UTS: Science School of Life Sciences

Honours Projects (2025)

UTS CRICOS 00099F
UTS TEQSA PRV12060

Contents

What is Honours?

An Honours program is intended to provide you with a 'research apprenticeship' in which you will become a member of a research team. The program is designed to ensure a thorough grounding in major methodologies common to most biomedical, medical, or environmental science disciplines, and will immerse you in a research environment at the leading edge of new knowledge development and innovation.

It's a unique opportunity for you to explore your research potential and put the theory from your undergraduate studies into practice. An Honours year in science is not only well regarded in academia, but also in industry where laboratory experience and a command of scientific thought processes are highly sought after. It's the first step towards a career in research, and a unique opportunity for you to explore your research potential.

You'll work independently on a research project of interest to you, under the supervision of an academic in the School of Life Sciences. You'll gain advanced scientific knowledge, learn to plan, organise and find solutions, work independently and communicate your ideas and results to your peers, the scientific community and the general public.

What should I do with this booklet?

This booklet will provide you with the research profiles of potential supervisors in the School of Life Sciences at UTS. Please look through the research areas available, identify projects and techniques that interest you, and then contact the supervisor(s) in whose research you are interested.

Email the supervisor(s) directly and arrange a time to meet to discuss your interest in undertaking Honours under their supervision, and potential research projects on which you may work.

What should I do after I have decided on a project?

Finalise agreement for supervision – it is important that you obtain agreement stating that the Academic offering the project agrees to supervise you.

Submit the appropriate application forms based on your degree choice, as below.

Download the application forms, complete them in full, and submit the relevant documentation. (QR code link or https://bit.ly/2IMprd6).

What do I do if I still have questions?

The Honours Committee is here to help.

Committee Chair & Program Director:
A/Prof Bronwyn O'Brien
bronwyn.obrien@uts.edu.au

AIMI (Australian Institute for Microbiology & Infection) Stream Coordinator:
Dr Mehrad Hamidian
mehrad.hamidian@uts.edu.au

Medical and Molecular Biosciences Stream Coordinators:

Dr Mike Kendig
michael.Kendig@uts.edu.au

Dr Daniel Mediati
Daniel.Mediati@uts.edu.au

Environmental Science Stream Coordinator:
Dr Anne Griebel
Anne.Griebel@uts.edu.au

Biotechnology Stream Coordinator:
Dr Vishal Gupta
Vishal.Gupta@uts.edu.au


Australian Institute
for Microbiology
& Infection
Unlock your potential –
enrol in Honours at AIMI
and explore the frontiers of
microbiology.
For more
information on AIMI's
research areas, scan
the QR code
UTS CRICOS 00099F
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42220 JULY 2025

Research projects at the Australian Institute for Microbiology and Infection (AIMI)

The vision of the Australian Institute for Microbiology & Infection (AIMI) is to make major contributions to global human, animal, and environmental health through innovative research that deciphers interlinked problems in microbiology, infection, and disease. We seek to generate translatable solutions for those problems.

AIMI website

We apply and develop cutting-edge research methods and tools, including next generation sequencing, molecular biology, bioinformatics, and microscopy, to understand how microbes grow, live, adapt, and survive.

We focus on problems of utmost significance to global health, including antimicrobial resistance (AMR), infectious diseases, the involvement of microbes in climate change, and generating solutions to these problems. More recently, AIMI has made a substantial push towards the development of novel RNA vaccines, diagnostics, and RNA therapeutics to address these challenges.

AIMI consists of seven research Themes, led by researchers with global standing, with eleven groups within these themes led by senior researchers, MCRs, and ECRs. These Themes focus on impacting the global challenges outlined above:

(1) Microbial Genomics & Proteomics
(2) Microbial Morphology & Development
(3) Emerging and Opportunistic Microbial Pathogens
(4) Computational Microbial Biology
(5) Microbial Ecology & Evolution
(6) Biology of Intracellular Microbes
(7) RNA Vaccines and Therapeutics

Australian Institute for Microbiology & Infection

Excellence in Research Honours Scholarship

Value $5,000

** $2,500 to the student's bank account as a stipend & $2,500 for project costs.*

Students will be considered for this competitive scholarship upon standard application for the UTS Honours program through an AIMI primary supervisor.

Priority will be given to high calibre students interested in pursuing a research-rich career in microbiology or infectious disease.

For more information
aimi.uts.edu.au
aimi@uts.edu.au

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UTS TEQSA PRV12060
40418 APRIL 2023

Dr Amy Bottomley

Position: Imaging Scientist, Microbial Imaging Facility
Discipline: Optical Microscopy, Microbiology
Email: Amy.Bottomley@uts.edu.au

Dr Amy Bottomley is an Imaging Scientist in the Microbial Imaging Facility (MIF) in the Faculty of Science, UTS. She has expertise in a range of microscopy techniques including transmitted light, fluorescence, confocal and super-resolution (3D-structured illumination microscopy) microscopy to facilitate cutting-edge microscopy. She also provides expertise on optimising preparation of mammalian and microbial samples for light microscopy. Amy's research background is in bacterial cell division and shape change, where she studied how bacterial growth is regulated in response to a variety of environmental cues, including during infection and in response to nutrient availability using a range of molecular microbiology, biochemistry and microscopy techniques. Amy collaborates with UTS researchers on a number of research areas to provide her bacterial an microscopy expertise.

Keywords: Optical microscopy, super-resolution microscopy, image analysis, bacterial cell division, molecular microbiology

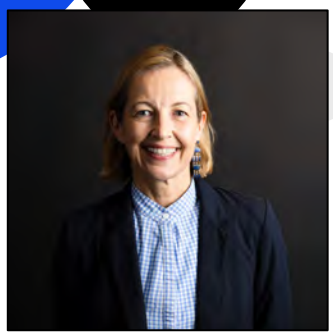
Honours programs: Bachelor of Science (Honours)

What methods or research skills will you learn?

- Wide-field fluorescence and deconvolution microscopy
- Live cell imaging
- Confocal microscopy
- Super-resolution microscopy (3D-SIM)
- High content imaging
- Image analysis
- Molecular microbiology skills including genetic modification, plasmid construction, sample preparation for imaging

I co-supervise Honours projects with:

- **Dr Yan Liao** - Using advanced genetic modification and microscopy imaging to characterize the new cell division proteins in Archaea
- **Dr Bill Söderström** – Molecular analysis of the bacterial cell division machinery using time-lapse and super-resolution (PALM/STIORM and SIM) microscopy
- **A/Prof Cindy Gunawan** – Understanding bacterial resistance to nanoparticles in the form of biofilm growth
- **Dr Lana McCLements** – Identifying novel biomarkers/mechanisms using a 3D bioprinted model of cardiac fibrosis
- **A/Prof Iain Duggin** – high throughput microscopy imaging to identify new cell division genes in Archaea



A/Prof. Louise Cole

Position: Director of the Microbial Imaging Facility (MIF)
Discipline: AIMI, Faculty of Science, UTS
Email: Louise.Cole@uts.edu.au

A/Prof Louise is the Director and Facility Manager of the Microbial Imaging Facility (MIF) in the Faculty of Science at UTS. She has a research background in plant and fungal cell biology, with a particular focus on endocytosis, plant-host pathogen interactions, long distance transport and cell-to-cell communication. She has expertise in a wide range of light and electron microscope methods including transmitted light, fluorescence, laser microdissection, optical tweezers, confocal and multiphoton, light-sheet, super-resolution, transmission electron and cryo-electron microscopy. In addition, she has extensive experience in optimising specimen preparation of plants, animals, and microbes for both light and electron microscope methods. She currently collaborates with UTS researchers from several faculties on a diverse range of topics providing her extensive microscopy expertise to drive their research forward with impact. She is passionate about training the next generation of imaging scientists.

Staff profile: https://profiles.uts.edu.au/34590-louise-cole

Keywords: Live cell imaging, Wide-field fluorescence & deconvolution microscopy, Confocal microscopy & spectral imaging, Tissue clearing & EM specimen preparation protocols, Super-resolution microscopy, High content & high-throughput imaging, Image analysis & 3D-visualisation methods.

Programs: Bachelor of Science (Honours) &/or Bachelor of Medical Science (Honours)

I cosupervise Honours projects on:

- Tissue-clearing & microscopy methods to investigate cell-cell & cell-stromal interactions in 3D models of pre-eclampsia (with A/Prof. Lana McClements, SoLS).
- Dissecting mechanisms that regulate inflammation and granuloma formation in Tuberculosis-infected tissue (with A/Prof. Bernadette Saunders, SoLS).
- Investigating the biological effects of nanoparticles on the heart (with Dr Kristine McGrath, SoLS).
- Using advanced brain tissue clearing and confocal microscopy techniques to identify and quantify dendritic spines in brain regions (hippocampus and striatum) following neuroinflammation (with Dr Laura Bradfield, SoLS).

What methods or research skills will you learn?

- Specimen preparation methods for light/optical microscopy including tissue clearing methods.
- Wide range of microscopy skills including the use of transmitted light, contrast methods and fluorescence imaging.
- Advanced microscopy methods such as confocal, super-resolution and high content/throughput imaging.
- Automated image analysis methods, including 3D-visualisation volume rendering methods, and the use of AI algorithms.

I also co-supervise projects with:

Dr Jen Mathews (C3) and Dr Amy Bottomley (AIMI).

A/Prof Iain Duggin

Deputy Director, Australian institute for Microbiology and Infection (AIMI), UTS.

Iain.Duggin@uts.edu.au

A/Prof Iain Duggin leads the Microbial Morphology and Development (MMD) research theme at the Australian Institute for Microbiology and Infection (AIMI) at UTS. MMD is a cluster of several teams working to solve problems linked to the lifestyles and cellular functions of microbes. Iain's team utilizes molecular and synthetic biology, genomics, and microscopy to understand how microbial cells divide and dynamically respond to their environments. Secondly, we develop biotechnology solutions (e.g., vaccines) to address two critical global problems: climate change and infectious disease.

Investigating the Shapeshifting Shenanigans of Microorganisms!

Iain's team utilizes model organisms including halophilic archaea and 'Asgard' archaea that can be found in some of Australia's precious aquatic environments, and uropathogenic Escherichia coli (UPEC), which is the main cause of urinary tract infections (UTI) and a worsening global pandemic linked to antimicrobial resistance. These microorganisms undergo dramatic cellular shapeshifting; we want to know how and why they do this by understanding the functions and potential applications of the genes and proteins involved. This will enable us to control microorganisms in a range of environments and industries. Read some of our recent work here. Please come and chat to us and find out more about the exciting projects available!

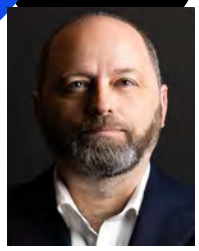
Keywords: Molecular and cellular biology, biotechnology, cytoskeleton, haloarchaea, Asgard archaea, evolution, eukaryogensis, cell division, E. coli, urinary tract infection.

Honours project topics (with co-supervisors):

- Key mechanims in cell division across the tree of life: What genes and proteins carry out cell division in archaea and how do they compare to bacteria and eukaryotes? (with Dr Yan Liao)
- How does the archaeal cytoskeleton bridge to the cell envelope to streamline cell shape for fast swimming!? (with Dr Hannah Brown)
- How can 'Asgard' archaea show us what the evolution of eukaryotic cells looked like? (with Dr Tim Williams & Dr Hannah Brown)
- How can we utilize archaea for applications of protein engineering? Development of a cell surface protein expression system (Dr Nick Horan & Dr Hannah Brown).
- Testing the efficacy of novel mRNA vaccines in protection against urinary tract infections (with Dr Bill Söderström and Dr Piklu Roy Chowdhury)

What methods do we use?

- Recombinant DNA technology and microbial synthetic biology/engineering.
- High-resolution fluorescence microscopy.
- Cellular infection models, coupled to live cell imaging (e.g. movies of cell dynamics)
- Protein structure and function, in vivo and in vitro.
- Molecular genetics and functional genomics and metagenomics.



Prof Garry Myers

Director, Australian institute for Microbiology and Infection (AIMI), UTS.
Garry.Myers@uts.edu.au

*****Students will be considered for the AIMI Excellence in Microbiology Honours Research Scholarship*****

Prof Garry Myers leads the mRNA Vaccine research theme at the Australian Institute for Microbiology and Infection (AIMI) at UTS. Garry's team focuses on informatics approaches to analyze genomes, transcriptomes, and proteomes in understanding host pathogen relationships. The overarching objective of the group's research is identification of molecular markers that can be exploited to develope mRNA vaccines and diagnostic tools to reduce the use of antibiotics and the burden of antimicrobial resistance (AMR).

Solutions to the AMR crisis

Antimicrobial resistance, the most challenging global medical problem, is on the rise. The affordability, technological, and analytical advances in DNA and RNA sequencing technology of pathogens provide excellent tools for massive-scale surveillance of gene flow and expression profiling of microbial genes under different conditions. The approaches additionally provide excellent resource for *in silico* identification of molecular markers that can be used for the development of diagnostic assays and alternative therapies to combat microbial diseases. However, the key to identification of good molecular markers is understanding how microbes modulate their gene functions under different diseased conditions. We trace such changes by monitoring expressional changes at transcriptional and protein levels. Our main objective is to better manage bacterial disease by developing diagnostic tools for early detection of disease and prime host immunity against pathogen invasion.

Prof Myers and Dr Piklu Roy Chowdhury (piklu.bhattacharya@uts.edu.au) have several exciting projects for Hons and HRD research. Please come and chat to us and find out more about the possibilities for getting a taste of a 'research focused' professional life!

Keywords: mRNA vaccines, antibiotic resistance, genomic epidemiology, transcriptomic profiling, proteomic profiling, molecular and cellular biology, biotechnology, diagnostics, RNA therapeutics.

Honours project topics:

- Transcriptional profiling of mastitis (a disease of the mammary glands) using bovine mastitis as a model.
- Development of a culture-independent, in-field diagnostic assay for mastitis.
- Development of RNA vaccine candidates for pink eye disease in farmed cows.
- Development of RNA vaccine candidates for foot-rot disease in farmed sheep.

What methods do we use?

- Recombinant DNA technologies & designing of RNA/DNA based probes for diagnostics.
- Comparative genomics and phylogenomic analysis of pathogen pools
- Infection models, coupled with transcriptomics and proteomic profiling.
- Molecular genetics, functional genomics, and transcriptomics.
- Protein function, *in vivo*, and *in vitro* testing.

Dr Mehrad Hamidian

Position: Senior Lecturer
Discipline: Australian Institute for Microbiology & Infection (AIMI)
Email: mehrad.hamidian@uts.edu.au

*****Students will be considered for the AIMI Excellence in Microbiology Honours Research Scholarship*****

Dr Mehrad Hamidian is specialised in microbiology and genomics. His research focuses on studying antibiotic resistance and genomic evolution of the opportunistic pathogen *Acinetobacter baumannii*, which has recently been placed as number 1 in the list of World Health Organization for development of antibiotic research. He is particularly interested in studying clonality as well as the role of mobile genetic elements (e.g., plasmids insertion sequences, transposons, integrons and genomic islands) in development and spread of antibiotic resistance in this important superbug. He applies a wide range of molecular microbiology and bioinformatics approaches including the whole genome sequencing approach to study *A. baumannii*.

Keywords: *A. baumannii*, antibiotic resistance, bioinformatics, whole genome sequencing (WGS), mobile genetic elements.

Honours programs: [Bachelor of Science (Honours) &/or Bachelor of Science (Honours)]

I supervise Honours projects on:

- Identifying the genes involved in replication and transfer of novel plasmid classes in *Acinetobacter*.
- Evolution of antibiotic resistance in globally disseminated multi-drug resistant clones of *A. baumannii*.

What methods or research skills will you learn?

- Antimicrobial resistance testing
- Plasmid transfer analyses (conjugation, transformation and mobilisation assays)
- PCR, qRT-PCR
- Whole Genome Sequencing, Bioinformatics/phylogenomics

Our team:

- Jonathan Koong (PhD candidate)
- Liam Tobin (PhD candidate)
- Eradah Abu Sabah (PhD candidate)
- Zein Maatouk (Honours student)

I collaborate/co-supervise with:

- A/Prof Cindy Gunawan (UTS)
- Prof Steven Djordjevic (UTS)
- Dr Johanna Kenyon (QUT, QLD)
- Dr Margaret Lam (Monash University, VIC)
- A/Prof Amy Cain (Macquarie university, NSW)

Dr Daniel Mediati

Position: Group Head and Lecturer
Email: Daniel.Mediati@uts.edu.au
Office: CB04.07.420

Daniel is the RNA Systems Biology and Therapeutics Group Head at the Australian Institute for Microbiology and Infection (Building 4, Level 7). Daniel completed his BSc (Hons I) and PhD in 2018. He was a SPARK Research Scholar at Stanford University and a Research Fellow at UNSW. The RNA Systems Biology and Therapeutics Group uses advanced genetic engineering, systems biology and RNA-based technologies to understand how bacteria interact with the environment and host to cause disease, with a focus on translating novel mechanistic findings for therapeutic and biotechnological applications

We supervise the below MSc and Hons research projects for 2026:

1. **Re-sensitise multidrug-resistant isolates of UTI to first-line trimethoprim antibiotic treatment**. With limited treatment options for antibiotic-resistant strains, re-sensitisation approaches that restore the efficacy of failing antibiotics in the clinic are needed.

2. **Investigate a novel RNA regulator of biofilm formation to modulate intracellular bacterial communities in the host**. Biofilms formed by pathogens are a serious problem especially those associated with medical implants. This project will define targets of a novel regulator for applications in eradicating biofilms in host infection.

3. **Bioengineer the bacterial cell wall for applications in host colonisation.** Expanding the genetic toolbox to manipulate bacterial cell wall integrity has implications for antimicrobial development and robust probiotic strain engineering.

What methods and technical skills will you learn?

- Synthetic biology, genetic engineering, regulation of gene expression.
- CRISPR editing, mRNA and ncRNA silencing, transcriptomics.
- Invertebrate and animal (mice) infection models.
- Human cellular infection models, mammalian tissue culturing.
- Live-cell imaging, wide-field fluorescence, high-resolution microscopy.
- R and python.

The current research team:

- Daniel Mediati (Head), Meja Petersson (MSc, 2026), Raimy Lynch (MSc, 2025), Billi Scarborough (Intern, 2025), Iain Duggin and Bill Söderström (collaborator groups).

*****Students will be considered for the Excellence in Research Scholarship. Awarded to Raimy Lynch in our group for his brilliant research in infection biology (2025)*****

Prof Diane McDougald

Professor
Australian Institute for Microbiology & Infection (AIMI)
Diane.McDougald@uts.edu.au
https://profiles.uts.edu.au/Diane.McDougald

Diane leads the Pathogen Evolution group in the Australian Institute for Microbiology & Infection (AIMI) here at UTS. The team is conducting a multicentre clinical trial on catheter associated urinary tract infections (CAUTI) in people with spinal cord injury (SCI).

Keywords: Complicated UTIs, qPCR, pathogen detection

Honours programs: [Bachelor of Science (Honours) &/or Bachelor of Science (Honours)]

I supervise Honours projects on:

- Multiplex q-PCR based detection for complicated multi-species catheter associated urinary tract infections (CAUTI)

What methods or research skills will you learn?

- General list of instruments/techniques/methods
  - Bacterial culture and identification
  - Molecular biology (qPCR)
  - DNA and RNA isolation
  - High throughput sequencing (RNA and DNA sequencing) and analysis

Our team:

- Dr. Parisa Noorian (Postdoctoral fellow)
- Dr Gustavo Espinoza-Vergara (Postdoctoral fellow)
- Dr MD Mozammel Hoque (Postdoctoral fellow)
- Mr Dominic Leo (PhD student)
- Ms Kailey Hamann (PhD student)
- Mr Jonah Moon (PhD student)

I collaborate with:

- Ass Prof. Scott Rice (Director, Microbiomes for One Systems Health (MOSH), CSIRO)
- Assoc. Prof. Iain Duggin (AIMI, UTS)
- Dr Bonsan Bonne Lee (Prince of Wales Hospital)

Dr. Bill Söderström

Position: Group leader & Senior Lecturer
Discipline: Australian Institute for Microbiology and Infection
Email: Bill.soderstrom@uts.edu.au
Lab website: https://www.soderstromlab.com

Bill leads the Microbial Super-Resolution Microscopy Lab in the Australian Institute for Microbiology and infection (AIMI) at UTS. His team works interdisciplinary at the intersection between bacteriology, infection biology and high-resolution bioimaging.

The lab is primarily interested in targeting bacteria and their shape-changes during human Urinary Tract Infections (UTIs), with the long-standing goal of developing new therapeutics, such as mRNA vaccines targeting the pathogens responsible for the infection. Most work in the Bil lab is done using the model pathogen Uropathogenic *E. coli* (UPEC).

Keywords: Microscopy, Pathogens, UTI

Honours programs: All Science Programs (Honours)

Honours project opportunities in Infection Biology:

- Bacterial responses to antibiotics during infection of human cells
- Behaviour of multispecies bacterial communities during UTIs
- Single-molecule infection biology

What methods or research skills will you learn?

- High-resolution fluorescence microscopy
- Model infections (*in-vitro* and *ex-vivo*)
- Microfluidics
- General bacteriology, biochemistry and cell culture

Our team:

- Ariana Costas, PhD Student (mostly in Paris)
- Lachy Chisholm, PhD student
- Diana Marshall, PhD student
- Xintong Yu, Master's student
- Bella Wicks, Honours student

We collaborate with:

At UTS we work closely with the groups of A/Prof Iain Duggin, A/Prof Cindy Gunawan and Dr. Daniel Mediati in AIMI, with A/Prof Maiken Ueland at the Centre for Forensic Science, and Dr. Ying Zhu in biomedical engineering in FEIT.

Cindy Gunawan

Associate Professor, UTS Chancellor's Research Fellow
Australian Institute for Microbiology and Infection
Cindy.Gunawan@uts.edu.au
https://profiles.uts.edu.au/Cindy.Gunawan

Cindy leads the Biofunctional Nanomaterials Research Group in the Australian Institute for Microbiology and Infection (AIMI) at UTS. The research team focuses on multi-targeting antimicrobials, to understand how they work and in turn, how pathogens develop resistance to the complex mechanisms. With the rapid rise of antibiotic resistance, advanced antimicrobials, such as nanoparticles, have been used as alternative technologies to fight infections. Identification of the molecular basis of adaptation responses is key to overcome the phenomena, preserving the efficacies of important alternative antimicrobials. The team works on planktonic and biofilm-forming bacteria, including multi-species consortium.

Keywords: Antimicrobials, bacterial resistance, evolutionary adaptation, biofilm
Honours programs: All Science Programs (Honours)

My lab can supervise Honours projects on:

- Understanding the origins and multi-targeting antimicrobial mechanisms of nanoparticles on biofilms
- How bacteria work together in biofilms to coordinate defence responses
- The efficacies of multi-targeting antimicrobials to control infections in simulated disease conditions

What methods or research skills will you learn?

- Antimicrobial exposure techniques (heterogeneous systems)
- Cellular assays, microscopy imaging, including nanoparticle tracking and biofilm imaging
- Molecular biology techniques – genomic, mRNA, metabolomic analysis
- Physical chemistry analytical techniques, including XPS, FTIR, EPR

Current team:

- Dr Riti Mann (Postdoc)
- Oliver McNeilly (PhD student)
- Kevin Yonathan (PhD student)
- Xiaorong Liu (PhD student)
- Amna Zahar (PhD student)
- Andes Deng (Honours student)
- Sophia Nguyen (Internship student)
- Ranjana Thapa (Internship student)

We collaborate with:

- Dr Mehrad Hamidian (AIMI)
- Dr Bill Söderström (AIMI)
- Distinguished Prof Steven Djordjevic (AIMI)
- Dr Kristine McGrath (SoLS, UTS)
- A/Prof Scott Rice (CSIRO)
- A/Prof Georgios Sotiriou (Karolinska Institute)

Gustavo Espinoza

Research Associate, ARC DECRA Fellow
Australian Institute for Microbiology and Infection
gustavo.espinozavergara@uts.edu.au

Gustavo leads the Single Cell Transcriptomics in Bacteria Lab in the Australian Institute for Microbiology and Infection (AIMI) at UTS. My lab uses cutting-edge techniques in molecular biology to study how infectious bacteria are transported from the environment to the host.

My current research is focused on the host-impact of bacteria transported in novel transmission vectors. We use advanced molecular biology techniques such as single cell transcriptomics in bacteria as well as mouse colonisation models to figure out what bacteria do after they escape from these novel vectors in the gut.

Keywords: Intestinal infections, Molecular Microbiology, Transcriptomics, Opportunistic pathogens.

Honours programs: All Science Programs (Honours).

My lab can supervise Honours students on:

- Understanding the molecular mechanisms behind colonisation of intestinal bacteria transported within novel vectors of disease transmission.
- Unlocking the impact of probiotic bacteria encapsulated inside protozoan expelled food vacuoles on gut microbiome.
- Assessment of chromosomal mutants on virulence and fitness in bacteria.

What methods or research skills will you learn?

- Bacteria-protozoa grazing experiments for production of expelled food vacuoles (novel vectors of bacterial transmission)
- Single cell transcriptomics in bacteria
- Molecular cloning and bacterial genome editing
- Gut microbiome studies in rodent models

Our team:

- **Mr. Jonah Moon** (PhD candidate studying the impact of protozoan predation on bacterial virulence and horizontal gene transfer)

We collaborate with:

- **Prof. Diane McDougald**, AIMI (co-supervised projects on intestinal pathogens).
- **Dr. Mike Kendig**, SoLS (co-supervised projects on microbiomes, probiotics and rodent models).
- **Dr. M Mozammel Hoque**, AIMI (co-supervised projects on microbial ecology and bioinformatics).

Dr Parisa Noorian

Research Fellow
Australian Institute for Microbiology & Infection (AIMI)
Parisa.Noorian@uts.edu.au

Parisa is a research fellow in the Australian Institute for Microbiology & Infection (AIMI) here at UTS. Her research focuses on prevention and treatment of urinary tract infections. Her current projects include a multicentre clinical trial on catheter associated urinary tract infections (CAUTI) in people with spinal cord injury (SCI) and a multi-institute project on the development of mRNA vaccines for recurrent UTIs.

Keywords: Urinary Tract Infections, Urinary catheters, Metagenomics, Multi-species Biofilms, *In vitro* models

Honours programs: All Honours courses in the School of Life Sciences

I supervise Honours projects on:

- Topic 1: Metagenomic assessment of antigen targets for mRNA vaccine in Catheter associated UTI
- Topic 2: Evaluation of eradication methods of multi-species biofilms on catheters
- Topic 3: Invasion of multi-species biofilm by new pathogens

What methods or research skills will you learn?

- High-Throughput sequencing (RNA and DNA sequencing)
- Metagenomics and Bioinformatics
- Microfluidics and flow-culture systems
- General microbiology techniques, Molecular microbiology (PCR, cloning)

Current team:

- Ms Kailey Hamann (PhD student)

I collaborate with:

- Assoc. Prof. Iain Duggin (AIMI, UTS)
- Prof. Diane McDougald (AIMI, UTS)
- Ass Prof. Scott Rice (Microbiomes for One Systems Health, CSIRO)
- Dr Bonsan Bonne Lee (Spinal Injuries unit, Prince of Wales Hospital)

Research projects in the Discipline of Molecular Biotechnology

The Molecular Biotechnology Discipline Group is at the forefront of cutting-edge advances in biotechnology and biomedical sciences, all aimed at enhancing the quality of health, medicines, food, and the environment.

Through our research-informed educational programs, we are shaping the future of biotechnology and biomedical sciences by nurturing the next generation of innovators and problem solvers. Our teaching programs include *Bachelor of Molecular Biotechnology, Bachelor of Medical Sciences*, *Masters in Medical Biotechnology* and *Masters in Science, majoring in Biomedical Engineering,* as well as our research training (Honours, Masters and PhD) programmes.

Our members research fundamental molecular and cellular biology questions, but also focus on discoveries that transform industry and society through the harnessing and development of cutting-edge technologies. Our research endeavours extend to identifying new and improved markers of disease and testing of new therapeutic interventions to provide greater accuracy, earlier detection and treatment options across a range of health conditions. Our investigations span a diverse array of conditions including respiratory diseases like COPD and asthma, *in utero* exposures, neurodegenerative, metabolic and cardiovascular diseases, as well as ovarian cancer, inflammatory bowel disease and pre-eclampsia. Furthermore, we explore the potential of nano- and biomaterials, synthetic biology, gene editing for improved drug delivery, vaccine development, regenerative medicine and cancer therapies.

We strive for excellence across all our teaching and research activities by fostering and promoting lifelong learning, building collaborative national and international networks and maintaining close engagement with industry and the broader community.

Dr Andrew Care

Senior Lecturer
School of Life Sciences
andrew.care@uts.edu.au

Andrew Care is a Senior Lecturer and Academic Director of the Biomanufacturing Immersion Facility (BIF). His research creatively blends Synthetic Biology with Nanoscience to solve problems in biotechnology and biomedicine. In the Care Lab, we take protein nanoparticles found in nature and re-engineer them into innovative tools for drug delivery, vaccine development, and biocatalysis… *it's a lot of fun!*

Keywords: Synthetic biology, Nanomedicine, Bioprocessing, Cancer, Alzheimer's

Honours programs: Bachelor of Science (Honours) & MPhil

We supervise Honours/MPhil projects on:

- Develop synthetic biological strategies to adapt protein nanoparticles
- Unravel the dynamic interactions between protein nanoparticles and the body
- Bioengineer protein nanotechnologies for drug delivery and/or vaccines

What methods or research skills will you learn?

- Protein design, engineering, production, and purification
- Biochemical assays
- Mammalian cell culture and cell-based assays
- Electron microscopy and fluorescence microscopy
- Immunohistochemistry
- Cellular and animal models of disease

Our team:

- Dr Claire Rennie (Postdoctoral Researcher)
- India Boyton (PhD Student)
- Nabila Morshed (PhD Student)
- Henrico Adrian (PhD Student)

We collaborate with:

- The Macquarie University Dementia Research Centre
- Children's Cancer Institute Australia
- ARC Centre of Excellence in Synthetic Biology
- Cognition, Ageing & Neurodegenerative Disease Lab - University of Adelaide
- CSIRO Advanced Engineering Biology Future Science Platform
- UTS: Prof Stella Valenzuela, A/Prof Iain Duggin, A/Prof Bernadette Saunders

Prof Hui Chen

Professor, Associate Head of School (Research)
Discipline - Molecular Biotechnology
Email Hui.chen-1@uts.edu.au

I am one of the star researchers in air pollution. Current research in my team focuses on the impact of air pollution and 3rd hand smoking on the development of chronic diseases, focusing on memory impairment and fatty liver disease.

https://profiles.uts.edu.au/Hui.Chen-1

Keywords: air pollution, lung-brain axis, fatty liver disorder

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- Brain changes due to exposure to environmental pollution
- Liver lipid and glucose metabolic disorders

What methods or research skills will you learn?

- Cell culture
- MTT, ELISA
- Immunohistochemistry,
- western blotting
- Real-time PCR
- Proteomics
- Lipidomics

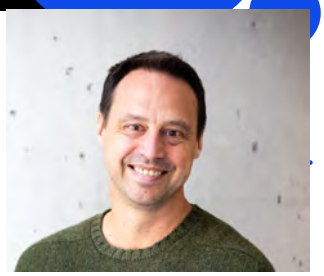
Our team:

- Dr David van Reyk – redox
- Dr Baoming Wang – liver, precision medicine
- Ms Xu Bai – PhD student
- Dr Min Feng – PhD student
- Dr Meng Wang – PhD student
- Ms Andrew Thorpe – PhD student
- Ms Rochelle Yarak – PhD student

I collaborate with:

- Distinguished Professor Brian Oliver – lung
- Professor Jacob George - liver
- Associate Professor Cathy Gorrie – brain
- Drs Chantal Donovan and Richard Kim – lung
- Professor Carol Pollock and A/Professor Sonia Saad (Kolling) - kidney

A/Prof Charles Cranfield



Head of Membrane Biophysics Group
School of Life Science
Charles.cranfield@uts.edu.au

We play with lipid membranes.

Such membranes have plenty of uses outside of just surrounding cells. Our lab uses them to test how antibiotics work, we make biosensors out of lipid membranes to test for inflammatory bowel diseases (IBDs), and we also like to study how they work at the very molecular level.

Keywords: Biosensors, Diagnostics, Drug discovery, Biophysics

Honours programs: C09168 Bachelor of Science (Honours), C09031 Bachelor of Medical Science (Honours)

We can supervise Honours projects on:

- ✓ A new technology to test for the activity of enzymes found in poo. Detecting these enzymes will help us diagnose inflammatory bowel diseases and colorectal cancers.
- ✓ Creation of a new fatty acid biosensor technology. This will have applications in testing water pollution and as a biosensor for various diseases.
- ✓ Hardcore Honours students interested in advanced biophysics techniques can elect to do a project looking at a phenomenon in lipid bilayers called the *dipole potential*.

What methods or research skills will you learn?

We'll teach you all about lipid science and how electricity, surface films, neutrons, X-rays and light can be used to identify how things interact with lipid membranes.

Our team:

We are PhD students, Honours students, Research Associates, and academics from the *Australian Nuclear Science and Technology Organization* (ANSTO) and industry. We also collaborate with friends from the School of Chemistry, USyd, UNSW and UQ.

Dr Chantal Donovan

Senior Lecturer
Discipline: Molecular Biotechnology
Chantal.Donovan@uts.edu.au

Dr Donovan co-leads the ImmunoPharmacology Research Group (IPRG) at UTS. She received her PhD in Respiratory Pharmacology from The University of Melbourne in 2015, followed by postdoctoral training in Respiratory Immunology at the University of Newcastle. Dr Donovan joined UTS in 2019 and her research is focused on how pharmacological agents can alter immune responses in different lung diseases.
https://profiles.uts.edu.au/Chantal.Donovan

Keywords: lung disease, asthma, COPD, pharmacology, immunology

Honours programs: Bachelor of Science (Honours); Bachelor of Medicine Science (Honours)

We supervise Honours projects on:

- How drugs targeting the lungs can alter immune responses.
- Discovery of new therapeutic targets for lung diseases targeting airway smooth muscle.

What methods or research skills will you learn?

- Mouse models of lung disease
- Tissue collection
- Histology
- RNA extraction/Real time PCR
- Immunofluorescence
- Flow cytometry

Our team & collaborators:

- Dr Richard Kim
- Distinguished Professor Brian Oliver
- Professor Hui Chen
- Dr Razia Zakarya

Alen Faiz

Senior Lecturer, School of Life Sciences
Molecular Biotechnology
alen.faiz@uts.edu.au

Dr Alen Faiz is a molecular biologist and geneticist who's primary focus is to understanding the biology of respiratory systems at the genetic and epigenetic levels, including under conditions of exposure to cigarette smoke and viral infection. Dr Faiz's research program has made significant contributions to the understanding of the molecular pathways that underpin the development and progression of COPD and asthma through the development of bioinformatics pipelines and advanced cell culture and genetic editing techniques. Dr Faiz obtained his PhD at the University of Sydney, Woolcock Institute of Medical Research in 2014. He then travelled to the Department of Pathology and Medical Biology, University Medical Centre Groningen, the Netherlands (2014-18). Dr Faiz joined UTS in 2018.

Keywords: Respiratory, CRISPR, genetic editing, bioinformatics

Honours programs: Bachelor of Science (Honours) &/or Bachelor of Science (Honours)

I supervise Honours projects on:

- Investigating the differences in human response of SAR-CoV-2 variants
- Identifying and recreating the in lab genetic variants of COPD and asthma
- Identifying prediction markers for treatment responsiveness in respiratory diseases

What methods or research skills will you learn?

- RNA/DNA extraction and analysis
- Cell culture
- CRISPR gene editing
- ELISA
- Bioinformatics

Our team:

- Mr Rashad Mahbub, PhD student
- Mr Jos van Nijnatten, PhD student
- Miss Senani Rathnayake Mudiyanselage, PhD student

I collaborate with:

- Professor Brian Oliver, Woolcock institute of medical research
- Professor Phil Hansbro, Centre of inflammation, UTS/Centenary

Dr Richard Kim

Senior Lecturer, School of Life Sciences (SoLS)
Molecular Biotechnology Discipline
Richard.Kim@uts.edu.au

Dr Richard Kim is a respiratory immunologist who co-leads the UTS ImmunoPharmacology Research Group (IPRG). Dr Kim completed his PhD (Immunology and Microbiology) at the University of Newcastle in 2015, was awarded a Lung Foundation Australia & Boehringer Ingelheim postdoctoral research fellowship (2018-2020), and joined the University of Technology Sydney in 2019. Dr Kim's research is strongly focused on interrogating innate immune responses in chronic lung diseases and aims to identify new therapeutic targets and treatments for severe asthma, chronic obstructive pulmonary disease, and respiratory infections, which are major clinical issues in Australia and globally.

https://profiles.uts.edu.au/Richard.Kim

Keywords: Respiratory immunology, severe asthma, infection, innate immunity, chronic lung diseases

Honours programs: Bachelor of Science (Honours) & Bachelor of Medical Science (Honours)

We supervise Honours projects on:

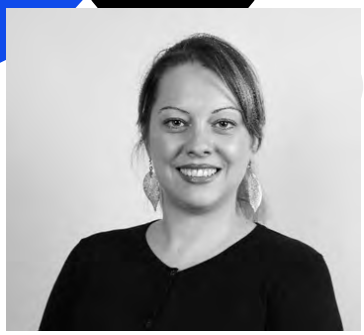
- Identifying new therapeutic targets in severe asthma
- Modifying immune responses in chronic lung diseases

What methods or research skills will you learn?

- Mouse models of lung disease (severe asthma, infections, and others)
- Tissue collection and processing
- RNA extraction & Real-Time qPCR analysis
- Flow cytometry
- Histology
- Immunofluorescence
- Protein analysis (ELISA, immunoblot)

Our team & collaborators:

- Dr Chantal Donovan (co-leader of UTS IPRG; SoLS)
- Distinguished Professor Brian Oliver (SoLS)
- Professor Hui Chen (SoLS)
- Dr Razia Zakarya (SoLS)
- Dr Madison Coward-Smith



A/Prof Lana McClements

Associate Professor and Heart Foundation Future Leader Fellow
Molecular Biotechnology
lana.mcclements@uts.edu.au

A/Prof Lana McClements is an academic at the University of Technology Sydney whose research focuses on developing novel technologies for improved monitoring and treatment of preeclampsia and cardiovascular diseases. She has pioneered and patented two new predictive and diagnostic biomarkers for preeclampsia, FKBPL and CD44, which are being translated into new tests for preeclampsia including in the point of care settings. With her team of researchers and clinical colleagues, they have developed innovative 3D patient-derived cardiac and placental platforms for personalised medicine. In 2022, she was awarded an Emerging Reproduction Research Leader award for her work in preeclampsia by the Society for Reproductive Biology (Australia and NZ).

https://profiles.uts.edu.au/Lana.McClements; www.drlanamcclements.com

Keywords: cardiovascular disease, biomarkers, heart, placenta, 3D organoids/spheroids

Honours programs: [Bachelor of Science (Honours) &/or Bachelor of Science (Honours)]

I supervise Honours projects on:

- *Investigating new treatments and biomarkers for cardiovascular women's health*
- *Extracellular vesicles from mesenchymal stem cells as a new treatment option for preeclampsia*
- *Evaluating new treatments for cardiac fibrosis using 3D bioprinted model*

What methods or research skills will you learn?

- 3D bioprinted organoid models;3D microfluidics placenta/vasculature-on-a-chip models
- Proteomics/transcriptomics
- Genetic manipulations/transfections (CRISPR, siRNA, plasmid. RALA)
- Cell culture Western blotting/RT qPCR/ELISA
- Microscopy (fluorescence/confocal), histology and imaging
- *In vivo* studies and *ex vivo* assessment

Our team:

- Ms Sahar Ghorbanpour, Postdoctoral Researcher and Lecturer
- Mrs Claire Richards, PhD candidate
- Mrs Dinara Alfrose, PhD candidate
- Mrs Fatemeh Heidari, PhD candidate
- Ms Ashley Bannister, Honours student

I collaborate with: Dr Kristine McGrath (Science, UTS), A/Prof Louise Cole (Science, MIF, UTS); Dr Amy Bottomley (Science, MIF, UTS); A/Prof Matthew Padula (Science, UTS) Prof Majid Warkiani (FEIT, UTS); Prof Deborah Marsh (Science, UTS); Dr Peter Su (FEIT, UTS)

Prof Brian Oliver

Distinguished Professor
Molecular Biotechnology
Brian.Oliver@UTS.edu.au

We have a unique collaborative group consisting of around 20 people who are based both at both UTS and the Woolcock Institute of Medical Research. Our group members are either trained as basic scientists and/or clinicians. Our projects span lab (basic) research to clinical research, but all are in the field of Respiratory Medicine.

Keywords: lung diseases (asthma, COPD, IPF), pharmacology/pharmaceutics, immunology, virology, air pollution, clinical medicine.

Honours programs: [Bachelor of Science (Honours) &/or Bachelor of Science (Honours), MPhil]

We supervise Honours projects on:

- **Understanding the cause(s) and treatments of lung diseases**
  We have projects which use in-vitro and/or in-vivo models of lung disease to understand the molecular pathogenesis of these diseases. We co-design projects with the student to allow them to peruse areas of interest to them, such as research into electronic cigarettes, viral infections, space travel. These projects are designed to give people the skills to peruse a Ph.D.
- **Clinical Research in Respiratory Disease**
  We have projects which places a student in a hospital environment and is specifically designed for students who wish to enter graduate medicine. These projects are highly competitive (D/HD average).

What methods or research skills will you learn?

- With our in-vitro / in-vivo projects you will learn lab skills such as qPCR, Western blotting, IHC, cell culture, in-vivo model assessment and more complex skills such as FACS, proteomics, RNAseq. Each student is encouraged to develop their project in such a way that it uses the technology that they want to be become expert in.
- Our clinical honours projects teach students a range of clinical assessment and patient communication skills.

Our team:

- See respiratroyresearchgroup.org

I collaborate with:

- We collaborate with researchers based at other universities for example UNSW, USYD, and internationally with people based in China, Europe (UK, France, Germany). Within UTS we widely collaborate, click on collaboration network on this webpage https://profiles.uts.edu.au/Brian.Oliver

Dr Jerran Santos

Position: Group Leader | Advanced Tissue Engineering and Stem Cell Biology
Discipline: Molecular Biotechnology
Email: Jerran.Santos@uts.edu.au

Dr Jerran Santos is the Group Leader of the Advanced Tissue Engineering and Stem Cell Biology Group at the University of Technology Sydney.His research group focus is on regenerative and precision medicine; utilizing stem cells and biomaterials in developing translational clinical applications. https://profiles.uts.edu.au/Jerran.Santos

Keywords: Stem Cells, Tissue engineering, regenerative medicine, regenerative disease, biotechnology, 3D printing, biomaterials.
Honours programs: [Bachelor of Science (Honours) &/or Bachelor of Science (Honours)]

We supervise Honours projects on:

- **Brain degenerative disease**
  Multiple Sclerosis, Parkinson's, Motor Neuron disease and Alzheimer's are the most common degenerative brain diseases. We have longitudinal projects dedicated to each one of these diseases. Into understanding their complex symptoms, progression and most importantly developing new therapies to aid the millions of people suffering.
- **Osteoarthritis**
  Articular hyaline cartilage degenerative diseases and injuries still pose a significant challenge for orthopaedic surgeons as the sites of defect often have a limited capability for natural repair. This has been a huge hinderance to the aging population and particularly veterinary treatment. Explore novel drug therapies to enhance cartilage repair and limit disease progression.
- **Treating brain injuries**
  Neuronal regeneration and repair therapies are of great interest because of their potential to reverse traumatic brain and spinal injuries that have severe effects on quality of life. Discover how newly developing therapies can manipulate endogenous stem cells to assist in injury repair.
- **Bone Regeneration**
  Investigating Bone Tissue Regeneration utilising Stem Cells and novel synthetic biomimetic scaffolds. This will be achieved by scaffold production by novel synthesis methods and 3D printing. Investigating the molecular mechanisms that respond and change in the stem cells over time as they mature in the presence of these materials.

What methods or research skills will you learn?

- Tissue Culture, molecular biology, RNA sequencing, proteomics, ELISA, Microscopy, RT-PCR, 3D printing, Bioinformatics, etc.

Our team:

- Dr. Jerran Santos, Prof Bruce Milthorpe, Neus Gomila Pelegri, Nancy Li, Aleksandra Stanszack, Gregory Lawrence

I collaborate with:

- Assoc. Prof Cathy Gorrie (UTS), Assoc. Prof Matt Padula (UTS), Assoc. Prof Tom Lawson (MQU), Dr. Herman Schultz (NYU), Dr Gad Vatine (Ben-Gurion), & others

Dr Razia Zakarya

Wendy McCormick Research Fellow
School of Life Sciences
razia.zakarya@uts.edu.au;
https://profiles.uts.edu.au/Razia.Zakarya

I am a Research Fellow in the Epigenetics of Chronic Disease Group (Woolcock Institute) where we are predominantly interested in the epigenetic mechanisms driving chronic diseases, such as asthma and diabetes.

Epidemiological studies have shown that there is a hereditary link in many chronic diseases, and although candidate genes of interest have been reported for particular phenotypes, the complete molecular mechanism underpinning chronic disease inheritance remains to be understood. Our work focuses on this question in the context of **epigenetics**, which can broadly be understood as the "language" that sits atop DNA to dictate how the cell forms and behaves.

Epigenetics is a burgeoning field addressing how our genes interact with our environment to make us who we are, in sickness and in health. If you are naturally curious, with a drive to understand the root causes of disease in modern society, then you will find a research project in this field highly rewarding. To motivate students and promote work-life balance, each cohort's best performing student will be offered the selection of a gift card or free entry to a gig in the 2024-25 summer season.

Keywords: Epigenetics, DNA Methylation, Histones, Chromatin, Next generation sequencing (NGS), Bioinformatics

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- DNA Methylation patterns underpinning airway hyperresponsiveness
- The effect of *in utero* exposure to air pollution on cell contractility

What methods or research skills will you learn?

- Large scale NGS (e.g., WGBS, CHIP-Seq, RNA-Seq) data handling and analysis
- *In vitro* cell culture methods
- qPCR
- Nucleic acid extraction

Our team:

- Professor Chris O'Neill
- Mr Ryan Forrest

I collaborate with:

- **Distinguished Professor Brian Oliver** – UTS SoLS & Woolcock Institute
- **Professor Hui Chen** – UTS SoLS
- **Dr Emily Colvin** – USYD School of Medical Sciences & Kolling Institute
- **Professor Ian Adcock** – Imperial College London
- **Dr Richard Kim** – UTS SoLS
- **Dr Chantal Donovan** – UTS SoLs

Dr. Madison Coward-Smith

Postdoctoral Research Fellow
Molecular Biotechnology Discipline
Madison.cowardsmith@uts.edu.au

Dr. Coward-Smith is a member of the ImmunoPharmacology Research Group (IPRG) here at UTS. She received her PhD from RMIT in 2024 and has a keen interest in cardiorespiratory research, with a focus on how respiratory diseases and infections can impact the cardiovascular system. Dr. Coward-Smith joined UTS in 2024 and her current research is focused on the development of new therapeutics for lung diseases and infection.

Keywords: Asthma, cardiovascular disease, vascular function, infection, innate immunity

Honours programs: Bachelor of Science (Honours); Bachelor of Medical Science (Honours)

We supervise Honours projects on:

- How respiratory diseases affect the cardiovascular system
- The development of new therapeutics to target lung immune responses

What methods or research skills will you learn?

- Mouse models of respiratory infection and disease
- Tissue collection and processing
- Lung histology
- Flow cytometry
- RNA extraction and qPCR analysis

Our team and collaborators:

- Dr. Chantal Donovan
- Dr. Richard Kim
- D. Prof. Brian Oliver
- Prof. Hui Chen
- Dr. Razia Zakarya
- Dr. Ye Zhang

Kristine McGrath

Position: Associate Professor, School of Life Sciences
Discipline: Molecular Biotechnology
Email: Kristine.Mcgrath@uts.edu.au

Interested in how biology can solve real-world health problems? Come chat with me!

I'm passionate about using biotechnology to translate molecular discoveries into therapeutic solutions for major health challenges. My research focuses on uncovering how inflammation, oxidative stress and sex steroids drive cardiovascular and endocrinology diseases like atherosclerosis and type 2 diabetes, respectively. Recently, I've also expanded my research to explore the development of biomaterials for use in cardiovascular stents as well as investigating environmental-related health risks. My research aims are to develop innovative therapeutic and biomaterial-based solutions that address both clinical and environmental health challenges.

Keywords: cardiovascular, diabetes, biomaterials, environmental pollution

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- Investigating the adverse effects of environmental pollution on the risk for cardiovascular disease, in particular atherosclerosis.
- Investigating the effects of sex steroid hormones on the cardiovascular system.
- Investigating the biocompatibility of biodegradable alloys for cardiovascular disease.

What methods or research skills will you learn?

- Mammalian cell culture (2D and 3D)
- Biochemical assays (i.e. oxidative stress assays, cell viability assays, ELISA, etc.)
- Histological methodologies including immunohistochemistry
- Molecular biology techniques including Western blot analysis, RT-qPCR

Our team:

CERT
CARDIOVASCULAR & ENDOCRINE RESEARCH TEAM

- Miss Karen Lye (PhD student)
- Miss Maryanne Du (PhD student)
- Mr Samuel Hansen (PhD student)
- Ms Shayesteh Shahriary (PhD student)
- Miss Rebecca Nguyen (Honours student)

Withing UTS, I collaborate and/or co-supervise projects with:

- A/Prof Lana McClements (Science)
- A/Prof Cathy Gorrie (Science)
- A/Prof Louise Cole (AIMI)
- Dr Helen Xu (FEIT)
- A/Prof Nham Tran (FEIT)

A/ Prof Quan Vuong

Program Director of Food Science and Technology
School of Life Sciences

Quan.vuong@uts.edu.au

A/ Prof Quan Vuong is a leading expert in Food Science, specialising in the development, characterisation, and application of teas and herbs; the extraction and utilisation of essential oils, phytochemical-enriched extracts, and bioactive compounds from natural sources including native fruits, medicinal plants, algae, seagrasses, and marine sponges as functional ingredients; the formulation of innovative food, cosmetic, and health-related products from natural materials; the application of advanced preservation technologies for fresh fruits and vegetables; and the valorisation of food industry by-products into high-value functional foods, nutraceuticals, and pet products.

Keywords: Active molecules; functional ingredients; new product development; food waste valorisation; and teas and herbs.

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- Aromatic and bioactive molecules from Australian native flora as potential food and therapeutic agents.
- Algae and seagrasses as ingredients for food production
- Valorisation of food waste to create functional ingredients

What methods or research skills will you learn?

- Experimental design, data collection and data analysis
- Various analytical techniques, such as High-Performance Liquid Chromatography (HPLC), Liquid Chromatography-Tandem Mass Spectrometry (LC MS/MS, Gas Chromatography-Mass Spectrometry (GC MS).
- Different processing techniques, such as microwave, ultrasonic, supercritical fluid extraction, freeze drying and encapsulation techniques.

I collaborate with:

- Colleagues from various discipline

Biologics Innovation Facility (BIF)

The UTS BIF is a state-of-the-art facility that offers a industry-like environment for bioprocessing training and pilot-scale biomanufacturing of products *e.g., antibodies, vaccines, cell therapies, cell agriculture products*

BIF Industry-Driven Honours Project Scholarships

These competitive scholarships offer a $2,500 bursary to support promising Honours students to undertake industry-partnered research projects within the BIF.

Preference given to high-calibre applicants intending to pursue further postgraduate research aligned with biomanufacturing.

For more information on project availability
contact Dr Andrew Care (andrew.care@uts.edu.au)

Research projects in the Discipline of Medical Science

The Discipline of Medical Science within the School of Life Sciences, Faculty of Science at UTS spans three themes and ten laboratory groups.

- Infectious Diseases is made up of the Tuberculosis and Respiratory Diseases Group, Microvesicles and Malaria Research Group and the Molecular Medical Microbiology Lab.
- The Metabolic Disorders and Cancer theme is composed of the Gene Therapy and Molecular Analysis Laboratory, Cancer Biology and the Translational Oncology Group.
- The Neuroscience and Neurological Disorders theme is constituted by the Brain and Behaviour Group, Neurotoxin Research Group, Laboratory of Cellular and Molecular Neuroscience and the Neural Injury Research Unit.

Research within these groups spans fundamental discovery to translational science, making impact in numerous medical and health areas including chlamydia, malaria, tuberculosis, gene therapy and diabetes, women's cancers, understanding compulsive disorders, investigating goal-directed decision making, motor neurone disease, multiple sclerosis and other neuroinflammatory conditions, spinal cord injury and more.

A/Prof Alessandro Castorina

Associate Professor
Discipline of Medical Science
Alessandro.castorina@uts.edu.au

Hi, I am Alessandro, and I am the leader of the **Laboratory of Cellular and Molecular Neuroscience**. Our team consists of a group of enthusiastic researchers exploring novel therapeutic options to cure neurodegenerative and demyelinating disorders of the central nervous system. We also study how certain environmental risk factors contribute to the onset and progression of such diseases. If you are interested in helping finding novel cures for multiple sclerosis and/or identify the underlying causes come and join us!

Keywords: Multiple sclerosis, demyelinating diseases of the CNS, neuroinflammation, ER stress; plant-derived neurotoxins

Honours programs: [Bachelor of Science (Honours) & Bachelor of Medical Science (Honours)]

I supervise Honours projects on:

- Novel therapies to treat multiple sclerosis; We study the beneficial effects of targeting the neuropeptide receptor PAC1 in animal and cellular models of multiple sclerosis and neuroinflammation
- Role of environmental toxins in multiple sclerosis pathogenesis; This project theme focusses on researches aimed to understand the role of certain environmental toxins as risk factors for multiple sclerosis and other demyelinating conditions.

What methods or research skills will you learn?

- Animal models of multiple sclerosis.
- Transgenic mice models (constitutive and conditional knockouts).
- CRISPR-Cas9 gene editing.
- Behavioral and neurological testing.
- Advanced imaging techniques (co-immunostaining, fluorescence).
- Real-time PCR.
- Western blotting.
- Cell cultures.
- Advanced cellular bio-assays.

Our team:

- Rubina Marzagalli (Volunteer post-doc)
- Margo Jansen (PhD candidate)
- Jordan Piper (PhD candidate)
- Minduli Withana (Master by Research)
- Several Honours, MPhil, internship students

I co-supervise projects with:

- Prof. Ken Rodgers (Neurotoxin group), Dr Laura Bradfield (Behavioral neuroscience group), Dr Alen Faiz (Respiratory Bioinformatics and Molecular Biology group) and actively collaborate with external partners at USYD (Prof. Kevin Keay and A/Prof. Markus Hofer), at UCLA (Prof. James Waschek and A/Prof. MacKenzie-Graham) and in Italy (Prof. Claudio Bucolo and Prof. Musumeci)

A/Prof Valery Combes

Associate Professor,
School of Life Sciences Faculty of Science
valery.combes@uts.edu.au

The Microvesicle and Malaria Research Group

I am a vascular biologist specialised in the pathogenesis of infectious diseases, notably severe malaria and the role of extracellular vesicles in these diseases. My research currently focuses on understanding the pathogenic mechanisms of the most severe complication of the malaria infection, cerebral malaria as well as finding biomarkers of severity to identify early the patients at risk of developing lethal complications. The Team also works on finding biomarkers allowing the diagnosis of Lymphangioleiomyomatosis (LAM).

Keywords: microvesicles, extracellular vesicles, malaria, pathogenesis, biomarkers, microRNA

Honours programs: Bachelor of Medical Science (Honours) &/or Bachelor of Science (Honours)

I supervise Honours projects on:

- Role of extracellular vesicles in the pathogenesis of severe malaria using in vitro systems
- Discovery of biomarkers of disease severity (malaria, Lymphangioleiomyomatosis)

What methods or research skills will you learn?

- Cell culture
- Proteomics
- Flow cytometry
- Fluorescence microscopy and cell imaging

Our team:

- Benjamin Sealy, PhD student
- Iris Cheng, PhD student
- Nuntiporn (Hong) Nunthanasup, PhD student visiting from Chulalongkorn University Thailand
- Erinn Watts (Honours)
- Noushin Khan (Honours)

I collaborate with:

- Dr Bernadette Saunders, UTS (co-supervisor LAM)

A/Prof Cathy Gorrie

Associate Professor
Neuroscience
Catherine.gorrie@uts.edu.au

Associate Professor Cathy Gorrie received her PhD in Neuroscience from UNSW in 2008. She joined UTS in 2011 and you may know her as a teacher in one of your subjects (Histology, Biobusiness). Her research interest is in neuroscience, in particular in **neurotrauma** (brain and spinal cord injury). She uses animal models to investigate damage to and repair of the central nervous system. She heads the Neural Injury Research Unit (NIRU) at UTS and has supervised 17 Honours students and 9 PhD students. https://www.uts.edu.au/staff/catherine.gorrie

Keywords: Spinal cord injury, animal models, inflammation, histology, immunohistochemistry

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- Development of compression model of spinal cord injury (SCI) in neonatal rats*
- Tissue clearing in brain and spinal cord tissue (See Louise Cole)

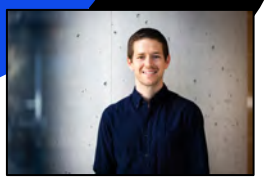
What methods or research skills will you learn?

- Animal (rat) models of SCI*, surgery, behavioural assessments
- Histology and Immunohistochemistry
- Imaging techniques
- Cell culture, Real time PCR, ELISA, WB

I collaborate with:

- Kristine McGrath
- Andrew Care
- Lana McClememts
- Jerran Santos and Matt Padula
- Bernadette Saunders
- Alessandro Castorini
- Louise Cole and Amy Bottomly (MIF)

*Animal ethics training is essential and all students must also undergo competency assessments. All experimental procedures will be conducted with appropriate UTS ethics approval.



Dr Mike Kendig

Senior Lecturer
Discipline of Medical Science
michael.kendig@uts.edu.au

I received my PhD in psychology from the University of Sydney in 2017 and then completed postdoctoral training at UNSW Sydney before joining UTS in 2022. Our lab studies the effects of high-fat, high-sugar diets on cognition, neuroinflammation, and the gut microbiome. Our work spans animal models (rats and mice) and studies in humans.

https://profiles.uts.edu.au/michael.kendig

Keywords: diet, cognitive function, obesity, gut microbiome, behaviour

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- **Ultra-processed foods**
- **Faecal Microbiota Transplantation**
- **Probiotics**
- **Diet and cognitive function**

What methods or research skills will you learn?

- Animal handling
- Behavioural testing
- Nutritional analyses of macronutrient composition
- Immunohistochemistry & microscopy

Our team (optional):

- Dr Simone Rehn: Postdoctoral Fellow
- Ms. Maedeh Mahmoudi: co-supervised PhD student

I collaborate and co-supervise with:

- Dr Gustavo Espinoza-Vergara (AIMI)
- Dr Poppy Watson (Graduate School of Health, UTS)
- Dr Laura Bradfield (University of Sydney)
- Dr Laurence Luu (UNSW Sydney)

Prof Deborah Marsh

Discipline Leader, Medical Science
Head, Translational Oncology Group
Discipline of Medical Research
Deborah.Marsh@uts.edu.au

The Translational Oncology Group at UTS is led by Prof Deborah Marsh (Deborah Marsh Profile | University of Technology Sydney (uts.edu.au); Deborah Marsh | LinkedIn), a cancer scientist working in cell and molecular biology, genetics and epigenetics. Our focus is women's cancers and associated conditions, with a specific interest in ovarian cancer. We use fundamental discovery research and translational science approaches to address issues of drug resistance and discover new therapeutic opportunities.

Keywords: women's cancers, ovarian cancer, gene editing, 3D bio-printing, genetics, epigenetics and epigenomics

Honours programs: [Bachelor of Science (Honours) &/or Bachelor of Science (Honours)]

We supervise Honours projects on:

• Drug repurposing to discover new ways to treat ovarian cancer

• Genetic engineering of key tumour suppressors and oncogenes in ovarian cancer

• Analyses of DNA damage pathways for the treatment of malignancy

• Chromatin remodelling factors in malignancy

• Understanding common factors between endometriosis and ovarian cancer

What methods or research skills will you learn?

Mammalian tissue culture, gene editing with CRISPR-Cas9, 3D bio-printing using the RASTRUM instrument from Inventia, cloning, real-time quantitative PCR, Western blotting, functional assays (proliferation, migration, clonogenic cell survival assays etc.), pre-clinical drug repurposing studies and screening (including *in silico* analyses), imaging, and more …

Our team:

- Kristie-Ann Dickson, Senior Research Associate (Kristie Dickson Profile | University of Technology Sydney (uts.edu.au))
- Dr Amani Alghalayini, Postdoctoral Scientist (Amani Alghalayini Profile | University of Technology Sydney (uts.edu.au))
- Dr Amy Sarker, Postdoctoral Scientist (Amy Sarker Profile | University of Technology Sydney (uts.edu.au))
- PhD Students: Yue (Daniel) Ma, Tao Xie, Natisha Field and Tali Skipper
- Honours Students (Autumn cohort 2024): Kiara Heyward and Phoebe Hunt

We collaborate with:

- Professor Nikola Bowden / Staff Profile / The University of Newcastle, Australia
- Professor Caroline Ford (unsw.edu.au)
- Professor Anna deFazio (sydney.edu.au)
- Professor Greg Neely (sydney.edu.au))
- Alen Faiz Profile | University of Technology Sydney (uts.edu.au)

A/Prof Najah Nassif

Associate Professor
Cancer Biology | Medical Science
Najah.Nassif@uts.edu.au
https://profiles.uts.edu.au/Najah.Nassif

Associate Professor Najah Nassif received her PhD in molecular biology from the University of New South Wales and after completing postdoctoral fellowships at Sydney University and UNSW, she commenced at UTS. Her primary research interests are in understanding the genetic and molecular basis of cancer with the aim of developing diagnostic and/or prognostic biomarkers and future novel therapies. Her current research is focused on understanding how dysregulation of the PTEN tumour suppressor gene regulates cancer development and progression. Her current research focuses on determining how altered regulation of PTEN gene expression and/or function, contributes to the development and/or progression of cancer. This includes examining the role of miRNA and other non-coding RNA interactions in regulating PTEN and cancer with the aim of developing future therapies.

Keywords: molecular biology, cancer biology, gene expression, tumour suppressor, quantitative PCR, mutation, gene regulation, epigenetics, miRNA, lncRNA

Honours programs: Bachelor of Science (Hons) and/or Bachelor of Medical Science (Hons)

I supervise Honours projects on:

- Examining the effect of PTEN sequence mutations on PTEN protein function.
- Investigating the role of the PTEN pseudogene (PTENP1) and miRNAs in the regulation of PTEN expression.
- Detecting PTEN promoter mutations and determining their effect on PTEN expression in cancer.
- Modelling PTEN gene mutations to determine their effect on PTEN protein structure.

What methods or research skills will you learn?

Techniques and methodologies you will learn will include real time quantitative (RT-qPCR) and digital PCR, cell and tissue culture, cell-based assays, DNA and RNA extraction and analysis, PCR, bioinformatics and other molecular biology techniques.

Our team:

Our team includes Honours and postgraduate research (PhD and MSc) research students as well as students undertaking research internships.

I collaborate with:

- Prof Ann Simpson (UTS) in research projects developing gene therapy for diabetes.
- Prof Marina Kennerson (ANZAC Research Institute and USYD) on neurogenetics research projects.

Prof Ken Rodgers

Professor of Neurotoxicology
School of Life Sciences
Kenneth.rodgers@uts.edu.au

Many neurodegenerative diseases are predominantly sporadic and are thought to be caused by a combination of environmental factors and genetic susceptibility. Protein amino acids play very important and diverse roles in our bodies and our research group is interested in non-protein amino acids that are capable of mimicking protein amino acids and are implicated in diseases such as motor neurone disease and multiple sclerosis.

Keywords: algal blooms, non-protein amino acids

Honours programs: Bachelor of Science (Honours) &/or Bachelor of Science (Honours)

We supervise Honours projects on:

- Topic 1
  Investigating the link between Multiple Sclerosis and the non-protein amino acid azetidine-2-carboxylic acid (AZE) that is present in beets
- Topic 2
  How does exposure to blue-green algal blooms increase the risk of developing motor neurone disease?

What methods or research skills will you learn?

- Mammalian cell culture, cytotoxicity assays, mass spectrometry, confocal microscopy

A/Prof Bernadette Saunders

Position Associate Professor
Discipline Medical Science
Email Bernadette.saunders@uts.edu.au

My research:

Focuses on understanding how we fight infections and limit inflammation, especially in diseases like tuberculosis and influenza. My work involves discovering and testing new biomarkers that can help diagnose TB disease more effectively, exploring potential new drugs to treat infections, and investigating innovative therapies for respiratory and inflammatory conditions

Keywords: Macrophages, Respiratory diseases, miRNA, biomarkers, drug discovery, tuberculosis, LAM

Honours programs: All Honours and Master of Philosophy Programs

I supervise Honours projects on:

- **miRNA, macrophage activity and Inflammation**

specific miRNAs are upregulated during infection. We are working to understand how these miRNA aid host immunity to infection.

- **Developing new drugs to treat infection**

Treating tuberculosis and other mycobacteria requires months of multiple antibiotics. Our group is working to identify and test new treatments for these diseases.

- **Biomarkers of TB disease**

Our group have identified a biomarker signature of TB disease. We are testing this signature in samples from a large TB study to validate its potential to aid TB diagnose

- **Developing new models of LAM (lymphangioleiomyomatosis)**

LAM is a rare, slow growing lung cancer. Our group is working to develop spheroid models of LAM cysts, for testing new treatment options for LAM.

What methods or research skills will you learn?

- Microbiology, antimicrobial drug testing, development and testing 3D spheroids, in vivo in mouse models of infection.
- Cell culture, immune functional assays, microscopy, ELISA, Cytometric Bead Assays, flow cytometry, drug testing
- Molecular biology: Real time PCR, sequencing

Our team (optional):

- Dr Tess Lai, and Dr Duc Nyugen
- PhD Students: Riley Easton, Jinx Moore, Liberty Conyers and Honours & Masters Students

  I collaborate & co-supervise students with UTS and External Academics locally and internationally.

Website: https://www.uts.edu.au/staff/bernadette.saunders

Prof. Ann Simpson

Professor of Biochemistry
Discipline of Medical Science
Ann.Simpson@uts.edu.au

Professor Simpson holds a BSc (Hons) and a PhD from the University of Sydney. Her main research interest is the gene therapy of diabetes mellitus. To this end her group engineers liver cells to secrete insulin and replace the function of the pancreatic islets that have been destroyed by the autoimmune process of Type 1 diabetes. She was the first to show a liver cell can store insulin in granules. In particular, her work now focuses on novel strategies to deliver genes directly to liver cells using third generation lentiviral vectors. So far her group has reversed diabetes with normal glucose tolerance in several diabetic animal models.

Keywords: gene therapy, type 1 diabetes, liver, lentiviral vectors, transplantation

Honours programs: Bachelor of Science (Honours) &/or Bachelor of Medical Science (Honours)

I supervise Honours projects on:

Transduction of liver cells with a clinically-applicable lentiviral vector: This project will aim to use a clinically applicable third generation self-inactivating lentiviral vector deliver pancreatic transcription factors to mouse liver cells to engineer pancreatic transdifferentiation and secretion of insulin.

What methods or research skills will you learn?

- Tissue culture, production of lentiviral vectors, RT-PCR, qRT-PCR, immunohistochemistry, biochemistry.
- Our team: Dr. Binhai Ren (Senior Research Fellow), Ms. Alexandra Mahoney (PhD student), Ms. Fahmida Abdi (PhD Student), Ms. Nicole Matysiak (Honours student)

I collaborate with:

- A/ Prof. Bronwyn O'Brien, Dr. Najah Nassif, Visiting Professor Kaneez Fatima-Shad (UTS), Prof Ian Alexander, Dr. Grant Logan, Children's Medical Research Institute (Westmead), Prof. Anand Hardikar (Western Sydney University)

Dr Gang Liu

Senior lecturer,
Lead of Tissue Repair and Cancer Group
Discipline of Medical Science
School of Life Sciences, Faculty of Science

Gang.liu@uts.edu.au

Dr Liu is a Rebecca Copper Foundation AI & Val Rosenstrauss Fellow and Group Leader, Tissue Repair and Cancer Group, School of Life Sciences, UTS

Dr Liu leads the Tissue Repair and Cancer Group, where his research explores one of the biggest questions in modern medicine: *how does tissue fibrosis drive lung disease development?* His team uses a combination of cell cultures, animal models, and clinical samples to uncover the mechanisms that link tissue scarring and fibrosis development, aiming to identify new and more effective therapies.

Dr Liu has published widely in high-impact journals such as *The Lancet*, *Lancet Infectious Diseases*, *European Respiratory Journal*, and *Nature Communications*. His research is highly collaborative, bringing together clinicians, scientists, and data specialists to bridge the gap between fundamental discoveries and real-world patient impact.

If you are curious about how the body's repair processes can go wrong and lead to devastating diseases, our group offers the chance to make a real difference while developing strong research skills for your career.

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- **Understand the inflammation and remodeling in lung fibrosis**
  Idiopathic pulmonary fibrosis (IPF) is a progressive lung disease characterised by chronic inflammation and scarring (fibrosis) of the lung tissue. Current treatment options are very limited, and patients often face a poor survival rate. This project aims to uncover how inflammation and tissue fibrosis interact to drive disease progression, providing new insights that may lead to better therapies

- **How fibrotic proteins contribute to the development of lung cancer**
  Lung cancer is often characterised by an abnormal deposition of extracellular matrix (ECM) proteins, which are the structural proteins that normally support lung tissue. However, the exact role of these ECM proteins in lung cancer development and progression remains unclear. This project will investigate how ECM proteins influence tumour behaviour in lung cancer, providing new insights into the tumour environment and potential therapeutic targets.

What methods or research skills will you learn?

- Histology analysis for fibrosis and tumour
- Protein extraction and immunoblot
- Immunohistochemistry and immunofluorescent
- Cell culture
- RNA extraction from mouse tissues and cells
- Real time PCR and qPCR

Nham Tran (PhD)

Churchill Fellow and Associate Professor
Medical Researcher with a focus on RNA Biology
nham.tran@uts.edu.au, www.tranlab.org

Our lab investigates the role of small non-coding RNAs, particularly microRNAs (miRNAs), in cancer biology and diagnostics. We focus on identifying miRNAs that can serve as robust clinical biomarkers for early cancer detection, with a primary emphasis on head and neck cancers. We also study the molecular mechanisms by which these RNAs regulate gene expression to drive tumour initiation and progression.

In addition, our research explores viral oncology, particularly HPV16-positive oral cancers, to understand how viral infection reshapes host non-coding RNA networks to promote oncogenesis.

Alongside our cancer research, we also investigate RNA-based models of parasite development, focusing on how microRNAs regulate infection and host immunity. We welcome motivated students who are eager to contribute to translational research at the intersection of RNA biology, virology, parasitology, and diagnostic technology.

Keywords: microRNAs – Cancer Biomarkers – Point-of-Care Diagnostics
Honours programs: Bachelor of Science (Honours) &/or Bachelor of Science (Honours)

Available Honours projects on:

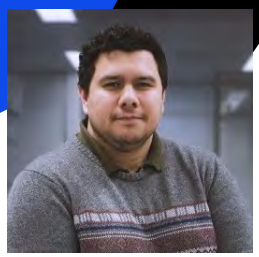
1. **miRNA Biomarkers** - Identifying and validating RNA markers for the diagnosis of rare cancers using multiplex qPCR
2. **RNA Mechanistic Studies** - Investigating how miRNAs regulate oncogenesis at the molecular level
3. **HPV16 Diagnostics** - Developing a salivary qPCR assay for clinical detection of HPV16 and other viruses (SpeeDx Industry Collaboration)
4. **Parasite RNA Biology** - Dissecting the function and expression of miRNAs in parasite infections (Collaboration with University of Galway)

What methods or research skills will you learn?

- **Cell Biology & Culture** – Maintenance of cell lines and application of cell biology techniques.
- **Molecular Biology** – DNA cloning, CRISPR genome editing, PCR, and quantitative PCR (qPCR).
- **RNA & DNA Technologies** – Transfections, luciferase reporter assays, and antisense oligonucleotide (ASO) applications.
- **Clinical Sample Handling** – Processing and analysis of blood and tissue specimens.
- **Scientific Communication** – You will be roster for oral presentations at lab meetings and individual 1:1 research progress discussion.

Our team (optional):

- In our lab, we have an Early Career Researcher (ECR), four PhD students, several interns, and rotational capstone students. We are a collaborative and supportive team who enjoy the research we do and the time we spend working together in the lab. **R**espect **N**ow **A**lways = **RNA**



Dr. Dan Enosi Tuipulotu

Lecturer & Antimicrobial Discovery Group Leader
Discipline of Medical Science
dan.enosituipulotu@uts.edu.au

Dr. Daniel Enosi Tuipulotu is a Lecturer at UTS in the School of Life Sciences, Faculty of Science. He completed his PhD in virology at the University of New South Wales, Sydney (2018). He then undertook postdoctoral training in Immunology at the Australian National University, Canberra (2019-2023). In 2024 he established his research group at UTS. His research aims to advance our understanding host immunity to infectious diseases and to develop novel treatments for microbial infections.

https://profiles.uts.edu.au/Dan.EnosiTuipulotu

https://scholar.google.com.au/citations?user=WarVwJoAAAAJ&hl=en

Keywords: Microbiology, Virology, Antimicrobials, Innate Immunity

Honours programs: Bachelor of Science (Honours) &/or Bachelor of Science (Honours)

I supervise Honours projects on:

- Developing novel therapies for antimicrobial-resistant pathogens, including small-molecule compounds, synthetic peptides, bacteriophages and lysins.

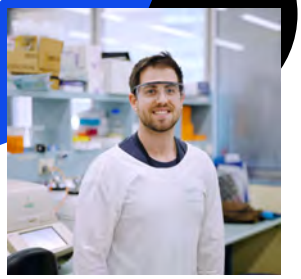
- Understanding the host immune responses to bacterial and viral pathogens, specifically how innate immune responses, such as interferon signalling, controls bacterial and viral infections (e.g. interferon stimulated genes).

What methods or research skills will you learn?

- Bioinformatics
- Protein biology
- Antimicrobial Assays
- Molecular biology techniques (Nucleic acid extraction, PCR, Cloning, ELISA)
- Microscopy (Light, Immunofluorescence, Electron)
- Cell culture

We collaborate with:

- A/Prof. Bernadette Saunders
- A/Prof. Cindy Gunawan
- A/Prof. Charles Cranfield
- Dr. Mehrad Hamidian
- Dr. Laurence Luu
- Dr. Matt Johansen



Dr Matt Johansen

Chancellor's Research Fellow
Centre for Inflammation, Centenary Institute/UTS
Matt.Johansen@uts.edu.au

I am a researcher that has a passion for understanding the interactions between pathogens (bacteria, viruses) and the host. In particular, I have a specific interest in mycobacterial infections (Tuberculosis; TB) and non-tuberculous mycobacteria (NTM) and in particular *Mycobacterium abscessus* infections. Further, since the COVID-19 pandemic we have established a high-containment PC3 laboratory for working with SARS-CoV-2 where we have discovered novel aspects of disease pathogenesis and identified new vaccines and therapeutic targets that we are further exploring.

Keywords: Mycobacteria, SARS-CoV-2, chronic lung disease, pathogenesis, host-pathogen interactions, drug discovery

Honours programs: Bachelor of Science (Honours) &/or Bachelor of Science (Honours)

We supervise Honours projects on:

- **Host-pathogen determinants of non-tuberculous mycobacterial infection**
  This project will further our understanding of the interactions between non-tuberculous mycobacteria (NTM) such as *Mycobacterium abscessus* and *Mycobacterium avium*, and host cells and how this shapes the infection landscape. This will be done in the context of healthy individuals as well as those with chronic lung diseases such as Cystic Fibrosis (CF).
- **Investigating SARS-CoV-2 pathogenesis to develop new therapies**
  In this project, we will investigate novel aspects of SARS-CoV-2 pathogenesis and use these findings to generate novel therapies that can then be used to prevent SARS-CoV-2 infection and protect from severe disease outcomes.

What methods or research skills will you learn?

- Cell and bacterial culture
- Handling of infectious organisms in a PC2 laboratory
- Mouse handling skills
- Cytokine quantification (Cytometric Bead Array)
- RNA extraction and cDNA synthesis
- Quantitative PCR (qPCR)
- Histological examination of formalin-fixed tissue
- Immunofluorescence

Our team:

- Professor Philip Hansbro (Centenary/UTS Centre for Inflammation)
- Postdoctoral researchers
- PhD/Masters/Honours students
- Research assistants

We collaborate with:

- Associate Professor Bernadette Saunders (UTS, Australia)
- Professor Warwick Britton (Centenary Institute, Australia)
- Dr Laurent Kremer (IRIM, Montpellier, France)
- Dr Shivani Singh and Professor Leopoldo Segal (NYU Langone, New York, USA)

Dr Franki Tse

Lecturer & MS Australia Research Fellow
Discipline of Medical Science
franki.tse@uts.edu.au

Dr Tse is a lecturer and group leader at the School of Life Sciences. After receiving his PhD in Biomedical Science from the Chinese University of Hong Kong in 2014, he undertook postdoctoral fellowships and trainings at the Hong Kong University of Science and Technology and the University of Sydney / Royal Prince Alfred Hospital (RPAH). He became a faculty member in 2018 and has been leading a group of honours, PhD students and postdocs to study oligodendrocyte pathology in neurodegeneration at the Hong Kong Polytechnic University. In 2025, he joins UTS and relocated his research group to Sydney. He is now a MS Australia Research Fellow and an Honorary Research Officer at the Department of Neuropathology, RPAH.

The goals of the oligodendrocyte pathology group are,

(1) To unveil the importance of oligodendrocyte pathology in neurodegenerative diseases
(2) To systemically dissect the molecular mechanism(s) underlying cell cycle regulation and myelination process of oligodendrocytes
https://profiles.uts.edu.au/Franki.Tse

Keywords: Oligodendrocyte, Myelin, Alzheimer's disease, Multiple Sclerosis, ATM, population genetics, DNA double strand breaks

Honours programs: Bachelor of Science (Honours) & Bachelor of Medical Science (Honours)

I supervise Honours projects on:

1) The effects of DNA double strand breaks on cell cycle regulation in myelinating cells
2) The contribution of GWAS-identified genetic risk factors to oligodendrocyte degeneration in sporadic Alzheimer's disease
3) The diagnostic application(s) of oxford nanopore technology for targeted long read sequencing in neuropathology

What methods or research skills will you learn?

- Human and mouse glial cell cultures
- Molecular techniques & analysis (Real-time PCR, & PCR)
- Immunocytochemistry & microscopy
- Immunohistochemistry & digital pathology
- Long read sequencing & analysis

Our team:

- Connor Philips: Research Assistant
- Christabella Winata: Honours Student (Co-supervised with A/Prof Castorina)
- Sunny Hoi-Sang Yeung: PhD candidate (Hong Kong)
- Iris Wai-Ting Ma: PhD candidate (Hong Kong)

I collaborate and/or co-supervise with:

- Prof. Bruce Brew (St Vincent's AMR & UNSW)
- Prof. Karl Herrup (University of Pittsburgh)
- A/Prof. Alessandro Castorina (UTS)
- A/Prof. Carmine Gentile (UTS)
- A/Prof. Ken Arai (Massachusetts General Hospital & Harvard)
- A/Prof. Michael E Buckland (USyd & RPAH)
- Dr. Chidozie Anyaegbu (Curtin University)
- Dr. Ivy Aifang Cheng (University of Macau)
- Dr. Michael Lovelace (St Vincent's AMR &UNSW)

Research projects in the Discipline of Environmental Sciences

We are a strong, collegial and internationally renowned team of environmental scientists in the School of Life Sciences in the Faculty of Science at UTS. The research in the Environmental Sciences Discipline Group spans the flora and fauna of both terrestrial and aquatic realms, and explores how plants and animals interact with each other and their environments. It is our aim to make a substantial and enduring contribution to the future of environmental science and health of our planet through climate change mitigation, adaptation and impact reduction.

A/Prof Andy Leigh

Position: Plant ecologist
Discipline: Environmental Science
Email: andrea.leigh@uts.edu.au

I have been a researcher, supervisor and educator in environmental science at UTS since 2007. Prior to coming to UTS, I conducted my PhD research on the functional significance of leaf shape at the Australian National University (ANU). I am passionate about learning how plants living in extreme environments, like deserts and alps, cope with extreme temperature stress, especially under water stress. My lab group and collaborators are using physiological tools to uncover how plants respond to these stresses to better predict tolerance of different species under climate change. Such insights, in turn, can inform how to best manage natural systems under threat. Our research therefore is aligned with the UN Sustainable Development Goal 13: Climate Action. More details on my UTS profile page: https://profiles.uts.edu.au/Andrea.Leigh

Keywords: plant ecology, temperature tolerance, water stress, climate change, extreme environments, desert, alpine
Honours programs: Bachelor of Environmental Biology (Honours) and BSc (Honours)

My team supervise Honours projects on:

- Plant tolerance to hot and cold temperature extremes, including glasshouse studies at ANU, Canberra, or at Australian Botanic Gardens, Mt Annan.
- How do droughted plants cope with heat extremes.
- Potential for co-supervised projects at the Australian National University (ANU), Western Sydney University (WSU) or University of Tasmania (UTas).

What methods or research skills will you learn?

Methods and skills include some or most of the following:

- Leaf function and response to temperature stress using chlorophyll fluorometry;
- Leaf gas exchange (photosynthesis, conductance, transpiration, respiration) using an Infrared Gas Analyser and/or Porometer;
- Leaf temperature using infrared thermography and/or dataloggers;
- Potted plant or seed germination experiments (experimental garden in Port Augusta, UTS rooftop, Australian Botanic Garden, Mt Annan, or UoW);
- Leaf morphological measurements and plant identification in the field;
- You will be required to become familiar with the statistical analysis package R, with guidance from the team, to analyse your results.

Our team (present and *recent* past):

- Dr Alicia Cook, PhD (2016-2021) and postdoctoral fellow (present)
- Pip Alvarez, PhD (2021-present)
- Lisa Danzey, Honours (2021-22) and PhD (2022-present)
- Catie Pottinger, Honours (2023-present)
- Michelle Bird, Honours (2023-present)
- Shae Jones, PhD, co-supervised at UoW (2021-present)
- Rosie Harris, PhD, co-supervised at ANU (2020-present)
- Dr Kirsty Milner, PhD (2016-2020)
- Dr Eli Bendall, PhD, co-supervised at UoW (2016-2020)

Dr Megan Murray

Position: Research Leader - The Phyto Lab
Discipline: Environmental Sciences
Email: Megan.Murray@uts.edu.au

Are you an Environmental Science student who pursues your academic curiosity and enjoys solving tricky problems? Would you consider yourself determined and persistent when it comes to complex scientific challenges? If muddy boots are a sign of a good day, not a bad one - The Phyto Lab are looking for you!

My research explores the effectiveness of phytoremediator plant species in polluted environments of all kinds, from small-scale local gardens up to mine sites and industrial complexes. My team also investigates a wide range of emerging sustainable-origin decontamination methods across a range of applications so we can understand what's going to make the environment cleaner and safer for the future. This includes sorbent materials diverted from current waste-streams, for example, cotton by-product and other organic fibers.

Keywords: Environmental solutions, pollution, restoration ecology

Honours programs: Bachelor of Science (Honours) & Master of Philosophy (Environmental Consultancy and Conservation Program)

I supervise Honours projects on:

- **Phytoremediation and sustainable solutions for environmental pollution**
  Projects include fieldwork, glasshouse trials, and desktop analyses focusing on native and introduced plant species as well as other decontamination technologies.

- **Landscape restoration and biodiversity enhancement**
  Projects include fieldwork and desktop analyses across the Greater Sydney region.

- **Broader ecological assessment, particularly botanical studies**
  Species-specific studies including invasive plant species.

What methods or research skills will you learn?

- Depending on your project, you will learn and practice environmental assessment, chemical analyses of plant tissues, water samples and all kinds of samples for a wide range of pollutants, botanical skills, and more.

I collaborate with:

- UTS Environmental Science Colleagues
- Local Councils in Greater Sydney and NSW
- Community groups
- Landowners and managers
- Not-for-profit and commercial organisations
- Other universities

A/Prof Katherina Petrou

Associate Professor
Discipline: Environmental Science/Marine Biology
Research Area: Algal ecophysiology & Climate Change
Email: Katherina.Petrou@uts.edu.au

I am an algal ecophysiologist, and leader of the Petrou Lab in the School of Life Science. My research combines micro- and macro-scale biology and ecology, taking a fine scale approach including single-cell and sub-cellular analyses to target questions on broad scale ecological consequences of environmental change. To achieve this, I primarily employ manipulative experimental approaches, often combining an extensive array of specialised techniques (see below) to assess photomechanistic effects, metabolic, biochemical and macromolecular compositional changes at the single cell and community level.

Keywords: phytoplankton, symbiosis, physiology, ecology, climate change

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- Phytoplankton physiology in a changing ocean
- Thermal tolerance in phytoplankton
- Coral and foraminifera physiology with ocean warming and acidification
- Metabolic fingerprinting of ancient far-red photosynthesis
- Diatoms in the food web: climate change and trophic carbon transfer

What methods or research skills will you learn?

- Cell culture – isolating and maintaining phytoplankton species
- Fluorometry – chlorophyll a fluorescence analyses on algal health
- Carbonate chemistry – for undertaking ocean acidification/alkalinization experiments
- Cell imaging - Confocal and fluorescence microscopy
- Flow cytometry – culture enumeration and physiology
- Biospectroscopy (FTIR, RAMAN) – single-cell biomolecular composition analyses
- Nutrient analyses & biochemical assays
- Image and data analyses

Lab Members: Dr Daniel Aagren Nielsen, Dr Rebecca Duncan, Alyson Theseira, Billy FitzGerald-Lowry, Holly Ceapa, Lily Stirling

Our lab collaborates with scientists within UTS and beyond including:

Dr Ruth Eriksen and Richard Matear (CSIRO, marine and atmospheric research); Dr Lennart Bach (Institute for Marine and Antarctic Studies, Tasmania); Professor Janne Søreide (University Centre in Svalbard, Longyearbyen, Norway); Øystein Varpe (University of Bergen, Bergen, Norway); Dr Kim Thamatrakoln (Rutgers, New Jersey, USA); Professor Glen Wheeler (Marine Biology Association, Plymouth, UK); Dr Brook L Nunn (Washington University).

Prof Jonathan Webb

Professor
Environmental Sciences
Jonathan.webb@uts.edu.au

Jonathan is a wildlife biologist with expertise in physiological ecology, behavioral ecology, and the biology of invasive species. His current research focuses on elucidating the impacts of the 2019-2020 wildfires on threatened reptiles and mammals, restoring degraded habitats for threatened reptiles, and investigating the effects of habitat fragmentation on threatened reptiles, mammals and birds. Jonathan's group also carries out laboratory studies to understand how thermal variation during egg incubation influences the phenotypic traits of hatchling lizards.

Keywords: conservation biology, thermal ecology, fire ecology, wildlife management
Honours programs: Bachelor of Science (Honours), Bachelor of Environmental Biology (Honours)

I supervise Honours projects on:

- How do wildfires affect reptile and mammal populations?
- Do thermal spikes that occur during incubation influence egg survival and hatchling phenotypes in lizards?
- What are the costs and benefits of heat hardening in ectotherms?
- How do animals cope with extreme heat events?

What methods or research skills will you learn?

- Field surveys and camera trapping to estimate the abundance and occupancy of reptiles and mammals
- Field work on habitat restoration projects on sandstone rock outcrops
- Mark-recapture analysis to estimate survival rates and population size
- Video analysis of locomotor performance and behavior
- Quantifying behavioral traits and thermal tolerance in lizards and invertebrates
- Laboratory experiments to assess how thermal variance during egg incubation influences offspring phenotypes in lizards
- Laboratory and field experiments to understand how ectotherms cope with extreme heat events

Our team:

- Maddison Archer (Honours); Kelsea Gray (Honours); Lisa Albino (Masters); Shijin Yao (PhD)

I collaborate with:

- Assoc. Prof. Brad Murray (UTS)
- Dr Leigh Martin (UTS)
- Prof. Mike Letnic (University of NSW)
- Prof. Martin Whiting (Macquarie University)
- Craig Adams, director Sssafe
- Tim Faulkner, director Aussie Ark

Dr Fraser Torpy
Dr Peter Irga

Plants and Environmental Quality Research Group
School of Life Sciences, Faculty of Science
School of Civil and Environmental Engineering, FEIT
Fraser.Torpy@uts.edu.au

Exposure to air pollution is an emerging world-wide problem, with growing evidence that it is a major cause of morbidity worldwide. Plant-based systems are gaining recognition as a possible adjunct to standard mechanical air pollutant management systems for the management of urban air pollution. An additional recent research direction focusses on the development and testing of biobased building materials for improving the urban carbon economy.
The UTS Plants and Environmental Quality Research Group has 20 years' experience in studying the role that botanical systems play in ameliorating many forms of air pollution. Projects within both the Science and Engineering Faculties, or cross-disciplinary research between Faculties, including the Faculty of Design, Architecture and Building, will be welcomed.

Keywords: biofiltration, phytotechnology, air pollution, green buildings, sustainability

Honours programs: [Bachelor of Science (Honours) &/or Bachelor of Science (Honours)]

Research Interest/Honours Project opportunities:

- Horticultural biotechnology for mitigating air pollutants
- Botanical systems for improving urban amenity: noise attenuation, aesthetics, water use, temperature, photovoltaic solar energy production, stormwater quality
- Biobased materials for improving the carbon economy of cities

Methods/Research Skills commonly utilised in our Laboratory include:

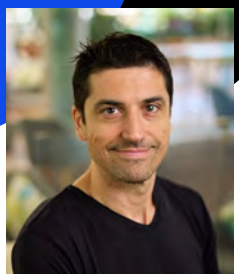
- Air pollutant generation and instrumental quantification
- Statistical data analysis
- Microbial identification and quantification (culture-based and molecular)

Team members:

- Dr Fraser R Torpy, Director (Science)
- Dr Peter J Irga, DECRA fellow (FEIT)
- Dr Nic Surawski (FEIT)
- Prof Sara Wilkinson (FEIT)

Collaborations:

- A broad range of private and government bodies in NSW and beyond, both national and international
  Website: https://peqresearch.wordpress.com



Dr Frédérik Saltré

Senior lecturer in Ecology & Biogeography
Discipline: Environnemental Sciences
Frederik.saltre@uts.edu.au

Frederik is an ecologist leading the Biogeography, Ecology & Modelling (BEAM) Lab. His research focuses on understanding how species and communities interact with their environments across spatial scales (from local to global) and temporal contexts (past, present, and future). His work encompasses plants, animals (including humans), and ecosystems in both terrestrial and marine environments. By applying advanced statistical methods and modelling, he investigates how species respond to environmental changes and the drivers behind biogeographic patterns of species diversity. This helps him evaluate the effectiveness of conservation strategies, policy decisions, and biodiversity management scenarios. He is the leader of the UTS Node and Modelling Stream of the ARC Centre of Excellence for Indigenous and Environmental Histories and Futures and has a joint appointment with the Australian Museum Research Institute.

Keywords: Ecology & climatology, global change & biogeography, species range shifts, Ecological modelling, point processes modelling & spatial analyses

Honours programs: Bachelor of Science & Bachelor of Environmental Biology

We supervise Honours projects on:

- **Exploring shifts in Mammalian trait space in Australia** – This project uses trait space analysis to explore how Australian mammalian traits have shifted since European invasion and how feral species have reshaped native ecosystems. Students can help shape the research questions, working with experts to deliver impactful, interdisciplinary outcomes
- **Demographic modelling to guide conservation of threatened and vulnerable species** – This project uses demographic modelling to evaluate extinction risk and design effective conservation strategies for species facing diverse threats. By combining data, expert input, and simulations, it will deliver evidence-based, cost-effective guidance for species recovery planning.
- **Simple empirical models for fuel moisture in wildfire risk assessment** – This project will test and compare simple empirical models for estimating dead fine fuel moisture content using a global dataset, assessing their accuracy, biases, and robustness across climates and ecosystems. The findings will help improve wildfire risk prediction and fire danger rating systems worldwide
- **Other topics:**
  Explore a wide range of topics and opportunities here

What methods or research skills will you learn?

- Research design, statistical analysis & programming, science communication, ecological interpretation, critical thinking, teamwork & collaboration

Our team: See detail about the team here

We collaborate/co-supervise projects with:

- Schools of Life Science and Applied mathematics (UTS & UNSW)
- Marine Vertebrate Ecology Lab (Uni Wollongong) & Cetacean Ecology Research Group (Massey University, New Zealand)
- Global Ecology lab and Vertebrate biodiversity (Flinders University, South Australia)
- Centre of Excellence for Indigenous & Environmental Histories and Futures

Dr Yvonne Davila

Senior Lecturer and Ecologist
Discipline: Environmental Sciences
Email: Yvonne.Davila@uts.edu.au

I am a terrestrial ecologist and I lead the **Pollination Ecology and Plant Conservation lab** which focuses on the ecology and conservation of plant-pollinator relationships, plant reproductive biology, and understanding how plant-pollinator interactions contribute to ecosystem function. We use a combination of field-based pollination studies, community ecology and network analyses to investigate the complex responses of plants and their pollinators to environmental change to inform conservation approaches.

Website/publications: https://profiles.uts.edu.au/Yvonne.Davila

Keywords: pollination ecology, plant ecology, species interactions, pollination networks, ecosystem function, seed production, biodiversity, conservation

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- Pollination, ecology and conservation of critically endangered plant species
- Seed germination responses to changing temperatures and moisture in rare and restricted plant species
- Dynamics of plant-pollinator interactions and networks, and plant reproductive ecology in response to environmental change

Methods or research skills will you learn:

- Experimental and observational approaches to examine flowering, plant-pollinator interactions, and seed production
- Field skills in plant and pollinator identification, floral and vegetation surveys, experimental pollination studies, field data collection
- Lab / glasshouse skills in seed germination studies
- Experimental design, statistical analyses and data visualisation (in R)

Current and recent research group members:

- Leon Sims, 2024-25 Honours - Alpine microclimatic variation influences plant-pollinator networks through flowering community and pollinator visitation.
- Tim Brenner and Arc Rosales, 2025, Undergraduate internship students - Investigating reproductive strategies and pollination to guide management of threatened mint bushes, *Prostanthera* species.
- Daisy Parmenter, 2025, Undergraduate internship student – Investigating drivers of eco-anxiety in the Greater Sydney Region.

I collaborate and co-supervise projects with:

- Dr Nathan Emery, Australian PlantBank, Botanic Gardens of Sydney
- Dr Trevor Wilson, National Herbarium of NSW, Botanic Gardens of Sydney
- Prof. Andy Leigh, School of Life Sciences, UTS
- Dr Zoe Xirocostas, School of Life Sciences, UTS
- Dr Anne Griebel, School of Life Sciences, UTS
- Assoc. Prof. Brad Murray, School of Life Sciences, UTS

James Hitchcock

Position: Senior Lecturer
Discipline: Environment
Email: james.hitchcock@uts.edu.au

James is a Senior Lecturer at the School of Life Sciences, University of Technology Sydney, Australia. He works in Freshwater and Estuarine Research Group. His work specialises in revealing how humans impact freshwater and estuarine ecosystems and what we can do to restore and protect them.

Keywords: food webs, fish, plankton, estuaries, rivers, coasts, lakes, water quality

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- **Cold water pollution and river ecosystems:** Large dams in NSW can release water up to 10°C colder than natural levels. We conduct field and experimental studies to determine how this impacts river communities and ecosystem functioning from primary producers to fish.
- **Environmental flows and river food webs:** Damming and water extraction in our rivers has dramatically declined ecosystem health. We conduct a range of studies across NSW to understand how restoring flows may benefit the productivity and functioning of river food webs.
- **Understanding anthropogenic impacts on estuarine food webs:** Estuaries are highly valued systems that face a multitude of different stressors. We conduct field and experimental studies on how food webs, from microbes to fish, respond to stressors and management actions.

What methods or research skills will you learn?

- **Science project management**: How to design field and experimental studies in aquatic ecosystems, how to manage projects with different components, field trip organisation, how to collaborate and work as a team on projects
- **Field and laboratory skills:** water quality sampling, algae, plankton and aquatic biota sampling and preservation, microscope and identification, organic matter analysis, and food web modelling. Most projects typically involve field work and driving.
- **Analysis, writing and communication:** scientific writing specialising in aquatic ecosystems, linking science to policy and management outcomes, statistical analysis, and communication with government/industry partners.

Our team:

- Prof. Simon Mitrovic, Dr Anne Coleville, Lauren O'Brien and the Freshwater and Estuarine Research Group.

We collaborate with:

- NSW Fisheries, Department of Climate Change, Energy, the Environment and Water, CSIRO, WaterNSW, local councils, other universities

Dr Anne Griebel

Lecturer in Environmental Biology
Discipline: Environmental Sciences
Email: Anne.Griebel@uts.edu.au

Anne is a landscape ecologist interested in understanding biosphere-atmosphere interactions and carbon and water cycling. She leads the Atmospheric Ecosystem Research & Observation (AERO) lab, which utilizes advanced techniques like eddy covariance flux measurements, remote sensing, and data-model integration to explore how plants and ecosystems respond to climate change, extreme weather, and disturbances. She manages two research stations in semi-arid rangelands in central Australia, and supervises Honours, Masters and PhD students. Her research informs sustainable strategies to manage forests, semi-arid and urban ecosystems. If you care about environmental or human health, enjoy working in the field or with large datasets, then get in touch to discuss prospective projects!

Keywords: greenhouse gas cycling, plant ecology, micrometeorology, climate change, environmental health, urban ecology

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- **Vegetation dynamics in semi-arid ecosystems**
  Projects include fieldwork in Australian semi-arid ecosystems and desktop analyses of long-term observations from field-based research stations
- **Urban greenhouse gas cycling and air quality**
  Projects will link atmospheric sciences, remote sensing data and human health in collaboration with the NSW Department of Climate Change, Energy, the Environment and Water
- **Pyro-ecophysiology in Greater Sydney**
  Projects will involve fieldwork in the Blue Mountains or Central Coast to link plant ecology with landscape flammability in fire-prone ecosystems

What methods or research skills will you learn?

- Conducting supervised research experiments in the field, laboratory and in climate-controlled environments
- Practical field skills in forestry and plant ecology research, such as biomass inventories, biodiversity surveys, measuring leaf gas exchange and leaf traits
- Hands-on experience with specialist scientific equipment to monitor vegetation dynamics, gas exchange, air quality, and atmospheric processes
- Practical skills in the acquisition and analysis of ecological data from eddy covariance stations (flux towers), weather stations, satellites, terrestrial lidar scanners or drones
- Using scripting languages for the analysis, visualisation and interpretation of environmental data

I collaborate with:

- Colleagues within the School of Life Sciences and the Faculty of Health at UTS
- Fire researchers and plant physiologists at Western Sydney University, Uni Melbourne, Uni of Western Australia, Charles Darwin University
- Ecologists and remote sensing experts from Australia's Terrestrial Ecosystem Research Network (TERN) and CSIRO
- NSW Department of Climate Change, Energy, the Environment and Water, NSW Rural Fire Service, NSW National Parks and Wildlife Service and NSW Health

Dr Leigh Martin

Lecturer
Environmental Sciences
Leigh.Martin@uts.edu.au

I am a terrestrial ecologist with an interest in invasive species, urban sustainability and reptile and amphibian ecology. I am a committed conservationist having spent 19 years as an environmental campaigner with the environmental NGO Total Environment Centre before taking on my current position at UTS. A particular interest is the conservation of biodiversity in urban and peri-urban areas. The importance of these areas is often overlooked. Current research focus includes distribution, abundance and environmental impact of feral deer in the Hunter Region; impacts of invasive exotic plants on reptiles and amphibians and urban heat mitigation.

Keywords: Invasive species, reptiles, amphibians, urban ecology.

Honours programs: Bachelor of Science (Honours) & Bachelor of Environmental Biology (Honours)

I supervise Honours projects on:

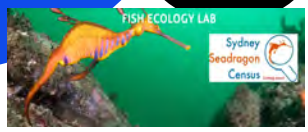
- Distribution, abundance and environmental impacts of feral deer in the Hunter region
- Impacts of invasive exotic plant species on reptiles and amphibians.

What methods or research skills will you learn?

- Reptile and amphibian survey techniques including trapping, handling and call surveys.
- Reptile and amphibian identification skills
- Wildlife survey techniques including camera trapping, scat surveys and other trace evidence
- Vegetation and habitat surveying techniques.

I collaborate with:

- Associate Professor Brad Murray (UTS)
- Professor Jonathan Webb (UTS)
- Lake Macquarie City Council
- Port Stephens Council
- Hunter Regional Pest Animal Committee
- Total Environment Centre



Prof David Booth

Professor of Marine Ecology
Discipline: Marine Biology
Email: David.Booth@uts.edu.au

The UTS fish ecology lab aims to provide the innovative research needed to inform the sustainability of the oceans and their fish populations while learning more of the fascinating life histories of fishes on coral reefs, coasts, deep sea and estuaries. We engage in public debate on a wide range of ocean issues and are a hub for student research training.

Keywords: marine fishes, ocean tropicalisation, seadragons, seahorses, coral-reef fishes

Honours programs: [Bachelor of Science (Honours)

We supervise Honours projects on:

- Topic 1. Conservation and ecology of the weedy seadragon. Link with SeaLife aquarium Sydney to understand feeding and reproduction of the weedy seadragon to assist in wild conservation. $3k scholarship from James Kirby Foundation available
- Topic 2: Tropicalisationof temperate reefs. How do seasonal arrivals of tropical fishes of Sydney affect local ecology?
- Topic 3: Estuary and harbour restoration to enhance fish and fisheries. With SIMS' Project Restore

What methods or research skills will you learn?

- Project development, experimental design and hypothesis testing
- Marine field and labwork logistics
- Collaboration wit Industry and University partners
- Analysis and presentation of data

We collaborate with (optional):

- Sydney Institute of Marine Science
- University of Adelaide
- IUCN Red List
- NSW DPI Fisheries

Dr Juergen Knauer

Chancellor's Research Fellow
Discipline: Environmental Sciences
Juergen.Knauer@uts.edu.au

I am an environmental scientist with a background in process-based vegetation and environmental modelling. I work with two widely used global models (CABLE-POP and LPJ-GUESS) to explore how ecosystems respond to climate and land management changes. I supervise projects on model development and applications to real-world environmental challenges such as fire prediction and sustainable land management. Students have the possibility to design and lead sub-projects they are passionate about, whether focused on ecological processes or practical applications. I also offer data-driven projects using machine learning to analyse vegetation survey data and large gridded environmental datasets. These projects aim to identify the environmental and anthropogenic drivers shaping the distribution of plant functional groups in Australia and globally.

Keywords: vegetation modelling, carbon cycling, climate change, plant ecophysiology

Honours programs: Bachelor of Science (Honours) & Bachelor of Environmental Biology (Honours)

I supervise Honours projects on:

- **Vegetation and Environmental Modelling**
  - Simulating grass fire fuel loads to support fire forecasting
  - Developing a grazing routine in the LPJ-GUESS dynamic vegetation model
  - Assessing the role of herbivory in carbon dynamics of grasslands
  - Under what conditions do annuals outcompete perennials?
- **Exploring Drivers and Controlling Factors of Vegetation Competition**
  - Identifying factors that limit the spread of invasive plant species
  - Understanding conditions that promote N-fixing plants
  - The distribution of photosynthetic strategies in Australia and globally

What methods or research skills will you learn?

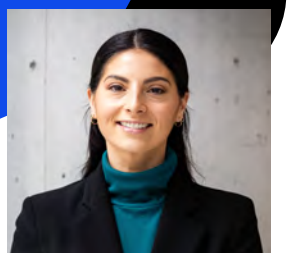
- Hands-on environmental modelling skills: performing historical and future simulations, debugging model code, model parameterization, model evaluation against diverse data sets
- Programming and scripting using R, C++, and Bash Shell
- High performance computing on NCI's supercomputer 'gadi'
- Analysis of a wide range of geospatial data, including remotely sensed products, vegetation surveys, and trait databases

Our team:

- Close collaboration with the EcoSens Lab led by Dist. Prof Alfredo Huete with plenty of expertise in remote sensing and Earth observation.

I collaborate with:

- The international vegetation and land surface modelling community
- Fire researchers, plant physiologists, and ecosystem modellers at Western Sydney University and across Australia.



Dr Zoe Xirocostas

Chancellor's Research Fellow
Environmental Sciences
zoe.xirocostas@uts.edu.au

I lead the Adaptive Ecology Lab within the School of Life Sciences at UTS. My work is focused broadly on plant ecology, invasive species, climate change adaptation, and plant-animal interactions (including pollination). My goal is to build a collaborative, positive lab that conducts meaningful research to unveil how our ecosystems will respond to global environmental change, both now and in the future, using experimental, synthetic and observational approaches. If this sounds like something you'd like to be a part of, please get in touch!

Keywords: plant ecology, climate change, plant-animal interactions, invasive species, glasshouse, fieldwork

Honours programs: Bachelor of Science (Honours) &/or Bachelor of Environmental Biology (Honours)

I supervise Honours projects on:

- Discovering how ecosystem complexity affects the adaptive capacity of plants to future climate scenarios.
- Understanding the above and belowground biodiversity impacts of the invasive plant *Lantana camara*.
- Investigating whether different colour morphs of *Lantana camara* are reproductively isolated.
- Detecting an invasive aquatic weed (Frogbit) using environmental DNA (eDNA).
- Whether we can use citizen science data to accurately detect phenological shifts (e.g., flowering periods) over time.

What methods or research skills will you learn?

- Fieldwork including logistical preparation, plant identification, seed collection, observational measurements (e.g., pollination visitation records and leaf damage), eDNA sample collection, and in-field manipulation/experimentation (e.g., pollination exclusion).
- Glasshouse experiments, seed germination, plant trait measurements, temperature and water manipulation of plants, and using Climatron growth chambers.
- Collating, cleaning and deriving insights from large online databases (e.g., Atlas of Living Australia or iNaturalist) and long-term observations recorded by collaborators.

I collaborate with:

- A/Prof Brad Murray, Dr Anne Griebel, Dr Yvonne Davila, Dr Greta Gaiani (UTS)
- Dr Inna Osmolovsky (UNSW)
- Dr Suz Everingham (WSU)
- Dr Ganesha Liyanage (The Australian PlantBank)

Research Projects in the Climate Change Cluster (C3)

The Climate Change Cluster (C3) undertakes integrated and interdisciplinary research at the intersection of the physical, chemical, and life sciences, providing a deeper understanding of the climate change-induced threats to aquatic plant and microbial ecosystems that are critical to the well-being of the global community.

Our research provides solutions to the most significant environmental and societal challenges confronting a warming planet, including food and energy security, sustainability and ecological resilience, and the intersection of human and environmental health.

We offer research projects across four research areas:

- **Algae biotechnology:** Working with industry to develop algae and their derivatives into innovative green and clean technologies to deliver sustainable climate change mitigation solutions.
- **Future reefs:** Studying how environmental conditions influence the reformation of corals and how to better preserve and rebuild healthy reefs through innovative, robust and effective collaborations with industry and community partners.
- **Ocean microbiology:** Designing and developing innovative microbial tools and methodologies to study the influence of shifting environmental conditions on aquatic micro-organisms
- **Productive coasts:** Developing and utilising leading-edge technologies to determine cellular and population-level responses and examine processes that impact water and sediment quality.

Scan the QR codes below to watch some of our current PhD students discuss their research at C3 or follow our Instagram account.

Chantal Philippe

"The role of bacterial pathogen behaviours in marine diseases"

Kira Picknell

"Development of a microbiological and Brewers Distilled Grain (BDG) supplement"

Dr Emma Camp

Position: Future Reefs Team Leader
Discipline: Marine Biology; Coral Reef Science
Email: emma.Camp@uts.edu.au

I am the Team Leader for the Future Reefs team in the Climate Change Cluster. Our group studies reef-forming corals, the organisms that sustain the entire productivity and biodiversity of coral reef ecosystems. Our goal is to understand how environmental conditions influence the coral 'holobiont' (the coral and its associated microbial communities) and therefore how local stressors and climate change impact coral reefs.

We research from organism scale molecular signatures to broad scale ecological interactions and specialise in advancing technical solutions to meet our goal. The outcomes directly inform how reefs will look and function into the future, but also how to better preserve and re-build "healthy reefs" of tomorrow.

Keywords: Coral Reefs; Mangroves; Active Intervention; Reef Restoration; Phenotyping; Coral Nutraceuticals; Sustainable Development Goal 14 (SDG 14; Life Below Water)
Honours programs: [Bachelor of Science (Honours) &/or Bachelor of Science (Honours)]

I supervise Honours projects on:

Broadly I supervise projects that investigate how coral fitness is impacted by environmental change and ways we can actively intervene to optimize coral health. Some example projects include:

- Tailoring coral feeds to optimise thermal resilience.

New solutions are needed to boost the resilience of corals to climate change. Optimising nutrients provided to corals in an intervention that can support coral survival under stress. A project in this space would look to optimize coral food to provided optimal benefit to coral during stress.

- Optimising Community Coral Restoration Practices

I co-founded Coral Nurture Program, the first stewardship-led restoration initiative on the Great Barrier Reef (www.coralnurtureprogram.org). We have ongoing projects to optimize restoration practices at high-value reef sites, to support the future of coral reefs.

- New phenotyping approaches for coral

Identifying corals with beneficial traits is crucial for aquaculture and restoration. The Future Reefs Team are developing a variety of new methods that can improve predictions on coral fitness, essential for effective management of reefs in the Anthropocene.

What methods or research skills will you learn?

- Coral husbandry, laboratory manipulation and potential field-based experimentation
- A variety of analytical methods to assess coral health; proteomics, metabolomics, photobiology, respirometry, elementomics, enzyme assays, cell counts and more!

Our team:

- The Future Reefs Team is comprised of ca. 20 people, including Research Fellows, Postdocs, and HDR Students.

We collaborate with:

Industry partners, traditional owner rangers, and researchers from national and international Universities.

Prof Martina Doblin

Position: Team Leader, Productive Coasts
Discipline: Marine and estuarine water quality
Email: Martina.Doblin@uts.edu.au

The Productive Coasts team is passionate about the ocean. Our vision is that estuarine and marine ecosystems are healthy and resilient to the threat of climate change, pollution and urbanisation. We collaborate with people outside of UTS and communicate the outcomes of our research in diverse ways, to ensure it is used to create sustainable solutions. One of our team members works in the NSW Department of Planning and Environment (DPE) and our past honours students have gone on to work in the federal government, DPE, Sydney Water, Hunter Water and for-purpose organisations. We celebrate science successes with chocolate or dumplings! 😊

Keywords: bushfire and flood impacts, water quality, constructed wetlands, harmful algal blooms, contamination

Honours programs: [Bachelor of Science (Honours) &/or Bachelor of Science (Honours)]

I supervise Honours projects on:

- Evaluating the effectiveness of wetland biofiltration systems to treat urban stormwater
- Ecological effects of stormwater in urban environments

What methods or research skills will you learn?

- Both studies will involve a combination of field and lab work in the Sydney region. You will use sophisticated laboratory techniques (e.g. e-DNA, high-throughput phenotyping) to assess the bioavailability of organic carbon to bacteria or the toxicity of pharmaceuticals on algae in laboratory assays.

Our team:

- Dr Charlene Trestrail (postdoctoral research fellow)
- Ms Kia Billings (research assistant)
- Raissa Gill (PhD student)
- Mariana Destila Bayu Intan (international PhD student)
- Giselle Firme (PhD student)
- Aaron Write (PhD student and Research Scientist NSW Department of Planning and Environment)

I collaborate with:

- Partnerships with NSW Department of Planning and Environment and Gamay rangers (indigenous custodians of Botany Bay) as well as collaboration with UTS chemists.

Dr Jen Matthews

Deputy Team Leader Future Reefs Research Group
Climate change cluster, Faculty of Science
Jennifer.Matthews@uts.edu.au

The Future Reefs research team studies reef-forming corals, the organisms that sustain the entire productivity and biodiversity of coral reef ecosystems.

Without help, coral reefs may not survive this century. But vital nutrients provided by microalgal symbionts may be key to coral survival success. My primary objective is to unravel the mysterious realm of coral nutrition, delving into the intricate connections between corals and their symbiotic partners. Just like any living organism, corals require optimal nutrition for their health and survival, especially when faced with environmental challenges. I integrate tools and techniques from chemistry, forensics, ecology, and marine biology to identify the best nutrition for corals to thrive and survive. By understanding the delicate balance of their nutritional needs, I can contribute to the development of new tools for the conservation and restoration of these magnificent and indispensable ecosystems.

Keywords: Metabolism, symbiosis, coral reefs, reproduction

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- The establishment of symbiosis in coral larvae
  How the algal symbionts of corals find their way into baby corals and snuggle up in the new symbiosis is still unresolved. Using high resolution microscopy and mass spectrometry, we will watch, in real time, the establishment of the symbiosis.

- The effect of microplastic on coral reproduction
  Microplastic pollution is one of the biggest environmental challenges of our time and has been linked to reduced reproduction in Oysters. Using a mix of coral husbandry, microscopy and spectroscopy, we will investigate whether microplastic pollutions impacts coral reproduction.

What methods or research skills will you learn?

- Mass spectroscopy (FTIR, LC-MS, MALDI-MSI), confocal microscopy, coral husbandry

Our team:

- In collaboration with Prof. Louise Cole (UTS AIMI) and Sydney Institute of Marine Biology

Prof Peter Ralph

Position: Executive Director Climate Change Cluster
Discipline: Marine Biology
Email: peter.ralph@uts.edu.au

The Algae Biosystems and Biotechnology (ABB) team has strong industry links to the biotechnology sector, where we aim to develop algae and their derivatives into innovative green and clean technologies.

Keywords: Algae, Biotechnology

Honours programs: Bachelor of Science (Honours)

We supervise Honours projects on:

- DESI-MS based high throughput lipidomic analysis of microalgae.
- Chlorella Phenomix: quantification of the many possible responses of Chlorella vulgaris to changing environments.
- Protoplast morphogenesis influenced by microorganisms and abiotic factors.
- Seaweed Protoplast: A tool for elite germplasm production.
- Exchange of nutrients between algae-bacteria separated by nano-porous gel.
- Rheological properties and flow dynamics of algae-bacteria co-cultures.
- A probabilistic model for rare earth elements uptake by microalgae in an open raceway pond system.
- Techno-Economy Analysis (TEA) of rare earth element recovery from mining waste using microalgae technology.
- Boosting rare earth element recovery of microalgae using reactive oxygen species as pre-treatment method
- Improving rare earth element recovery of microalgae using mutagenesis

What methods or research skills will you learn?

- Experiment design
- Generate and screen large populations of algae for traits of interest
- Maintenance of algae culture
- Spectroscopic measurements
- Fluorescence measurements
- Coding an Techno-Economy Analysis (TEA)
- Data analysis and figure preparation

Our team:

- Team leader and deputy team leader: Prof Peter Ralph and A/Prof Mathieu Pernice
- Postdocs: Nature Poddar, Phong Vo, Andrei Herdean, Unnikrishnan Kuzhiumparambil, Manoj Kumar, Vishal Gupta
- Assistant Technical officers: Lucia Bennar, Allen Lo, Mikael Kim, Lakshmi Krishnan, Anjon Mondal, Cora Hinkley, Robert Rodger, Farjana Akter, Bernardo Campos, Eric Luong.
- HDR students: Hawraa Elhossaini, Fateme Mirakhorli, Kira Picknell, Anna Caterina Pozzer, Sean Macdonald Miller, Amber Brierley, Lilian Hoch.

Dr Elliot Scanes

DECRA fellow, Lecturer
Marine Biology
Elliot.scanes@uts.edu.au

I am a marine biologist in the Ocean Microbes Group at UTS. My research is focused on the *microbiomes* of marine life, and how the microbiome can affect the ecology and survival of their host. I am looking for an Honours student to work on the **microbiome of seahorses**.

Keywords: marine biology, marine ecology, microbiome, marine restoration

Honours programs: Bachelor of Science (Honours)

We supervise Honours projects on:

We are seeking a student to work on the microbiome of seahorses (*Hippocampus whitei*). This project will determine the microbiome of seahorses grown in the lab and then released into the wild as part of a marine ecosystem restoration project. We will then determine whether the microbiome is affecting the survival of seahorses released into the wild. This project will be done in collaboration with the Sydney Institute of Marine Science (SIMS).

White's Seahorse, *Hippocampus whitei* – Photo: David Harasti

What methods or research skills will you learn?

In this project you will learn lab and research skills including how to look after seahorses in the aquarium, well as molecular microbiology skills in genetic sequencing and quantitative PCR, as well as scientific writing and communication.

Our team:

You will also be supervised by David Booth (UTS) and David Harasti (NSW DPI)

We collaborate with:

This project will be part of a larger seahorse restoration project collaborating with UTS, NSW Department if Primary Industries (DPI) and the Sydney Institute of Marine Science (SIMS).

Prof Justin Seymour

Position: Professor,
Ocean Microbiology Group Leader
Discipline: Ocean Microbiology, with the Climate Change Cluster
Email: Justin.Seymour@uts.edu.au

In the **Ocean Microbiology Group** we aim to understand how the sea's smallest inhabitants – the microorganisms - ultimately control the function of the ocean, particularly in light of global climate change. Our research incorporates aquatic microbial ecology and biological oceanography, and we examine microbiology across a range of marine environments (tropical coral reefs to Antarctica). We are interested in the ecological relationships among marine microorganisms and between microbes and marine animals and plants. Finally, we also examine how marine microbes can influence human health.

Keywords: Marine microbiology, water quality, microbial ecology

Honours programs: [Bachelor of Science (Honours) &/or Bachelor of Science (Honours)]

We supervise Honours projects on:

- **Do marine heatwaves lead to outbreaks of marine pathogens?**
  In this project, the impact of marine heatwaves on stimulating outbreaks of pathogenic *Vibrio* bacteria, and how this effects human health risks and/or oyster aquaculture, will be examined.
- **Understanding the impacts of rainfall on microbial water quality at NSW beaches**
  This project will apply sophisticated *Microbial Source Tracking* techniques to define threats to human health within coastal ecosystems
- **Do interactions with other bacteria contribute to harmful cyanobacterial blooms?**
  This project will examine whether symbioses between bacteria contribute to the success of harmful cyanobacteria within Australian waterways.

What methods or research skills will you learn?

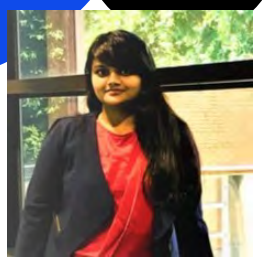
- Concepts in Microbial Ecology and Environmental Microbiology
- Molecular biological approaches (e.g. DNA extraction, PCR, qPCR, DNA sequencing)
- Classical microbiological methods

Our team

- Projects in the Ocean Microbiology Group will generally involve co-supervision with one of the post-docs in the team, including Dr Jean-Baptiste Raina, Dr Nahshon Siboni, Dr Amaranta Focardi or Dr Elliot Scanes

We collaborate with:

- Government departments (NSW Department of Primary Industries and NSW Department of Planning and Environment), several coastal councils and the oyster aquaculture industry.



Dr Nature Poddar

Position: Research Fellow
Discipline: Climate Change Cluster, Faculty of Science
Email: nature.poddar@uts.edu.au

With over six years of experience in biochemical engineering and algal biotechnology, I am passionate about developing and applying innovative solutions for sustainable and profitable biorefinery processes. As a Research fellow at UTS, I am responsible for designing, validating, and transferring a digital twin system that uses artificial intelligence to optimise algae growth and carbon capture for their applications in agriculture and food industries. I am a chief investigator of UTS><Young Henry project which aims at the development of algae-based feed supplement to reduce GHG emissions by livestock industries. I also investigate technoeconomic and sustainability (life-cycle assessment) analysis of multiple algae-based biorefinery projects.

For more information, read here.

Keywords: Algae; Biorefinery; Climate Change; Sustainability

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- **Techno-Economic Analysis for Algae Strain Selection for Biorefinery**

[*Conduct a full desktop TEA analysis to identify the most suitable algae strain and process for producing various bioproducts*].

- **Techno-Economic Analysis of Downstream Processing in Algae-Based Biorefineries**

[*Conduct a TEA focusing on the downstream processing stages (harvesting, dewatering, extraction, and purification) of algae biomass. The study will assess the economic viability of different downstream processing technologies and their impact on the overall cost-effectiveness of the biorefinery*]

What methods or research skills will you learn?

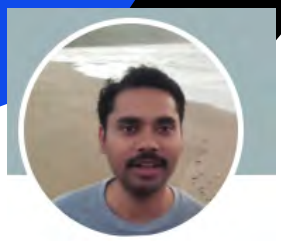
- Literature Survey
- Data Analysis: MS-Excel, SPSS, Sensitivity Analysis, Cost-benefit analysis
- Modelling: Bioprocess Modelling and process flow analysis, Economic Modelling

My team:

- Students: Kira Picknell (PhD); Conor Button (Honors 2024); Mass B. (Honors 2023)

I collaborate with:

- UTS/C3 members



Vishal Gupta

Position : Research fellow
Discipline : C3
Email : vishal.gupta@uts.edu.au

My research is aimed at the sustainable utilization of non-terrestrial resources or marine resources i.e. Seaweeds/algae for food and fuel, improved agriculture through the discovery of novel biostimulants, the development of climate resilient crops through synthetic biology, and the understanding of ecosystem functioning through studies of environmental and organism associations using multi-omics. I am focused on achieving the UN Sustainable Goals through the development of resources, processes, and technologies for the BLUE ECONOMY.

https://profiles.uts.edu.au/Vishal.Guptaq

Keywords: Algae, Biorefinery, Aquaculture, -Omics

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

1. **Trait characterization of the developed seaweed mutants for their use in aquaculture.**
   This project will include phenoassays on growth, photosynthesis parameters, proximate analysis, and metabolomics of the mutant and wild type at different abiotic conditions.

2. **Effect of multiple abiotic factors on the physical and biochemical traits of seaweed for aquaculture applications.**
   We will investigate the nutrient assimilation potential of the seaweed and the effects on growth, proximate composition, photosynthesis efficiency, and in vivo metabolic alterations.

3. **High-throughput screening of seaweed cultivation conditions**.
   This will include large experimental setup with magnitude of abiotic conditions tested on Robot, generating big data, handling and analyzing big data, AI tools

4. **Seaweed reproductive biology regulations.**
   Developing and validating both genetic and spectral markers for reproductive maturity in seaweed Ulva

What methods or research skills will you learn?

- Basics of Photobiology, untargeted metabolomics, co-expression and/or correlation matrix as a statistical tool, understanding of big data analysis, revealing meaningful physiological information, and the conceptualization of a research problem relevant to industrial translation

My team:

- Paris Hannan, Natalie

I collaborate with:

- Andrei Herdean, Unnikrishnan, and other C3 members

Andrei Herdean

Senior Lecturer
Biology
andrei.herdean@uts.edu.au

Dr Andrei Herdean is an innovator at the crossroads of machine learning, biology, and complex experimentation. He has worked in Sweden, Denmark, and Switzerland, and has been at UTS for six years. His research integrates high-throughput phenotyping, experimental automation, and artificial intelligence to address complex biological questions in photosynthesis, algal biotechnology, and ecological monitoring.

Andrei's Honours projects aim to immerse students in challenging, multidisciplinary research that combines the scientific method with cutting-edge tools. Students will gain experience in physiology and molecular biology techniques that are transferable across medicine, ecology, and biotechnology. These include flow cytometry, fluorometry, spectroscopy, cell culturing, media preparation, DNA extraction, and quantification

Keywords: high-throughput phenotyping, microalgae, photosynthesis repair, artificial intelligence in biology, flow cytometry, spectroscopy, molecular biology

Honours programs: Bachelor of Science (Honours) | Bachelor of Environmental Science (Honours)

I supervise Honours projects on:

- **High-throughput phenotyping of microalgae.** Development and application of automated platforms to measure and analyse algal physiology at scale, including integration of advanced imaging and data analytics.
- **Directed evolution of photosynthetic organisms.** Harnessing experimental evolution to improve photosynthetic efficiency and stress tolerance in microalgae.
- **Photosystem II repair and damage dynamics.** Investigating the molecular and physiological mechanisms of photodamage and repair in algae under changing environmental conditions.
- **Experimentation with AI in biology.** Applying machine learning to guide biological experiments, optimise culture conditions, and discover novel phenotypic traits.

What methods or research skills will you learn?

- Flow cytometry and high-throughput fluorometry
- Spectroscopy for pigment and photosynthetic efficiency analysis
- Microalgal cultivation and experimental design
- Molecular biology methods: DNA extraction, quantification, and amplification
- Machine learning applications for experimental optimisation and data interpretation
- Media preparation, sterile technique, and data analysis workflows

Dr Chris Songsomboon

Position: Research Fellow in Environmental Data Analytics
Discipline: Climate Change Cluster (C3), Faculty of Science
Email: kittikun.songsomboon@uts.edu.au

With eight years of experience in genomics and bioinformatics in diverse organisms – plants, animals, and microbe – for academic and industrial research, I found my passion in applying bioinformatic approaches to utilise genetic resource for sustainable development. As a Research Fellow in Environmental Data Analytics at C3, I am responsible for bioinformatics application and statistically experimental design for many marine species and ecosystem. Bioinformatics projects range from species level of de-novo genome assembly, variance/structural variation calling, methylation, transcriptome, proteome, metabolome to an ecological level of microbiome linking with environmental factors.

For more information, visit www.obio.info

Keywords: Bioinformatics, Multi-Omics, Biodiversity, Climate Change

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

1. **Optimisation of Transcriptomic Data Analysis on Non-model Microalgaes**
   Aim: To determine most effective and reliable bioinformatic approach to process transcriptome in non-model microalgae.
   Approach: Compare the performance and result of multiple transcriptomic pipelines and software.
2. **Identifying Key Microalgae for Reference Genome Development: Bridging the Gap between Evolutionary Significance and Economic Potential**
   Aim: To identify key microalgae species that need a de-novo reference genome based on evolution and economic importance
   Approach: Conduct phylogenetic trees of microalgae species and construct matrix of evolution and economic characteristics.

What methods or research skills will you learn?

- Literature Review
- Data Analysis: data gathering, data validation, data processing via R or Python
- Bioinformatics: Transcriptomic pipeline (i.e. BWA, BOWTIE, STAR, STRINGTIE, HT-Seq, FeatureCounts) and Phylogenetic tree (i.e. IQ-tree, RAmXL)

I collaborate with:

- UTS/C3 members

Dr Unni Kuzhiumparambil

Position: Senior Lecturer/Chemistry Group Leader
Discipline: Climate Change Cluster (C3), Faculty of Science
Email: unnikrishnan.kuzhiumpaarambil@uts.edu.au

Dr. Unni is an analytical biochemist, currently leading biomaterial research programs in C3. Specializing in development of high value product from algae, Unni works closely with industry focusing on generating sustainable and environmentally friendly products from algae biomass. Unni also has expertise in downstream processing of biomass including developing green extraction techniques, metabolite analysis using Mass Spectrometry and NMR techniques and Omics

Keywords: Bioplastics, biofiber, green solvents, mass spectrometry

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

1. **Develop green techniques for metabolite extraction from algal biomass**

   Aim: To develop and optimize environmentally friendly extraction techniques for high-efficiency metabolite recovery from algal biomass, minimizing energy use and solvent waste.

   Approach: Utilize green extraction methods such as supercritical CO_2, microwave-assisted, and enzyme-assisted extraction, combined with eco-friendly solvents like water and DES, to achieve sustainable metabolite recovery.

2. **Develop algae-based sustainable, biodegradable composite fibers**

   Aim: To develop and produce algae-based composite fibers with enhanced mechanical properties and biodegradability for use in textiles, packaging, and other applications.

   Approach: Prepare blends of polysaccharides or proteins from algae, with biodegradable polymers and produce fibres through techniques like wetspinning, electrospinning followed by mechanical and biodegradability testing to optimize performance.

What methods or research skills will you learn?

- Research methodology, hands-on wet chemistry techniques such as extraction of metabolites, analysis of metabolites using HPLC, GC MS, LC-MS, extraction of proteins and polysaccharides, wet spinning techniques and material testing

Our team

- Farjana Aktar, Shintu Varghese (HDR students), Dr Stalin Kondaveeti, Dr Anjon Mondal, Taya Lapshina and Cora Hinkley

I collaborate with:

- Industry partners, material scientists, fiber and textile experts

Dr. Sana Malik

Post-Doctoral Researcher
Climate Change Cluster, Faculty of Science
Email: sana.malik@uts.edu.au

With over 8 years of experience, Dr. Malik has played a pivotal role in developing algae biorefineries, implementing algae technologies in wastewater treatment, and refining algae harvesting processes. She has extensive expertise in maximizing carbon capture through algae growth and in creating comprehensive, cradle-to-grave processes for the cultivation, processing, and utilization of algae biomass. Currently, she employs phenomics to identify elite algal strains for industrial and environmental applications. Dr. Malik leads several innovative projects that emphasize strain enhancement via adaptive laboratory evolution, metabolic pathway engineering, and phenomics, incorporating advanced technologies such as AI, machine learning, and robotics. For more information, click here

Keywords: Algal Biorefinery, Algal Phenomics, Evolutionary Engineering, AI and Robotics, Stress-resilient Elite Strains
Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- **Evolutionary Engineering of Algae for Enhanced Lutein Production**
  This project focuses on using evolutionary engineering techniques to improve algae strains for enhanced lutein production, a valuable carotenoid with applications in health and nutrition. By subjecting algae to selective pressures in controlled environments, the project aims to develop strains that exhibit higher lutein yields, optimizing both the biological and commercial viability of lutein production from microalgae. This project supports Sustainable Development Goal 2 (***Zero Hunger***) and Goal 3 (***Good Health and Well-Being***) by enhancing the nutritional value of algae, which can contribute to more sustainable and health-promoting food sources.
- **Automated Phenotyping of Algae to Select Stress-Resilient Elite Strains**
  This project uses automated phenotyping to assess algae strains for resilience to environmental stressors like pH, temperature, nutrients, salt, and CO_2. By employing high-throughput techniques and data analysis, elite strains can be efficiently selected, crucial for improving algal cultivation and industrial applications. It supports SDG 12 (***Responsible Consumption and Production***) and 13 (***Climate Action***) by enhancing algal cultivation efficiency and sustainability. Additionally, it reflects global trends in AI and robotics, showcasing the impact of automation and data-driven methods in advancing biological research and resource management.

What methods or research skills will you learn?

- Methods for evolving algae under controlled conditions, Metabolite Analysis, and Cultivation Optimization to select strains with improved metabolic pathways for lutein synthesis.
- Use of liquid-handling robots to create a range of experimental conditions in multi-well plates.
- Fluorescence Activated Cell Sorting (FACS) to sort and analyze cells
- High-throughput screening of wild-type or elite strains using precision robotics.
- High-throughput imaging systems and analytical tools to evaluate algal traits and performance
- Experimental Design, Troubleshooting and Optimisation, Data Analyses

My team:

- Elise Aschoff [Honors 2024], Ewan Ferris [Tech Staff]

I collaborate with:

- UTS/C3

A/Prof Mathieu Pernice

Position: Deputy Director, C3 and Associate Professor
Discipline: Climate Change Cluster (C3), Faculty of Science
Email: mathieu.pernice@uts.edu.au

A/Prof. Mathieu Pernice is Deputy Director of the Climate Change Cluster and is an internationally recognized expert in algae biotechnology and climate change.

Mathieu's vision is to help create a future where we can feed the world's growing population without harming the environment. His work combines Algae Biotechnology with Aquaculture and Food innovation, showing how we can turn algae into powerful solutions for sustainability and food security.

Keywords: Nutrition, Microalgae, Omics, Climate Change

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

Topic 1: Development of Sustainable Algae-Based Feed for Aquaculture

This project develops algae-based alternatives to fish meal and fish oil for feeding native Australian fish in aquaculture.
Approach: Screening microalgae for optimal nutrition, refining cultivation methods, and conducting feeding trials to assess effects on fish growth, health, and diet performance.

Topic 2: Development of Sustainable Algae-based Nutraceuticals

This project explores automated phenomics to optimize microalgae production of high-value compounds like omega-3s and carotenoids for nutraceutical use..

Approach: Combining phenomics and genetic tools to enhance algae cultivation and biochemical profiles, focusing on maximizing bioactive compound yields.

What methods or research skills will you learn?

- Phenomics facility for optimization of algae strains and culture conditions
- Spectroscopic methods to measure algae biomass and productivity
- Fluorescence Activated Cell Sorting (FACS) to sort and analyze algae cells
- DNA and RNA sequencing to characterize algae cells

Our team:

- Research assistants: Dr Mikael Kim, Lucia Bennar, and Allen Lo
- PhD students: Anna Tasi Tevaga, Emma Fineran, Justin Tierney, Klara Peumery

We collaborate with:

- Industry partners such as NSW DPI Fisheries, v2food, and Fermentalg
- Start-ups such as Algenie, FULFood, and Sophie's Bionutrients
- Aquaculture Nutrition Scientists such as Igor Pirozzi and Wayne O'Connor, and Food scientists such as Mike Kendig, Van Quan Vuong, Taiwo Akanbi, and Fengzheng Gao.

Research projects in the UTS Centenary Centre for Inflammation

Welcome to the dynamic world of the Centre for Inflammation. As part of School of Life Sciences in the Faculty of Science at UTS, we are on a mission to confront major human inflammatory diseases head-on, shaping a healthier future for individuals and communities worldwide. We focus on increasing the understanding of disease pathogenesis of major human mostly respiratory diseases that don't have good treatments at the moment. This includes, COPD, severe asthma, pulmonary fibrosis, COVID, flu and others. We are a large Centre and are located in the research dedicated Centenary Medical Research Institute. Immerse yourself in a vibrant realm of scientific exploration. Our quest to unravel the complexities of inflammatory diseases and forge new therapies is guided by our dedication to excellence and societal betterment. Our commitment extends beyond the laboratory, as we collaborate closely with industry, government, and community partners to transform our research into tangible solutions.

Here, you'll find not just a learning environment, but a supportive community that fosters inclusive leadership, interdisciplinary collaboration, and meaningful engagement.

Dr Elinor Hortle

Postdoctoral Researcher Centre for Inflammation
School of Life Sciences

elinor.hortle@uts.edu.au

Dr Elinor Hortle is a post-doctoral researcher interested in studying the host response to infection. She started her research career at the University of Tasmania, before completing her PhD at Macquarie University studying the effect of genetics on resistance to malaria in mice. She then moved into zebrafish research, investigating the ways in which platelets affect tuberculosis infection. In 2021 Elinor started her current position at the Centre for Inflammation, where she studies host-pathogen interactions in respiratory infections.

Keywords: host-pathogen interactions, infection, mast cells, inflammasomes, innate immunity

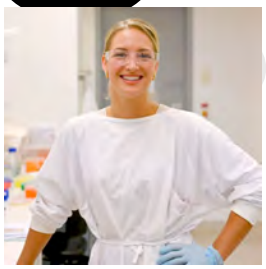
Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- Mast-cell proteases in lung infections
- Potassium flux and inflammasome activation in chronic lung disease

What methods or research skills will you learn?

- Microbiological techniques
- Cell culture
- Flow Cytometry
- *In vivo* and *In vitro* infections
- qPCR
- Histology



Dr Aster Pijning

Postdoctoral Research Associate
Faculty of Science
Aster.pijning@uts.edu.au

Dr. Aster Pijning is an early-career protein biologist specializing in thrombosis and haemostasis research. She earned her Ph.D. from the University of Sydney, where she discovered a novel mechanism of blood clotting regulation. Currently a Postdoctoral Research Associate at the University of Technology Sydney, Dr. Pijning focuses on improving protein therapeutics in bleeding and thrombotic disorders.

Keywords: Thrombosis, platelets, proteins, molecular biology, cardiovascular disease

Honours programs: Bachelor of Science (Honours) &/or Bachelor of Science (Honours)

We supervise Honours projects on:

Assessing the redox state of platelet ß3 integrin and association to vascular health

What methods or research skills will you learn?

- Assessing current medical and scientific literature and identifying knowledge gaps in cardiovascular disease
- Mass spectrometry
- SDS-PAGE
- Scientific writing
- Human sample handling
- Functional platelet assays
- Flow cytometry

Our team:

- Prof Phil Hogg
- Dr Mark Schreuder
- Dr Diego Butera
- Kenny Liu

We collaborate with:

- A/Prof Freda Passam, MD (USyd), Dr Alex Dupuy (Usyd)

Research projects with other affiliated supervisors

The School of Life Sciences also offers Honours research projects with a wide range of other supervisors affiliated with UTS. This includes projects from UTS Faculty of Engineering and Information Technology (FEIT) and other visiting researchers at UTS. Their research profiles and projects are listed below.

David Chapman

Senior Respiratory Scientist (RNSH)
School of Life Sciences
David.Chapman@uts.edu.au

The Respiratory Investigation Unit is the major respiratory function laboratory in the Northern Sydney Local Health District, providing clinical testing to over 3000 patients per year. We utilise standard and complex measures of lung function tests to improve the diagnosis, treatment and management of people with lung disease. We collaborate extensively with the Airway Physiology & Imaging Group at the Woolcock Institute. Our group consists of respiratory physicians, clinical respiratory scientists, speech pathologists, respiratory physiotherapists and specialist research scientists.

David Chapman Profile | University of Technology Sydney (uts.edu.au)

Keywords: respiratory physiology, small airway function, asthma, COPD, functional breathing dysfunction

Honours programs: Bachelor of Medical Science (Honours) & Bachelor of Science (Honours)

We supervise Honours projects on:

- **Understanding Healthcare Journeys for People with Functional Breathing Dysfunction**
  Patients with Functional Breathing Dysfunction take on average 7 years to receive proper diagnosis and treatment. We are investigating the barriers to proper diagnosis and developing education tools to expedite the diagnostic process

- **Diagnosing Exercise-induced Laryngeal Obstruction**
  We video the larynx during exercise and are investigating the sensitive of tests to detect exercise-induced laryngeal obstruction

- **Early detection of lung disease following Allogeneic Stem Cell Transplant**
  We are investigating the role of complex measures of small airway function in the early detection of lung disease following allogenic stem cell transplant

What methods or research skills will you learn?

- Standard pulmonary function testing
- Complex lung function
- Patient communication and clinical assessment

We collaborate with (optional):

- Distinguished Professor Brian Oliver – UTS SoLS & Woolcock Institute
- Professor Greg King, Woolcock Institute
- Dr Danielle Stone – Speech Pathology, Royal North Shore Hospital
- Dr Kaj Blokland - Woolcock Institute

E/m Professor John Ellis

Emeritus Professor
Faculty of Science
john.ellis@uts.edu.au

John completed a PhD on leishmaniasis at the Liverpool School of Tropical Medicine, and subsequently did postdoctoral research on *Eimeria* vaccines at the Institute for Animal Health (U.K.) and *Babesia* phylogeny (Flinders University of South Australia). He joined UTS in 1991. His main research interests are focused on translational research that includes development of vaccines and diagnostics for parasitic protozoan diseases. This has included studies on veterinary vaccines, neosporosis in animals, diagnostics for human gastrointestinal and tropical diseases such as dientamoebiasis, cryptosporidiosis, giardiasis, amebiasis, leishmaniasis and malaria. He was awarded the higher doctoral degree of DSc by Liverpool University in 2006 for his pioneering research on the biology of cyst -forming coccidian including Neospora caninum. He has published over 200 peer-reviewed research papers and is an editor of the U.K. based, peer-reviewed journal Parasitology published by Cambridge University Press.

Staff profile: https://profiles.uts.edu.au/John.Ellis/about

Keywords: parasitology, molecular biology, bioinformatics, diagnostics, vaccines

Honours programs: [Bachelor of Science (Honours) or Bachelor of Medical Science (Honours)]

I supervise Honours projects on:

- Diagnosis and epidemiology of human parasitic diseases, including *Dientamoeba fragilis*, cryptosporidiosis, giardiasis and toxoplasmosis.
- Genetic diversity in the trypanosomatidae (trypanosomes and *Leishmania*)
- Methods for fast tracking a review of the scientific literature

What methods or research skills will you learn?

- “omics” and bioinformatics
- Cell culture of parasites
- PCR and DNA sequencing
- Molecular phylogenetics
- Publishing, bibliometrics and methods for searching scientific literature

Our team:

- HDR students: Luke Hall and Louis De Couvreur

I collaborate with:

- Dr Damien Stark, Department of Microbiology, St. Vincent’s Hospital Sydney
- Dr Rogan Lee, ICPMR, Westmead Hospital
- Professor Paul Kennedy, School of Software, UTS

Dr Lacey Johnson

Principal Research Fellow, Australian Red Cross Lifeblood; Visiting Fellow, School of Life Sciences, UTS
Ljohnson@redcrossblood.org.au

Dr Lacey Johnson is a cell biologist with a particular passion for platelets. For the last decade she has worked at Australian Red Cross Lifeblood striving to improve the quality of platelets for transfusion. Lacey's research is particularly focused on extending the very finite shelf-life of platelets through novel hypothermic methods of storage (cryopreservation and refrigeration).

Keywords: Platelets, cryopreservation, storage, transfusion

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

Alternative ways to store platelets for transfusion, specifically these projects aim to:

- Examine the fibrinolytic capacity of cold-stored platelets
- Examine wound-healing properties of cryopreserved platelets

What methods or research skills will you learn?

- Cryobiology
- Flow cytometry and imaging flow cytometry
- ELISA
- Biochemical assays
- Cell culture

Our team:

- Lauren Waters, Post-doctoral fellow
- Ben Wood, PhD student

I co-supervise projects with:

- Dr Matthew Padula, School of Life Sciences, UTS

Dr Jiao Jiao Li

Senior Lecturer
Biomedical Engineering
jiaojiao.li@uts.edu.au

Dr Jiao Jiao Li (better known as JJ) has research interests in tissue engineering and regenerative medicine, particularly for musculoskeletal tissues and associated conditions (e.g., regrowing bone/cartilage, regenerative therapy for osteoarthritis). Her projects involve different techniques including stem cell culture, co-culture models, biomaterials synthesis, bioactive scaffold design, and molecular biology.

JJ was a recent National Health & Medical Research Council (NHMRC) Research Fellow, Co-Deputy Director of the Australian Research Council (ARC) Training Centre for Innovative BioEngineering, and Science & Technology Australia 2021-22 Superstar of STEM.

Website: https://profiles.uts.edu.au/jiaojiao.li

Keywords: tissue engineering, stem cells, biomaterials, musculoskeletal, nanomedicine

Honours programs: Bachelor of Science (Honours), MPhil

I supervise Honours projects on:

- **Developing a regenerative therapy for osteoarthritis**
  This project explores the use of stem cells and their biological derivatives (e.g., extracellular vesicles) as a novel therapeutic for treating osteoarthritis. Experiments will involve cell culture, isolating biological products from the cells, applying these to diseased cells, and characterising their effects on diseased cells using a variety of techniques including molecular biology.
- **Developing a bioactive scaffold for regenerating the osteochondral interface**
  This project designs and develops a bioactive scaffold, which can regenerate cartilage on one end and bone on the other end (osteochondral tissue). Experiments will involve sourcing and testing different combinations of bone/cartilage-inducing biomaterials on cells, developing a new scaffold design, and testing stem cell responses to the scaffold.

What methods or research skills will you learn?

- Cell culture
- Biological characterisation (e.g., microscopy, cell proliferation, gene expression)
- Biomaterials synthesis, processing, and characterisation
- Data analysis

I collaborate with:

- We collaborate with researchers at other Australian universities (e.g., USYD, RMIT, UQ) and internationally, as well as within UTS. Projects may be co-supervised with Prof Brian Oliver, Prof Hui Chen, and/or A/Prof Valery Combes.

Devanshi Seth

Visiting Professor
School of Life Sciences, Faculty of Science
Emails: Ann.Simpson@uts.edu.au
d.seth@sydney.edu.au

Prof Devanshi Seth is a pioneer in world-class research on the genetics of alcohol-related cirrhosis bringing international prestige through scientific productivity, high impact publications, training higher degree students with strong collaborations. Her unique Alcoholic Liver Disease Research Program in Australia is dedicated to understanding genetic, cellular, molecular and clinical aspects of liver diseases, a significant area of human health and cost burden.

Keywords: Alcohol, Fatty Liver, Cirrhosis, Lipotoxicity, Lipid droplet, Lipidomics, Disease modelling, Genetics, Inflammation, Zebrafish, CRISPR-Cas9, Live imaging, Nanoparticle, Drug discovery

Honours program:[Bachelor of Science (Honours) &/or Bachelor of Medical Science (Honours)]

I supervise Honours projects on:

Persistent hepatic fat resulting in lipotoxicity is a root cause of cirrhosis. Majority of risk genes associated with cirrhosis are involved in lipid biology, making lipids the genetic nexus of fatty liver. Alcohol- and non-alcohol-related fatty liver disease (ALD & NAFLD) share these genetic risks. The mechanisms linking genetic susceptibility to lipotoxicity remain elusive. ***Both projects are available for Honours and PhD.***

Topic 1. Novel approaches targeting hepatic fat: Testing new treatment paradigms in zebrafish genetic models of fatty liver diseases. Our novel zebrafish models of fatty liver (alcohol, high fat diet (HFD)) and CRISPR-Cas9 knockdown of risk genes (pnpla3, tm6sf2, faf2) show increased triglyceride (TG) and inflammation in the liver (Fig 1 panel B; bioRxiv 2023, doi 10.1101/2023.04.14.536511). We will study the roles of lipid droplet genes in lipid biology in zebrafish genetic fatty liver models. *Outcome:* Identification of potential therapeutic targets to reduce excess fat and prevent disease progression.

Topic 2. Developing a novel nanoparticle system targeting lipid for drug delivery in fatty liver disease in zebrafish models. This interdisciplinary project combines nanotechnology, genetics, cell biology, dietary drugs and zebrafish disease models to study the roles of lipid droplet genes in disease progression and targeting them through drugs directed to liver specific cells (Fig 1 panel C). *Outcome:* IP generation for novel liver specific drug delivery system using nanoparticles.

What methods or research skills will you learn: CRISPR-Cas9, Lipidomics (MS), Confocal, Live imaging, Molecular genetics, Genomic analysis, qPCR, Flow cytometry, Nanoparticle, Cell culture, Zebrafish disease modeling.

We collaborate and co-supervise projects: Dr Stuart Fraser, USYD; Prof Macela Bilek, USYD; Dr Dan Hessleson, Centenary Institute; Dr Stefan Oehlers, Singapore

A/Prof Wei Deng

Position: Associate Professor
Discipline: School of Biomedical Engineering, FEIT
Email: wei.deng@uts.edu.au

I work with my team on pioneering transdisciplinary research that spans nanobiotechnology, oncology, gene engineering and medical science to create new technologies for cancer and genetic disease treatment. My research achievement advances the field of nanocarrier delivery through the development of an innovative new feature. Nanocarrier delivery platforms are commonly used in pharmacology to encapsulate drugs or gene materials (likely DNA and RNA), making them more effective in the treatment of cancers and other genetic disease. My team have now been able to engineer these nanocarrier delivery platforms to release their payload at the disease site (such as tumour) with the minimal off-target effect. My lab can perform experiments on biological manipulation and measurement, animal model development and histological analysis, nanocarrier engineering and characterisation.

Keywords: lipid nanoparticles, gene therapy, CRISPR, siRNA, nanomedicine

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- Lipid nanoparticles for siRNA delivery technologies
- In vivo CRISPR-based gene editing by using lipid nanoparticles
- Understanding the protein corona formation on lipid-polymer nanoparticles

What methods or research skills will you learn?

- Cell culture
- Animal work
- Bioassay protocols (Real time PCR, Western blot and Flow cytometry)
- Live cell imaging on a fluorescence microscope
- Nanocarrier synthesis and characterization

Our team:

- Dr Thuy Anh Bui, research associate
- Rui Sang, PhD student
- Meenu, PhD student
- Xinpu Yang, PhD student
- Haoqi Mei, PhD student
- Zichen Xu, Master student

I collaborate with:

- Dr Andrew Care, School of Life Sciences, UTS (co-supervisor of honours projects)
- Professor Ewa Goldys, UNSW
- Professor Shane Grey, Garvan Institute of Medical Research

Dr Helen Xu

Senior Lecturer
Biomaterials and Biomedical Implants
xiaoxuehelen.xu@uts.edu.au

Dr Xu is a biomaterials scientist and biomedical devices engineer in the School of Biomedical Engineering at UTS. She completed two prestigious Chancellor Postdoctoral Research Fellowship at Macquarie University in 2017 and at UTS 2021. She joined the School of Biomedical Engineering in FEIT since 2022. Her research has been focusing on cancer precision diagnosis using inorganic fluorescent nanomaterials, and regenerative tissue engineering using bulk metallic biomaterials as biomedical implants. Dr Xu has developed the research projects focusing on the surface modifications and the upconversion nanoparticles in multimodal bioimaging, and near infrared light triggered drug release in precision nanomedicine for cancer diagnosis and treatment. Another ongoing project is to evaluate a new biodegradable Zn based alloys aiming for the applications in biomedical implants, such as bone osteosarcoma implant and cardiovascular stent.

Keywords: theranostics, Biomedical Imaging, Biomedical implants, Inorganic nanoparticles, Biodegradable metals and alloys, DNA/Antibody conjugation

Honours programs: Bachelor of Science (Honours) and PhD Programs

fluorescent nanoparticles for image-guided surgery

- Aptamer modification on fluorescent nanoparticles (FNP) for tumor margin profiling
- Fabricate the Near infrared FNPs to the biomedical imaging contrast agent
- Surface modify the NIR FNPs with DNA/peptides/antibody for specific cancer cells
- Validate the targeting efficiency and assess the imaging accuracy for NIR FNPs

Biodegradable Zinc based alloys as biomedical implants

- Biocompatibility assessment using a series of cell lines
- Biodegradability assessment in simulated body fluids
- Mechanical properties evaluations including tensile, ductility and compression

What methods or research skills will you learn?

- Cell culture, assessments on cell viability, proliferation and other biology methods
- Biochemistry reactions between biological molecules (peptides, aptamers, & antibody) and inorganic nanoparticles (fluorescent NPs, magnetic NPs)
- Biophysical measurements on fluorescent NPs within cells
- Biodegradation process investigation using electrochemical analysis
- Mechanical properties testing
- Biomedical implants design and manufacturing
- Learning to present data at weekly presentations at lab meetings and 1:1 meeting

Our team

Jing Luan (PhD), Gong Lei (PhD candidate), Hongwei Mou, Farrel Separgo, Lucas Chabo.

Available Co-Supervisors

- Kristin McGrath, Dennis McNevin

Dr Ying Zhu

Position: Lecturer
Discipline: Biomedical Engineering
Email: Ying.Zhu@uts.edu.au

Dr Zhu received her PhD in 2015 in Australia's top biosensor and biodevice group at UNSW Sydney. Dr Zhu's subsequent postdoc work (2015-2017) in the Thayer School of Engineering at Dartmouth College extended her biosensor expertise to translational cancer research. Dr Zhu was supported by her Cancer Institute NSW Early Career Fellowship (2017-2020) to establish further her work in using nanoplasmonic sensors for cancer diagnosis. She is now a lecturer in the School of Biomedical Engineering at UTS.

Dr Zhu is leading the laboratory of In-vitro Nanodiagnostics at UTS. Her current research focuses on developing new nanomaterials and nanoscale devices to capture and analyse biomarkers for cancer diagnostics. She works in a multidisciplinary field across chemistry, materials, nanotechnology and biomedicine. She has been dedicated to bridging the gap between biomedical engineers and biologists/clinicians. She has contributed to translational biomedical research by developing new analytical technologies via a multi-disciplinary, highly collaborative, "bench-to-bedside" approach.

Website: https://profiles.uts.edu.au/ying.zhu; https://www.yingzhulab.com/

Keywords: cancer diagnosis, biomarker, biosensor, nanotechnology, surface chemistry
Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

Single extracellular vesicle analysis for the early detection of pancreatic cancer
Pancreatic cancer (PC) has the lowest survival rates among all cancers. Early detection can increase survival ten-fold through curative-intent surgery. However, current diagnostic methods, such as imaging or tissue biopsies, are unsuitable for widespread screening. Therefore, there is an urgent need to develop a new, highly sensitive test using accurate markers to detect PC earlier. In this research project, we will develop a novel, highly sensitive blood test to detect PC early. The test targets a new blood marker called extracellular vesicles (EVs). We will utilise a high-throughput and multiparametric single EV analysis that employs fluorescence-based nanoparticle tracking analysis for single EV analysis. This project will evaluate the capability of the new single EV assay to identify single EVs with different biomarker profiles.

What methods or research skills will you learn?

- Cell culture
- EV isolation and analysis
- Fluorescent labelling
- Bioinstrumentation (e.g. nanoparticle tracking analysis)

We collaborate with:

- Professor Dayong Jin (IBMD, UTS)
- Dr Peter Reece (School of Physics, UNSW)
- Dr Ming Li (School of Engineering, Macquarie University)
- Dr Dannel Yeo (Li Ka Shing Cell and Gene Therapy Initiative Group, Centenary Institute)
- Dr George Sharbeen (School of Medical Science, UNSW)

Dr Aaqil Rifai

Chancellor's Research Fellow
School of Biomedical Engineering
aaqil.rifai@uts.edu.au

Dr. Aaqil RIfai is a Chancellor's Research Fellow and a biomaterials and tissue engineering academic. He has received over $900,000 in competitive research income.

In 2016, Dr. Rifai was invited to pursue a full-time PhD at RMIT University's School of Engineering under Prof. Kate Fox, Prof. Elena Pirogova, Dr. Nhiem Tran and Prof. Andrew Greentree. During his PhD, he developed the first diamond-coated additively manufactured titanium scaffolds to enhance mammalian cell growth and inhibited Staphylococcus aureus colonisation. Dr. Rifai published over 10 high-quality peer-reviewed publications during his PhD, leading to significant media attention. After completing his PhD in August 2020, Dr. Rifai secured a full-time postdoctoral research position at RMIT University. Soon after, Dr. Rifai won the prestigious Alfred Deakin Postdoctoral Research Fellowship at Deakin University in March 2021, where he embarked on his independent research career. He developed novel self-assembled peptide hydrogels for bone tissue regeneration under the guidance of A/Prof. Richard Williams.

Dr. Rifai is currently developing organoid models mimicking the extracellular matrix with potential avenues for rapid, clinically relevant production of bone and cartilage tissue.

Profile: https://profiles.uts.edu.au/Aaqil.Rifai

Keywords: hydrogels, tissue engineering, osteoarthritis, regeneration

Honours programs: [Bachelor of Science (Honours) &/or Bachelor of Science (Honours)]

I supervise Honours projects on:

- Topic 1 – Investigation of an osteoarthritic and regenerative *ex vivo* model for clinical efficacy
- Topic 2 - Development of novel extracellular matrix-derived scaffolds to induce bone, cartilage or muscle regeneration

What methods or research skills will you learn?

The student will be exposed to *in vitro,* and *ex vivo* stem cell culture and mice tissue models, employing histology, ELISA and immunohistochemistry. Assessments of tissue integration and regeneration will include cell viability assays, immunocytochemistry and immunohistochemistry staining, micro-CT, rt-qPCR, and analysis of bone and cartilage-related markers and confocal imaging. Day-to-day activities will involve experimental execution, data analysis, literature review, research meetings, and scientific writing.

Our team:

- We are excited about our cutting-edge research with our newly formed team, which consists of a PhD student and 4 capstone students. Dr. Rifai also co-supervises 3 PhD students at Deakin University.

We collaborate with:

- We collaborate with the Single Cell Genomics group including Prof. David Gallego Ortega, Bone Biology Unit in St. Vincent's Hospital in Melbourne and have opportunities to work with international tissue engineering experts from Trinity College Dublin.