

UTS: Science School of Life Sciences

Honours Projects (2024)



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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 Coordinator
Dr Laurence Luu
laurence.luu@uts.edu.au

Environmental Science Stream Coordinator
Dr Andrei Herdean
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Research projects in the Australian Institute of Microbiology and Infection

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.

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.



AIMI website

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 \$2500

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



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: 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.

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:

- Clearing rat spinal cord and brain tissue to investigate role of inflammatory cells in relation to neural injury and lesion formation (with A/Prof. Cathy Gorrie, SoLS).
- 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).
- Microscopic analysis of parasitic blow fly microstructures for species discovery and delineation (with Dr Nik Johnston, SoLS).

What methods or research skills will you learn?

- Specimen preparation methods for light/optical microscopy.
- 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:

A/Prof. Willa Huston (SoLS) and Dr Jen Mathews (C3).



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 program at the Australian Institute for Microbiology and Infection (AIMI) at UTS, and is the primary subject coordinator for General Microbiology at UTS.

His team utilizes the latest technology in molecular and synthetic biology, genomics, and microscopy to understand how microbial cells grow and dynamically respond to their environments, and to develop biotechnology solutions to address two critical global problems: climate change and infectious disease (antimicrobial resistance). Iain's group is a leader in the molecular and evolutionary cell biology of archaea (our ancient microbial cousins), and uropathogenic *Escherichia coli* (UPEC), the main cause of urinary tract infections (UTI)—a worsening global pandemic.

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

Keywords: Molecular and cellular microbiology, biotechnology, archaea, *E. coli* model systems.

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

We supervise Honours projects on:

- Comparative biology of prokaryotic cell division. What proteins carry out cell division in archaea? And how do they interact with the cell envelope to bring about division?
- Genetic and cell structural dynamics of prokaryotic cell morphology. How does the archaeal cytoskeleton control cell shape changes? What regulatory systems control changes in bacterial cell shape and division during infection?
- How can we utilize archaea and their components for protein and vaccine engineering?
- Please send your academic CV/transcript and come and chat to us to find out more about the specific projects we have to offer you!

What methods or research skills do we use?

- Recombinant DNA technology and microbial synthetic biology/engineering.
- High-resolution fluorescence microscopy.
- Cellular infection models, coupled to live cell imaging.
- Protein function, structure, interactions, and evolution.
- Functional genomics and next-gen DNA sequencing

Our team:

- Post-doctoral scientist: Nick Horan. HDR students: Hannah Brown, Vinaya Shinde, John Cristianos. Group leaders in MMD: Bill Söderström, Yan Liao.

Hons Co-supervisors and collaborators:

- Yan Liao (archaeal cell biology), Bill Söderström (UPEC shapeshifting, superresolution imaging), Amy Bottomley (high content fluorescence microscopy), and others.
- Brendan Burns (UNSW – archaeal cell biology and eukaryotic cell evolution).



Dr Mehrad Hamidian

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

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
- Transcriptomics
- Whole Genome Sequencing
- Bioinformatics/phylogenomics

Our team:

- Jonathan Koong (PhD candidate)
- Liam Tobin (PhD candidate)
- Oliver McNeilly (Research associate)

I collaborate/co-supervise with:

- A/Prof Cindy Gunawan (UTS)
- Prof Steven Djordjevic (UTS)
- Dr Johanna Kenyon (QUT)
- A/Prof Amy Cain (Macquarie university)



Dr Yan Liao

Position: Chancellor's Research Fellow

Discipline: Microbiology

Email: yan.liao@uts.edu.au

Dr Liao received her PhD in Microbiology and Immunology from the University of New South Wales in 2017. Dr Liao then joined UTS as a postdoctoral research fellow and is now a Chancellor's Research Fellow and group leader at the Australian Institute for Microbiology & Infection. Her research group focuses on 1) to decipher the principles of cell division in Archaea – ancient microorganisms that are of central importance to understanding the emergence of complex life; 2) to develop archaeal cells for industrial applications such as for metal nanoparticle biosynthesis and potential therapeutic applications. Dr Yan Liao's work is improving our understanding of archaeal fundamental biology and benefiting industry by harnessing archaea for human and environmental health.

Keywords: cell division, archaea, genetic modification, microscopy imaging, nanoparticles, anticancer activity

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- Topic 1: cell division in haloarchaea (salt-loving archaea)
Using advanced genetic modification and microscopy imaging to characterize the new cell division proteins in Archaea
- Topic 2: Biosynthesis of metal nanoparticles using haloarchaeal strains
Assessing the abilities of haloarchaeal strains for the biosynthesis of metal nanoparticles and characterizing the properties of nanoparticles.
- Topic 3: Evaluation of anti-cancer effect of haloarchaea.
Investigating the cytotoxic effects of metabolites or components from haloarchaea against cancer cell lines.

What methods or research skills will you learn?

- Fluorescence microscopy
- Super-resolution microscopy (confocal, 3D-SIM) and electron microscopy (TEM)
- General molecular biology techniques including gene modification, plasmid construction and protein expression.

I collaborate with:

- Dr Amy Bottomley (AIMI, UTS, co-supervisor for Topic 1)
- A/Prof Cindy Gunawan (AIMI, UTS, co-supervisor for Topic 2)
- A/Prof Yuen Yee Cheng (IBMD, UTS, co-supervisor for Topic 3)



Prof Diane McDougald

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

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).

<https://profiles.uts.edu.au/Diane.McDougald>

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)



Bill Söderström

Senior Lecturer, ARC Future Fellow
Australian Institute for Microbiology and Infection
Bill.soderstrom@uts.edu.au

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.

Our lab is mostly interested in targeting bacteria and their shape-changes during Urinary Tract Infections (UTIs). We use advanced imaging technologies together with custom-made microfluidics devices to figure out bacterial behaviors in infection models with the long-standing goal of developing new therapeutics.

Honours Students in my group can apply for the AIMI

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Keywords: Urinary Tract Infections, Bacterial Morphology, Microfluidics, Super-resolution Microscopy

Honours programs: All Science Programs (Honours)

My lab can supervise Honours projects on:

- Understanding bacterial development in Urinary Tract Infections models
- Molecular regulation of bacterial cell division and morphology changes
- Develop and test novel therapeutics against Urinary Tract Infections (Nanobodies)
- Time-dependent changes in the human microbiome in diseased persons

What methods or research skills will you learn?

- Super-resolution and time-lapse fluorescence microscopy
- Microfluidics and flow-culture systems
- General bacteriology, genetics (PRC, cloning), biochemistry (western blot) and cell culture

Current team:

- Dr. Alaska Pokhrel (Post doc, Bacterial development in Urinary Tract Infections)
- Matthew Pittorino (PhD student, Single-molecule microscopy on cell division)
- Ariana Costas (PhD student, Urinary Tract Infections in mouse models)
- Lachlan Chisholm (Honours student, Multi-strain Urinary Tract Infection models)

We collaborate with:

- [A/Prof Iain Duggin](#), AIMI (can co-supervise projects on UTIs)
- [Dr. Maiken Ueland](#), MaPS (will co-supervise projects on microbiome of diseased)
- [Prof. Majid Warkiani](#), FEIT (can co-supervise projects on microfluidics)

Lab Website: <https://soderstrombill.wixsite.com/billslab>



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)

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

Chancellor's Research Fellow / Senior Lecturer
 School of Life Sciences
andrew.care@uts.edu.au

Andrew Care is a Chancellor's Research Fellow who 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, Protein engineering, 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)
- Caitlin Sives (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; A/Prof Louise Cole



Prof Hui Chen

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

I received my Medical Degree (MD) from Nanjing University, China (2002) and PhD in neuroscience from the University of Melbourne (2006). I am one of the star researchers in e-vaping and air pollution. Current research in my team focuses on the impact of air pollution and 3rd hand smoking on the development of chronic diseases, including memory impairment, anxiety, fatty liver disease, respiratory disorders, and kidney disorders.

Keywords: air pollution, e-vaping, memory, anxiety, brain, lung, liver, kidney

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
- Risks of chronic kidney disease due to environmental pollution exposure
- Lung consequences – asthma, COPD

What methods or research skills will you learn?

- Western blotting, real-time PCR, ELISA, immunohistochemistry
- Proteomics, lipidomics
- Cell culture
- Animal experiments

Our team:

- Dr David van Reyk – brain, liver
- Drs Chantal Donovan and Richard Kim – lung, brain
- Distinguished Professor Brian Oliver – lung
- Professor Carol Pollock and A/Professor Sonia Saad (Kolling) – kidney



A/Prof Charles Cranfield

Associate Professor
Molecular Biotechnology Discipline
Charles.cranfield@uts.edu.au

The [UTS Membrane Biophysics Group](#) specialises in investigating the intricate molecular interactions between biological membranes, ion channels, transporters and small molecules.

Keywords: Lipid membranes, biosensors, peptides

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

We supervise Honours projects on:

- The function and structure of proteins and peptides as they interact with cell membranes. This includes ion channels and transporters.
- Membrane-based sensors for the detection of inflammatory disorders like *inflammatory bowel disease* (IBD) and *chronic obstructive pulmonary disease* (COPD).

What methods or research skills will you learn?

- Electrical impedance spectroscopy with tethered bilayer lipid membranes
- Fluorescence spectroscopy and microscopy
- Molecular dynamics simulations
- Neutron reflectometry
- Differential scanning calorimetry
- Langmuir-Blodgett methods

Our team:

A/Prof Charles Cranfield (Group leader)

Adj Prof Bruce Cornell (SDx Surgical Diagnostics)

Dr Stephen Holt (Honorary, ANSTO)

Lissy Hartmann (PhD student)

Upeksha Mirissa Lankage (PhD student)

Suganeya Soundarajan (PhD student)

Samara Bridge (MSc Student)

We collaborate with:

- SDx Tethered Membranes Pty Ltd
- A/Prof Ron Clarke (University of Sydney)
- Dr Evelyne Deplazes (University of Queensland)
- A/Prof Tristan Rawling (University of Technology Sydney)



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:

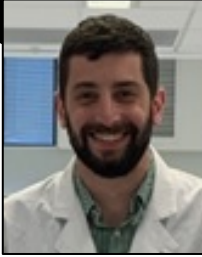
- How drugs targeting the lungs can alter immune responses.
- Discovery of new therapeutic targets for lung diseases targeting airway smooth muscle.

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 Mudiyansele, 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
- 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)



A/Prof Lana McClements

Associate Professor and Heart Foundation Future Leader Fellow
Molecular Biotechnology
zana.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/pharmaceuticals, 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 respiratoryresearchgroup.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 Stanzack, 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

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.



Dr Laura Bradfield

Position: Senior Research Fellow/Senior Lecturer
 Discipline: Medical Science
 Email: Laura.Bradfield@uts.edu.au

I received my PhD in neuroscience from the University of New South Wales (UNSW) in 2010, after which I completed Postdoctoral training at both University of Sydney and UNSW. I joined UTS in 2018. My research focuses on the behavioural and brain mechanisms of compulsivity as it applies across multiple disorders, such as obsessive compulsive disorder and substance use disorder. Recent work from my lab, conducted in rats and mice, has demonstrated that neuroinflammation in various brain regions likely underlies the cognitive-behavioural impairments observed in compulsive disorders and this is driven by disruption of astrocytic function. I pride myself on running a diverse, friendly, and welcoming laboratory.

Keywords: obsessive-compulsive disorder, substance use disorder, neuroinflammation, neural circuits of reward-based decision-making

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- Cognitive-behavioural testing of animals with local pockets of neuroinflammation throughout the brain and/or chemogenetic silencing/activation of glial cells or neurons in those regions. Regions studied include prefrontal cortex, striatum, amygdala, thalamus, and hippocampus.
- Cognitive-behavioural testing of animals who have undergone a model of contingency management treatment of substance use disorder, with further analysis to determine the brain mechanisms of relapse resistance.
- Using advanced brain tissue clearing and confocal microscopy techniques to identify and quantify dendritic spines in brain regions (hippocampus and striatum) following neuroinflammation.

What methods or research skills will you learn?

- Behavioural studies (operant conditioning)
- Immunohistochemistry
- Microscopy
- Cell culture
- Optogenetics and chemogenetics
- Tissue clearing

Our team:

- Dr. Mike Kendig: DECRA and Chancellor's Fellow
- Dr. Joanne Gladding: Postdoctoral Fellow
- Amolika Dhungana: Research Assistant
- Sahar Gharbanpour: Research Assistant
- William Kendall: Research Assistant
- Arvie Abiero: PhD student
- Kiruthika Ganesan: PhD student
- Maedeh Mahmoudi: PhD student

I collaborate with:

- A/Prof. Alessandro Castorina and A/Prof. Louise Cole.

Website/Publications: <https://scholar.google.com/citations?user=AIdA89UAAAAJ&hl=en>



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 McClements
- 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.



Prof Willa Huston

Associate Dean, Teaching and Learning
Faculty of Science

Wilhelmina.Huston@uts.edu.au

In our lab we work on Sexually transmitted infections. We want to uncover mechanisms of pathogenesis and disease, but we also work to identify new and improved diagnostic methods, and treatment approaches. We are interested in the whole picture of infection and disease, so we look at the pathogen, the host immune response, and also the microbiome. Our focus is mainly on women and we have some research projects that look at the adverse outcomes of infection like infertility and pelvic inflammatory disease.

Keywords: chlamydia; sexually transmitted infection, pathogen, infectious disease, women's reproductive Health

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

We supervise Honours projects on:

- Chlamydia pathogenic mechanisms
This project will involve working in cell culture to explore mechanisms of pathogenesis for Chlamydia. Techniques you will learn include: microscopy, molecular biology, cell culture, pathogen handling.
- Cell culture models of pathology and infertility
 - This project will involve developing and analysing cell culture models to understand how tissue damage can occur in the female reproductive tract.

What methods or research skills will you learn?

Techniques/topics you will learn include: microbiology, microscopy, molecular biology, cell culture, pathogen handling, data analysis, biochemistry, immune responses, and some biology.

Our team:

- Depending on your project you could collaborate with Dr Laurence Luu, a Chancellors Fellow in the team, or our collaborators such as Associate Professor Louise Cole in the MIF.



Dr Mike Kendig

Chancellor's Research Fellow
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. I am interested in how the foods we eat affect our cognitive abilities and metabolic health, and the role of the gut microbiome in these effects. My recent work in rats has shown that consuming a 'junk-food' diet high in fat and sugar impairs short-term memory in a dose-dependent fashion.

<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:

- **Cognitive effects of binge-like consumption of diets high in fat and sugar**
In this project rats are given continuous or binge-like access to high-fat, high-sugar foods for several weeks. A range of cognitive and behavioural parameters are then assessed, and neuroinflammation quantified in various brain regions.
- **Testing the role of the microbiome in diet-induced cognitive impairment using faecal microbiota transplantation**
This project tests the relationship between unhealthy diets, microbiome composition and cognitive function. Faeces collected from donor rats fed healthy or unhealthy diets are processed and then transferred into recipient rats to introduce a new microbiome, with behavioural tests conducted before and after the transfer.

What methods or research skills will you learn?

- Animal handling
- Behavioural testing
- Nutritional analyses of macronutrient composition
- Immunohistochemistry
- Microscopy

Our team:

- Dr Laura Bradfield: Senior Lecturer & Senior Research Fellow
- Dr Simone Rehn: Postdoctoral Fellow
- Dr Joanne Gladding: Postdoctoral Fellow
- Amolika Dhungana: Research Assistant
- Maedeh Mahmoudi: PhD student

I collaborate and co-supervise with:

- Dr Laura Bradfield
- Dr Laurence Luu
- Dr Poppy Watson (Graduate School of Health, UTS)
- Prof. Margaret Morris (UNSW Sydney)



Dr Laurence Luu

Position: Chancellor's Research Fellow and Lecturer
 School of Life Sciences, Discipline of Medical Science
 Email: Laurence.luu@uts.edu.au

I am a Lecturer and UTS Chancellor's Research Fellow. I am very passionate about all things related to medical microbiology. My research aims to understand how different bacterial human pathogens evolve and cause disease in order to develop new treatments and/or vaccines. For more information see: <https://profiles.uts.edu.au/Laurence.Luu>

Keywords: *Chlamydia*, bacterial pathogens, microbiome, genomics, bioinformatics, molecular biology, CRISPRi

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

I supervise Honours projects on:

- *Chlamydia trachomatis* in female infertility
 There are three potential projects on *Chlamydia trachomatis*, the most common sexually transmitted bacteria.
 1. Investigating drug resistance with CRISPRi-cas12 silencing
 2. Unraveling the role of phosphorylation in *Chlamydia* development
 3. Developing a universal genomic typing scheme for *Chlamydia* epidemiological investigations

These projects are suitable for students with an interest in medical microbiology, molecular biology (projects 1 and 2), proteomics (project 2) bioinformatics (project 3).

- T cell antigen discovery for *Bordetella pertussis*:
Bordetella pertussis causes whooping cough, one of the most prevalent vaccine-preventable disease. This project aims to discover new pertussis T-cell antigens to improve the current vaccines and is suitable for students interested in medical microbiology/immunology.

What methods or research skills will you learn?

- Depending on the project, techniques you will learn include: Microbiology, inactivated-CRISPR (CRISPRi), systems biology (genomics, transcriptomics, proteomics), bioinformatics, molecular biology (PCR, qPCR, ELISPOT, cloning etc), animal handling and/or cell culture.

Our team:

- *Chlamydia* projects will be co-supervised with Prof Willa Huston.
- *Bordetella pertussis* projects will be co-supervised with A/Prof Bernadette Saunders.
- I also co-supervise projects with Dr Mike Kendig on the impact of fatty diets on cognition and the microbiome (i.e. the gut-brain axis).



Prof Deborah Marsh

Discipline Leader and 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 (<https://profiles.uts.edu.au/Deborah.Marsh>), a cell and molecular biologist and cancer scientist trained in genetic and epigenetic analyses of sporadic and familial cancers. The group runs collaboratively with Senior Research Associate Kristie Dickson (<https://profiles.uts.edu.au/Kristie-Ann.Dickson>). Our focus is women's cancers, with a specific interest in ovarian cancer. We undertake both fundamental discovery research and translational science to tackle issues of drug resistance and discovering new therapeutic approaches.

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

What methods or research skills will you learn?

- Mammalian tissue culture
- Gene editing with CRISPR-Cas9
- 3D bio-printing using the RASTRUM 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)
- Live cell imaging using the Incucyte Live Cell Imager
- etc..

Our team:

- Kristie Dickson, Senior Research Associate
- Yue (Daniel) Ma, Tao Xie, Natisha Field – PhD students
- Tba'd – Postdoctoral Scientists



Dr Najah Nassif

Senior Lecturer
Medical Science / Cancer Biology
Najah.Nassif@uts.edu.au
<https://profiles.uts.edu.au/Najah.Nassif>

Dr 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 leads to cancer. Her current research focuses on determining how dysregulation of PTEN tumour suppressor gene expression and/or function, contributes to the development and/or progression of cancer. This includes examining the role of miRNA interactions in regulating PTEN.

Keywords: molecular biology, cancer biology, gene expression, tumour suppressor, quantitative PCR (and RT-PCR), mutation, epigenetics, miRNA, lncRNA

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

I supervise Honours projects on:

- Examining the effect of PTEN mutations on PTEN function.
- Investigating the role(s) of the PTEN pseudogene (PTENP1) and miRNAs in the regulation of PTEN expression.
- Detecting PTEN promoter mutations and their effect on PTEN expression in cancer.
- Determining the effect of *PTEN* gene mutations on PTEN protein structure.

What methods or research skills will you learn?

- Real time quantitative and digital PCR
- Cell/tissue culture
- RNA and DNA extraction and analysis
- Bioinformatics
- DNA and RNA electrophoresis

Our team:

- Nicole Matysiak (Honours)
- James Favalaro (PhD)
- Additional co-supervised PhD and Honours students

I collaborate / co-supervise projects with:

- Prof Ann Simpson (UTS) – Gene therapy for diabetes.
- Prof Marina Kenerson (ANZAC Research Institute and USYD) – Neurogenetics research.



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:

My research focuses on exploring the mechanisms by which we control infection and regulate inflammation, in diseases like tuberculosis and influenza. This research includes studies to identify and test new biomarkers to aid disease, new drugs, that could be used to treat infection and in investigating new therapeutics to treat respiratory and inflammatory diseases.

Keywords: Respiratory diseases, macrophages, lung inflammation, microRNA, biomarkers, drug discovery, tuberculosis, LAM

Honours programs: All Honours and Master of Philosophy Programs

I supervise Honours projects on:

- **How microRNA control inflammation and macrophage activity.**

Our group has shown that specific miRNA are upregulated during infection. We are working to understand how these miRNA aid macrophage function and immunity to infection.

- **Developing new drugs to treat infections including tuberculosis**

Treating tuberculosis and other mycobacterial diseases requires multiple antibiotics, given for 6-18 months. Our groups are working to identify new treatments to aid control of these diseases.

- **Biomarkers of TB disease**

Our group have identified a biomarker signature that has potential to aid diagnosis of tuberculosis. Our group is working with samples from a large TB study to validate the potential of biomarker.

- **Developing new biomarkers of LAM (lymphangioleiomyomatosis) disease**

LAM is a rare, slow growing lung cancer that predominantly effects women. Our group is working to develop a 3D model of LAM cysts to use for testing new treatment options for LAM. We are also collecting and testing samples from LAM patients to try to develop a new diagnostic test for LAM.

What methods or research skills will you learn?

- Microbiology, how to grow bacteria and test bacterial functions and measuring growth, within cells, in 3D spheroids and in vivo in mouse models of infection.
- Tissue culture; isolating and growing macrophages from blood, bone marrow & lungs and testing the functional activity of these cells by multiple immune assays
- Immune assays (including ELISA, Cytometric Bead Assays, flow cytometry, proteomics)
- Real time PCR, sequencing,
- In vivo infection studies with mice
- Human biomarker measurements-measuring by PCR, ELISA, CBA, functional assays

Our team:

- Post Doc :Tess Lai
- PhD Students: Giang Le, Liberty Conyers
- Honours & Masters Riley Easton, Betsy Cole, Eddie Yokanovich, Kiran Duwadi -

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)



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
Algae ecophysiology and climate change
Katherina.Petrou@uts.edu.au

Website: <https://www.katherinapetrou.com>

Associate Professor Katherina Petrou is a phytoplankton ecophysiologicalist, and leader of the Petrou Lab in the School of Life Science. Her 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, she primarily employs 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, physiology, ecology, climate change

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- Topic 1
Effects of climate change on marine diatom silica production
- Topic 2
Optimisation of measuring single-cell calcification rates in coccolithophores

Methods & research skills you could learn:

- Cell culture
- Fluorometry
- Carbonate chemistry
- Confocal and fluorescence microscopy
- Flow cytometry
- Nutrient analyses & biochemical assays
- Image analysis
- Data analysis & plotting

Our team:

- The Petrou lab is comprised of myself, a senior postdoctoral researcher, 3 PhD students, 2 Honours students and 2 interns.

Our lab collaborate with scientist from around the globe including but not limited to:

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 Thamtrakoln (Rutgers, New Jersey, USA); Professor Glen Wheeler (Marine Biology Association, Plymouth, UK); Dr Brook L Nunn (Washington University, Seattle, USA).



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>

Research projects in the Climate change cluster (C3)

C3 produces new insights into problems facing ecosystems around the world, to support the wellbeing of the animals, plants and communities that rely on them. 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.
- **Future reefs:** Studying how environmental conditions influence reef-forming corals and how to better preserve and re-build healthy reefs.
- **Ocean microbiology:** Understanding how ocean microorganisms are influenced by, and influence, oceanographic processes and marine ecosystems.
- **Productive coasts:** Exploring how photosynthetic organisms respond to natural and human changes in their environment.



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:

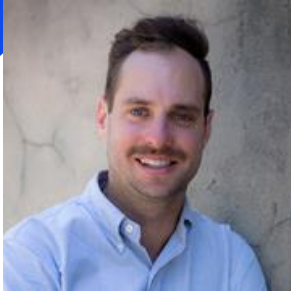
- DESI-MS based high throughput lipidomic analysis of microalgae.
- Chlorella Phenomix: quantification of the many possible responses of *Chlorella vulgaris* to changing environments.
- Protoplast morphogenesis influenced by microorganisms and abiotic factors.
- Seaweed Protoplast: A tool for elite germplasm 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

Chancellor's Research Fellow
Marine Biology and Ecology
Elliot.scanes@uts.edu.au

As a marine biologist and ecologist my work is focused on understanding how marine organisms will respond to climate change. I am specifically interested in the relationship between oysters and their microbial partners, how this relationship will be impacted by climate change; and what that means for oysters, the ecosystems they support and the people who rely on them for food and income.

[Read more here!](#)

Keywords: Marine Biology, Marine Ecology, Microbial Ecology, Aquaculture

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- **The effects of climate change on oyster disease**
Global climate change is warming Australia's oceans and endangering the ways we produce food. Oysters are vital for coastal ecosystems and as a source of food but are vulnerable to disease. This project will investigate how climate change is affecting oyster disease.
- **The microbiome of Sydney's urban marine life**
Sydney Harbour is uniquely placed as a highly biodiverse marine habitat nestled within Australia's largest city. This project will use molecular microbiological techniques to understand whether this proximity to urbanization is altering the microbiome of our most precious marine life.

What methods or research skills will you learn?

- Molecular techniques to identify marine bacteria
- How to sample and analyse marine microbial samples
- DNA extraction
- Data analysis

I collaborate with:

- The Sydney Institute of Marine Science
- University of Sydney
- University of New South Wales
- NSW Department of Primary Industries
- NSW Department of Planning and Environment



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 techno-economic 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:

- Exchange of nutrients between algae-bacteria cultured separated by nano-porous gel.
- Rheological properties and flow dynamics of algae-bacteria co-cultures

What methods or research skills will you learn?

- Cell-culturing and microbiological techniques
- Rheology: Rheometer, Fluid dynamics, Stocks equation
- Analytical techniques: HPLC, Plate reader, FACS
- Data Analysis: MS-Excel, SPSS, ImageJ

My team:

- HDR Student: Kira Picknell
- Technical Staff: Hawraa E.; Mass B.

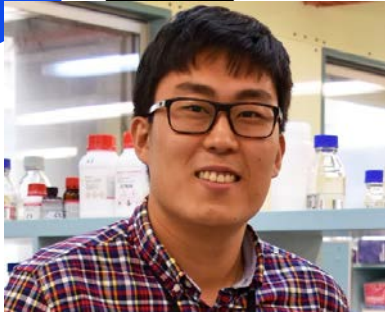
I collaborate with:

- UTS/C3 members

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 Jaesung Peter Choi

Chancellor's Research Fellow
Centre for Inflammation, School of Life Sciences
Jaesung.Choi@uts.edu.au

Dr Choi is an emerging researcher in the field of cardiovascular research. He received his PhD from the University of Sydney in 2016 and joined UTS in 2020 with Chancellor's Postdoctoral Research Fellowship. His research focuses on identifying a therapeutic targets for the commonest stroke in children: Cerebral Cavernous Malformation (CCM). His recent work includes development of a novel micro-CT imaging, identified the gut microbiome as a critical stimulant of CCM and repurposed an-FDA approved drug to treat experimental CCM.

Keywords: vascular biology, cardiovascular diseases, stroke, mouse model, genetics, micro-CT imaging

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

I supervise Honours projects on:

- Preventing stroke from cerebral cavernous malformations using precision microbiome (project 1) and sex hormone (project 2) therapies.

What methods or research skills will you learn?

- Protein extraction and analysis
- Mouse genetics
- Real-time PCR
- Micro-CT imaging
- Electron microscopy
- Fluorescent microscopy
- Flow cytometry
- Histology



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 Gang Liu

Senior lecturer, School of Life Sciences, Faculty of Science

Leader of Fibrosis Node, Centre for Inflammation, UTS/Centenary Institute

Gang.liu@uts.edu.au

Dr Liu was awarded his PhD in immunology and microbiology at the University of Newcastle in 2016. His PhD research is about airway and lung remodelling in chronic obstructive pulmonary disease, chronic asthma and idiopathic pulmonary fibrosis. He was a postdoctoral researcher in Hunter Medical Research Institute, and his research is to understand the role of mast cells (a type of immune cells) in lung diseases. Dr Liu moved to the Center of Digestive System at University of Newcastle for his second postdoc research (2017-2019), and his research was to link immune response, microbiota changes and gut fibrosis in inflammatory bowel diseases. Dr Liu joined in Centre for inflammation at UTS and Centenary Institute as the leader of Fibrosis Node in 2019. His current research focuses on tissue fibrosis related diseases in the lung and gut. His works are to understand the relationship of fibrosis and inflammation in the fibrotic diseases using animal models and clinical samples. These will identify novel therapeutic options to these fibrotic disorders.

Keywords: Fibrosis, inflammation, extracellular matrix protein, mast cells, lung, gut

Honours programs: Bachelor of Science (Honours)

I supervise Honours projects on:

- **Topic 1: Understanding of gut fibrosis in inflammatory bowel disease.**
Inflammatory bowel disease (IBD) is a chronic disease that associated with chronic inflammation induced structure change/fibrosis in the gut. This project is to understand how gut fibrosis contributes to the development of IBD.
- **Topic 2: The role of extracellular matrix proteins regulates in idiopathic pulmonary fibrosis.**
Idiopathic pulmonary fibrosis (IPF) is progressive disease that IPF patients have only 2-5 years survival time. It characterised with increased extracellular matrix proteins (a group of proteins to support lung structure), however the role of extracellular matrix proteins in IPF remains unknown. This project is to elucidate the mechanism of these proteins regulating fibrosis in IPF.

What methods or research skills will you learn?

- Histology analysis for remodelling and fibrosis
- Protein extraction and immunoblot
- Immunohistochemistry and immunofluorescent
- Cell culture
- Primary cells isolation
- Animal handling and models
- RNA extraction from mouse tissues and cells
- Real time PCR and qPCR
- ELISA

Our team

Fibrosis research team of Fibrosis Node in Centre for Inflammation (UTS/Centenary Institute)



Centre for Inflammation Proteomics Node

Node Leader
Science/ Multiomics
Matthew.orourke@uts.edu.au
Philip.hansbro@uts.edu.au

The establishment of the Proteomics Node for the centre for inflammation is a new initiative to enhance ongoing projects in respiratory disease, under the direction of chair of inflammation Prof Phil Hansbro and proteomics Node Leader Dr Matthew O'Rourke. The Node aims to develop and implement mass spectrometry based "Omics" style techniques and apply them to the analyses of a range of respiratory diseases including Chronic Obstructive Pulmonary disease (COPD), Severe asthma and the current COVID-19 pandemic. This work will be performed in collaboration with the Centre For Inflammations and its internationally recognised mouse models and track record in single cell RNAseq and histological analysis.

Professor Phil Hansbro is an internationally recognised research leader in the study of respiratory diseases, such as asthma, COPD, (aka emphysema) and COVID-19 infections. His work is substantially contributing to understanding the pathogenesis and developing new therapies for these diseases.

Dr Matt O'Rourke Completed his PhD in 2016 and was honoured with a place on the 2017 Chancellors list and a subsequent admission to the Royal Society of NSW. He is an emerging leader in the field of proteomics and mass spectrometry with an established track record in Imaging Mass Spectrometry (IMS), Liquid chromatography Mass Spectrometry (LC/MS) and biomarker discovery.

Keywords: COPD, Asthma, Proteomics, COVID-19, mass spectrometry, Multiomics
Honours programs: Bachelor of Science (Honours), Bachelor of Medical Science (Honours)

We supervise Honours projects on:

- Investigating the proteomic basis for the progression of COPD and COVID-19
- Understanding the development of steroid resistance in Asthma
- Development of Multiplex MS assays for high throughput proteomics on archival tissue

What methods or research skills will you learn?

- Protein extraction and analysis
- Mass spectrometry
- Metabolomics
- Lipidomics
- Multiomics and omics integration
- Post translational modification detection
- Molecular imaging
- Bioinformatics

Our team:

The Team at CFI consists of ~50 members including post-doctoral fellows, PhD Students, Honors students, Research assistants, administrative and support staff all under the directorship of Prof Phil Hansbro. We are the Number 1 emphysema research group in the world with an impeccable pedigree and strong commitment to world class research.



Dr. Saima Firdous Rehman

Position: Post-doctorate Research Associate

Discipline: Microbial Omics, School of Life Sciences

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Dr. Saima Firdous Rehman is an ECR who completed PhD (May 2022) from the University of Newcastle Australia. She is a trained respiratory microbiologist, immunologist, and bioinformatician working as a Post-doctorate Research Associate at the Faculty of Life Sciences, University of Technology Sydney. Dr. Saima's role is to lead the microbiome analysis and development of pipelines at the bioinformatics cluster at UTS. Dr. Saima has utilized the unique mouse models of cigarette smoke-induced experimental COPD, and customized diets to investigate the dietary effects on the key microbiome and lipid mediators changes involved in disease induction and progression. Dr. Saima has been involved in cutting-edge respiratory research with potential outcomes that will lead to the development of targeted therapies for COPD patients. Dr. Saima has pioneered the field of gut microbiome research in COPD, publishing the world's first gut microbiome and metabolome analysis in COPD (Nat Comm, 2020).

Website: <https://profiles.uts.edu.au/SaimaFirdous.Rehman/about>

Keywords: Chronic Obstructive Pulmonary Disease (COPD), Microbiome, Dietary interventions, *In vivo* experimental mouse model, Bioinformatics

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

Prof. Phil Hansbro and Dr. Saima Firdous Rehman will jointly supervise Honours projects on:

- Understanding the role of dietary lipids in COPD utilizing experimental mouse models and bioinformatics
- Investigating the role of GPR120 and omega-3 in experimental COPD to develop targeted therapies for COPD.
- Investigating the role of sphingolipids and associated pathways in the pathogenesis of COPD

What methods or research skills will you learn?

- Animal handling
- Immune cell quantification, airway modeling, and pulmonary fibrosis and lung function analysis
- RNA/DNA extraction
- RT-qPCR
- Big data integration and visualization, Bioinformatics

Team members

Dr. Alen Faiz

Dr. Sobia Idress

Research projects with other affiliated supervisors

The School of Life Sciences also offers Honours research projects with 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.



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
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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 Nham Tran

Associate Professor & REDI MTP Connect Fellow
Cancer Researcher
nham.tran@uts.edu.au

Dr. Tran is a cancer researcher who specialises in RNA biology and the development of POC PCR devices. He earned his PhD in RNA biology from Johnson and Johnson and UNSW, where he conducted the first study characterising small RNAs in head and neck cancers and holds several patents in this field. His research program focuses on utilizing small RNAs (miRNAs) as clinical biomarkers for early cancer detection and studying how these small RNAs regulate genes to trigger cancer onset. The team has identified specific miRNAs in head and neck cancers and is currently investigating these pathways. Additionally, Dr. Tran is researching viral oncology, with a focus on the HPV16 virus in oral cancers and how it alters noncoding RNAs to regulate oncogenesis. In addition to his clinical and basic research, He also has experience in constructing PCR machines for POC diagnostics. His lab welcomes enthusiastic students interested in cancer research to join their team. Lab website: www.tranlab.org

Keywords: Oral Cancer, Micornas, RNA Biology, HPV, Gene Regulation, Biomarkers

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

- miRNAs biomarkers for diagnosis of head and neck cancers
- Investigating the mechanistic role of miRNAs in cancer oncogenesis
- Developing a salivary 3 plex qPCR assay for clinical testing of HPV16
- Characterisation of cancer incidence in Head and Neck Cancers from SE Asia
- Nanotubes: cell to cell tunnels and their role in cancers
- Bioinformatics-miRNA targets and mapping of interactomes
- Next Gen qPCR assays for diagnosis

What methods or research skills will you learn?

- Cell culture and cell biology methods
- Molecular biology skills such as DNA cloning, CRISPR, PCR and qPCR
- RNA and DNA transfections, Luciferase assays, ASO technologies
- Bioinformatics, R studio, statistical analysis and pathway mapping using Cytoscape
- Working with clinical samples such as blood and tissue
- Learning to present data at weekly presentations at lab meetings and 1:1 meeting

Our team

Dayna Mason (PhD), Fiona Deutsch, Sumaiya Chowdhury, Jess Keatinge, Sarah Stapleton, and Lauren Pearn.

Available Co-Supervisors

- Shelia Donnelly, Valery Gay



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)

