STUDY WITH US: PROJECTS FOR MASTERS AND PHD CANDIDATES
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14 Research Supervisors and their projects
   • Molecular Biosciences
   • Clinical Translation
   • Healthy Communities
FHMRI brings together world-leading, innovative and inspiring research experts to improve health, prevent disease and combat health inequities.

We work with health practitioners and patients to better understand and seek solutions to the most pressing health and medical needs of Australians, inclusive of those in rural and remote communities.

The Institute is comprised of three research themes and a Research Education and Development Hub, which bring together diverse research and education strengths. The three thematic areas are:

1. **Molecular Biosciences**
   To cure disease and improve health, we need to know more about how the body works and then understand the molecular basis of what can go wrong. Our researchers are undertaking cutting-edge research to find scientific solutions to clinical dilemmas.

   We are making discoveries across an array of research programs including defining the complex mechanisms underlying the microbiome-gut-brain axis and the nervous system, identifying novel molecules and pathways involved in cancer, tackling immunity and drug resistant bacteria and creating new approaches to providing early disease detection methods and medical treatments.

2. **Clinical Translation**
   Our clinical researchers work to develop and implement new methods for the prevention, diagnosis and treatment of disease to improve health. This is facilitated by their co-location with Flinders Medical Centre and private hospital, and strong partnerships with rural and remote communities.

   Clinicians, researchers and nurses are working together to enhance understanding about blinding eye conditions, heart and vascular disease, sleep disorders, and many other diseases.

3. **Healthy Communities**
   Living a healthy life means more than just the absence of disease – it encompasses our physical, mental and social wellbeing. While many Australians enjoy good health, there is still an unacceptable divide in health inequalities.

   Our research is committed to understanding the effects of people’s circumstances on their health, including the impact of living in rural and remote locations and being Aboriginal and Torres Strait Islander peoples. We use health data research to minimise and prevent injury and disease and promote better health, and seek to improve the organisation and delivery of health services.
Research Education and Development (RED) Hub

Researchers of the Flinders Health and Medical Research Institute (FHMRI) are supported by the RED Hub, which has been developed specifically to support and nurture our talented researchers so that their work can have maximum impact.

FHMRI’s RED Hub provides support, training and professional and personal development for our researchers.

This includes our Honours and Higher Degree by Research (HDR) students (e.g. Masters and PhD).

How does RED Hub support our students?
The RED Hub provides an innovative suite of programs, training workshops, fora and events to promote excellence in research and build a vibrant, cohesive, interdisciplinary community. It provides:

• Mentoring Programs
• Research Seminar Programs
• Student communities of practice (online networking forums)
• Professional development opportunities (including CV development, careers workshops, milestone workshops, grant writing experience)
• Personal development opportunities (including leadership opportunities)

Mentoring
We aim to foster the development of students through mentoring programs. These programs are designed to facilitate the transfer of the personal and professional knowledge of an experienced person (mentor) to a less experienced staff member or student (mentee) to assist in the development of the mentee. The Honours and HDR mentoring program are run in a group format.
Become a FHMRI researcher and join our vibrant research community

Whatever your previous degree, there will be a research training position for you in one of our multidisciplinary research teams.

We have three overarching research themes in FHMRI: Molecular Biosciences, Clinical Translation and Healthy Communities. These include research in areas from medical science, clinical science, epidemiology, psychology and public health, to chemistry, biotechnology, pharmacology and more. There is a project for you within FHMRI.

You will be supervised by leaders in their field and work with researchers and/or clinicians from other disciplines in a truly collaborative, real-world health and medical environment.

We are committed to educating the medical researchers of the future; our expert and internationally recognised researchers will mentor you and create tailored opportunities for your career pathway.

This booklet contains projects currently being offered by FHMRI researchers. Feel free to contact them to discuss potential project opportunities for Honours or a Higher Degree by Research.

What is the process for enrolling in Honours or a Higher Degree by Research (PhD or Masters)?

1. Contact supervisor(s) of interest via email
2. Meet with the supervisor(s) to discuss potential projects and visit the facilities where the research will be conducted
3. Make sure you meet the eligibility criteria for Flinders University (you should discuss this with your potential supervisor as well). Check eligibility requirements as follows:
   - PhD & Masters candidates: flinders.edu.au/study/apply/apply-research-degree
4. Read the information about HDR scholarships at the following link: flinders.edu.au/study/apply/apply-research-degree/scholarships-fees
   - Keep in mind that the major round of scholarship applications closes on October 31st
5. Apply.

For further information contact:
Professor Briony Forbes,
Deputy Director, Research Education and Development (RED Hub);
briony.forbes@flinders.edu.au

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Overview of FHMRI research
Molecular Biosciences

PROJECTS

CANCER

Liver Calcium Signalling
• Ectrophysiological characteristics of liver cell calcium channels
• Molecular mechanism by which lipids alter channel activity
• Mechanisms by which the natural compound curcumin inhibits calcium channels activated by ischemia reperfusion
Emeritus Professor Greg Barratt

Molecular Medicine and Genetics
• Novel treatment strategies for Chronic Lymphocytic Leukemia (CLL)
• Identifying the mechanisms of venetoclax resistance in Acute Myeloid Leukemia (AML)
Dr Giles Best

Circular RNAs in Cancer
• Investigating RNAs: we are interested in how they are formed and regulated in cancer, human diseases and across stem cell differentiation
Associate Professor Simon Conn

Metabolism and Cancer
• Design cancer therapies based on targeting metabolic and growth pathways used by cancer cells
• Investigating insulin receptor and IGF-1R signalling in diabetes and cancer
Professor Briony Forbes

Chromosomal Instability and Cancer
• Test our hypothesis that more genetically disrupted cancer cells will produce more reactive oxygen species, and that this will be a useful prognostic marker for stratifying patient treatments
• Test our hypothesis that there is a novel aneuploidy sensing pathway that connects gain or loss of chromosomes with metabolic disruption
Dr Stephen Gregory

Precision Medicines
• Our group uses ‘big-data’ to develop prognostic tools that can present personalised likelihoods of therapeutic and adverse effects to cancer medicines
Dr Ashley Hopkins
• Investigate strategies to improve the use of targeted therapies in advanced cancers
Dr Madélé van Dyk

Immunomodulation
• Modulation of immune cell activation during Type 1 diabetes and islet transplant rejection
• Checkpoint inhibitors as an immunotherapy for cancer
• Investigating the interplay between vascular and endocrine cell types during islet transplantation
Dr Claire Jessup

Asbestos Diseases
• Establish and characterise mesothelioma cancer organoids which can be used to predict treatment response
• Molecular features of drug tolerant mesothelioma cell populations
• Next generation sequencing to understand the molecular events that cause non-invasive mesothelioma to become invasive
Associate Professor Sonja Klebe

Lymphoproliferative Research
• Drug resistance mechanisms in lymphoproliferative malignancies
• Lipid metabolism in CLL
• Redox and metabolic changes in CLL
Associate Professor Bryone Kuss

Genetics and Epigenetics
• Identification and confirmation of mutations in chronic lymphocytic leukaemia and similar blood diseases
• Identification and confirmation of breast cancer susceptibility genes
• Long range gene regulation and effects of repetitive regions on DNA methylation
Associate Professor Karen Lower
Pharmacology
- Assessment of the effects of potent DDAH1 inhibitors on a comprehensive set of metabolomic, biological and clinical end points of triple negative breast cancer and lung fibrosis
- Identification of the mechanisms that suppress DDAH1 activity under specific circumstances in order to identify novel DDAH1 “activators” for the treatment of diseases affecting the cardiovascular system, particularly hypertension and atherosclerosis

Professor Arduino A Mangoni & Dr Sara Tommasi

Gene Expression
- Study genes that mediate cancer cell responses to metabolic and epigenetic disruptors Non-coding RNA involvement in gastrointestinal cancers, characterise 3-dimensional organoid models of colorectal cancer

Associate Professor Michael Michael

Pharmacology
- Characterise the structural features of enzymes that bind specific drugs (e.g. anti-cancer drugs) and predispose to interactions between drugs in patients receiving polypharmacy

Dr Pramod Nair

Environmental control of cell growth and cell division
- Understanding cancer cell metabolism
- The impact of cell metabolism on DNA repair and its implications for aging and cancer
- Cancer cells survival under nutrient stress

Professor Janni Petersen

Prostate Cancer
- Development of novel therapeutic strategies to target the androgen receptor and cyclin-dependent kinases in lethal prostate cancer
- Cancer cell plasticity as a therapy resistance mechanism in lethal prostate cancer
- Non-coding genomic alterations as drivers of lethal prostate cancer

Associate Professor Luke Selth

Bowel Health
- Developing biomarkers to allow early detection and prevention of cancer
- Looking into risk of bowel cancer in people with a family history of cancer
- Using biomarkers to monitor success of cancer treatment
- Developing new ways to reduce the number of colonoscopies being done in Australia
- Determining the type (and combination) of polyps in the bowel that increase risk for cancer in the future
- Looking into whether people will make changes to their lifestyle to reduce cancer risk
- Improving the quality of colonoscopy in South Australia

Dr Lauren Thurgood

ERCCA and HER2
- Identification of the mechanisms that drive the central nervous system
- The impact of genetic predispositions on cellular function using brain cells derived from Parkinson’s patients

Dr Cedric Bardy

Multiple Myeloma Translational Research
- Manipulating endoplasmic reticulum stress levels in multiple myeloma cells to enhance the cytotoxic effects of proteasome inhibitors
- Biomarker and therapeutic roles of adhesion proteins in multiple myeloma
- Characterising drug efflux transporters on multiple myeloma cells to enhance therapeutic responses
- Elucidation of the role a novel iron-dependent cell death mechanism termed ‘ferroptosis’ plays in the survival of multiple myeloma cells and how this biological process contributes to the efficacy of drugs used to treat this cancer

Professor Stuart Brierley

Multiple Myeloma Research
- Targeting transport, signalling and destruction inside the cancer cells
- Astrocyte stress reactivity networks in proteotoxic stress and activation in diseases of the nervous system
- Regulation of ubiquitin signalling and membrane organelles in Parkinson’s disease

Associate Professor Erin Symonds

Lymphoproliferative Research – Proteomics and Metabolism
- The effect of the tumour microenvironment on CLL cell survival
- Assessing proteome changes following targeted therapies
- Targeting metabolic pathways in CLL as a novel therapeutic strategy

Dr Craig Wallington-Beddoe

NEUROSCIENCE

EMBL Australia Organelle Biology and Disease
- Targeting transport, signalling and destruction inside the cancer cells
- Astrocyte stress reactivity networks in proteotoxic stress and activation in diseases of the nervous system
- Regulation of ubiquitin signalling and membrane organelles in Parkinson’s disease

Associate Professor Pirjo Apaja

Human Neurophysiology and Genetics
- Design innovative biotechnologies to biomimic the human brain microenvironment to grow and study live neuronal tissue derived from induced pluripotent stem cells in vitro
- The influence of the human brain microenvironment on the cancerous progression of glioblastoma and its resistance to current chemo- and radio therapies
- The impact of genetic predispositions on cellular function using brain cells derived from Parkinson’s patients

Dr Cedric Bardy

Visceral Pain
- Potential projects include investigating visceral pain mechanisms from the level of the single cell through to intact pathways and clinically relevant models of visceral pain (including irritable bowel syndrome, inflammatory bowel disease, bladder pain syndrome and endometriosis)

Professor Stuart Brierley

Visceral Pain
- Understanding the mechanism by which sensory neurons detect pelvic pain associated with endometriosis, and how pain is transmitted and processed to/by the central system

Dr Joel Castro Kraftchenko

Visceral Pain
- Understanding the mechanisms responsible for the development of chronic pelvic pain and the development of novel and safe pharmacotherapies

Dr Luke Grundy
Overview of FHMRI research
Molecular Biosciences

PROJECTS

• Characterisation of spinal projection neurons relaying visceral pain into the brain
• Identifying altered sensitivity of visceral afferent input and spinal cord dorsal horn circuits in models of chronic visceral pain
• Sites of central convergence between visceral organs

Dr Andrea Harrington

Childhood Dementia
• Evaluation of a novel, clinically relevant therapeutic strategy in an authentic mouse model, determining whether treatment can a) prevent or b) reverse established disease.
• Examining tissues from the mouse and human central nervous system to better understand the disease processes occurring in childhood-onset dementia and to identify novel therapeutic intervention points

Associate Professor Kim Hemsley

Molecular Dementia and Memory
• Tau and kinase-mediated signal transduction using different biological model systems
• Molecular processes encoding mammalian cognitive function and molecular events that control memory and other brain functions

Dr Arne Ittner

Molecular and Cellular Physiology
• How does the microbiome control our metabolism?
• How does the food we eat activate gut hormone release?
• How does the gut speak to our brain?

Professor Damien Keating

Sensory Cell Biology
• Development of a sentinel cell line to detect and differentiate between pain types in serum
• Development of a novel neuron-chip interface that allows growth of different pain neurons phenotypes
• Detection of human vesicular miRNAs in complex CSF solutions

Dr Dusan Matusica

Motion vision
• Exploration of the neural mechanisms underlying motion vision

Professor Karin Nordström

Integrative Neuroscience
• Elucidation of brain mechanisms for autonomic physiological responses to emotional stress

Associate Professor Yoichiro Otsuka

MND& NR Research
• Motor Neuron Disease; examining urinary biomarkers that may be prognostic or pharmacodynamic

Dr Mary-Louise Rogers

Learning and neurological disease using a nematode model
• Investigating how a specific neuropeptide signalling pathway controls both feeding and mating behaviours
• Assessing the proteomic changes associated with memory formation
• Investigating the role of neuronal dopamine signalling in pain sensitisation

Dr Yee Lian Chew

INFECTION & IMMUNITY

Molecular Virology
• Functional analysis of the dengue virus NS1 protein through high-throughput mutagenesis, molecular virology and high-resolution imaging
• Identification and characterisation of novel antiviral drugs that target the dengue virus NS1 protein through high-throughput screening, high resolution imaging and structural analysis
• Identification and development of small molecule inhibitors of the essential interaction between SARS-CoV-2 nsp3 and nsp4 proteins

Dr Nicholas Eyre

Immunology Autoimmunity and COVID-19
• Molecular signatures or barcodes of antibodies in the above diseases are used in the clinical setting as biomarkers of blood antibody responses and as markers of treatment responses

Professor Tom Gordon & Dr Jing Wang
Eye and Vision Health
• Response of human eye cells to infection with emerging viruses (Dengue virus, Zika virus, Ebola Virus)
• Toxoplasma gondii infection of human eye cells
• Migration mechanisms for leucocytes into the human eye
• Treatment strategy for COVID-19
Professor Justine Smith

Microbiome and Host Health
• Investigations of the complex mediatry role of the human microbiome in acute and chronic conditions including acute infections in those receiving intensive care, recurrent urinary tract infections, chronic lung disease, cancer, and ageing-associated cognitive decline
Professor Geraint Rogers

Chronic Disease
• Elucidating mucosal barrier function in autoimmune disease
• Application of precision medicine techniques to understand the drivers of autoimmune disease
Dr Elke Sokoya

OTHER
Medical Biotechnology
• Development of single cell oils rich in omega-3 fatty acids to assist human nutrition
• Development of controlled alginate hydrolysis for medical applications
• Characterisation of the delivery of therapeutic proteins to diseased cells
• Targeting fatty acid metabolism for containing obesity

Protein Misfolding and Inflammation
• Characterising the dual roles of hypochlorite as an inducer of protein misfolding and a regulator of extracellular proteostasis machinery
• Characterising the extracellular proteostasis network in pregnancy
• Elucidating the role of protein misfolding in pregnancy-associated complications
• Investigating non-canonical functions of human alpha-macroglobulins in health and disease
Dr Amy Wyatt

Centre for Marine Bioproducts Development
• Food and nutraceutical developments from marine bioresources
• Marine microbial natural products development for industry application
• Novel 3D-bioprinting marine-derived biomaterials and bioinks
• Development of Australian seaweed-based functional foods and biodegradable bioplastics
Professor Wei Zhang
Overview of FHMRI research

Clinical Translation

PROJECTS

Lung Disease
- Investigation into the physiological outcomes and hemodynamic effects of fluid instillation with the creation of a two-hit acute lung injury model, utilising ventilator-induced injury or bacterial stimulated inflammation
  
  **Associate Professor Shailesh Bihari**
  - Investigation into the physiological and immunological outcomes of bacterial and viral induced respiratory inflammation

  **Associate Professor Dani-Louise Dixon**
  - Modulate the proinflammatory response during acute respiratory inflammation by exposure to a low-to-moderate dose of ionising radiation, thereby reducing the severity of injury to the lung

  **Dr James McEvoy-May**

Sleep Health
- Evaluating aspects of a new respiratory-mechanics based method for assessing breathing effort and timing in ICU or in a Sleep Health context
- New methods for assessing noise impacts on sleep and health outcomes

  **Associate Professor Shailesh Bihari & Professor Peter Catcheside**
  - Environmental noise impacts on sleep, functioning and health
  - The use of circadian-system guided lighting strategies
  - Improving sleep in patients with motoneurone disease using new monitoring technology
  - Respiratory load sensory mechanisms
  - Improved methods for assessing personal protective equipment (PPE) mask resistance, leak and filtration performance effectiveness

  **Professor Peter Catcheside**

- Multiple projects including detailed upper airway physiology studies to advance knowledge on the mechanisms of upper airway muscle reflexes and how impaired pharyngeal muscle function contributes to airway collapsibility through to clinical trials aimed at delivering one or more targeted therapies to treat sleep apnoea including new pharma therapies

  **Professor Danny Eckert**
  - Assessment of the efficiency of breathing in health and disease and determining the underlying mechanisms of muscle activation in movement control and strategies for rehabilitation

  **Dr Anna Hudson**
  - Evaluating the efficacy of personalised treatments for insomnia (including wearable devices) and new models of care to transform the management of insomnia and associated mental ill-health

  **Dr Nicole Lovato**

  **Dr Gorica Micic**
  - Better understand sleep, insomnia and circadian rhythms to create targeted and more effective treatments including cognitive behavioural therapy, bright light therapy, melatonin

  **Dr Andrew Vakulin**

Paediatric, Reproductive and Perinatal Pharmacoepidemiology
- Improving maternal and child health through the development and promotion of safer, more effective and personalised approaches to pharmacotherapy

  **Associate Professor Luke Grzeskowiak**

Cancer
- Finding My Way program
- Healthy Living after Cancer – online
- Defining symptoms & impacts of Adjustment Disorder in cancer
- Reducing the burden of cardiovascular disease in breast cancer patients and survivors
- iSCREEN
- Identifying the predictors of digital engagement for people with cancer

  **Professor Bogda Koczwar**
  - Detect precancer or cancer at its earliest stage when cure is more likely
  - Cost-effectively deliver Barrett’s oesophagus (precancer) surveillance by stratifying for cancer risk and targeting individuals at significant risk
  - Develop a cost-effective framework for Barrett’s oesophagus screening

  **Professor David Watson**

Urology
- Epidemiologic methods including predictive modelling, systematic literature reviews with meta-analysis, covering topics ranging from screening and treatment selection to health-related quality of life

  **Associate Professor Michael O’Callagahan**
Heart Health

- The establishment of a Human Tissue Biobank through collection of biological samples from those living with peripheral arterial disease
- The application of immunohistochemistry to interrogate atheromatous tissue will provide insight into the inflammatory cellular milieu

Associate Professor Chris Delaney

- Coronary artery disease, non-ischaemic cardiomyopathy and hypertrophic cardiomyopathy. The research program uses Cardiovascular Magnetic Resonance Imaging, Cardiac Computed Tomography and echocardiography as mechanistic, diagnostic and prognostic tools to investigate pathophysiology, diagnosis and outcome of heart disease

Professor Joseph Selvanayagam

Liver

- Clinical research into new models of care for chronic liver failure
- Applying new therapies for hepatocellular carcinoma
- Investigating new models of liver care for remotely living Aboriginal and Torres Strait Islander peoples
- Investigating heart disease in patients with cirrhosis

Professor Alan Wigg

Rheumatology

- Improve understanding of mechanisms of response, or lack thereof, to biologic DMARDs
- Improve understanding of RA pathophysiology by characterising newly identified macrophage, fibroblast, and T-cell subsets and analysing their responses to treatment
- Attempt to identify markers that will reliably predict RA remission and flare

Associate Professor Jenny Walker & Associate Professor Mihir D Wechalekar
Overview of FHMRI research
Healthy Communities

PROJECTS

Personalised Health Informatics
- Contact tracing and social distancing intervention
- Digital tools for mental health professionals to interact and support patients outside the clinic
- Systematic reviews
- Novel health interventions
- COVID-19 & mental health

Associate Professor Niranjan Bidargaddi

Behavioural
- Smoking and alcohol cessation in rural & remote Australia
- Designing tobacco control messages for people with mental ill health
- Examining the tobacco industry involvement policies of health research societies and associations
- Design and evaluation of a health mobile phone app for pregnant Aboriginal mothers and their children under 5 years
- Designing and evaluating youth resilience strategies for young people in rural and remote and Aboriginal communities

Professor Billie Bonevski

Health Economics
- Telehealth services in primary care
- Comparing methods of Health Technology Assessment in Australia and the UK
- Evaluation of policy reforms in the community-based aged care services
- Assessing the costs and benefits of incorporating more complex model structures for the economic evaluation of new health technologies

Associate Professor Hossein Afzali

Dr Candice Oster
- Cross-sectional studies focusing on health risk behaviours, including tobacco cessation, alcohol consumption, quality of life domains, risk attitudes and motivations, with various populations

Dr Joshua Trigg
- Determining how physical, social, psychological, and economic impacts of life changing events inhibit access to treatments for common mental health conditions.
- Increasing and improving access to mental health support.

Dr Anthony Venning

Dr Laura Edney
- Assess the performance and validity of using sleep-specific quality of life outcome measures in economic evaluation relative to frequently used preference measures
- Assess the economic impact of avoidable hospital readmissions due to acute coronary syndrome and chest pain

Associate Professor Billingsley Kaambwa
- Evaluating options for improving the organisation and delivery of health care in the Emergency Department
- Designing and evaluating models of care to reduce inpatient length of stay
- Evidence-based co-design of interventions to reduce Hospital Acquired Complications

Professor Jonathan Karnon
- Substitution of doctors by nurses and allied health professionals in hospitals and residential aged care
- Hospital avoidance programs in acute care
- Patient flow, overcrowding and access block in hospitals
- Use of health economics to inform decision making in local health networks

Dr Tim Schultz

Rural & Remote Health
- Rural and remote workforce retention

Associate Professor Narelle Campbell
- Dementia care in rural and remote Australia
- Novel psychosocial and cognitive markers of suicide behaviours

Dr Vivian Isaac

Dr Kate Fairweather
- The use of theories and models of behavioural health to explore and understand health behaviours and inform interventions at the individual, community, organisational, and policy levels
• Analyse existing data to provide additional information about the decision making process nursing and allied health students and recent graduates undertake when they consider rural and remote practice

Dr Chris Rissel & Ms Annie Farthing
• Evaluation of local Aboriginal and Torres Strait Islander cultural safety training which is provided to nearly all students and new employees working in health services in the Northern Territory

Dr Chris Rissel

Health, Society and Equity (Southgate)
• Analyse data on the impact of the distribution of the social determinants of health (e.g. employment, education, housing, income) on health equity

Dr Joanne Flavel

• Develop a comprehensive history of community health services in Australia (including women’s and Aboriginal and Torres Strait Islander health services) which offer a different model of care to the mainstream medical model

Professor Fran Baum & Associate Professor Anna Ziersch

Aboriginal and Torres Strait Islander Public Health
• Ear health; development of strategies to improve ear health screening and the treatment pathways
• Kidney health; the complex interplay between age, gender, socio-economic status, and geography in the development of chronic disease among Aboriginal and Torres Strait Islander young people
• Infectious disease epidemiology
• Consumer decision-making; the role of children

Dr Jacqueline Stephens

• Assessing the role of Aboriginal Liaison Officers in hospitals
• How to change the way in which nutrition research and practice is delivered to Aboriginal people

Dr Annabelle Wilson

Women, Alcohol and Breast Cancer Prevention
• Seek understanding of how women’s perception of breast cancer risk is relative to the social conditions (gender, age, social class and cultural/environmental drivers) that shape women’s reasons and logic for continuing or modifying alcohol consumption

Professor Paul Ward
Supervisor name: **Dr Cedric Bardy**

Supervisor email: cedric.bardy@flinders.edu.au

Name of research group: Laboratory for Human Neurophysiology and Genetics

Description of research area and interests:
We bioengineer live human brains in vitro. The brain cells are generated from fresh biopsies or cellular reprogramming of induced pluripotent stem cells. Our research program is at the frontier of human cellular neuroscience research and translational applications that benefit global public health. Our lab has expertise in a range of state-of-the-art technologies including transcriptomics, machine learning-based analysis, electrophysiology and functional imaging. We currently focus on discovering treatments for brain cancer and neurodegenerative disorders.

Outline of project:

1. Targeting transport, signalling and destruction inside the cancer cells
2. Astrocyte stress reactivity networks in proteotoxic stress and activation in diseases of the nervous system
3. Regulation of ubiquitin signalling and membrane organelles in Parkinson’s disease

Skills students will gain:

Knowledge of:
- proteotoxic stress signalling, protein quality control
- membrane protein and organelle function
- post-translational modifications
- protein interactions and networks in human diseases

Experience in:
- molecular biology, protein chemistry and cell biology
- advanced fluorescence microscopy
- culture of cancer cells and primary astrocytes and neurons

www.emblaustralia.com
portal.sahmriresearch.org/en/persons/pirjo-apaja

Location: SAHMRI

Supervisor name: **Associate Professor Pirjo Apaja**

Supervisor email: pirjo.apaja@flinders.edu.au

Name of research group: EMBL Australia Organelle Biology and Disease

Description of research area and interests:
Our group is studying faulty membrane transport and signals in cancers such as brain blastomas and diseases of the nervous system e.g., Parkinson’s disease, neurodevelopmental disorders. We are finding targets and discovering ways to support cells to fight against proteotoxic stress. Our cells are constantly moving materials inside them, and during this process repair or degrade damaged molecules. Sometimes this movement through membrane transport gets jammed, causing accumulation of harmful materials, faulty cell signalling, aberrant differentiation or uncontrolled cell division. This can lead to cancer or a neurodevelopmental or neurodegenerative disease. Our laboratory uses multidisciplinary techniques: targeted proteomics and computational protein network studies, biochemical and cell biological assays and advanced light microscopy with relevant human disease models in cells, mice, and Drosophila. Our goal is to find drug targets, mechanisms and biological identifiers for early-stage causative disease-associated molecular changes.

Outline of projects:

1. Targeting transport, signalling and destruction inside the cancer cells
2. Astrocyte stress reactivity networks in proteotoxic stress and activation in diseases of the nervous system
3. Regulation of ubiquitin signalling and membrane organelles in Parkinson’s disease

Skills students will gain:

Knowledge of:
- proteotoxic stress signalling, protein quality control
- membrane protein and organelle function
- post-translational modifications
- protein interactions and networks in human diseases

Experience in:
- molecular biology, protein chemistry and cell biology
- advanced fluorescence microscopy
- culture of cancer cells and primary astrocytes and neurons

www.emblaustralia.com
portal.sahmriresearch.org/en/persons/pirjo-apaja

Location: SAHMRI
Supervisor name: Emeritus Professor Greg Barritt
Supervisor email: greg.barritt@flinders.edu.au
Name of research group: Liver calcium signalling group
Description of research area and interests:
We are studying the role of intracellular calcium as a signalling molecule in liver disease. We are particularly interested in two liver pathologies. The first pathology relates to how altered intracellular calcium signalling contributes to the accumulation of lipid in liver cells in non alcoholic fatty liver disease (NAFLD). This NAFLD can progress to more serious liver disease, such as non alcoholic steatohepatitis (NASH) and hepatocellular carcinoma. The second pathology involves the role played by intracellular calcium in liver ischemia reperfusion injury (IRI is the paradoxical damage of restoring blood supply to tissue), which can occur following surgical liver resection for liver cancer and in liver transplant surgery.
We utilise the disciplines of cell physiology, biochemistry and molecular biology to investigate calcium signalling in liver cells. We have a particular knowledge and interest in the application of electrophysiology (patch clamp recording) to study calcium channels, and the use of intracellular fluorescent calcium reporters and cell imaging to measure intracellular calcium. We collaborate with liver surgeons in the S.A. Liver Transplant Unit (Flinders Medical Centre) in trying to understand pathological intracellular calcium signalling in the human liver.

Outline of projects:
We know that lipids in steatotic liver cells inhibit calcium channels in the plasma membrane and endoplasmic reticulum. We also know that other calcium channels in the liver cell plasma membrane are activated by ischemia reperfusion. However, molecular mechanisms involved in these processes remain to be understood. We are keen to investigate areas that include:
1. Are the electrophysiological characteristics of liver cell calcium channels altered by lipid accumulation?
2. What is the molecular mechanism by which lipids alter channel activity?
3. What is the mechanism by which the natural compound curcumin inhibits calcium channels activated by ischemia reperfusion?

Skills students will gain:
- Fluorescence microscopy
- Patch clamp recording and electrophysiology
- Cell culture
- Molecular biology techniques especially cell transfection
- Anatomy, cell biology, and physiological functions of the liver

Key staff associated with project:
Dr Grigori Rychkov. flinders.edu.au/people/cedric.bardy
www.bardylab.com

Location: SAHMRI
Research Supervisors and their projects
Molecular Biosciences

Supervisor name: Dr Giles Best
Supervisor email: giles.best@flinders.edu.au
Name of research group: Molecular Medicine and Genetics

Description of research area and interests:
With the head of the Molecular Medicine and Genetics department, Associate Professor Bryone Kuss, we are responsible for co-ordinating aspects of a research program on Chronic Lymphocytic Leukemia (CLL) and Acute Myeloid Leukemia (AML). My work focuses on understanding the mechanisms that drive the survival and proliferation of leukemia and lymphoma cells. I am particularly interested in the role of the tumour microenvironment and how the interaction between leukemia/lymphoma cells and the other cells that comprise the TME can confer resistance to therapy. The goal of the work is to use this information to identify novel therapeutic strategies.

Outline of project:
• Novel treatment strategies for Chronic Lymphocytic Leukemia (CLL)
• Identifying the mechanisms of venetoclax resistance in Acute Myeloid Leukemia (AML)

Skills students will gain:
• Experience in a range of scientific techniques, including flow cytometry, western blotting, mass spectrometry
• The ability to design and execute experimental plans
• Communication skills necessary for relaying scientific information to teams of clinicians and fellow scientists in both written and oral formats

Key staff associated with project:
Associate Professor Bryone Kuss
Associate Professor Karen Lower
Dr Lauren Thurgood
Dr Binoy Appukuttan
Dr Stephen Gregory.
flinders.edu.au/people/giles.best
Location: Flinders Medical Centre

Supervisor name: Professor Stuart Brierley
Supervisor email: stuart.brierley@flinders.edu.au
Name of research group: Visceral Pain Research Group

Description of research area and interests:
Our research focuses on common forms of chronic pain that arise from our internal organs. In particular, we focus on the ‘Gut-brain’ axis, which allows processes in the gut to be detected and felt. This includes investigating epithelial cells, afferent neurons, spinal cord mechanisms, brain neurochemistry and pain responses using a wide array of state of the art molecular, genetic, pharmacological and functional techniques. This is complemented by using clinically relevant models of inflammatory bowel disease (IBD) & irritable bowel syndrome (IBS) as well as samples from human patients.

We also focus on common conditions affecting other visceral organs, including bladder pain syndrome and endometriosis, which utilizes similar techniques to those described above. We have a track record of publishing in high impact journals including Nature (PMID: 27281198), Cell (PMID: 28648659), PNAS (PMID: 30012612), Nature Communications (PMID: 24476666), Gastroenterology (PMID: 23958540) and JCI Insight (PMID: 31536477)

Outline of projects:
We offer a wide range of potential projects on these topics that we’d be delighted to discuss with you. This includes investigating visceral pain mechanisms from the level of the single cell through to intact pathways and clinically relevant models of visceral pain (including irritable bowel syndrome, inflammatory bowel disease, bladder pain...
syndrome and endometriosis). We also have samples from these patient cohorts which allows translation from our pre-clinical studies to human tissue.

Your project will utilize a wide array of state of the art molecular, genetic, pharmacological and functional techniques, which allows us to determine how our internal organs communicate with our brain to generate the symptoms of chronic pain. Our lab (& your project) is already funded by NHMRC, ARC and NIH.

Skills students will gain:

- Electrophysiology (afferent, and patch clamp)
- Microscopy (epifluorescence, confocal, slide scanning)
- Neuroanatomy (circuit tracing)
- Molecular approaches (immunohistochemistry, real time PCR)
- In vitro neurophysiology imaging (calcium imaging)
- Physiology (whole animal approaches)
- Data analysis and management
- Laboratory small animal handling

Key staff associated with projects:

Dr Joel Castro
Dr Andrea Harrington
Dr Luke Grundy
Dr Gudrun Schrober
Dr Sonia Garcia-Caraballo
Dr Mariana Brizuela.

Description of research area and interests:
The underlying mechanisms of chronic pelvic pain associated with endometriosis are poorly understood, with no efficacious treatment to date. Our research focuses on identifying the molecular entities and mechanisms responsible for pain detection and transmission in endometriosis. This will provide novel therapeutic strategies and ultimately improve the quality of life of patients with endometriosis.

We have a wide array of state-of-the-art molecular, genetic, imaging, pharmacological and functional techniques in our lab. We also have access to diverse core facilities available at SAHMRI and in campus. This is complemented by the use of pre-clinical models of endometriosis, as well as clinical samples from human patients.

Outline of projects:
The first step in the pain pathway is the sensory neurons that project from peripheral tissues to the central nervous system (CNS). How sensory neurons detect/transmit pain from pelvic organs affected by endometriosis is not known, providing a limiting factor for developing treatments for endometriosis-related chronic pelvic pain. There is a fundamental lack of understanding of:

1. The types of sensory neurons innervating the uterus and the vagina, and how pain is detected from these sites.
2. The precise ion channels/receptors expressed within these afferents, which govern their function.
3. How these sensory neurons are altered in endometriosis.
4. What changes in ion channel/receptor expression occur to trigger these alterations and ultimately generate chronic pelvic pain.

Our group is currently working to fill this gap of knowledge. We offer a wide range of potential projects within these topics that we’d be delighted to discuss.

Skills students will gain:
The student will acquire a series of intellectual and practical skills relevant to the research on chronic visceral pain-associated with endometriosis.

- The design and execution, in a timely manner, of a concrete scientific project
- Experimental techniques ranging from the molecular/cellular level to the whole organism.
- Analysis and interpretation of complex data sets.
- Development of the student’s scientific writing and oral communicative skills.
- Working with a dynamic research team, in a real-life, science-related working environment.

Key staff associated with projects:

Professor Stuart Brierley
Dr Luke Grundy
Dr Andrea Harrington
Ms Jessica Maddern.
Research Supervisors and their projects
Molecular Biosciences

Supervisor name: 
Dr Yee Lian Chew
Supervisor email: yeelian.chew@flinders.edu.au
Name of research group: Chew worm lab

Description of research area and interests:
In the Chew worm lab, we are interested in investigating the fundamental basis of learning and neurological disease using a nematode (worm) model. We use the worm because it has a compact and experimentally accessible nervous system of only 300 neurons, and it’s transparent! – which makes visualising neuronal responses and changes really simple and can be conducted in real-time in living animals. Some of the questions we are interested in include:

• What genes are required for associative learning responses?
• What are the neuromodulators required for sensitisation of pain receptor cells?
• How are neuropeptides used to switch between behavioural states of feeding and mating?
• What are the interactors of disease-associated genes such as SOD1 in motor neuron disease?

Outline of projects:
• Caenorhabditis elegans is a small nematode worm that has a compact nervous system of 302 neurons and an unrivalled access to genetics and live-animal microscopy. This makes the nematode system a highly effective model for neuroscience studies. The lab is focused on understanding the cellular and molecular basis of nervous system functions, focussing on the ability to acquire experience-dependent behavioural changes.

Examples of projects offered include:

Investigating how a specific neuropeptide signalling pathway controls both feeding and mating behaviours: Male worms have an intriguing adaptive response in that they will choose to leave a good source of food in order to search for mates, suggesting that there is a control mechanism that switches their behaviour from active feeding to active mate-searching. We have found that a neuropeptide LURY-1 is found in neurons that control feeding, as well as other neurons that regulate male mating behaviour. This project will seek to test if LURY-1 contributes to this behavioural switch in male worms, using established genetic knockout and transgenic lines that express the peptide specifically in either feeding neurons or mating neurons. This would reveal a previously unknown system for control of adaptive behaviour in an animal model.

Assessing the proteomic changes associated with memory formation: Classical conditioning is a form of learning where animals associate a biologically potent stimulus (e.g. food or starvation) with a normally innocuous stimulus (e.g. a sound/smell/taste). If worms are cultivated in a high salt buffer in the absence of food, they will associate high salt with starvation, and will henceforth start to avoid high salt conditions. This project will use a cutting-edge technology called TurboID to analyse protein-based changes in salt-sensing neurons in naïve and conditioned animals to determine what proteomic changes are associated with new learning behaviours.

Investigating the role of neuronal dopamine signalling in pain sensitisation: Sensitisation of pain receptors is a key step in the development of chronic pain, a condition that affects up to one-fifth of Australians. The molecular mechanisms underlying sensitisation are not yet well understood. Our research suggests that the neurochemical dopamine is important for sensitisation of critical components of pain-sensing neural circuits. This project will investigate dopamine-dependent mechanisms on pain sensitisation in C. elegans, using techniques such as advanced microscopy, CRISPR/Cas9 and high-throughput behavioural analysis.

Skills students will gain:
• Nematode handling and maintenance
• Molecular Biology and cloning
• Genetics/genetic crosses
• Animal behaviour experiments
• Transferable life skills – writing, organisation, time management, oral presentation skills, teamwork, working autonomously

Key staff associated with projects:
PhD students in Chew lab
Collaborators nationally.

www.flinders.edu.au/people/yeelian.chew
www.chewwormlab.wordpress.com/
Want to know more about worms? www.wormbook.org/ or youtube.com/watch?v=zjqlLwPgLnv0&ab_channel=OpenWorm
Location: Flinders Medical Centre
Associate Professor Simon Conn

Supervisor email: simon.conn@flinders.edu.au

Name of research group: Circular RNAs in Cancer Laboratory

Description of research area and interests:
Throughout my career, I have loved the challenges and opportunities of Molecular & Cellular Biology. Despite DNA sequencing identifying 26,000 genes, next-generation sequencing of the RNA transcripts has shown, unequivocally, that the canonical RNAs from these genes are the exception, rather than the rule. We are the only dedicated laboratory in Australia investigating the most contemporary class of non-coding RNA transcripts in eukaryotes, called circular RNAs. We are interested in how they are formed and regulated in cancer, human diseases and across stem cell differentiation. These are my molecular heroes and once you start researching them, I guarantee you will not be able to stop.

Outline of projects:
All projects in my laboratory are focussed on the initiation, progression, diagnosis and treatment of human disease, with a particular focus on cancers. The common element to these projects is that students possessing a high level of molecular biology skills and motivation to make a difference (to even one person) will find the laboratory an excellent environment for achieving high-impact outputs.

Skills students will gain:
• Unparalleled knowledge of molecular biology – we will award students who are proven to be proficient in Molecular Biology a certificate of competence which can be used in their CV for future employment.
• Students will improve their critical thinking about scientific questions and appropriate experimental design

Key staff associated with projects:
Dr Vanessa Conn
Dr Marta Gabryelska
Dr Brett Stringer.

flinders.edu.au/people/simon.conn

Location: Flinders Centre for Innovation in Cancer
**Research Supervisors and their projects**

**Molecular Biosciences**

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**Supervisor name:**

**Dr Nicholas Eyre**

**Supervisor email:**

nicholas.eyre@flinders.edu.au

**Name of research group:** Molecular Virology Group

**Description of research area and interests:**

Our research focuses on virus-host interactions and viral genome replication for the related (+)RNA viruses dengue virus (DENV), Zika virus (ZIKV) and hepatitis C virus (HCV). In particular we apply novel reporter virus tools, sensitive and minimally invasive high-resolution imaging techniques and targeted and random manipulation of viral genomes to better understand the viral and host determinants of viral replication compartment formation, morphology and function and how viral replication complexes interact with viral assembly platforms. We also apply our novel reporter viruses and associated technologies towards high-throughput screening of novel antiviral drug candidates. It is hoped that identification of features of viral proteins and virus-host interactions that are essential for the viral replication cycle will identify targets for future antiviral drug development. Furthermore, through application of novel reporter virus tools and high-throughput screening and imaging we aim to identify and characterise novel small molecule antiviral drug candidates for further pre-clinical testing and characterisation.

**Skills students will gain:**

- Molecular and cell biology (cloning, mutational approaches, gene expression analysis, cell culture, heterologous gene expression)
- Protein-protein interaction assays (co-immunoprecipitation, proximity ligation assays, luminescence/fluorescence-based reporter assays)
- High resolution confocal microscopy and live cell imaging
- Automated imaging for high-throughput screening

**Key staff associated with projects:**

Dr Amanda Aloia
Associate Professor Jill Carr
Dr Tim Chataway
Dr Alex Colella.

[flinders.edu.au/people/nicholas.eyre](flinders.edu.au/people/nicholas.eyre)

**Location:** Flinders Medical Centre

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**Supervisor name:**

**Professor Briony Forbes**

**Supervisor email:**

briony.forbes@flinders.edu.au

**Name of research group:** Proteins in Metabolism and Cancer

**Description of research area and interests:**

The Forbes lab aims to develop novel treatments for diabetes and cancer through understanding the basic mechanism by which insulin and insulin-like growth factors (IGFs) bind and activate their receptors to promote metabolic control, cell growth and survival. Surprisingly we still lack fundamental information as to how insulin and IGFs interact with their receptors to promote the key conformational changes required to activate the receptor tyrosine kinase domains and subsequent downstream signalling pathways. We will probe this interaction by making novel mutants of the ligands and the receptors and then testing these in cell-based assays for their abilities to promote downstream signalling. This will allow us to understand in detail which interactions between the ligands and the receptors are key for promoting specific receptor activation outcomes. Ultimately this information will allow us to create novel insulins for the treatment of diabetes and novel IGF inhibitors for the treatment of cancers that are dependent on IGF signalling for growth and survival.

**Outline of projects:**

- Functional analysis of the dengue virus NS1 protein through high-throughput mutagenesis, molecular virology and high-resolution imaging
- Identification and characterisation of novel antiviral drugs that target the dengue virus NS1 protein through high-throughput screening, high resolution imaging and structural analysis
- Identification and development of small molecule inhibitors of the essential interaction between SARS-CoV-2 nsp3 and nsp4 proteins

**Location:** Flinders Medical Centre

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Skills students will gain:
Technical skills gained will include molecular biology, protein expression and purification, immunoblotting, cell culture, in vitro biological assays (metabolic and cell growth assays). Broader analytical, critical thinking and oral and written communication skills will be gained. You will have opportunities to meet and network with exceptional national and international researchers in the field. Prior knowledge of cell biology, signalling and protein structure and function would be helpful but not essential.

Key staff associated with projects:
Ms Carlie Sawtell
Ms Allanah Merriman
Mr Andrew Blyth.
flinders.edu.au/people/briony.forbes

Location: Flinders Medical Centre

Supervisor name: Professor Jonathan Gleadle
Supervisor email: jonathan.gleadle@flinders.edu.au
Name of research group: Renal

Description of research area and interests:
Up to a tenth of the world’s population is affected by chronic kidney disease and over 2 million people are receiving dialysis or kidney transplantation. Regardless of the cause of the kidney disease, most patients exhibit a relentless decline in kidney function, often accompanied by reductions in kidney size. There is a pressing need to develop novel therapies that prevent chronic kidney disease development and progression. This project will address this by investigating and capitalising on the natural response to loss of kidney mass. After donation of a kidney from a healthy individual or following nephrectomy for kidney cancer, the remaining kidney undergoes functional improvement and growth. The mechanism driving this remarkable ability of the remaining kidney to naturally enlarge and increase its function in a healthy and enduring way has been elusive, though insulin growth factor has been suggested. We are using contemporary genomic techniques to define responsible mechanisms.

Outline of projects:
The project will follow exciting preliminary evidence that particular genes and enzymes are induced early in the process of compensatory kidney growth. The project will seek to confirm if these genes are induced during hypertrophy, the cells involved and the underlying driving process.

Skills students will gain:
A broad array of contemporary molecular and cellular techniques to determine RNA and protein expression and regulatory mechanisms.

Key staff associated with projects:
Dr Darling Rojas-Canales
Mrs Elise Tucker
Dr Anthony Fedele.
flinders.edu.au/people/jonathan.gleadle

Location: Flinders Medical Centre
Research Supervisors and their projects

Molecular Biosciences

Supervisors' names:
Professor Tom Gordon
Dr Jing Wang

Supervisors' emails:
t.gordon@flinders.edu.au;
jing.wang@flinders.edu.au

Name of research group: Department of Immunology Autoimmunity and COVID-19 Research Program

Description of research area and interests:
This world class research group uses sophisticated immunochemical, genomic and proteomic techniques to discover molecular signatures of autoantibodies in human autoimmune diseases such as lupus (in collaboration with the Garvan Institute in Sydney); and performs molecular profiling of protective antibodies in patients with acute COVID-19 infection (in collaboration with the Doherty Institute in Melbourne).

Outline of projects:
Molecular signatures or barcodes of antibodies in the above diseases are used in the clinical setting as biomarkers of blood antibody responses and as markers of treatment responses.

Skills students will gain:
• Critical analysis of literature and learning how to convert great ideas into effective experiments
• Solid grounding in cell biology: cell staining, immunofluorescence, microscopy, quantitative analysis and appropriate statistical treatment of data
• Opportunities to use cutting edge genetic technologies including CRISPR and NextGen Sequencing to answer significant questions about cancer metabolism

flinders.edu.au/people/stephen.gregory

Location: Flinders Medical Centre
Description of research area and interests:
Chronic pain is a major, but underacknowledged clinical issue affecting >1.5B people globally. In Australia, chronic pain affects 3.2M people and costs $73B per annum. Chronic pelvic pain is a common, debilitating and complex form of chronic pain that derives from our internal organs and is a key clinical feature of a number of bladder disorders. The mechanisms underlying the pathogenesis of chronic pelvic pain remains unknown and there are no current clinically efficacious and safe pharmacological treatments or cures for chronic pelvic pain. My research program focuses on understanding the mechanisms responsible for the development of chronic pelvic pain and the development of novel and safe pharmacotherapies.

Outline of projects:
Patients with chronic and/or recurrent urinary tract infections (UTIs) are at increased risk of developing chronic pelvic pain and functional bladder disorders associated with altered sensation, including overactive bladder syndrome and interstitial cystitis. The underlying mechanisms responsible for inducing this protracted state of neuronal hypersensitivity are unknown. Multiple projects are available for enthusiastic Honours and PhD students to investigate the complex interactions of bacteria, the toxins that they release, and the development of inflammation in the modulation of sensory nerve function.

Skills students will gain:
Students will have the potential to learn a range of laboratory skills including in-vivo cystometry, ex-vivo nerve recordings, bacterial culture, isolation and cell culture of primary sensory neurons, calcium imaging, quantitative and single PCR, flow cytometry. Students will also develop animal handling and surgical skills and gain experience in project planning.

Key staff associated with projects:
Professor Stuart Brierley
Dr Steven Taylor
flinders.edu.au/people/luke.grundy
youtu.be/EV9gWyKuI5M

Location: SAHMRI
Research Supervisors and their projects
Molecular Biosciences

Supervisor name: Dr Andrea Harrington
Supervisor email: andrea.harrington@flinders.edu.au
Name of research group: Central Pathways Projects, Visceral Pain Research Group

Description of research area and interests:
Our research is aimed at characterising the neural circuits within the spinal cord and brain controlling how painful sensations from internal (visceral) organs are processed. We use a range of neural tracing, physiological and molecular approaches at the whole animal to single cell levels in order to establish the neuroanatomy, pharmacology and functional connectivity of these nerve pathways. We then use this information to identify how these central circuits may be altered in various models of chronic visceral pain and mediate cross-organ sensitisation. We offer a range of Honours & HDR projects that are focused on various aspects and can be tailored to student interests.

Outline of projects:
• Characterisation of spinal projection neurons relaying visceral pain into the brain. These projects will combine neuroanatomical tract tracing approaches with molecular localisation to identify the types of neurons in the spinal cord activated by painful visceral stimuli and where they relay this information into the brain. An extension of these projects is to then identify changes to the spinal neurons in models of chronic visceral pain.
• Identifying altered sensitivity of visceral afferent input and spinal cord dorsal horn circuits in models of chronic visceral pain. These projects will use molecular, neuroanatomical tract tracing, neurophysiology imaging and whole animal physiology approaches to establish the degree of sensitisation developed in the central pathways in various models of chronic visceral pain and identify the mechanisms involved.

Skills students will gain:
• molecular approaches (immunohistochemistry, real time PCR)
• microscopy (epifluorescence, confocal, slide scanning)
• neuroanatomy (circuit tracing)
• in vitro neurophysiology imaging (calcium imaging)
• physiology (whole animal approaches)
• data analysis and management
• laboratory small animal handling

Key staff associated with projects:
Potential co-supervisors:
Professor Stuart Brierley
Dr Luke Grundy
Dr Joel Castro
Dr Gudren Schrober
Dr Sonia Garcia-Caraballo.
flinders.edu.au/fhmri-neuroscience/our-labs/visceral-pain-research-group
flinders.edu.au/people/andrea.harrington

Location: SAHMRI

Supervisor name: Associate Professor Kim Hemsley
Supervisor email: kim.hemsley@flinders.edu.au
Name of research group: Childhood Dementia Research Group

Description of research area and interests:
Sanfilippo syndrome (or Mucopolysaccharidosis type III: MPS III) is a devastating inherited childhood-onset dementia that affects approximately 1 in 65,000 children in Australia. It has a variable rate of progression, but generally causes death in early adulthood. There is presently no approved treatment. We use cell, mouse and in collaboration, fly models of the disease with the goal of better understanding what causes degeneration of the central nervous system in this disorder, developing and testing potential treatments.

Outline of projects:
There are two full-time projects available in 2022 that will each evaluate a novel clinically relevant therapeutic strategy in an authentic mouse model of MPS III. We will explore the impact of photobiomodulation on disease progression in treated animals and compare it to that in sham-treated mice. The ability of the treatment to prevent or reverse established disease will be explored.

The study is funded by a collaborative grant awarded by the Cure Sanfilippo Foundation (USA) and Cure Mickey Foundation (USA) to A/Prof Kim Hemsley, Dr Adeline Lau and our collaborators at the University of Sydney (Dr Paul Austin and Professor John Mitrofanis). A $5000 scholarship is available for each of the two Honours Projects. Please contact Associate Professor Hemsley to discuss the studies further.
Skills students will gain:

Students could expect to gain skills in qPCR, mass spectrometry, immunohistochemistry and/or immunofluorescence, confocal microscopy, delivery of therapeutic modalities to mouse models, performance of behavioural testing. Students will also gain skills in reading and critiquing the scientific literature, preparing and delivering written and oral presentations and communicating with families affected by childhood-onset dementia.

Key staff associated with projects:

Dr Adeline Lau (Co-Supervisor)
Ms Helen Beard
Ms Barbara King.
flinders.edu.au/people/kim.hemsley

Location: Flinders Medical Centre

Supervisor name: Dr Ashley Hopkins
Supervisor email: ashley.hopkins@flinders.edu.au
Name of research group: Precision Medicines Group

Description of research area and interests:

My research focus is precision oncology. I use clinical epidemiology and pharmacometric techniques to develop clinical prediction models for advanced cancer treatments. Ultimately these models aim to improve patient outcomes by identifying precision use strategies and facilitating informed decisions with respect to medicines.

The data with which my clinical prediction models are made are typically "big data", sourced from clinical trials conducted by pharmaceutical companies, or data registries. Current data contributors include Roche, Eli Lilly, Eisai, Novartis, Boehringer Ingelheim, and ASCO’s CancerLinQ.

Outline of projects:

Our group uses ‘big-data’ to develop prognostic tools that can present personalised likelihoods of therapeutic and adverse effects to cancer medicines. The aim is to help clinicians and patients make more informed decisions about their medicines.

We currently have access to data (demographic, laboratory and tumour data) from over 60,000 advanced cancer patients treated with immunotherapies, targeted therapies and chemotherapies. Such data allow the development of prognostic tools that can present personalised likelihoods of therapeutic and adverse effects to medicines. It is hypothesised that effective communication of personalised predictions of expected benefits and harms from medicines used in advanced cancer treatment will improve shared decision making, lead to more informed and empowered patients, and enable better decisions regarding whether to commence and continue medicines.

Skills students will gain:

Skill development focusses on the basics of:

- Cancer pharmacology
- Clinical epidemiology
- Precision medicine
- Patient centred care

Key staff associated with projects:

Professor Michael Sorich
Associate Professor Andrew Rowland
Dr Ganessan Kichenadasse
Professor Ross McKinnon.
flinders.edu.au/people/ashley.hopkins

Location: Flinders Medical Centre
Research Supervisors and their projects

Molecular Biosciences

Supervisor name: Dr Arne Ittner
Supervisor email: arne.ittner@flinders.edu.au
Name of research group: aiLab – Laboratory for Molecular Dementia and Memory Research

Description of research area and interests:
Our research program focusses on a brain protein called tau, which is central in Alzheimer’s disease and other forms of dementia. We are particularly interested in the molecular events involving tau in the healthy brain and in Alzheimer’s disease.

Cognitive functions such as learning, decision making, and adaptive behaviour are shaped by memory of previous experiences. We aim to understand the biological foundation of memory and how it is impaired in dementia. Memory formation relies on synapses – junctions between brain cells that control transmission of relevant information. Protein phosphorylation mediated by enzymes called protein kinases is a common mode of signal transduction within synapses. We believe it is critical to understand how protein kinases signal to control memory function and how tau is regulated in healthy and disease states of memory as this is largely unknown.

Our team within the Flinders Health and Medical Research Institute offers a unique environment for students to get involved and start their career in biomedical research. Our work is supported by NHMRC, ARC and Flinders University.

Outline of projects:
- Research projects offered to students will explore molecular processes encoding mammalian cognitive function. Furthermore, the classic and most recent methods of protein biology, proteomics, and neuroscience will be used to delineate the molecular events that control memory and other brain functions. Projects focus on a molecular, genetic or cognitive process as a starting point and are further developed into a complete project plan.

Skills students will gain:
1. Strong skill sets in molecular and neuronal cell biology (molecular cloning, PCR, CRISPR, cell culture, immunofluorescence microscopy)
2. Technical expertise in protein biology and proteomics of signal transduction (immunoblots, phospho-peptide mapping, protein interaction assays)
3. Skills in the analysis of cognitive and behavioural capacities (memory and behaviour tests)
4. Understanding of the fields of neurobiology and dementia research (literature searches and discussion, journal clubs)
5. An opportunity to network within the Australian and international scientific community.

Key staff associated with projects:
Dr Kristie Stefanoska
Dr Prita Asih.

orcid.org/0000-0001-5244-6897

Location: Flinders Medical Centre

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Supervisor name: Dr Claire Jessup
Supervisor email: claire.jessup@flinders.edu.au
Name of research group: Immunomodulation Laboratory

Description of research area and interests:
The Immunomodulation (iMOD) Laboratory is interested in harnessing the power of the immune system to modulate disease. We examine the molecular activation of immune cells involved in the treatment of cancer and the development of autoimmune diseases (e.g. Type 1 diabetes).

Outline of projects:
- Modulation of immune cell activation during Type 1 diabetes and islet transplant rejection
- Checkpoint inhibitors as an immunotherapy for cancer
- Investigating the interplay between vascular and endocrine cell types during islet transplantation.

Skills students will gain:
- Tissue culture, in vitro immune assays and cell isolation from patient samples
- Cellular analysis techniques including flow cytometry and confocal microscopy
- Molecular techniques including real-time PCR, cloning and antibody engineering
- Islet transplantation, diabetes and cancer disease models.


Location: Flinders Medical Centre
Supervisor name:
Professor Damien Keating
Supervisor email:
damien.keating@flinders.edu.au
Name of research group: Molecular and Cellular Physiology

Description of research area and interests:
Our team is focused on understanding how our cells signal with each other through the release of hormones and neurotransmitters. A major focus for us centres on the gut and how specialised secretory cells lining the gut wall can respond to the food we ingest and the gut microbiome to release signalling molecules that affect metabolism, obesity, food intake and activate the gut-brain axis. We publish in the leading international journals including Nature. People are at the centre of good research and we aim to provide our team members with a well-rounded and diverse skill set and professional development for whatever career path they choose.

Outline of projects:
• How does the microbiome control our metabolism? – we recently published a key paper describing how the gut microbiome interacts with specialised gut endocrine cells to regulate host metabolism (Martin et al, PNAS 2019). We wish to build on this to understand the mechanisms controlling this pathway.
• How does the food we eat activate gut hormone release? – we use human gut tissue samples to show that nutrients and other factors trigger the release of gut hormones that are important for metabolic control and blood glucose levels (Sun et al, Diabetes 2017, Findeisen et al, Nature 2019). We want to use our novel approaches to understand how other nutrients trigger gut hormone release and the physiological implications of this.
• How does the gut speak to our brain? – new work in our lab has discovered a number of ways that gut endocrine cells are activated that are relevant to the gut-brain axis. We would like to understand how these various stimuli, including food, fluids, and psychoactive drugs, activate specific parts of our brain to trigger diverse effects including nutrient intake, mood and activity. Outcomes from such projects relate directly to human health disorders including obesity, diabetes, depression, bipolar disorder and mania.

Skills students will gain:
These studies are carried out using a number of approaches including measurements of secretion, ELISA, transfection of cells, immunohistochemistry, live cell imaging, 3-D reconstruction microscopy, real time RT-PCR, Western blot and culturing of primary cells and cell lines. These are complimented with whole animal in vivo studies including metabolic profiling of transgenic and knockout mouse lines.


Location: Flinders Medical Centre
Research Supervisors and their projects
Molecular Biosciences

Supervisor name: Associate Professor Sonja Klebe
Supervisor email: sonja.klebe@sa.gov.au
Name of research group: Anatomical Pathology/Asbestos Diseases Lab

Description of research area and interests:
Malignant mesothelioma is an aggressive tumour with an extremely poor prognosis; even with treatment, most patients die within 2 years of being diagnosed. Current treatment still relies on combination chemotherapy, and despite considerable efforts, new treatment modalities have been unable to significantly improve patient survival in over 15 years. Our research group is focused on improving outcomes for patients suffering with malignant mesothelioma. We utilise cancer cells derived directly from patients to understand the biology of mesothelioma so we can create more effective, personalised treatments for patients. We are also committed to improving diagnosis so that patients can receive earlier cancer detection and treatment and our research has had a real-world impact on the way pathologist diagnose mesothelioma.

Outline of projects:
• Can mesothelioma organoids be used to predict treatment response? Drug screening programs aimed at testing patients’ own, living cancer cells in the laboratory prior to assigning treatment is becoming a real possibility with the use of innovate three-dimensional models of cancer called cancer organoids. We aim to establish and characterise mesothelioma cancer organoids using cells derived directly from patients.

Skills students will gain:
Students will have the potential to learn various laboratory techniques including, cell culture using patient derived cells and cell lines, cloning, quantitative PCR, ELISA, flow cytometry and immunohistochemistry. We work closely with patient’s diagnostic specimens and students will gain experience handling these types of specimens.

Key staff associated with projects:
Dr Ash Hocking
Dr Sarita Pabrakaran
Dr Alix Farrall
Ms Lauren Mortimer.

Location: Flinders Medical Centre.

Supervisor name: Associate Professor Bryone Kuss
Supervisor email: bryone.kuss@flinders.edu.au
Name of research group: Lymphoproliferative Research Group

Description of research area and interests:
Haematological malignancies: Chronic Lymphocytic Leukaemia (CLL) and Multiple Myeloma. A particular interest in metabolomics, proteomics and molecular genomics of these tumours and their response to therapies.

Outline of projects:
• Drug resistance mechanisms in lymphoproliferative malignancies
• Lipid metabolism in CLL
• Redox and metabolic changes in CLL

The dream of a cancer treatment that does not require chemotherapy is becoming a reality for some patients with the advent of molecularly targeted therapies. However, in others these new drugs fail as their cancers develop resistance. Understanding how cancer cells do this is the primary aim of our research. Using leukaemic cells from patients with Chronic Lymphocytic Leukaemia (CLL) and Mantle Cell lymphoma (MCL), treated with Ibrutinib and/or Venetoclax, we will explore the molecular mechanisms of drug resistance and find new ways to overcome it.

Ibrutinib, an inhibitor of Bruton’s tyrosine kinase which impairs the B cell receptor (BCR) pathway in lymphocytes, and venetoclax, which inhibits the prosurvival protein BCL2, are two such molecular therapies. We hypothesise that resistance mechanisms will be multifactorial involving functional escape from the BCR pathway.
inhibition by utilisation of pathway redundancy; alteration of homing receptor expression; metabolic rewiring and reactivation of the NFkB and NFAT pathways.

This research project addresses these clinical issues using a comprehensive and systematic approach to explore resistance mechanisms and molecular escape. This work represents collaboration between Flinders Medical Centre, Peter MacCallum Cancer Centre and Royal North Shore Hospital.

Skills students will gain:
Molecular biology particularly DNA and RNA extraction, proteomic analysis, PCR and possibly next gen sequencing approaches to genomic questions. Flow cytometry and cell culture.

Key staff associated with projects:
Associate Professor Bryone Kuss
Dr Lauren Thurgood
Dr Giles Best
Associate Professor Karen Lower.
flinders.edu.au/people/bryone.kuss
Location: Flinders Medical Centre

Supervisor name:
Associate Professor
Karen Lower
Supervisor email:
karen.lower@flinders.edu.au
Name of research group: Genetics and Epigenetics research lab

Description of research area and interests:
The lab is focussed on understanding the genetic basis of disease, from identification of inherited and somatic mutations through to dysfunctional epigenetic regulation of gene expression. All research has a clinical focus and utilises patient samples to answer key outstanding clinical questions.

Outline of projects:
• Identification and confirmation of mutations in chronic lymphocytic leukaemia and similar blood diseases
• Identification and confirmation of breast cancer susceptibility genes
• Long range gene regulation and effects of repetitive regions on DNA methylation

Skills students will gain:
• Standard molecular lab methods, such as PCR and Sanger sequencing
• Analysis and confirmation of next generation sequencing
• Cloning and gene expression analysis
• CRISPR Cas9 methodologies

Key staff associated with projects:
This research will be carried out within the larger research group including:
Dr. Binoy Appukuttan
Dr Stephen Gregory
Dr Lauren Thurgood
Associate Professor Bryone Kuss.
All projects have a clear clinical focus and are tightly linked to answering key clinical questions.
One project is a collaboration with Oxford University.
flinders.edu.au/people/karen.lower
Location: Flinders Medical Centre.
Research Supervisors and their projects

Molecular Biosciences

**Supervisor name:**
**Professor David Lynn**

Supervisor email: david.lynn@flinders.edu.au

Name of research group: Systems Immunology/Biology Laboratory

Description of research area and interests: Professor Lynn leads a multidisciplinary group of researchers that apply computational and experimental systems immunology methods to investigate how vaccines and microbes (pathogenic and commensal) modulate the immune system in a range of different contexts. He has two major NHMRC-funded projects in this area investigating how the microbiota modulates immune responses to vaccination and cancer immunotherapy. He also has a parallel research program in cancer systems biology (particularly CRC and prostate cancer) and his group has developed a broad range of bioinformatics software and online databases facilitating systems biology analyses that are used by thousands of researchers worldwide. Professor Lynn is also very actively engaged in clinical research. He is the PI in SA for the BRACE trial, which has recently received $10 million in funding from the Gates Foundation to investigate whether BCG provides non-specific protection against COVID19 in up to 10K healthcare workers. He also leads a NHMRC-funded systems vaccinology study in infants.

Outline of projects:
- New methods for systems level analyses of innate immunity and cancer.
- We are seeking Honours and HDR students with an interest in immunology; microbiology; cancer biology; computational or systems biology. Previous experience in programming is strongly recommended if seeking a purely computational biology/bioinformatics project, but mixed wet-lab/bioinformatics projects are a possibility for those without programming skills.

Skills students will gain:
- Mouse models of cancer; immunology; flow cytometry; range of animal handling techniques; germ-free mice; gene expression analysis; microbiome analysis
- Preclinical models; vaccine biology; immunology; flow cytometry; range of animal handling techniques; epigenetics; ELISA; gene expression analysis
- Preclinical models and clinical cohorts; vaccine biology; immunology; mouse models of infection; flow cytometry; range of animal handling techniques; ELISA; gene expression analysis
- Bioinformatics; systems biology; network analysis; programming; gene expression analysis; multi-omics integration.

Key staff associated with projects:
Dr. Stephen Blake
Dr Natalie Stevens
Dr Miriam Lynn
Dr Feargal Ryan.

flinders.edu.au/people/david.lynn

Location: SAHMRI

**Supervisor name:**
**Professor Arduino A Mangoni**

Dr Sara Tommasi

Supervisors’ email: arduino.mangoni@flinders.edu.au
sara.tommasi@flinders.edu.au

Name of research group: Pharmacology

Description of research area and interests: We are interested in the role of specific metabolites and enzymes within the arginine metabolic pathways in the pathophysiology of disease states. In particular we are investigating the enzyme dimethylarginine dimethylaminohydrolase 1 (DDAH1) as a therapeutic target in cancer, idiopathic or radiation induced lung fibrosis, and atherosclerosis. We have developed effective ways to reduce the expression and the activity of DDAH1 for therapeutic purposes e.g. cancer and lung fibrosis, however we are also investigating strategies to “activate” DDAH1 in other medical conditions e.g. atherosclerosis and hypertension.

Outline of projects:
- Assessment of the effects of potent DDAH1 inhibitors developed in house, with or without other agents (e.g. anti-angiogenic drugs), on a comprehensive set of metabolomic, biological and clinical end points in in vitro and in vivo models of triple negative breast cancer and lung fibrosis;
- Identification of the mechanisms that suppress DDAH1 activity under specific circumstances in order to identify novel DDAH1 “activators” for the treatment of diseases affecting the cardiovascular system, particularly hypertension and atherosclerosis.

flinders.edu.au/people/arizona.mangoni
Skills students will gain:
Analytical chemistry, assessment of in vitro and in vivo models of common diseases, molecular biology techniques, principles of drug discovery and development.

Key staff associated with projects:
Mr Anthony Doman
Vinitha Ragavan
International collaborators from the Mario Negri Institute of Pharmacological Sciences (Milan, Italy), the Department of Biomedical Sciences of the University of Sassari (Italy), and the Medizinische Fakultät Carl Gustav Carus | Technische Universität Dresden.

flinders.edu.au/people/arduino.mangoni
Location: Flinders Medical Centre

Supervisor name: Dr Dusan Matusica
Supervisor email: dusan.matusica@flinders.edu.au
Name of research group: Sensory Cell Biology Lab
Description of research area and interests:
We are interested in biomarkers that can be used to detect and define pain. Detecting pain seems easy, it hurts, but determination of e.g. a response to treatment or defining pain in newborns or people that cannot express themselves is more challenging. We aim to find and develop biomarkers in blood and cerebrospinal fluid of humans and animal models of pain types by using different strategies. This will be an essential tool to reduce the burden of chronic pain and the misuse of pain killers such as opioids.

Outline of projects:
• Development of a sentinel cell line to detect and differentiate between pain types in serum
• Development of a novel neuron-chip interface that allows growth of different pain neurons phenotypes
• Detection of human vesicular miRNAs in complex CSF solutions

Skills students will gain:
• Confidence in conduction and analysis of qRT-PCR experiments
• Insight into analysis of sequencing data
• Handling of human and animal samples
• Cell culture
• Insight into neuron-chip interface technology

Key staff associated with projects:
Professor Rainer V Haberberger
Dr Marie O’Shea
Associate Professor Michael Z Michael
flinders.edu.au/people/dusan.matusica
news.flinders.edu.au/blog/2017/09/05/better-pain-relief-via-microchip-new-research/
linkedin.com/in/dusan-matusica-7993a675/?originalSubdomain=au
Location: Flinders Medical Centre
**Research Supervisors and their projects**

**Molecular Biosciences**

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**Supervisor name:**

**Associate Professor Michael Michael**

**Supervisor email:**

michael.michael@flinders.edu.au

**Name of research group:** Gene Expression Lab

**Description of research area and interests:**

Colorectal cancer is the second highest cause of cancer related death in Australia. We study the genetic and epigenetic processes that are associated with this disease. Most of our work involves understanding how genes are aberrantly activated in cancer, so we study chromatin and RNA. We often focus on non-coding RNAs, including microRNAs. We also study how cells communicate through small extracellular vesicles, with a view to understanding how a tumour interacts with its microenvironment. Our projects range from developing novel diagnostics and understanding how the environment (especially diet) impacts cancer risk, to identifying novel therapeutic targets. With our collaborators, we are currently interested in the metabolic rewiring of cancer cells that allows them to proliferate in an uncontrolled manner. We combine molecular biology approaches with genetics, cell biology, biochemistry and pharmacology to explore how transcriptional and post-transcriptional processes are regulated, in the expectation that we will identify new anti-cancer treatments.

**Outline of projects:**

- Epigenetic signatures associated with metastasis location
- Epigenetic changes associated with diet
- Characterise three dimensional organoid models of colorectal cancer
- Develop novel RNA, gene and cell therapy technologies

**Skills students will gain:**

- Molecular biology: purifying nucleic acids, PCR, RT-PCR, cloning, genomics (next gen. sequencing), bioinformatics. Protein quantification and characterisation
- Microbial and mammalian cell biology, flow cytometry, metabolism assays
- Advanced separation techniques (ultracentrifugation, chromatography), Nanoparticle characterisation, electron microscopy
- Near super-resolution light microscopy
- Small animal experimentation
- Experimental design, statistical methods

**Key staff associated with projects:**

Professor Janni Petersen
Dr Shashikanth Marri
Ms Marie Lowe
Ms Virginia Papangelis
Ms Reham Mounzer.

[flinders.edu.au/people/michael.michael](http://flinders.edu.au/people/michael.michael)

[youtube.com/watch?v=YrjrlUkyPWE](http://youtube.com/watch?v=YrjrlUkyPWE)

**Location:** Flinders Centre for Innovation in Cancer

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**Supervisor name:**

**Dr Pramod Nair**

**Supervisor email:**

pramod.nair@flinders.edu.au

**Name of research group:** Pharmacology

**Description of research area and interests:**

Our research utilises advanced computational and experimental approaches to study how drugs are metabolised by different enzymes. More specifically, our group uses various computational tools for Biomolecular Modelling of pharmacological targets (e.g. proteins, enzymes, receptors) to rationally guide our experiments (e.g. site-directed mutagenesis and enzyme kinetics). Some of our studies also utilise state-of-the-art computational approaches that are performed on supercomputing platforms to characterise protein flexibility and drug binding. Understanding the flexibility of biomolecules is valuable to gain atomic insights of complex phenomena such as molecular recognition, protein folding, and the transport of ions and small molecules in and out of proteins.

**Outline of projects:**

Cytochrome P450 (CYP) and UDP-glucuronosyltransferase (UGT) are key enzyme families responsible for the metabolism (i.e. chemical breakdown) of drugs in the body. A combination of novel computational and experimental approaches will be used to characterize the
structural features of CYPs and UGTs that allow these enzymes to bind specific drugs (e.g. anti-cancer drugs) and predispose to interactions between drugs in patients receiving polypharmacy. The project will assist the rational design of new drugs and support the safe and efficacious use of current drugs.

Skills students will gain:
Biomolecular Modelling tools e.g. Molecular Docking and Molecular Biology methods e.g. polymerase chain reaction, site-directed mutagenesis.

Key staff associated with projects:
Professor Ross McKinnon
Professor John Miners
flinders.edu.au/people/pramod.nair
Location: Flinders Medical Centre

Supervisor name: 
Professor Karin Nordström
Supervisor email: karin.nordstrom@flinders.edu.au
Name of research group: Motion vision group

Description of research area and interests:
In the motion vision we use electrophysiology and quantitative behaviour techniques to understand how the visual system extracts vital information from the surround. We work on insects, primarily hoverflies, which are excellent study animals as they are small and physiologically accessible, which means that we can record from individual neurons in living, behaving animals. We routinely record from neurons at different stages of sensory processing, from the periphery, through the brain to the descending nerve cord. We are particularly interested in how sensory selectivity is achieved at the single neuron level, and how this affects behavioural output, but we also work on projects related to the biology of the insects, including their important role in pollination, how early development affects adult traits, sleep, stress.

Outline of projects:
Potential students can approach us for a tailor-made project that will suit your specific interests and learning outcomes. We are looking for enthusiastic students with a commitment to learn and who want to contribute to an active, collaborative group. Speak to current or past lab members to find out more.

Skills students will gain:
Electrophysiology, Matlab, data analysis, statistical analysis, quantitative behaviour, motion vision, insect vision, insect husbandry.

Key staff associated with projects:
Dr Yuri Ogawa
Dr Joseph Fabian
Mrs Sarah Nicholas.
www.hoverflyvision.weebly.com

Location: Flinders Medical Centre
Research Supervisors and their projects

Molecular Biosciences

Supervisor name: Associate Professor Yoichiro Otsuka (Yoichirou Ootsuka) (YoYo)
Supervisor email: yoichiro.otsuka@flinders.edu.au
Name of research group: Integrative Neuroscience Laboratory

Description of research area and interests:
Autonomic responses to emotionally significant events, or psychological stressors, are involuntary and are triggered by the brain via the autonomic (sympathetic) nervous system. We often notice these changes manifesting in reactions such as feeling hot (so called emotional hyperthermia), having a rapid heartbeat or becoming pale (skin artery vasoconstriction). These reflexes are unavoidable and are necessary in order to prepare the body for survival. However, these changes can become excessive and persist even in the absence of actual emotionally significant events, leading to pathology and severe states of illness, sometimes called autonomic dysfunction. For this understanding, it is essential to establish the basic brain circuitry through which emotional signals trigger normal autonomic physiological responses. The circuitry is largely unknown. Our lab is pursuing the brain circuitry for these psychogenic autonomic physiological responses by combining state-of-the-art biotechnological techniques with conscious/anesthetized animal physiological and neuroanatomical experiments.

Outline of projects:
Experiments will be conducted in conscious/anesthetized rats/mice. The project will investigate whether activation or inhibition of neurons in a specific brain area alters stress-associated behavioural and physiological changes. Miniature probes will be chronically implanted for recording of bio-physiological signals. To control brain neurons activity, special exogenous protein will be expressed in the neurons by genetic alteration using adeno-associated viral vectors and transgenic animals.

Skills students will gain:
- The project is in the brain neuroscience research field. HDR and Honours students will have opportunities to learn general animal surgery and the following major techniques;
  1. Recording vital bio-physiological signals such as brain and heart electrical signals, blood pressure and body temperature in conscious live animals,
  2. Controlling neuronal activity with state-of-the-art techniques including optogenetics and chemogenetics.

Key staff associated with projects:
Emeritus Professor William Blessing
Miss Anna Antipov
Mr Jett Zivkovic
Professor Tomoyuki Kuwaki
Professor Akihiro Yamanaka.

Location: Flinders Medical Centre

Supervisor name: Professor Janni Petersen
Supervisor email: janni.petersen@flinders.edu.au
Name of research group: Environmental control of cell growth and cell division

Description of research area and interests:
Janni Petersen is a cancer cell biologist, who has an interest in understanding the mechanisms that allow cancer cells to grow and divide. Cancer is a disease of inappropriate cell growth and cell division. Cancer cells migrate to colonize new parts of the body, here they undergo cell division in environments with limited nutrient supply therefore, cancer cells are frequently nutritionally stressed. In shedding light on the mechanisms behind environmental and metabolic control of cell division and cell survival we aim to identify novel target for the treatment of human cancers.

Outline of projects:
- Understanding cancer cell metabolism
- The impact of cell metabolism on DNA repair and its implications for aging and cancer
- Cancer cells survival under nutrient stress, what makes cancer cells unique?

Skills students will gain:
A wide range of techniques including:
- Mammalian tissue culture, cell biology, cell physiology
- Genetics (CRISPr/Cas9 technology)
- Biochemistry including: SDS-PAGE, western blotting, immuno-precipitations, kinase assays.
- Molecular biology including PCR, DNA cloning and DNA sequencing
- Imaging including Immunofluorescence, microscopy and live cell imaging.
Key staff associated with projects:
Ms Tingting Wang
Ms Katie Morrison
Ms Reham Mounzer.
flinders.edu.au/people/janni.petersen
Location: Flinders Centre for Innovation in Cancer

Supervisor name:
Associate Professor
Munish Puri
Supervisor email:
munish.puri@flinders.edu.au
Name of research group: Bioprocessing (Medical Biotechnology)

Description of research area and interests:
The Research Program in my laboratory focuses on various issues pertaining to the Biotechnology and Pharmaceutical industries. The major goals of my research are to produce and purify novel therapeutic proteins/small metabolites (known as bioactives) from a variety of sources e.g. microbes, animal and plant cells and to improve their functional efficiency and specific activity for carrying out transformations of pharmaceutical intermediates/animal cell products with health benefits. This can be accomplished by two strategies: Bioprocessing and Metabolic engineering.

The following research is currently underway in partnership with our national and international collaborators: a) health and nutrition to develop preventive medicine and nutritional supplements to improve human health; b) food biotechnology for nutraceutical extraction and functional food development relating to single cell oils that are rich in omega-3 fatty acids, and enzyme production; c) nanobiotechnology for enhancing the thermostability of enzymes that have application in health products and d) health substantiation by validation of the function(s) of bioactives.

Outline of projects:
Several projects will be offered, each focused on developing a solution to an industry problem that is associated with human health globally.
i. Development of single cell oils rich in omega-3 fatty acids to assist human nutrition
ii. Development of controlled alginate hydrolysis for medical applications
iii. Characterisation of the delivery of therapeutic proteins to diseased cells
iv. Targeting fatty acid metabolism for containing obesity
v. Green extraction process development for novel bioactives.

Skills students will gain:
• Experience in conducting systematic literature reviews
• Analytical, microscopy, SDS-PAGE, bioreactor use and downstream skills
• Techniques including the growth of microbial and mammalian cells
• Experience in purifying proteins and immobilising enzymes
• An understanding of research in medical biotechnology
• Skills in the reporting and publishing of research.

We have international and national collaborations, which will allow students to interact with world class leaders in this field. Most of our projects are supported by Industry partners, thus depending upon the project, students will gain Industry exposure.

Key staff associated with projects:
Dr Liu Fei Tan
Dr Adarsha Gupta
Ms Kushari Burns
Dr Reinu Abraham

flinders.edu.au/people/munish.puri
Location: Health Sciences Building
Research Supervisors and their projects
Molecular Biosciences

Supervisor name:
Professor Claire Roberts
Supervisor email: claire.roberts@flinders.edu.au
Name of research group: Pregnancy Health and Beyond Lab
Description of research area and interests:
Claire Roberts is a pregnancy and placenta researcher who has recruited large numbers of pregnant women into pregnancy cohorts, two of which are named SCOPE (Screening for Pregnancy Endpoints) and STOP (Screening Testes to Predict poor outcomes of Pregnancy). She has large clinical, lifestyle and psycho-social datasets to go with biobanks for these cohorts. She has developed patented algorithms for use as screening tools to predict which women are at risk of developing a major pregnancy complication including preeclampsia, gestational diabetes mellitus, small for gestational age and spontaneous preterm birth. These were developed in SCOPE and validated in STOP.

Claire’s research is interested in both genetic and modifiable risk factors including maternal diet and micronutrient status, metabolic health and other lifestyle factors, that could be targeted to reduce risk for pregnancy complications. For these her group interrogates cohort data and also uses cell and molecular techniques to determine how modifiable factors affect placental function ex vivo and in vitro.

The group is currently undertaking a study to profile placenta and maternal blood across gestation using next generation sequencing technologies. Multi-omic data is revealing how the placenta develops across gestation and what is different at the molecular level in the placenta in pregnancy complications. Differences conferred by fetal sex are a focus of interest.

Outline of projects:
Effects of micronutrients on placental function.
• Genetic factors including fetal sex that contribute to placental function and pregnancy outcomes at the population, cohort and placental transcriptome levels.
• Bioinformatic analyses of multi-omic profiling of the placenta across gestation.
• Role of circRNA in placental development and function and pregnancy outcome
• Follow-up of STOP women and children aged 3 years old.

Skills students will gain:
Cell culture, ELISA, western blotting, molecular biological techniques, bioinformatics and biostatistics.

Key staff associated with projects:
Dr Tanja Jankovic-Karasoulos
Dr Anya Arthurs
Ms Melanie Smith
Mr Dylan McCullough
Dr Shalem Leemaqz.

Location: Flinders Medical Centre

Supervisor name:
Professor Geraint Rogers
Supervisor email: geraint.rogers@flinders.edu.au
Name of research group: Microbiome & Host Health
Description of research area and interests:
Our research focuses on how the microbiome influences human health outcomes across a range of clinical contexts.

Outline of projects:
Potential projects include investigations of the complex mediatory role of the human microbiome in acute and chronic conditions including acute infections in those receiving intensive care, recurrent urinary tract infections, chronic lung disease, cancer, and ageing-associated cognitive decline.

Skills students will gain:
An understanding of the influence of the human microbiome on health and disease and of associated analytical techniques, particularly mass parallel sequencing. Experience in microbiology, bioinformatics, data science, molecular genetics, biostatistics, complex determinants of health, inter-disciplinary collaboration, and clinical translation.

Key staff associated with projects:
Dr Steven Taylor
Dr Jocelyn Choo
Dr Lito Papanicolas.

Location: Flinders Medical Centre
Supervisor name: **Dr Mary-Louise Rogers**  
Supervisor email: mary-louise.rogers@flinders.edu.au  
Name of research group: MND & NR Research Laboratory

**Description of research area and interests:**  
Our laboratory is wholly focused on motor neuron disease research. We are world leaders in urinary biomarkers, and publish in leading journals, obtaining funding from various sources.

**Outline of projects:**  
Our laboratory was the first in the world to describe a urinary biomarker of motor neuron disease that follows disease progression and can determine treatment effects. The new project will be examining by proteomic and other analysis other urinary biomarkers that may also be prognostic or pharmacodynamic.

**Skills students will gain:**  
- Proteomics  
- Western blots  
- ELISAs  
- Protein quantification

flinders.edu.au/people/mary-louise.rogers  

Location: Flinders Medical Centre

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Supervisor name: **Associate Professor Luke Selth**  
Supervisor email: luke.selth@flinders.edu.au  
Name of research group: Prostate Cancer Research Group

**Description of research area and interests:**  
Prostate cancer will affect approximately 1:7 Australian men and results in >3,000 deaths per annum in this country alone. To improve outcomes for men with this disease, the Prostate Cancer Research Group at Flinders University undertakes basic research to characterise the mechanisms by which prostate tumours metastasise and become resistant to therapies. We feed this new knowledge into translational research projects aimed at developing new drugs and biomarkers to improve the treatment and management of patients.

Our group collaborates widely with scientists, clinicians, computational biologists and engineers to ensure that our findings have maximal impact. Importantly, our “team science” approach means that we also undertake impactful research on other types of cancer, most notably breast cancer. Our research exploits a unique assortment of model systems (patient-derived xenografts, patient-derived tumour material cultured in the lab and cell lines), contemporary ‘omic’ techniques and cutting-edge bioinformatics tools.

**Outline of projects:**  
- Development of novel therapeutic strategies to target the androgen receptor and cyclin-dependent kinases in lethal prostate cancer: This project aims to investigate the efficacy and mode of action of novel therapeutics developed by our national and international collaborators. Such pre-clinical evaluation is a critical step in the drug development pipeline.

- Non-coding genomic alterations as drivers of lethal prostate cancer: This project comprises primarily bioinformatics-based research, with the goal to identify epigenetic drivers of therapy resistance. It will harness our labs collaborations with world-leading computational biology labs in Cambridge, UK.

**Skills students will gain:**  
Cutting-edge “omic” techniques i.e. transcriptomics (RNA-seq, single-cell RNA-seq), epigenomics (ChIP-seq, ATAC-seq, DNA methylation profiling), metabolomics; molecular biology and biochemistry; cell and tissue culture; bioinformatics; data analysis and presentation; science communication.

**Key staff associated with projects:**  
Professor Lisa Butler  
Professor Shudong Wang  
Associate Professor Phil Gregory  
Professor Jason Carroll  
Professor Scott Dehm  
Dr Jianling Xie  
Ms Adrienne Hanson  
Mr Scott Townley.

flinders.edu.au/people/luke.selth  
scholar.google.com.au/citations?user=IfXWSaQAAAAJ&hl=en  

Location: Flinders Centre for Innovation in Cancer
Research Supervisors and their projects
Molecular Biosciences

**Supervisor name:**
*Professor Justine Smith*

**Supervisor email:**
justine.smith@flinders.edu.au

**Name of research group:** Eye & Vision Health

**Description of research area and interests:**
Professor Smith supervises projects on the group of diseases called uveitis. Uveitis is inflammation inside the eye that may be caused by a viral or parasitic infection, or may be a non-infectious inflammatory disease (similar to multiple sclerosis or inflammatory bowel disease). Professor Smith is an ophthalmologist (eye doctor), who treats patients with uveitis at Flinders Medical Centre, and at her laboratory, the research team studies the cellular and molecular mechanisms of uveitis and works towards better treatments.

**Outline of projects:**
- **Response of human eye cells to infection with emerging viruses (Dengue virus, Zika virus, Ebola Virus):** Work with RNA and/or protein isolated from human eye cells that have been infected with an emerging human virus, to understand the interactions between the virus and different eye cells.
- **Toxoplasma gondii infection of human eye cells:** Toxoplasmosis is a common parasitic disease carried by cats that cannot be cured and that affects the retina. Infect human retinal cells and/or tissues with Toxoplasma gondii parasites to study how the parasite damages the retina.
- **Migration mechanisms for leucocytes into the human eye:** Adhesion molecules on the vascular endothelium allow leucocytes to patrol the body and fight pathogens. However, they may misdirect leucocytes into the eye in the absence of infection to cause uveitis. Study the adhesion molecules on the endothelium of the eye and investigate how expression may be manipulated as the basis for a new uveitis treatment.
- **Treatment strategy for COVID-19:** Use eye cells and/or tissues as a model system for developing drugs to treat COVID-19.

**Skills students will gain:**
- Experimental design, including developing scientific hypotheses.
- Laboratory methods: our research involves many different molecular and cell biology techniques.
- Data analysis and presentation.
- Science communication.

**Key staff associated with projects:**
- Mr Liam Ashander
- Dr Yuefang Ma
- HDR and MD students who also work on the team to progress research on uveitis.

**Location:** Flinders Medical Centre

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**Supervisor name:**
*Dr Elke Sokoya*

**Supervisor email:**
elke.sokoya@flinders.edu.au

**Name of research group:** Chronic Disease Research Laboratory

**Description of research area and interests:**
Autoimmune disease occurs when our body mistakenly starts attacking its own tissue. This can be the synovial joints (rheumatoid arthritis), the pancreas (type I diabetes), the nerves (multiple sclerosis) or the bowel (Crohn’s disease). Left untreated, it leaves patients severely crippled and debilitated. The incidence of autoimmune disease has tripled in the last few decades and it affects more people than heart disease, diabetes and cancer combined.

The hallmark feature of autoimmune disease is chronic inflammation – our body’s defence from invading pathogens and toxins. The conventional medicine paradigm involves attempting to quieten the inflammation by targeting the immune system with pharmaceuticals. However, the underlying trigger remains and dampening the immune system leaves patients prone to developing serious infections and cancer.

The approach of the Chronic Disease Research Laboratory is to investigate the root cause of autoimmune disease and to test therapies and interventions that inform clinical practice.

**Outline of projects:**
- **Elucidating mucosal barrier function in autoimmune disease:** Working with patient samples, markers of mucosal barrier function will be tested. Validating a biomarker to assess small intestinal mucosal barrier dysfunction, will enable us to test a variety of approaches to restore mucosal barrier function.
Application of precision medicine techniques to understand the drivers of autoimmune disease. Using a precision medicine approach, a range of testing will be performed to identify the driver of autoimmunity in individual patients, to potentially reverse rather than mitigate their condition.

Working with patient samples, markers of mucosal barrier function will be tested. Validating a biomarker to assess small intestinal mucosal barrier dysfunction, will enable us to test a variety of approaches to restore mucosal barrier function.

Skills students will gain:
- Experience in using patient samples to identify treatable targets
- Exposure to state-of-the-art techniques such as microarray hybridisation technology platforms
- Experience in collating and analysing clinical data
- An understanding of many aspects of clinical studies, including patient recruitment, inclusion and Exclusion criteria and selecting controls.

Key staff associated with projects:
Associate Professor Mihir Wechalekar
Dr Cuong Tran.
flinders.edu.au/people/elke.sokoya

Description of research area and interests:
The research of the Bowel Health Service focuses on preventing bowel cancer. This includes developing new biomarkers to improve screening options for people in the community, personalising surveillance for people at increased risk for bowel cancer, and monitoring for risk of cancer recurrence after surgery.

Outline of projects:
- Developing biomarkers to allow early detection and prevention of cancer
- Looking into risk of bowel cancer in people with a family history of cancer
- Using biomarkers to monitor success of cancer treatment
- Developing new ways to reduce the number of colonoscopies being done in Australia
- Determining the type (and combination) of polyps in the bowel that increase risk for cancer in the future
- Looking into whether people will make changes to their lifestyle to reduce cancer risk
- Improving the quality of colonoscopy in South Australia

Skills students will gain:
- Knowledge of risk factors for bowel cancer
- Learn about different pathologies that can be found with colonoscopy
- Experience in working with large data sets
- Will learn about performing statistical analysis
- Understanding patient behaviour when it comes to bowel cancer prevention

Key staff associated with projects:
Gastroenterologists, nurses, technical staff, administration staff, scientists.
flinders.edu.au/people/erin.symonds

Location: Flinders Centre for Innovation in Cancer
Research Supervisors and their projects
Molecular Biosciences

Supervisor name: Dr Lauren Thurgood
Supervisor email: lauren.thurgood@flinders.edu.au
Name of research group: Lymphoproliferative Research Group – Proteomics and Metabolism

Description of research area and interests:
My research area is focussed on chronic lymphocytic leukemia (CLL), a common adult leukemia. The overall goal of my research is to understand the differences of these cancer cells to healthy cells and if these changes can be targeted using novel therapies. This approach uses techniques such as proteomics to look at changes in protein expression and cell culture models to understand how these cells respond to various stimulation. I have a strong interest in cancer cell metabolism and how cancer cells use nutrients to proliferate. This includes understanding how disruption of nutrient delivery or nutrient use can be targeted for new therapies. Using the Cell Screen Facility at FHMRI, we are interested in screening large numbers of novel compounds against metabolic pathways to determine their efficacy in CLL.

Outline of projects:
- The effect of the tumour microenvironment on CLL cell survival
- Assessing proteome changes following targeted therapies
- Targeted therapies as shifting the paradigm in CLL treatment. However, there are no predictive biomarkers for response or resistance. By analysing the proteome of CLL cells taken from patients pre- and post-treatment and correlating this with clinical outcomes we hope to identify biomarkers of response and resistance

Skills students will gain:
Flow cytometry, cell culture, proteomics, understanding of clinical research, working in a large and diverse research team (e.g. clinicians, scientists).

Key staff associated with projects:
Dr Giles Best
Associate Professor Karen Lower
Dr Stephen Gregory
Associate Professor Bryone Kuss.
flinders.edu.au/people/lauren.thurgood

Location: Flinders Medical Centre

Supervisor name: Dr Madelé van Dyk
Supervisor email: madele.vandyk@flinders.edu.au
Name of research group: FHMRI Cancer

Description of research area and interests:
The main research area for this project is Precision Medicine in Oncology, where we will focus on using existing knowledge together with individual patient and disease characteristics to provide an individualised treatment, to give the patients a better chance at survival. To do this, the project will involve elements of: Clinical Pharmacology (what the body does to the drug and in turn how the drug affects the body), Clinical Oncology (clinically prevent, diagnose and treat cancer), Pharmacogenomics (how the genetic makeup of an individual affects their response to drugs) and Pharmacometrics (mathematical models of biology, pharmacology, disease, and physiology used to describe and quantify interactions between drugs and patients).

Outline of projects:
Due to the short survival time for some advance cancers, this project will investigate strategies to further improve the use of targeted therapies in advance cancers. The aim of this project will focus on improving survival while minimising toxicity by increasing our current understanding of how a particular drug produces its effects against cancer and how we can better use it to provide a more personalised approach. The project will use a combined molecular and clinical approach to answer initial clinical questions but also opens up a pathway to investigate further challenging unmet clinical needs.

Skills students will gain:
Handling clinical patient samples and
cancer patient recruitment. Interacting with cancer patients. Advance training in the use of detecting and quantifying medicines from human samples (cancer patients) with a high-performance liquid chromatography-mass spectrometry (HPLC-MS) approach (similar techniques used in forensic science). Advance training in analysing clinical based research data, performing statistical analyses on this data and how to interpret and relate this data to establish and address real-world challenges currently faced in clinical practice. The student will also have the opportunity to write up their own publications in a well-experienced and supported environment. Working with senior clinicians and scientists from Adelaide's major research institutions and hospitals, the student will have the opportunity to network within a multi-disciplinary environment ranging from Clinical Pharmacology, Clinical Oncology, Pharmacogenomics, and Pharmacometrics. Currently we have international and national collaborations with Germany and Sydney, which will allow the student to present their work to world-class leaders in this field, further expanding their networking experience.

Key staff associated with projects:
Dr Ganessan Kichenadasse
Professor Betty Sullustio
Dr Daniel Barratt
Mr Shane Spencer
Professor David Foster.

linkedin.com/in/madelé-van-dyk-17b009b2

Location: Flinders Centre for Innovation in Cancer

Supervisor name: Dr Craig Wallington-Beddoe
Supervisor email: craig.wallingtonbeddoe@flinders.edu.au
Name of research group: Multiple Myeloma Translational Research Laboratory

Description of research area and interests:
My translational research program focuses on the presently incurable blood cancer multiple myeloma with the aim of investigating key biological processes to develop novel therapeutic strategies. The research is conducted at Flinders University and at the Centre for Cancer Biology UniSA, and links with the haematology clinical trials unit and direct patient management at Flinders Medical Centre.

Outline of projects:
• Manipulating endoplasmic reticulum stress levels in multiple myeloma cells to enhance the cytotoxic effects of proteasome inhibitors and other novel agents, particularly in the setting of relapsed or refractory disease.
• Biomarker and therapeutic roles of adhesion proteins in multiple myeloma.
• Characterising drug efflux transporters on multiple myeloma cells to enhance therapeutic responses.
• Elucidation of the role a novel iron-dependent cell death mechanism termed “ferroptosis” plays in the survival of multiple myeloma cells and how this biological process contributes to the efficacy of drugs used to treat this cancer. This project involves exploring several aspects of the ferroptosis signalling pathway, relating lipid and iron metabolism, generation of ROS and glutathione production to multiple myeloma cell survival and death.

Skills students will gain:
Cell culture, PCR, RNA sequencing, Western blotting, flow cytometry and involvement in the development of phase 1 clinical trials.

Key staff associated with projects:
Dr Lauren Thurgood
Ms Rachel Mynott (PhD student)
Professor Stuart Pitson
Professor Claudine Bonder
Dr Manjun Li.
flinders.edu.au/people/craig.wallingtonbeddoe

Location: Flinders Centre for Innovation in Cancer
Research Supervisors and their projects
Molecular Biosciences

Supervisor name: Dr Amy Wyatt
Supervisor email: amy.wyatt@flinders.edu.au
Name of research group: Protein Misfolding and Inflammation Laboratory

Description of research area and interests:
Proteins are the molecular machinery responsible for carrying out the multitude of functions that are necessary to sustain life. In order for proteins to perform these functions they must first attain and then maintain their correct three-dimensional shape or ‘fold’. The accumulation of incorrectly folded (i.e. misfolded) proteins underlies more than 40 debilitating human disorders including Alzheimer’s disease, heart disease, arthritis and preeclampsia. Many of these conditions are currently without effective therapies. Misfolded proteins accumulate in the human body due to genetic mutations, damage induced by biological stresses or overwhelming of the biological systems normally responsible for protein folding quality control including molecular chaperones that stabilise misfolded proteins and facilitate their refolding or disposal. Our research focuses on understanding the relationship between inflammation and protein misfolding in health and disease with the end goal of contributing to the framework for the development of novel therapeutic and diagnostic strategies.

Outline of projects:
• Characterising the dual roles of hypochlorite as an inducer of protein misfolding and a regulator of extracellular proteostasis machinery
• Characterising the extracellular proteostasis network in pregnancy
• Elucidating the role of protein misfolding in pregnancy-associated complications
• Investigating non-canonical functions of human alpha-macroglobulins in health and disease

Skills students will gain:
• Biochemical analysis of proteins and protein misfolding using a range of techniques such as electrophoresis, Western blotting, chromatography, circular dichroism, fluorimetry and a range of plate reader assays.
• Bacterial cell culture and recombinant protein expression
• Purification of endogenous proteins from complex biological fluids
• Mammalian tissue culture and a range of cell-based assays
• Flow cytometry and confocal microscopy

youtu.be/unqkQ6sGTkk

Location: Flinders Medical Centre
Research Supervisors and their projects

Molecular Biosciences

Supervisor name:
Professor Wei Zhang
Supervisor email:
Wei.zhang@flinders.edu.au
Name of research group: Centre for Marine Bioproducts Development (CMBD)

Description of research area and interests:
The ocean contains unknown varieties of new marine bioresources, spawning innovation in food production, health and nutrition, and fuel and energy alternatives. We are diving deep, developing new marine bioproducts and the latest bioprocess technologies, focussing on green and circular manufacturing. We are globally recognised as research leaders on Australia’s marine bioresources – up to 95% of which are not found anywhere else in the world.

The CMBD conducts R&D on marine bioprocess, bioproducts and biotechnology in collaboration with a wide range of disciplines including medicine, health and disease treatment and prevention, food sciences, agriculture, aquaculture, environmental protection and management, renewable energy and biotechnological engineering.

We are developing novel marine bioproducts for sustainable and profitable seafood and functional foods, marine nutraceuticals and cosmeceuticals, marine bioproducts and biomaterials, preventive medicines and pharmaceutical industries, and the advanced manufacturing processes to manufacture them in the circular economy context.

Outline of projects:
1) Food and nutraceutical developments from marine bioresources
   This project will develop green and clean extraction processes to efficiently produce various marine bioproducts using emerging and patented advanced technologies. The extracted products will be characterised and analysed in composition, functionalities, bioactivities, and nutritional values to determine their potential applications in food, functional food and nutraceutical product development toward commercialisation to make an impact on industry and community health through nutritional intervention.

2) Marine microbial natural products development for industry application
   The project focuses on biodiscovery research from marine microbes and microalgae and their derived product development for industry application using diverse biotechnological approaches. Microbes are sourced from diverse marine organisms, such as marine sponges and macroalgae, and microalgae are mainly focused on edible species. Industrial applications primarily target food such as plant-based proteins for meat analogues, and pharmaceutical industries. The in-house developed microbiome analysis approach using advanced Next Generation Sequencing will provide a distinctive technical advantage for microbiome-based research.

3) Novel 3D-bioprinting marine-derived biomaterials and bioinks
   The research aims to develop a comprehensive design and fabrication process flow diagram, in-depth physiochemical characterisation of marine biomaterial to address Critical Quality Attributes (CQA) of products and Quality by design (QbD) of the 3D bioprinting industry. The projects will involve innovative technologies from functional chemistry, biochemistry and biomedical science to develop biomaterials for artificial scaffolds for tissue and organ regeneration. The application of novel biomaterial will focus on 3-D printing of skin tissues and neuronal organoids for the discovery and development of potent bioactives for skin health and aging health products.

4) Development of Australian seaweed-based functional foods and biodegradable bioplastics
   The first research project area will focus on South Australian seaweeds for developing a variety of targeted vegan-friendly food and functional food products with commercialization potentials for the Australia market. The second project area will develop seaweed-based novel bio-composite materials as biodegradable bioplastics for environmentally friendly plastics products such as food packaging films.

5) Functional food product development from marine and terrestrial bioresources
   The project focuses on researching and developing functional food products from edible medicinal bioresources of both marine and terrestrial environments, based on the “Edible medicines theory and practice”. The integration of traditional nutritional and medicinal knowledge and modern biotechnology will be the key technology platform to enable the complementary formulation of bioactive and functional ingredients from both marine and terrestrial bioresources. We are aiming to uncover the scientific basis to develop a series of functional foods and preventive medicinal products with these active ingredients that add more than just nutrition, to improve the quality of life and for better overall health and wellbeing of the human population.
Skills students will gain:
The CMBD research scope is diverse, aiming to develop sustainable and profitable seafood and functional foods, marine nutraceuticals and cosmeceuticals, marine bioproducts and biomaterials, biomedicine and marine biofuels industries, and the advanced manufacturing processes to manufacture them in the circular economy context.

We provide great training programs and generous scholarships for talented students to conduct their research projects. The techniques cover a wide range of areas of science and technology, including Biochemistry (enzyme assays and bioactive assays), Biotechnology, Green Chemistry (supercritical fluid extraction, microwave-assisted extraction, ultrasound-assisted extraction, pulse electric field, and vortex fluid device), Molecular Biology (NGS sequencing, metagenomics, and bioinformatics), Cell Biology (cell and tissue cultures), Analytical Technology (UPLC, LC-MS etc), 3D-Bioprinting, and Microscopy techniques.

Key staff associated with projects:
Associate Professor Kirsten Heimann
Professor Colin Raston
Associate Professor Justin Chalker
Dr Michael Conlon
Dr. Zhongfan Jia.

flinders.edu.au/centre-marine-bioproducts-development
anzmbs.asn.au
mbcrc.com
tcgcm.com.au

Scholarships:
PhD: CMBD will offer 'Top-up scholarship' of an additional $5,000 per year (tax-free) for those PhD applicants who have secured other scholarships. For PhD students who have demonstrated outstanding performance, the Top-up scholarship will be offered at $10,000 per year for year 2 and year 3. The CMBD also offers a research project-based scholarship at the standard rate for excellent PhD candidates.

Masters (Honours) of Biotechnology: CMBD will offer a scholarship of $5,000 per student for outstanding Masters/ Honours of Biotechnology students who have gained a minimum GPA 6.0 (out of 7.0) and/or demonstrated academic excellence and research potential.

Location: Health Sciences Building
## Research Supervisors and their projects

### Clinical Translation

**Supervisors’ names:**

**Associate Professor Shailesh Bihari**

**Professor Peter Catcheside**

**Supervisors’ emails:**

shailesh.bihari@flinders.edu.au

peter.catcheside@flinders.edu.au

**Name of research group:** ICCU and FHMRI Sleep Health collaborative research group

**Description of research area and interests:**

The Flinders Intensive and Critical Care Unit (ICCU) and FHMRI Sleep Health research groups have strongly overlapping research interests. This includes a new approach for assessing breathing effort and timing in patients with breathing problems in sleep and in mechanically ventilated patients in an ICCU setting. Another area of interest is in assessing the impact of the noisy ICCU environment on sleep and health outcomes such as delirium, where sleep disturbance could play an important role in promoting sub-optimal health outcomes in hospital care.

**Outline of projects:**

Potential projects could focus around evaluating aspects of a new respiratory-mechanics based method for assessing breathing effort and timing in ICCU or in a Sleep Health context. Alternatively, projects could focus on new methods for assessing noise impacts on sleep and health outcomes.

**Skills students will gain:**

- A comprehensive understanding of human respiratory/sleep physiology and health and relevant measurement approaches
- Skills in research design and methodology
- Statistical knowledge

**Supervisor name:**

**Associate Professor Shailesh Bihari**

**Supervisor email:**

shailesh.bihari@flinders.edu.au

**Name of research group:** The Lung Lab

**Description of research area and interests:**

The Lung Lab has various interests in the respiratory health but specifically stimuli of acute lung injury and methods to alleviate respiratory inflammation and damage. We have an established history in several in vitro and in vivo models, as well as clinical studies linked with the Intensive and Critical Care Unit at Flinders Medical Centre. Areas of focus include mediator regulation of cellular activation and infiltration of the lung and the resultant lung remodelling, and the implications on pulmonary function including respiratory mechanics and fluid regulation. As part of this research group, I have interests in intravenous fluid instillations and the hemodynamic effects on the respiratory system resulting in respiratory dysfunction and damage.

**Outline of projects:**

The project aims to continue investigation into the physiological outcomes and hemodynamic effects of fluid instillation with the creation of a two-hit acute lung injury model, utilising ventilator-induced injury or bacterial stimulated inflammation. The project will use in vivo models to explore the mechanisms underlying the physiological changes associated with the two-hit acute lung injury model.

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[Research Supervisors and their projects](#)
Supervisor name: **Professor Peter Catcheside**
Supervisor email: peter.catcheside@flinders.edu.au

**Name of research group:** FHMRI: Sleep Health (formerly Adelaide Institute for Sleep Health)

**Description of research area and interests:**
The FHMRI: Sleep Health group is one of the leading sleep research laboratories in Australia with broad research interests spanning a range of sleep problems and impacts on daytime functioning and health. Research is mainly focused on advancing evidence-based approaches to better diagnose and manage sleep problems through

- **a. Understanding mechanisms and consequences of sleep disturbances.**
- **b. The development and testing of novel measurement and treatment approaches strategically designed to improve sleep problem identification and management.**
- **c. Randomised controlled trials to definitively establish causal mechanisms and the clinical utility of new versus current best practice methods.**

The FHMRI: Sleep Health group has extensive collaborations across the College of Science and Engineering, College of Education, Psychology and Social Work, Flinders Medical Centre (Respiratory and Sleep Medicine and the Intensive and Critical Care Unit (ICCU)) amongst other groups and initiatives.

**Outline of projects:**
Current research interests and potential future research directions include projects to investigate

- **Environmental noise impacts on sleep and daytime functioning and health.**
- **The use of circadian-system guided lighting strategies to accelerate circadian realignment to shift-work.**
- **Use of a new respiratory-mechanics based method for assessing breathing effort and timing in ICCU or in a Sleep Health context.**
- **The use of new under-mattress and other sleep monitoring technology for helping to improve sleep in patients with motorneurone disease.**
- **Respiratory load sensory mechanisms.**
- **The use of novel EEG recording methods for examining auditory-evoked responses.**
- **Improved methods for assessing personal protective equipment (PPE) mask resistance, leak and filtration performance effectiveness.**

**Skills students will gain:**
- A comprehensive understanding of human sleep and respiratory physiology and health and relevant measurement approaches
- Skills in research design and methodology
- Statistical knowledge
- Skills in reporting and publishing research

**Key staff associated with projects:**
Professor Bob Adams
Professor Danny Eckert
Dr Gorica Micic
Dr Branko Zajamsek
Professor Karen Reynolds.

**Location:** Flinders Medical Centre

**Skills students will gain:**
Animal handling and surgical skills, protein analysis methods including ELISAs, histological staining and analysis, cell culture and general lab techniques.

**Key staff associated with projects:**
Associate Professor Dani-Louise Dixon
Dr James McEvoy-May.

**Location:** Flinders Medical Centre
Research Supervisors and their projects
Clinical Translation

Supervisor name: 
**Associate Professor Chris Delaney**

Supervisor email: 
chris.delaney@sa.gov.au

Name of research group: Vascular Surgery Atherosclerosis Research and Biobank

Description of research area and interests: 
Atherosclerosis is a systemic pro-inflammatory state which commonly presents as ischaemic heart disease (IHD), ischaemic stroke and peripheral arterial disease (PAD).

Unlike atherosclerotic disease in other vascular territories, endarterectomy (surgical removal of atherosclerotic plaque from diseased arteries) is a mainstay of treatment for PAD and this represents a unique opportunity to preserve such plaque for future profiling.

Importantly, endarterectomy is carried out across the spectrum of PAD, ranging from patients with intermittent claudication (ischaemic pain induced by walking and relieved with rest) to those with critical limb ischaemia. This allows assessment of plaque across different manifestations of the disease process. At the same time, the surgical exposure required to perform endarterectomy also allows for access to peri-vascular muscle, fat and adventitia (the outer lining of the blood vessel wall), all of which have been recently proposed to influence the atherosclerotic process through the role of myokines, adipokines and adventitial fibroblasts respectively.

Outline of projects:

**Objective 1** – The establishment of a Human Tissue Biobank through collection of biological samples from those living with PAD. This will facilitate insight into the complex interplay of multiple organ systems in the atherosclerotic disease process and take steps towards achieving our ultimate goal which is the ability to personalise the diagnosis and treatment of PAD.

In doing so, we expect that such a Biobank will foster multiple opportunities for research and collaboration both within Flinders University (FU) and externally. Already our group has made connections with the Flow Cytometry and Breath Analytics Laboratories within FU and we are hopeful of establishing collaborations with the Gastroenterology and Neuroscience Laboratories allowing us to better understand the role of the gut microbiome and neuro-hormonal regulation in the pathogenesis of PAD.

**Objective 2** – To demonstrate proof of concept of the efficacy of the Flinders Medical Centre PAD Biobank and our capacity to work as a team, we have identified a project that will examine the cellular milieu in atherosclerotic plaque of PAD patients. To put this into context, the immune diversity in atherosclerotic plaque suggests a critical yet ill-defined role for infiltrating and resident macrophages and many other immune cells, but particularly activated monocytes and T-cells. To date, the underlying mechanisms and roles of these cells remain unclear.

To enhance our understanding of these mechanisms, we will quantify the numbers of macrophages within plaque, blood monocytes, mast cells and T-cell subsets. Foamy macrophages and their senescent markers will also be assessed due to their potential link with advanced atherosclerotic lesions and plaque instability.

Hypotheses:

- A biobank of high-quality, clinically validated biological specimens, annotated with medical, demographical and laboratory data from patients with PAD will be an invaluable resource for researchers to better understand this disease.
- The application of immunohistochemistry to interrogate atheromatous tissue will provide insight into the inflammatory cellular milieu.

Skills students will gain:
Laboratory techniques will include enzymatic digestion of tissue, purification of single cells, cryopreservation, immunohistochemistry, immunophenotyping by flow cytometry, extraction of RNA, RT/PCR analysis and protein extraction. Experience working in a clinical surgical dept and research laboratory.

Key staff associated with projects:
Dr Ian Beckman
Ms Kaye Beckman.
flinders.edu.au/people/christopher.delaney

Location: Flinders Medical Centre
Skills students will gain:
Animal handling and surgical skills, protein analysis methods including ELISAs, histological staining and analysis, cell culture and general lab techniques, clinical sample preparation and analysis.

Key staff associated with projects:
Associate Professor Shailesh Bihari
Dr James McEvoy-May.

Location: Flinders Medical Centre

Outline of projects:
The project aims to continue investigation into the physiological and immunological outcomes of bacterial and viral induced respiratory inflammation. The project may use in vitro, in vivo, or a combination of both models, as well as clinical samples, to explore the mechanisms underlying the inflammation of respiratory diseases.
**Research Supervisors and their projects**

**Clinical Translation**

**Professor Danny Eckert**

**Supervisor email:** danny.eckert@flinders.edu.au

**Name of research group:** FHMRI Sleep Health/Adelaide Institute for Sleep Health

**Description of research area and interests:** Understanding the physiological causes of sleep apnoea and developing new targeted therapies through a comprehensive translational research program. A variety of experimental approaches are used to measure upper airway neuromuscular control and respiratory mechanics in humans to advance knowledge of basic mechanisms through to multicentre clinical trials to test new therapies including pharmacotherapies.

**Outline of projects:**

- Multiple projects are on offer. These include detailed upper airway physiology studies to advance knowledge on the mechanisms of upper airway muscle reflexes and how impaired pharyngeal muscle function contributes to airway collapsibility through to clinical trials aimed at delivering one or more targeted therapies to treat sleep apnoea including new pharmacotherapies.

**Skills students will gain:**

- A comprehensive understanding of human sleep and respiratory physiology
- Clinical research expertise
- Advanced skills in study design and methodology
- Data and statistical analysis techniques
- Skills in reporting and publishing research

**Key staff associated with projects:**

- Professor Peter Catcheside
- Professor Bob Adams
- Associate Professor Andrew Vakulin
- Associate Professor Sutapa Mukherjee
- Dr Amal Osman
- Dr Jayne Carberry

Lab manager and support members Carolin Tran and team.

Research now flinders.edu.au/adelaide-institute-sleep-health

**Location:** Mark Oliphant Building

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**Associate Professor Luke Grzeskowiak**

**Supervisor email:** luke.grzeskowiak@flinders.edu.au

**Name of research group:** Paediatric, Reproductive and Perinatal Pharmacoepidemiology Group

**Description of research area and interests:** Nearly all women take medications during pregnancy or lactation, but greater than 90% of medications lack adequate information on efficacy or safety in this setting. Due to this lack of knowledge, thousands of unborn children are exposed to harmful medications every day, resulting in adverse pregnancy outcomes (e.g. miscarriages, preterm birth, birth defects, and growth restriction) and long-term effects on child health and development (e.g. metabolic disorders, neurodevelopmental disorders), whereas other women deliberately avoid safe pharmacological treatment for illnesses that may jeopardize maternal and infant health if left untreated.

My research is focused on improving maternal and child health through the development and promotion of safer, more effective and personalised approaches to pharmacotherapy. My research utilises a range of methodologies including conducting clinical trials, utilising ‘big data’ to undertake large observational studies, and qualitative methods (e.g. consumer interviews and/or surveys).
Outline of projects:

Potential projects but open to discussion of topics covered above

- Provide evidence surrounding medication utilisation to understand patterns of consumer and prescriber behaviour, and identify and address evidence-practice gaps
- Generate robust and reliable outcome estimates to facilitate informed decision-making regarding the potential benefits, risks, and uncertainties of medication use
- Identify the common characteristics of individuals at greatest likelihood of experiencing medication harms or benefits, to enable improved targeting of treatment interventions

Possible areas of research include:

- Asthma management during pregnancy
- Iron deficiency anaemia in pregnancy
- Management of common lactation problems including lactation insufficiency and mastitis
- Antibiotic dosing in pregnancy
- Postpartum pain management
- Antidepressant use in pregnancy or in young people
- Medication utilisation in primary care
- Medication safety interventions in neonatal care

Skills students will gain:

Skill development focusses on the basics of:

- Obstetric and neonatal pharmacology
- Pharmacoepidemiology
- Clinical epidemiology
- Clinical trials & cohort studies
- Evidence-based medicine

Key staff associated with projects:

Dr Tamara Varcoe
Professor Tim Green
Associate Professor Alice Rumbold
Associate Professor Rosalie Grivell
Dr Scott Morris
Professor Claire Roberts.

flinders.edu.au/people/luke.grzeskowiak

Location: Flinders Medical Centre
Research Supervisors and their projects
Clinical Translation

Supervisor name: Dr Anna Hudson
Supervisor email: anna.hudson@flinders.edu.au
Name of research group: FHMRI Sleep Health

Description of research area and interests:
The respiratory muscles are rhythmically activated all day, every day by the central nervous system to ventilate the lungs. My research investigates how activation of the respiratory muscles is optimised in health and the changes that occur in healthy ageing, lung disease and injury. I also investigate general motor control, e.g. in the limb muscles, to inform my research in respiratory muscles. My goal is to understand respiratory muscle control to improve health outcomes when it fails. To do this, I use neurophysiological techniques to measure muscle activity and brain activity and I assess respiratory muscle mechanics using ultrasound. This integrated approach is the only way to assess human respiratory muscle control.

Outline of projects:
Multiple projects are on offer. These include assessment of the efficiency of breathing in health and disease and determining the underlying mechanisms of muscle activation in movement control and strategies for rehabilitation.

Skills students will gain:
• A comprehensive understanding of respiratory physiology.
• Clinical research experience
• Skills in study design and research techniques
• Understanding of data and statistical analysis

Key staff associated with projects:
Professor Danny Eckert
Professor Peter Catcheside
Associate Professor Sutapa Mukherjee
Dr Thomas Altree.

Supervisor name: Professor Bogda Koczwara
Supervisor email: bogda.koczwara@flinders.edu.au
Name of research group: Cancer Survivorship and Psycho-Oncology Group

Description of research area and interests:
Our research aims to improve health outcomes for cancer survivors through examination of burden of disability and unmet needs after cancer diagnosis and development and implementation of new models of care for cancer patients and survivors such as systematic collection of patient reported outcomes (PROs).

We have a particular interest in management of comorbidities and cancer, especially cardiovascular disease and are currently developing a nurse led clinical pathway for care delivery.

Our research examines novel digital technologies to enable access to care. We have developed innovative online psychological interventions for cancer patients. We are also focusing on e-health literacy and health disparities in access and uptake of digital technologies in cancer.

Outline of projects:
• Finding My Way research program – adaptation and replication of the Australian Finding My Way program, to the UK context, adaptation of the program to the metastatic breast cancer setting and analysis of implementation data.
• Healthy Living after Cancer – Online: an online adaptation of an evidence-based nutrition, physical activity, and weight management program for cancer survivors.
Supervisor name:
**Dr Nicole Lovato**

Supervisor email:
nicole.lovato@flinders.edu.au

Name of research group: FHMRI Sleep Health (formally Adelaide Institute for Sleep Health)

Description of research area and interests:
Dr Lovato’s research is focused on the basic and clinical aspects of sleep, circadian rhythms, and sleep disorders such as insomnia, and the translation of this knowledge to ensure best-practice sleep healthcare is accessible and cost-effective for the community. Dr Lovato has developed and assessed novel, tailored psychology-based treatments for patients suffering from insomnia and other sleep disorders. She has an ongoing interest in this area.

Outline of projects:
Several projects will be offered, each focused on evaluating the efficacy of personalised treatments for insomnia (including wearable devices) and new models of care to transform the management of insomnia and associated mental ill-health in Australia and globally.

Skills students will gain:
Evidence synthesis, systematic literature reviews, intervention co-design, qualitative and quantitative analysis, clinical trials design and conduct, ethics and governance reporting.

Key staff associated with projects:
Professor Leon Lack
Associate Professor Andrew Vakulin
Dr Gorica Micic
Dr Emer Van Ryswyk
Dr Alexander Sweetman.

flinders.edu.au/adelaide-institute-sleep-health

Location: Mark Oliphant Building

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- **Defining Symptoms and Impacts of Adjustment Disorder in Cancer: A case series analysis**: developing a symptom and impact list of how people with cancer experience adjustment disorder, in order to facilitate more effective screening and treatments.
- **iSCREEN**: A pilot implementation study of patient reported outcome collection in breast cancer patients.
- **Identifying predictors of digital engagement for people with cancer**: Identify the impact of digital health literacy and socioeconomic factors on engagement with digital health applications in cancer care.
- **Using the Quality of Cancer Survivorship Care Framework** to increase our understanding of the evidence base supporting quality survivorship care in breast cancer.

Skills students will gain:
Evidence synthesis, systematic literature reviews, intervention co-design, qualitative and quantitative analysis, clinical trials design and conduct, ethics and governance reporting.

Key staff associated with projects:
Ms Reegan Knowles
Dr Lisa Beatty
Dr Emma Kemp.

flinders.edu.au/people/bogda.koczwara

Location: Flinders Centre for Innovation in Cancer
Research Supervisors and their projects
Clinical Translation

Supervisor name: Dr James McEvoy-May
Supervisor email: j.mcevoy@flinders.edu.au
Name of research group: The Lung Lab

Description of research area and interests:
The Lung Lab has various interests in the respiratory health but specifically stimuli of acute lung injury and methods to alleviate respiratory inflammation and damage. We have an established history in several in vitro and in vivo models, as well as clinical studies linked with the Intensive and Critical Care Unit at Flinders Medical centre. Areas of focus include mediator regulation of cellular activation and infiltration of the lung and the resultant lung remodelling, and the implications on pulmonary function including respiratory mechanics and fluid regulation. As part of this research group, I have interests on bacterial and viral stimuli of respiratory inflammation, investigating physiological and immunological outcomes of respiratory function, with a focus on the immunomodulation potential of low dose ionising radiation. In addition, I have research interests in respiratory health following in utero exposures to ionising radiation. These radiation-based interests expand to include both medical and occupational exposures.

Outline of projects:
The project aims to modulate the proinflammatory response during acute respiratory inflammation by exposure to a low-to-moderate dose of ionising radiation, thereby reducing the severity of injury to the lung. The project may use in vitro, in vivo, or a combination of both models to explore the mechanisms underlying the immunomodulatory properties of ionising radiation.

Skills students will gain:
Animal handling and surgical skills, protein analysis methods including ELISAs, histological staining and analysis, cell culture and general lab techniques.

Key staff associated with projects:
Associate Professor Dani-Louise Dixon
Associate Professor Shailesh Bihari
Associate Professor Tony Hooker.
researchnow.flinders.edu.au/en/persons/james-mcevoy
Location: Flinders Medical Centre

Supervisor name: Dr Gorica Micic
Supervisor email: gorica.micic@flinders.edu.au
Name of research group: FHMRI Sleep Health (formally Adelaide Institute for Sleep Health)

Description of research area and interests:
Dr Micic is a Clinical Psychologist and Postdoctoral Research Associate at FHMRI Sleep Health. Her research interests relate to understanding the psychological, behavioural and physiological aspects of normal and disordered sleep. This includes the underlying mechanisms of circadian rhythm (body clock) disorders, insomnia and environmental factors that impact sleep (e.g., light and noise). She has conducted extended and intricate human laboratory experiments in these areas and has access to various existing datasets through this work, within the research team and through collaborations. This work aims to better understand sleep, insomnia and circadian rhythms to create targeted and more effective treatments to improve sleep, daytime functioning and wellbeing.

Outline of projects:
• establish the psychological and physiological impacts of environmental noise on sleep
• investigate the underlying causes and mechanisms of circadian rhythm (body clock) misalignment
• improve sleep and daytime functioning through optimised light and noise interventions
• investigate targeted treatments for circadian rhythm disorders and insomnia
• examine cross-sectional and longitudinal impacts of sleep and sleep-related factors

Skills students will gain:
Animal handling and surgical skills, protein analysis methods including ELISAs, histological staining and analysis, cell culture and general lab techniques.

Key staff associated with projects:
Associate Professor Dani-Louise Dixon
Associate Professor Shailesh Bihari
Associate Professor Tony Hooker.
researchnow.flinders.edu.au/en/persons/james-mcevoy
Location: Flinders Medical Centre
Skills students will gain:
Methodological research implementation, translation of findings and publishing
• Applied research and clinical skills
• Inter-disciplinary collaboration
• Statistical knowledge
• Understanding of human-based research in the laboratory and ambulatory settings
• Work with diverse clinical groups including healthy and vulnerable individuals
• Extensive sleep laboratory skills including set-up of Polysomnography (PSG) and administration of psychological, neurocognitive and other day and night time performance and functioning assessments

Key staff associated with projects:
Professor Peter Catcheside
Dr Nicole Lovato
Professor Leon Lack
Dr Branko Zajamsek
Dr Kristy Hansen, Associate Professor
Dr Alexander Sweetman
Dr Ranjay Chakraborty
Dr Sarah Appleton
Dr Yohannes Melaku.
flinders.edu.au/adelaide-institute-sleep-health
flinders.edu.au/people/gorica.micic
Location: Mark Oliphant Building

Supervisor name:
Associate Professor Michael O’Callaghan

Supervisor email:
michael.ocallaghan2@sa.gov.au

Name of research group: Flinders Medical Centre Urology Unit

Description of research area and interests:
My research investigates health outcomes in patients with urologic cancers. A particular focus is prostate cancer and our group manages the state prostate cancer registry: SA-PCCOC. In addition to this, our research studies kidney cancer, bladder cancer, testicular cancer and other aspects of urology.

Outline of projects:
Our group supervises students at undergraduate, Honours, Masters and PhD levels, and particularly junior medical staff who are seeking selection into the urology specialty program. Projects use a variety of epidemiologic methods including predictive modelling, systematic literature reviews with meta-analysis, and cover topics ranging from screening and treatment selection to health-related quality of life.

Skills students will gain:
Systematic literature reviews, evidence appraisal, meta-analysis, statistical analysis, cohort studies.

Key staff associated with projects:
Research & clinical staff from the Flinders Medical Centre Urology Unit.
flinders.edu.au/people/michael.ocallaghan

Location: Flinders Medical Centre
### Clinical Translation

**Research Supervisors and their projects**

**Supervisor name:**
**Professor Joseph Selvanayagam**  
**Supervisor email:** joseph.selvanayagam@flinders.edu.au  
**Name of research group:** Cardiac Imaging Research

**Description of research area and interests:**
As the Director of Cardiac Imaging Research (CIR), Professor Joseph Selvanayagam leads a group with an international reputation in randomised clinical trials, and cardiac imaging research. The research program can be summarised under the overall theme of using cardiac imaging to answer mechanistic questions in three broad areas in cardiology: Heart failure and Cardiomyopathy, Coronary Artery Disease and Arrhythmia Disorders. The CIR team members have the required technical expertise in advanced imaging analysis to successfully carry out the proposed project. The group also has the existing IT infrastructure to execute the project within the required time frame.

**Outline of projects:**

Hypertrophic cardiomyopathy (HCM) is an inherited condition that results in an abnormally thickened heart muscle. It is the most common inherited heart muscle condition affecting up to 1 in 200 of the general population.

Treatment of HCM has focused on relief of symptoms by drugs such as Beta-blockers which slow the heart rate and allows blood to completely fill the chambers before it is pumped out, leading to improved heart function. However, symptom relief is often incomplete and there is no evidence on the benefit of Beta-blockers or related medications to reverse abnormal heart muscle thickening.

There is some preliminary evidence that a drug, Perhexiline, currently used as an anti-anginal agent, increases the energy efficiency of the heart, and may aid in the improvement of symptoms in patients with HCM. No study has looked at the reduction of muscle thickness with Perhexiline which is the principal driver of heart failure in HCM. We aim to study the effects of perhexiline treatment on heart muscle thickness in symptomatic HCM patients.

**Skills students will gain:**
- Overview of conduct of research projects.  
- Active involvement in the proposed project, including writing of the first draft.  
- Completion of abstract. Co-author in an original article.

**Key staff associated with project:**
Co-supervisor Dr Rajiv Ananthakrishna.  

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**Supervisor name:**
**Associate Professor Andrew Vakulin**  
**Supervisor email:** andrew.vakulin@flinders.edu.au  
**Name of research group:** FHMRI Sleep Health (formerly Adelaide Institute for Sleep Health)

**Description of research area and interests:**
Falls are a major cause of preventable injury, hospitalisation, morbidity, loss of independence and mortality in older adults. 1 in 3 people aged ≥65 years living at home experience a fall annually. Falls represent a significant healthcare burden. In 2016-17 alone, >120,000 people aged ≥65 years were hospitalised from fall-related injuries in Australia costing >$600M (direct acute care cost). Emerging evidence, including from our team, indicates that poor sleep health and sleep disorders (e.g., insomnia; obstructive sleep apnoea [OSA]) are common (~50%) in older people, and are independent contributors to falls risk (e.g., balance and gait abnormalities). Despite this, sleep health is currently completely ignored in falls prevention and rehabilitation clinical practice and guidelines. Our research program is focusing on understanding the impact of sleep and circadian disorders on falls risk in older people, and importantly we are investigating if sleep disorder treatment is a feasible and effective approach to reduce falls risk.

**Outline of projects:**

Our sleep and falls risk research program is focusing on case control and pilot randomised trials in both sleep disorder and health older people as well as high risk fallers form falls clinic. We are aiming 1) examine the impact of sleep disorders and their treatment on gait and falls risk in older people; and (2) use sensor technology to...
Supervisors’ names:
Associate Professor Jenny Walker
Associate Professor Mihir D Wechalekar

Supervisors’ emails:
mihir.wechalekar@flinders.edu.au
jenny.walker@flinders.edu.au

Name of research group: Rheumatology

Description of research area and interests:
Rheumatoid arthritis (RA): disease activity, pathophysiology, and target tissue (the joint lining or synovial tissue (ST)) biology. We run a synovial tissue biobank, the only such facility in Australia & one of the very few world-wide.

Outline of projects:
RA affects 1-2% of the population, mostly in their working age, and leads to pain, disability and enormous societal costs; response to treatment predicts ability to work. Despite treatment advances, including biologic disease modifying therapies (DMARDs), remission (lack of clinically detectable disease) occurs in only ~20%, and sustained remission in even less. In addition, there are no established parameters that can currently objectively predict remission or impending flares. RA is a heterogeneous disease clinically and pathologically, and one reason for the suboptimal response relates to the current non-targeted, trial and error use of DMARDs. This is in contrast to an alternative pathobiological approach based on target-organ (synovial tissue (ST), the joint lining) biopsy analyses. ST analyses can allow therapy to be targeted to specific variants of the disease and potentially provide an objective guide to therapy modification and discontinuation. With existing national and international collaborations underpinned by a unique serial sequential biospecimen (ST, serum, RNA, DNA) collection from a clinically well-characterised cohort of treatment naïve patients with RA we aim to: (a) improve understanding of mechanisms of response, or lack thereof, to biologic DMARDs; (b) improve understanding of RA pathophysiology by characterising newly identified macrophage, fibroblast, and T-cell subsets and analysing their responses to treatment; and, (c) attempt to identify markers that will reliably predict RA remission and flares.

Skills students will gain:
Skills in laboratory techniques- histology, immunohistochemistry, RT-PCR. Exposure to and involvement in some newer research techniques- RNASeq, CyTof Translational research from bedside to bench to bedside.

Key staff associated with projects:
Ms Annabelle Small.

flinders.edu.au/people/mihir.wechalekar

Location: Flinders Medical Centre

monitor gait and sleep in the home environment for prolonged periods before and after sleep disorder treatment. Our specific aims include:

• Prospectively compare fall risk profiles and gait quality between age- and gender-matched older people with and without a sleep disorder
• Establish if sleep disorder therapy improves fall risk profiles and gait quality at 3-, 6- and 12-month follow-up in older people
• Investigate if novel in-home monitoring technology effectively identifies temporal relationships between sleep quality, circadian phase and continuous gait quality measurements.

Skills students will gain:
• Sleep physiology and disorders
• Sleep study data collection and interpretation of electrophysiological signals
• Circadian physiology
• Clinical gait and balance physiology and assessment
• Research data collection, processing, and analysis.

Key staff associated with project:
Dr David Stevens
Associate Professor Sutapa Mukherjee
Associate Professor Ching Li Char-Coetzer
Dr Nicole Lovato
Dr Alexander Sweetman
Dr Chris Barr
Dr Daina Sturnieks.

flinders.edu.au/adeelaide-institute-sleep-health
academic.oup.com/biomedgerontology/article/75/12/2450/5732393
Location: Mark Oliphant Building

flinders.edu.au/people/mihir.wechalekar

Location: Mark Oliphant Building
Research Supervisors and their projects
Clinical Translation

Supervisor name: Professor David Watson
Supervisor email: david.watson@flinders.edu.au
Name of research group: Upper Gastrointestinal (GI) cancer research group
Description of research area and interests:
Our aim is to transform the outcomes for individuals with oesophageal adenocarcinoma by prevention and early detection, focussing on strategies to 1) detect precancer or cancer at its earliest stage when cure is more likely; 2) more cost-effectively deliver Barrett’s oesophagus (precancer) surveillance by stratifying for cancer risk and targeting individuals at significant risk; and 3) develop a cost-effective framework for Barrett’s oesophagus screening in the Australian context.

This research entails developing new clinical and genomic data and integrating these outcomes within a health economic model to ensure clinical resources are focussed to areas of greatest benefit, and concurrently to minimise low-value interventions for Barrett’s oesophagus and oesophageal adenocarcinoma.

Outline of projects:
Blood biomarkers (eg miRNA, DNA methylation) for diagnosis and treatment prediction
- Breath biomarkers for diagnosis and treatment prediction
- Clinical outcomes and strategies to improve these outcomes
- Health Economic modelling to identify strategies to improve cost-effectiveness of intervention strategies
- Patient preferences for treatments and interventions

Skills students will gain:
Molecular biology, clinical outcomes measures, health economics modelling.

Key staff associated with projects:
Dr Damian Hussey
Dr Norma Bulamu
Dr Roger Yazbek.
flinders.edu.au/people/david.watson
Location: Flinders Medical Centre

Supervisor name: Professor Alan Wigg
Supervisor email: alan.wigg@sa.gov.au
Name of research group: Liver research group
Description of research area and interests:
Clinical research into new models of care for chronic liver failure.

Outline of projects:
Applying new therapies for hepatocellular carcinoma, investigating new models of liver care for remotely living Aboriginal peoples, investigating heart disease in patients with cirrhosis.

Skills students will gain:
Literature review, writing skills, data analysis and presentation, biostatistics, health economics.

Key staff associated with projects:
Dr Kaye Muller
Dr Jeyamani Ramachandran.
flinders.edu.au/people/alan.wigg
Location: Flinders Medical Centre
Healthy Communities

Supervisors’ names:
Professor Fran Baum
Associate Professor Anna Ziersch

Supervisor email:
fran.baum@flinders.edu.au
anna.ziersch@flinders.edu.au

Name of research group: Health, Society and Equity (Southgate)

Description of research area and interests:
The project seeks to understand and build an evidence base for decolonising practice in Aboriginal and Torres Strait Islander primary health care. Colonisation in Australia is ongoing and contributes to major effects on the health and wellbeing of Aboriginal and Torres Strait Islander peoples. Decolonising health care practices are the ways of working that seek to overcome colonial approaches to health. This means transforming the policies, processes and practices that have influenced health in the past, and which are still present today.

Outline of projects:
• Narrative review of decolonising practice in health care
• Analysis of the policy context for Aboriginal and Torres Strait Islander Primary Health Care
• Examining service users’ experiences of decolonising practice

Skills students will gain:
Critical appraisal, descriptive statistics, advanced statistics (e.g., multivariable analysis), modelling, surveys/interviews.

Key staff associated with projects:
Professor Jonathan Karnon.
flinders.edu.au/people/hossein.afzali

Outline of projects:
• Telehealth services in primary care
• Comparing methods of Health Technology Assessment in Australia and the UK
• Evaluation of policy reforms in the community-based aged care services
• Using longitudinal data to estimate costs and outcomes of frailty interventions
• Assessing the costs and benefits of incorporating more complex model structures for the economic evaluation of new health technologies

Skills students will gain:
Critical appraisal, descriptive statistics, advanced statistics (e.g., multivariable analysis), modelling, surveys/interviews.

Key staff associated with projects:
Professor Jonathan Karnon.
flinders.edu.au/people/hossein.afzali

Location: Health Sciences Building
• Selecting one (or more) of the partner services to investigate decolonising practice at that service in depth.
• Conducting research with the Aboriginal and Torres Strait Islander primary health care sector more broadly to gather a range of perspectives on decolonising practice

Skills students will gain:
Students will be able to select a topic that is directly related to the project and of interest to them. They will then have the opportunity to be part of a dynamic and supportive team of Aboriginal and non-Indigenous researchers seeking to conduct research that combines Indigenous and non-Indigenous knowledge and approaches to research. Students will have the opportunity to gain skills in partnership-based research, qualitative and mixed methods research, and Indigenous research methods.

Key staff associated with projects:
Associate Professor Tamara Mackean, Dr Kim O’Donnell, Professor Juanita Sherwood, Associate Professor Deb Askew, Professor Annette Browne, Professor Michael Kidd, Ms Sonya Egert, Ms Colleen Hayes, Ms Laura Bahnisch.

flinders.edu.au/southgate-institute-health-society-equity/aboriginal-torres-strait-islander-health

Location: Health Sciences Building

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**Supervisors’ names:**

**Professor Fran Baum**

Supervisor email:
fran.baum@flinders.edu.au

Name of research group: Health, Society and Equity (Southgate)

Description of research area and interests:
There are opportunities for research projects linked to a broad area of study in the Southgate Institute to develop a comprehensive history of community health services in Australia (including women’s and Aboriginal and Torres Strait Islander health services) which offer a different model of care to the mainstream medical model.

Student research projects linked to this area of study would be primarily qualitative, and focus on the areas of: archival analysis of documents such as Federal and State/Territory policy documents from the 1970s onwards, and other documents, such as those from the Australian Community Health Association and its state branches.

Outline of projects:
This is an ongoing area of work for researchers in the Southgate Institute. Together with academic and industry partners in SA, Victoria and NSW, researchers at the Southgate led a grant application to the ARC in 2020 which is currently under consideration. If this application is successful, there will be opportunities for students to be involved in the larger study. If it is unsuccessful, there will be opportunities to work on small research projects in this area which can contribute to developing a history of community health in Australia.

Skills students will gain:
• Qualitative research skills in areas such as:
  • Document analysis
  • Undertake and analyse interviews
  • Analyse interview transcripts
  • Building research partnerships with external stakeholders
  • Analysis and write up of qualitative research for academic publications

Key staff associated with projects:
Associate Professor Tamara Mackean
Professor Colin MacDougall
Professor Warwick Anderson
Professor Virginia Lewis
Professor David Legge

flinders.edu.au/southgate-institute-health-society-equity/

Location: Health Sciences Building
Research Supervisors and their projects

Healthy Communities

Supervisor name: Associate Professor Niranjan Bidargaddi
Supervisor email: niranjan.bidargaddi@flinders.edu.au
Name of research group: Personalised Health Informatics Group

Description of research area and interests: The objective of our research is to develop and implement digital health systems, that improve capacity to predict, identify, treat and prevent in general and clinical populations e.g. mental health, endometriosis, ageing. Our most recent focus has been real-time monitoring and support for the mental health sector (MRFF Rapid Translation projects). Areas of interest include: 1) Objective, real-time monitoring, and early support tools for mental health using smartphones and wearables and innovative use of Medicare claims data. 2) Trials of digital health interventions focussed on real-time monitoring and support 3) End-user studies with State mental health care authorities, community mental health care providers and consumer/carer groups focussed on intervention development and implementation. We also develop consumer focussed digital monitoring and support resources for other chronic disease areas.

Outline of projects:

• Systematic reviews: Students will have opportunity to contribute to reviews on a number of topics currently underway
• Novel health interventions: Using novel mobile and web monitoring platforms developed in our lab to design and trial novel personalised support in the following areas. Interventions to promote; healthy financial behaviour using real-time banking data, healthy internet use habits using online activity data and compliance to hand hygiene and reduce infection using hand hygiene dispenser sensor and staff movement data in hospital settings
• COVID-19 & mental health: Under COVID-19 restrictions, mental health service providers have had to alter the ways in which they deliver care. In this research we wish to explore the changes in healthcare delivery and in particular the use of technology in the delivery of mental health services in a multi country study (Australia, USA, UK)

Skills students will gain:
Skills in systematic reviews, Digital Health, qualitative interview and analysis skills, project planning, multidisciplinary work experience.

Key staff associated with project:
Dr Yasmin Van Kasteren, Implementation Researcher, Dr Sarah Immanuel, Biomedical Signal Processing, Dr Wen Hao, Digital Platforms, Ms Lydia Oakey Neate, PhD student, Ms Christie Sherriff, MD Advanced Studies student, Ms Wei Du, MD Advanced Studies student. Research Associates: Ms Amy Nielsen, Mr John Fouyaxis.
tiny.cc/phit

Location: Tonsley/Flinders Health Sciences Building/SAHMRI

Supervisor name: Professor Billie Bonevski
Supervisor email: billie.bonevski@flinders.edu.au
Name of research group: Public Health

Description of research area and interests: Chronic diseases such as cardiovascular disease, cancer, diabetes, respiratory diseases place the greatest health burden on the Australian community. Many of these conditions are preventable and share common health behaviour risk factors such as smoking, alcohol consumption, physical inactivity and poor nutrition or low levels of screening. Our research is focussed on understanding health behaviours and using this knowledge to design, evaluate and scale up health behaviour change interventions for the primary and secondary prevention of chronic diseases. One feature of our research is targeting population groups who are at increased risk of chronic diseases due to socioeconomic, cultural, or clinical factors. For example, both prevalence of health risk factors and chronic disease outcomes are worse in rural and remote areas than in the cities. Our interventions aim to change behaviours at individual, organisational and community levels to promote health. Much of our research involves community-based partners and stakeholders including health providers and services, non-government organisations and consumers to increase the reach of our research impact.

Outline of projects:

• Understanding the barriers to quitting smoking in rural and remote Australia.
• Examining the effectiveness of smoking cessation interventions targeting rural and remote communities.
• A priority setting exercise: Stakeholder and community health priorities in rural and remote areas of Australia.
• Design and evaluation of a health mobile phone app for pregnant Aboriginal mothers and their children under 5 years.
• Examining strategies for increasing community participation in cancer prevention public education events.
• Exploring rural and remote communities understanding and use of cancer prevention strategies.
• Designing and evaluating youth resilience strategies for young people in rural and remote and Aboriginal communities.
• Where do people in rural and remote communities go to seek information on reducing alcohol consumption?
• Designing tobacco control messages for people with mental ill health.
• Examining the tobacco industry involvement policies of health research societies and associations.

Skills students will gain:
• Conducting critical appraisal of the literature and conducting systematic reviews
• Qualitative research skills such as interviewing and focus groups
• Co-design methods
• Quantitative research skills including cross-sectional surveys, pilot trials and other trial designs
• Statistical analysis techniques
• Implementation science methods.

Key staff associated with project:
Dr Joshua Trigg
Dr Kate Fairweather
Academics in the public health and rural remote health disciplines.

Supervisor name: Mrs Anthea Brand
Supervisor email: anthea.brand@flinders.edu.au
Name of research group: Remote Primary Health Care Manuals Project

Description of research area and interests:
The Remote Primary Health Care Manuals (RPHCM) are a suite of manuals that are used to guide high quality care for people living in remote areas of Australia. The manuals have a focus on Indigenous health and are developed and updated ‘by the users for the users’ to ensure that the knowledge contained in the manuals is not only evidence based but is appropriate to the practicalities of remote primary health care and is culturally appropriate to meet the needs of local communities. There are a number of research areas arising from the review process of these manuals including how the manuals inform practice and the outcomes of their implementation as well as clinical research topics associated with specific protocols across early childhood, antenatal and postnatal care, chronic disease, trauma, ear and eye health.

Outline of projects:
The RPHCM are reviewed on a regular basis, the current review period is funded for the period 2019-2022. A variety of short-term research projects could be undertaken during the review period under the supervision of the project team and/or in collaboration with other research groups. The duration of the review period is best suited for evidence reviews and brief qualitative research.

Skills students will gain:
• Gather, analyse, evaluate and present literature
• Systematic reviews
• Data collection and analysis
• Report writing, protocol and procedure development
• Stakeholder collaboration and management
• Translation of evidence to practice, in particular in remote and culturally specific contexts
• Cross-cultural communication

Key staff associated with projects:
Project Officers (Academic B/C)- Remote Primary Health Care Manuals
Dependent on topic area other Flinders NT academic staff may be engaged in research/supervision.

www.remotephcmanuals.com.au
Location: Centre for Remote Health, Alice Springs
Research Supervisors and their projects

Healthy Communities

Supervisor name: Dr Laura Edney
Supervisor email: laura.edney@flinders.edu.au
Name of research group: Health Economics

Description of research area and interests:
Cancer is a common cause of morbidity and mortality in Australia and appropriate, cost-effective treatment to improve health outcomes is a key health priority. Ensuring current health care meets quality standards for all patients can contribute to improving overall health outcomes and health equity. Our research utilises population level administrative datasets to evaluate diagnostic pathways, treatment patterns, specific care models, their costs and their relationships to health outcomes with a focus how these differ across tumour and patient groups. We are also interested in the supportive care needs of cancer patients and understanding patient preferences for how supportive care needs might be best addressed and how these can inform local implementation of evidence-based care models with a focus on reducing age and location disparities in unmet needs.

Outline of projects:
Projects include describing and evaluating patterns of health care, costs and outcomes for cancer patients; evaluating the costs and outcomes of multidisciplinary team-based care for cancer patients; capturing patient preferences for addressing supportive care needs and developing implementation frameworks to adapt evidence-based interventions to the local context to reduce the unmet supportive care needs of cancer patients.

Skills students will gain:
- Ethics application to re-use existing data set to follow up participants from 2010 study
- Survey design, data collection and analysis
- Data set analysis
- Publication – conference presentation/writing a paper

Key staff associated with projects:
Dr Chris Rissel, other staff may contribute to supervision dependent on the needs and level of the research student.

Location: Anywhere – I work from the Flinders Northern Territory campus (Darwin). However, I am experienced with supervision via distance and the research design does not require face to face data collection or analysis. Students who are physically located in the Northern Territory will be preferred. We are planning a PhD scholarship which could potentially provide some financial support.

Supervisor name: Associate Professor Narelle Campbell
Supervisor email: narelle.campbell@flinders.edu.au
Name of research group: Rural and Remote Health

Description of research area and interests:
Rural and remote workforce retention

Outline of projects:
Participants from a national 2010 allied health professional study that examined participant personality profession and work location agreed to be followed-up. The proposed study will contact these 2010 participants to understand the match between their 2010 work intentions and subsequent work location decisions. The aim of the research will be to investigate rural and remote work location decisions and association between intent and actual outcome.

The existing data set comprises 586 records of allied health professionals with an interest and/or experience in rural and remote employment. Variables in the 2010 data set include gender, profession, role, work location by RA code, length of employment in RA code and intended length of employment in RA code, year of graduation, rurality of background (childhood/adulthood/education); influences on work location decisions, attitude to remote work, meaningfulness of work; personality profile (Temperament and Character Inventory).

Depending on the level and interests of the student undertaking the research, this project could potentially also include medicine and nursing participants from other research projects to which Narelle is connected.

Skills students will gain:
- Ethics application to re-use existing data set to follow up participants from 2010 study
- Survey design, data collection and analysis
- Data set analysis
- Publication – conference presentation/writing a paper

Key staff associated with projects:
Dr Chris Rissel, other staff may contribute to supervision dependent on the needs and level of the research student.

Location: Anywhere – I work from the Flinders Northern Territory campus (Darwin). However, I am experienced with supervision via distance and the research design does not require face to face data collection or analysis. Students who are physically located in the Northern Territory will be preferred. We are planning a PhD scholarship which could potentially provide some financial support.
Supervisor name:
Dr Kate Fairweather
Supervisor email:
kate.fairweather@flinders.edu.au
Name of research group: Because of my diverse research interest and capabilities, I collaborate across research groups, including Discipline of Public Health, Discipline of Behavioural Health

Description of research area and interests:
My research has a broad scope, but the uniting elements revolve around health and wellbeing.
My expertise is essentially in psychiatric epidemiology, and typically focuses on the following topic domains:
- Suicidality
- Transdiagnostic models of health. It is relatively common for people with one illness to have another, concurrently
- Epidemiological risk factor models addressing diseases and disorders
- Social psychological models of health cognition and behaviour
- Genetic and environmental influences on health outcomes, and the impact of their interactions (Twin studies)
- Health translation research

I am interested in strategic identification of data, which, through collaborative team formation, can enable investigation of an extensive range of factors related to an outcome of interest.
These data may be analysed independently, or combined through data ‘harmonisation’ to ‘value-add’ a meta-dataset.

Further, while I am interested epidemiological designs and analytical approaches, I am keen to talk to students who may be curious in studying twins data. Prior knowledge of R and/or Stata programs would be useful, but not essential.

Outline of projects:
Potential projects, but open to discussion of topics covered above
- Investigating the suicidality-smoking nexus
- Social identity (and stigma) and its role in health care contexts
- The application of nuclear family twin models to understand the role of genes and environment in health outcomes.

Skills students will gain:
- Interdisciplinary approach to understanding health issues and potential resolutions.
- Use of varied (transdisciplinary) analytical methods to investigate research questions (can combine both quantitative and qualitative approaches).
- Discovering science can be awe-inspiring, and that innovation occurs when we ‘think outside the box’.

Key staff associated with projects:
Collaborators who have expertise in the particular scientific domain of investigation.

Location: Health Sciences Building
Research Supervisors and their projects
Healthy Communities

**Supervisor name:**
**Dr Joanne Flavel**
**Supervisor email:** joanne.flavel@flinders.edu.au
**Name of research group:** Health, Society and Equity (Southgate)

**Description of research area and interests:**
My research is concerned with the role of social and economic factors such as housing, income, employment and education that impact people's daily lives, and determine population health outcomes and health inequalities. I work on projects examining how social and economic factors contribute to rising health inequalities and I also work on projects that examine the social and economic experiences of people from refugee backgrounds who have settled in Australia.

**Outline of projects:**
I would be interested in supervising students looking at factors contributing to health equities or the social and economic experiences of people from refugee backgrounds who have settled in Australia. I am primarily interested in quantitative research projects involving secondary data analysis.

**Skills students will gain:**
Quantitative research that aims to provide an evidence base to inform policy and advocacy.

**Key staff associated with projects:**
Professor Fran Baum
Associate Professor Anna Ziersch.
flinders.edu.au/southgate-institute-health-society-equity.html

**Location:** Health Sciences Building

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**Supervisor name:**
**Dr Vivian Isaac**
**Supervisor email:** vivian.isaac@flinders.edu.au
**Name of research group:** Rural and Remote Health

**Description of research area and interests:**
Dr Vivian Isaac is a Senior Lecturer, Rural Mental Health at Flinders University Rural Health South Australia (FRHSA). He has a PhD in Rural Health (University of New South Wales) and previously a Wellcome Trust Research Fellow at the Institute of Psychiatry, King's College, London and an experienced social worker. Vivian Isaac’s main academic interests is to understand the interactions between psychosocial biomarkers, social cognition, and health behaviors of vulnerable communities in rural and remote settings. He has an interest in cognitive ageing, dementia care, cognition and stress outcomes in rural health workforce and psychosocial epidemiology.

**Outline of projects:**
- Dementia care in rural and remote Australia. There is an overwhelming need to build best-practice evidence in dementia care, leading to improved health outcomes for persons with dementia and their carers. Evidence of non-pharmacological interventions is growing and have been recommended to be pursued at first instance, rather than pharmacological treatments in dementia care. The project will aim at co-design effective person-centred, non-pharmacological dementia care models for low resourced rural and remote settings.
- Novel psychosocial and cognitive markers of suicide behaviours Traditional indicators of suicide risk have predominantly focused on common mental health risk factors. We have noted that previous research does not adequately focus on psychosocial and cognitive factors, the evidence linking these factors with suicide is in its infancy or does not exist e.g., cognition; self-efficacy. Understanding the role of psychosocial and cognitive factors will improve strategies in suicide prevention.

**Skills students will gain:**
Epidemiological research methods, qualitative and quantitative analysis, psychometrics

**Key staff associated with projects:**
Dr Abraham Kuot
Dr Mohammad Hamiduzzaman
Dr Daya Ram Parajuli.
flinders.edu.au/people/vivian.isaac

**Location:** Renmark campus
Supervisor name: 
**Associate Professor Billingsley Kaambwa**

Supervisor email:
billingsley.kaambwa@flinders.edu.au

Name of research group: Health Economics

Description of research area and interests:
- Measurement of quality of life outcomes
- Estimation of healthcare costs
- Economic evaluation
- Statistical and Econometric modelling

Outline of projects:
- Quality of life (QoL) is an indicator of how healthy, comfortable, and able to participate in or enjoy life events individuals are. Within sleep research, QoL can be measured using sleep-specific or generic measures. Using a large dataset, this project will assess the performance and validity of using sleep-specific quality of life outcome measures in economic evaluation relative to frequently used preference-based quality of life outcome measures.
- Avoidable hospital readmissions due to acute coronary syndrome (ACS) and chest pain are an unnecessary expense to Australians. However, the actual number and cost of these readmissions are unknown making it difficult for Australian health authorities to manage the problem. Using existing national hospitalization data obtained from several sources including the Admitted Patient Collection of each Australian state and territory, this project will focus on: (i) calculating the frequency of avoidable readmissions due to ACS and chest pain (ii) calculating the actual cost of these readmissions and (iii) finding out what causes some of these costs to be high and others to be low.

Skills students will gain:
Understanding of
- Approaches for assessing the performance of sleep-specific versus generic quality of life measures.
- Statistical and econometric approaches for assessing validity and performance of quality of life measures.
- Methods of estimating hospital readmissions
- Methods of calculating costs and associated variability
- Econometric approaches for assessing healthcare costs

Key staff associated with projects:
Professor Robert Adams
Associate Professor Isuru Ranasinghe.
flinders.edu.au/people/billingsley.kaambwa

Location Health Sciences Building
Research Supervisors and their projects

Healthy Communities

Supervisor name: Professor Jonathan Karnon
Supervisor email: jonathan.karnon@flinders.edu.au
Name of research group: Health Economics

Description of research area and interests:
Economic evaluation is an important tool to identify high and low value approaches to the organisation and delivery of health care. Economic evaluation is routinely used to inform the value of health technologies funded by the Commonwealth government. However, economic evaluation is rarely used to inform decisions taken within local health services, such as the Southern Adelaide Local Health Network (SALHN), the network that manages Flinders Medical Centre.

This research area aims to use the large amount of clinical and economic data collected across the health system to inform the design and implementation of new models of care, to improve the organisation and delivery of health care within local health services.

Outline of projects:
- Evaluating options for improving the organisation and delivery of health care in the Emergency Department
- Designing and evaluating models of care to reduce inpatient length of stay
- Evidence-based co-design of interventions to reduce Hospital Acquired Complications

Skills students will gain:
- Quantitative data analysis of health systems data
- Evidence review and synthesis
- Co-design methods with local health service clinicians and consumers

Key staff associated with projects:
Dr Laura Edney, clinical academics in relevant clinical areas.
flinders.edu.au/people/jonathan.karnon

Location: Health Sciences Building

Supervisor name: Dr Candice Oster
Supervisor email: candice.oster@flinders.edu.au
Name of research group: Discipline of Behavioural Health

Description of research area and interests:
My research is concerned with behavioural health; that is, the connection between health and behaviour(s). Lifestyle and behaviours account for a significant proportion of morbidity and mortality worldwide. Positive, informed modification in health behaviours is the ultimate aim of behavioural health programs. This can be achieved at the individual level by supporting healthy lifestyles, while also recognising the significant role that the broader context of our lives plays in our health behaviours, such as our communities and physical environment, and the role of healthcare workers, organisations, and policy. Digital technology is also an important component of behavioural health. A key element of my research is the use of theories and models of behavioural health to explore and understand health behaviours and inform interventions at the individual, community, organisational, and policy levels. Methodologically I am interested in qualitative and mixed methods research, with a particular interest in participatory research approaches (e.g., co-design, photovoice) and theoretically informed qualitative analysis.

Outline of projects:
I would be interested in working with students looking at any aspect of behavioural health as described above. Examples of previous and current projects include community co-design of social prescribing to address social determinants of health; the use of photovoice to explore...
people’s experiences of health behaviours; designing virtual clients for teaching Motivational Interviewing to health professionals; exploring the role of ‘place and space’ in behavioural health.

**Skills students will gain:**
Students will gain an understanding of the field of behavioural health and the importance of theoretically informed, translational research in this area. Depending on the research project, students will gain experience in qualitative, mixed, and/or participatory research methods.

**Key staff associated with projects:**
Ms Paula Redpath  
Dr Anthony Venning  
Ms Fiona Glover  
Dr Kate Fairweather.

[flinders.edu.au/people/candice.oster](http://flinders.edu.au/people/candice.oster)

**Location:** Margaret Tobin Centre

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**Supervisors’ names:**
**Dr Chris Rissel**  
**Ms Annie Farthing**

**Supervisor email:**
annie.farthing@flinders.edu.au

**Name of research group:** Qualitative exploration of the decision making of nursing and allied health students and recent graduates of urban universities about rural practice

**Description of research area and interests:**
Access to quality health care providers continues to be challenging in rural and remote regions of Australia with resultant gaps in health outcomes and life expectancy. There has been some focus on medical practitioner shortages in these areas, however there is limited understanding of how nursing and allied health students and early career practitioners choose locations to practice.

**Outline of projects:**
This project will analyse existing data to provide additional information about the decision making process nursing and allied health students and recent graduates undertake when they consider rural and remote practice. There will be a focus on identifying differences in intention considering geographic practice location

**Skills students will gain:**
- Understanding of data collection and qualitative analysis methods
- Preparation of research documentation (eg ethics applications, research reports, manuscripts for publication)
- Research project presentation experience

[flinders.edu.au/flinders-nt](http://flinders.edu.au/flinders-nt)  
[flinders.edu.au/people/chris.rissel](http://flinders.edu.au/people/chris.rissel)  
[flinders.edu.au/people/annie.farthing](http://flinders.edu.au/people/annie.farthing)

**Location:** Centre for Remote Health, Flinders Northern Territory. Possibility to carry this out remotely.
Research Supervisors and their projects

Healthy Communities

Supervisor name: Dr Chris Rissel
Supervisor email: chris.rissel@flinders.edu.au
Name of research group: Flinders University, Northern Territory

Description of research area and interests: Remote and rural health is a unique setting for primary health care and public health. It covers a broad range of health issues and social determinants of health, and requires health professionals to work in multidisciplinary teams and collaborate. Allied Health, nursing and medical student placements are important for training health professionals, and also to expose them to a positive experience working in a remote setting. Evaluating their placements and tracking their workplace locations is an important aspect of building the remote health workforce.

Outline of projects:
- Analyse data from the process evaluation of student placements in the Northern Territory
- Collect and analyse annual data on workplace location of student placement alumni
- Prepare papers for peer-reviewed publication and present results

Skills students will gain:
- Literature reviewing
- Understanding of data collection and analysis methods
- Preparation of research documentation (e.g., ethics applications, research reports, manuscripts for publication)
- Research project presentation experience

Key staff associated with projects:
Associate Professor Narelle Campbell
Associate Professor Sue Lenthall
Ms Annie Farthing
flinders.edu.au/flinders-nt
flinders.edu.au/people/chris.rissel

Location: Flexible. Supervisor is based at Flinders Northern Territory campus (Darwin) but experienced with supervision via distance.

Supervisor name: Dr Tim Schultz
Supervisor email: timothy.schultz@flinders.edu.au
Name of research group: Health Economics Team

Description of research area and interests: The Health Economics Team conducts health services research on safety, quality, effectiveness, and efficiency. This work often involves the development and evaluation of new models of care that are designed to improve the health system; for example, home infusions for people with multiple sclerosis, hospital avoidance programs, or strategies to reduce Emergency Department overcrowding and access block.

I am interested in how to positively change healthcare delivery and outcomes for patients, for example by encouraging the use of evidence in clinical practice, by addressing patient safety concerns, or by testing new roles in the healthcare team, such as new roles for nurses and allied health professionals.

My main research methods include the conduct of systematic reviews, mixed methods and purely quantitative or qualitative evaluations, health economics, patient safety data analysis, and conducting clinical trials.

Outline of projects:
Several projects are on offer. These include:
- Substitution of doctors by nurses and allied health professionals in hospitals and residential aged care.
- Hospital avoidance programs in acute care
- Patient flow, overcrowding and access block in hospitals
• Use of health economics to inform decision making in local health networks.

Skills students will gain:
• Experience in conducting systematic reviews e.g. reviews of effectiveness, mixed methods reviews, qualitative reviews, umbrella reviews and scoping reviews
• Skills in evaluation: quantitative data collection and analysis; qualitative data collection and analysis; mixed methods data collection and analysis
• An understanding of evidence-based practice and knowledge translation
• Experience in health economics

Key staff associated with projects:
Health Economics team and collaborating researchers.

Location: Health Sciences Building
Supervisor name:  
Dr Jacqueline Stephens  
Supervisor email:  
jacqueline.stephens@flinders.edu.au  
Name of research group:  
Aboriginal Health, Public Health  

Description of research area and interests:  
My research is focused on identifying and eliminating healthcare inequity. I am interested in the patient journey, patient decision-making, and factors influencing access to healthcare, particularly the geographical dispersion of healthcare and factors influencing access to healthcare.  
I use a mixed methods approach to unpack and understand issues from multiple standpoints, using a range of methodologies including data linkage, cohort studies, geospatial analysis, interviewing, focus groups, cross-sectional surveys, and randomised controlled trials.  
My research has a focus on child and adolescent health, including ear health, chronic disease (particularly kidney disease), and infectious diseases. My work has a particular focus on addressing the disproportionately impact of these conditions among Aboriginal and Torres Strait Islander communities and people living in rural and remote locations.  
My research involves collaboration with researchers located across South Australia and New South Wales, involves working closely with Aboriginal Community Controlled Health Services, and networking with stakeholders across both public and private health sector.  

Outline of projects:  

Ear Health  
Aboriginal and Torres Strait Islander children experience some of the highest rates of ear infections and hearing impairment internationally. Timely and accurate identification of ear disease and hearing impairment is important in early treatment to prevent long-term impacts on health and wellbeing. My research is focussed on the development of strategies to improve ear health screening and the treatment pathway for these children, as well as novel approaches to support the health and wellbeing of children with ear disease.  

Kidney Health  
Aboriginal and Torres Strait Islander people are disproportionately impacted by diabetes and end-stage kidney disease. This disparity is not fully explained by the differences in diabetic prevalence or co-morbidities. The ARDAC Study is a longitudinal cohort study which aims to identify the complex interplay between age, gender, socio-economic status, and geography in the development of chronic disease among Aboriginal and Torres Strait Islander young people. There are opportunities for HDR students (Honours, Master, PhD) to participate in research associated with the ARDAC Study. Particularly, two scholarships exist to support two exemplary PhD candidates:  
1) PhD Scholarship 1: A PhD opportunity to conduct epidemiological research using data linkage; based at Flinders University, South Australia.  
2) PhD Scholarship 2: A PhD opportunity to co-create a culturally appropriate intervention for addressing chronic kidney disease; based in New South Wales.  

Infectious Diseases  
My research has also included epidemiology of HIV, hepatitis C, and sexually transmitted infections, as well as other communicable infections, including influenza, pertussis (whooping cough), and legionellosis.  

Consumer Decision-Making  
Understanding the role of children and young people in healthcare decision making is critical to ensuring they have a voice about the healthcare they receive. There are opportunities for HDR students (Honours, Master, PhD) to develop a research project to understand the experiences of children and young people in healthcare pathway and investigate ways to ensure their views are incorporated into healthcare decision making related to their health.  

Skills students will gain:  
- Development and project management of research projects.  
- Working with stakeholder organisations.  
- Experience working within Aboriginal and Torres Strait Islander health.  
- Quantitative research methods  
- Qualitative research methods  

Key staff associated with projects:  
Professor Jonathan Craig  
ARDAC Investigator & Advisory Groups  
Members of the Flinders University Aboriginal Health team.  

flinders.edu.au/scholarships-system/index.cfm/scholarships/display/ad1e738  

Location: Health Sciences Building
Supervisor name: **Dr Joshua Trigg**  
Supervisor email: joshua.trigg@flinders.edu.au  
Name of research group: Public Health  
Description of research area and interests:  
My work spans a range of topics in public health and safety. I research risk attitudes and behaviours regarding modifiable lifestyle risk factors, and how these relate to physical health and psychological wellbeing. I have researched with older adults, in Aboriginal community and health settings, and in natural disaster contexts. I also have an interest in human-animal relationships as an influence on attitudes and behaviours. My approaches include the use of population health datasets, community and field interviewing, mixed-methods techniques, and work with non-profit, emergency services organisations, and government bodies.  
Outline of projects:  
Cross-sectional studies focusing on health risk behaviours, including tobacco cessation, alcohol consumption, quality of life domains, risk attitudes and motivations, with various populations.  
Skills students will gain:  
Development of research projects, working with stakeholder organisations, quantitative and qualitative data analysis, surveying and interviewing, academic writing, and presentation.  
Key staff associated with projects:  
Professor Billie Bonevski  
Other members of the Flinders Public Health Team.  
flinders.edu.au/people/joshua.trigg  
researchgate.net/profile/Joshua-Trigg  
Location: Health Sciences Building

Supervisor name: **Dr Anthony Venning**  
Supervisor email: anthony.venning@flinders.edu.au  
Name of research group: Discipline of Behavioural Health (DBH)  
Description of research area and interests:  
My research is concerned with not letting the physical, social, psychological, and economic impacts of life changing events inhibit access to treatments for common mental health conditions. With this in mind, and in order to meet the demand for more non-traditional and alternative platforms that provide mental health support, the DBH and its industry collaborators are involved in producing materials to be used by, and training health professionals to work within, both High Intensity (HI) and Low Intensity (LI) mental health settings.  
Outline of projects:  
I would be interested in supervising students in any project which seeks to increase / improve access to mental health support. Examples of previous and current projects include the acceptability of and engagement with Digital Mental Health Platforms, the contextualization of Guided Self-Help Material for guided self-help material, the acceptability of Low Intensity CBT in cancer survivorship, and the economic viability of telephone delivered psychological services.  
Skills students will gain:  
Students could gain skills in both quantitative and qualitative methodologies, along with working within a collaborative training / research environment with industry partners.  
Key staff associated with projects:  
Ms Paula Redpath  
Dr Candice Oster  
Ms Fiona Glover  
Dr Kate Fairweather.  
flinders.edu.au/people/anthony.venning  
Location: Margaret Tobin Centre
Research Supervisors and their projects
Healthy Communities

Supervisor name: Dr Annabelle Wilson
Supervisor email: annabelle.wilson@flinders.edu.au
Name of research group: Aboriginal and Torres Strait Islander Public Health

Description of research area and interests:
My work is related broadly to how health professionals work with Aboriginal people. I research strategies that support health professionals to work in Aboriginal health (including community of practice peer mentoring) and barriers and facilitators to practice. I also undertake research about the food system including how to (re)build trust with consumers during food scares. I have recently transferred this to pandemic management, looking at what strategies might help maintain public trust during COVID-19, to ensure that public health recommendations are taken up by the public.

Outline of projects:
I am currently involved in a large project assessing the role of Aboriginal Liaison Officers in hospitals. I am an Advanced Accredited Practising Dietitian and currently have a grant under review looking at how to change the way in which nutrition research and practice is delivered to Aboriginal people, from a deficit to a strengths-based model. I am involved in a number of small grants related to the food system.

Supervisor name: Professor Paul Ward
Supervisor email: paul.ward@flinders.edu.au
Name of research group: Women, Alcohol and Breast Cancer Prevention research group

Description of research area and interests:
Alcohol consumption is an important risk factor for breast cancer. However, we know little about the reasons and logic for alcohol consumption among Australian women in midlife particularly in relation to diversity in women’s life circumstances. Various new projects are underway to contribute knowledge to future breast cancer prevention. Specifically, they seek understanding of how women’s perception of breast cancer risk is relative to the social conditions (gender, age, social class and cultural/environmental drivers) that shape women’s reasons and logic for continuing or modifying alcohol consumption. Our research will generate recommendations for tailored approaches and enable ‘audience segmentation’ of alcohol/breast cancer preventive messages.

The research team brings together expertise in sociology, anthropology, psychology, epidemiology, oncology, health promotion and cancer prevention.

Outline of projects:
An Australian Research Council (ARC) funded Discovery project (‘Osiris’) is focussing on social class, alcohol consumption and differential perceptions of breast cancer risk among women in midlife (45-64 years). A FHMRI Kickstart grant was awarded to expand the ARC Discovery research to understand how women pre-midlife (25-44 years) understand alcohol-related breast cancer risk before midlife when breast cancer risk increases with age.

Two College of Medicine & Public Health PhD researchers have commenced doctoral projects – Mrs Jessica Thomas (Flinders Foundation Scholarship) is exploring women’s perception of breast cancer risk relative to social role quality and Mrs Kristen Foley (NHMRC scholarship) will explore the commercial determinants of alcohol consumption women are exposed to during midlife. Another PhD will begin this year (using a stipend from the ARC Discovery funding) to explore women’s own perceptions of breast cancer candidacy.

Skills students will gain:
Qualitative research, quantitative research, surveys, theoretical development

Key staff associated with projects:
Dr Emma Miller
Dr Belinda Lunnay
Dr Margaret Becker.
flinders.edu.au/people/paul.ward
Location: Health Sciences Building
Skills students will gain:

- Qualitative research
- Aboriginal and Torres Strait Islander health research
- Indigenous knowledges and methodologies
- Reflexivity
- Health Professional practice

Key staff associated with projects:
Associate Professor Tamara Mackean
Dr Kim O’Donnell
Ms Liz Withall.

flinders.edu.au/people/annabelle.wilson

Location: Health Sciences Building
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