stress during the Holocene during the periods leading up to and after major changes in reef growth and relate this to other geochemical proxy data reconstructing paleoenvironmental changes.
- **The origin of the Great Barrier Reef – when, where and why?**  
**Supervisors:** Jody Webster & Greg Webb (UQLD)  
The origin of the Great Barrier Reef is still shrouded in mystery. The when, where and why of how this iconic reef system turned-on is still very poorly understood. You will integrate new and existing sedimentologic, biologic, geochemical, and chronological data sets from a unique suite of fossil reef cores from the GBR (Ribbon Reef 5, Boulder Reef) to explore the past evolution of the GBR in response to major global climate and environmental changes. Using a suite cutting edge analytical techniques (e.g., hyperspectral imaging, LA-ICPM U/Th dating) combined with a quantitative paleoecologic approach, will test a range of hypotheses put forward to explain the turn-on of the GBR (sea level, SST, sediment influx, upwelling etc). You will also explore new data and samples

collect on the recent Schmidt Ocean Institute (SOI) RV Falkor expedition – Seamounts, Canyons & Reefs of the Coral Sea. This will provide new insights into how the GBR ecosystem evolved over past 700 ka.

– **Death by a thousand cuts: understanding the role of paleowater quality (high sediment & nutrient flux) in the growth and demise of the Great Barrier Reef over the past 30,000 years**

**Supervisors:** Jody Webster, Dirk Erler (Southern Cross University) & Greg Webb (UQLD)

Exp. 325 revealed that the Great Barrier Reef (GBR) had a complex and dynamic history of reef growth and demise over the past 30 kyr, characterized by five distinct reef sequences. Reef death occurred in two ways: subaerial exposure caused by sea-level fall or due to rapid sealevel rise and associated environmental changes. Previous work highlighted the importance of high sediment flux and poor water quality, rather than abrupt sea-level rise alone, in ultimately determining reef demise. The objective of this project is to investigate the role of paleowater quality (sediment and nutrient flux) had in controlling the evolution of the GBR over the past 30 ky. We will investigate fossil coral reef material for IODP Expedition 325 (Great Barrier Reef Environmental Changes) to: (1) reconstruct a unique, high-resolution record of sediment and nutrient flux to the reef using a suite of geochemical proxies (major trace and rare earth elements, nitrogen isotopes); and (2) relate the changes in paleowater quality to changes in reef communities, accretion and bioerosion, that ultimately led to reef demise. This project will greatly improve our understanding of the critical environmental thresholds that led to reef demise in the past and how reefs recovered after disturbances on different spatio-temporal scales. **Note: this project is funded by new ANZIC IODP Legacy grant to support analyses on the fossil core reefs cores.**

– **The lives and deaths of the Great Barrier Reef – combining data & models to understand the evolution of Australia's iconic reef**

**Supervisors:** Jody Webster & Tristan Salles

Predicting how the Great Barrier Reef (GBR) will respond in the face of future global climate changes is both poorly constrained and controversial. This relates to our incomplete understanding of how reef systems respond to environmental changes but also the lack of baseline data — particularly on centennial to millennial time scales. The study of the evolution of the GBR over past 500-600 ka can provide unique insights about how this iconic reef system responded to abrupt and major environmental changes over a range of spatio-temporal scales. In this project, you will integrate existing sedimentologic, biologic, geochemical, and chronological data sets from a unique suite of fossil reef cores from the GBR. Then you will use sophisticated modelling software (pyReef-Core) that predicts core stratigraphy, facies, and reef communities, in combination with innovative data sciences tools (BayesReef - bayesian inference computational algorithm) to optimize model inputs/parameters, to explore the past evolution of the GBR in response to major global climate and environmental changes.

– **The last coral reef frontier - quantitative geomorphology of the modern and ancient Coral Sea reefs**

**Supervisors:** Jody Webster, Tristan Salles & Robin Beaman (JCU).

High-resolution LADS bathymetry data from southern Great Barrier Reef showing reef and inter-reef areas (data source <http://www.hydro.gov.au/aboutus/lads/lads.htm>). The project will investigate new and existing high-resolution remote sensing data (LIDAR & multibeam bathymetry data, aerial photographic imagery, ROV imagery) to understand the main processes controlling the geomorphic variation of reef and associated environments in the largely unexplored reefs of the Coral Sea. You will also explore new data and samples collected on the recent Schmidt Ocean Institute (SOI) RV Falkor expedition – Visioning the Coral Sea Marine Park. Using advanced GIS and 3D visualization tools, we will develop a new quantitative morphologic characterisation of the reef and inter-reef areas (ie. deep slopes & terraces, banks, sediment wedges, channels, shoals, sand wave/dunes). We will also explore the relationships between the benthic habitats/sedimentary facies, the quantitative geomorphic data and physical processes operating in the Coral Sea. This project could also incorporate sophisticated new numerical reef model tools (pyBadlands, pyReef) under development by the GRG. The project will have implications for improving our understanding modern reef environments and processes as well enhancing our knowledge of ancient carbonate platforms.

A comprehensive list of student projects is also available at the [GRG website](#).



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# Associate Professor Derek Wyman

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
		YES	

## Who am I?

I am an igneous petrologist- geochemist with strong interests in the Archean (Earth > 2.5 billion years ago). I also study ore-forming processes through time because of the clues they provide about Earth's geodynamic evolution. I have supervised Honours theses on a wide variety of ore deposits (in NSW, WA, VIC, QLD and SA), seafloor studies including submarine volcano morphology near Tonga, the world's oldest diamond-bearing rocks, Archean terrane evolution and weathering studies in NSW and WA.



## Why you should talk to me about Honours

Natural resources remain a major contributor to the Australian economy and the global need for metal will continue to grow as we adopt low-carbon technologies and address the challenges of climate change. If you are interested in a career in the resource industry or in an area that relates to the industry from an environmental, financial, legal or other perspective, then I may be able to offer a thesis study that enhances your career path. Occasionally, a student will bring a research topic from a summer employer and I am happy to develop those into strong scientific studies. Two projects supported by government (WA Geological Survey) and Industry are very likely to proceed in 2021.

### HONOURS FOCUS AREAS:

- **Gold (Copper) Deposits of NSW**  
There is potential for studies at several gold deposits in NSW. One possible study involves the Dargues gold deposit near Majors Creek (east of Canberra). It is a small, young, operation where many scientific issues need to be resolved because the deposit is distinct from the major deposits of NSW. The study would use geochemistry and petrography to resolve issues about the origin of the deposit and the “vectors” that point to high gold abundances. This would mainly involve core samples selected on the basis of existing assay results and not work in the mine itself. Several other industry projects in the early exploration stage may be suitable for Honours projects in 2022. Any of these projects would be excellent pathways into the resource industry of NSW or Australia as a whole.”
- **A Comparison of Archean Volcanism in Australia and Canada**  
Samples collected from the Gullewa area in WA's Yilgarn craton (proto-continent) have been chemically and isotopically analyzed but the data has not yet been assessed. In this study, the Yilgarn rocks will be compared to data and thin sections from an important part of the similarly aged Canadian Abitibi greenstone belt. There are competing claims for the geodynamic setting of the two terranes and the study will examine differences in how the magmas were generated and evolved with a focus on the possible contribution of mantle plumes. These are two of the most geologically and economically important greenstone belts on Earth and the study will provide an excellent perspective on the variety of geologic processes that operated 2.7 billion years ago as Earth underwent a surge in crustal growth.



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# Dr Sabin Zahirovic

Available to supervise Honours students in the following disciplines:

Environmental Studies	Geography	Geology & Geophysics	Marine Science
		YES	

## Who am I?

I am fascinated by the processes that shape our planet's physical evolution on geological timescales. My research focuses on plate tectonics and paleo-geography, and what that means for our understanding of past climate and planetary habitability, sea level, biogeography, and the formation of natural resources. I combine geological and geophysical data to build digital models of Earth's past tectonic arrangement and evolution, and test these scenarios using global mantle convection models. These allow me to see what mantle structure is inferred from the surface tectonic motions, which helps me test end-member plate tectonic scenarios. Although my models are global, I have typically focused on better understanding the "Tethyan" region, spanning from Europe through to central Asia, and into Southeast Asia and the northern Australian margin.



More recently my research has also explored planetary carbon cycling, mainly the ways in which we can use the plate reconstructions and other digital Earth models to better understand "perturbations" to our planet's carbon budgets, and how this affected climate, and in some cases drove major extinction events. These numerical models help us contextualise the contemporary challenges we face – from the effects of climate change to the need for raw materials in a low-carbon economy. I work with a national and international team of collaborators, and am currently Chair of Paleogeography in the US\$77 million 10-year Deep-time Digital Earth program from the IUGS, Executive Committee member of the international Deep Carbon Observatory, and Treasurer of the Geological Society of Australia's NSW Division. I firmly believe that our students represent our most important asset, and I look forward to working with you to develop your transferable and specialised geo-scientific skills during your Honours project.

## Why you should talk to me about Honours

I am happy to tailor an Honours project to align with your interests, your goals, and the skills you would like to develop. Honours is a significant commitment in terms of your time and effort, but my aim is to make it a worthwhile and rewarding experience. Drop me a line if you want generic or specific advice regarding Honours, happy to have a chat over a coffee!

### HONOURS FOCUS AREAS:

- Tectonic deformation and deformable plate reconstructions of Australia's northern and northwest continental margin in the Phanerozoic
- Plate tectonics and mantle convection over the last billion years
- Tectonic and paleogeographic evolution of Southeast Asia since the Late Cretaceous
- The growth of carbonate platforms on Australia's continental margins in deep time
- Planetary carbon cycling from a tectonic and deep-time perspective



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