College of Science and Engineering
Honours Projects

Available to commence

July 2020
Preface

The projects listed in this booklet are available at the time of publishing. We will endeavour to update the list as new projects become available or as places are filled. This list is intended to be an initial guide to assist students to choose areas of preference. The final details of a project proposal must be established by consultation with your potential supervisor. If you are interested in any of these projects you need to contact the supervisor directly to discuss both the project details and your suitability to undertake the project.

Staff members will, in addition, be happy to talk about any alternative project ideas you may have considered, however there is no guarantee that they will have the capacity to take you on.

Application process

Applications for semester 2, 2020 opened on Monday 27 April 2020 and close on Friday 17 July 2020. Honours begins on Monday 27 July 2020. It is imperative that you are available to start on day 1. The first 4 weeks of Honours will be jam-packed with compulsory inductions, relevant training and discussion of academic policies, followed by a full immersion into your project. You will need to be present on campus for most of this period.

Before applying you will need to have spoken with potential supervisors about the projects that they have available.

If you are an internal, external or international student applying for a 1 year Honours Program you can apply online. Please enter the correct 1 year study code HBSC or HBIT or HBDTI or HBAGIS or HBEM to select the correct 1 year course.

If you are enrolled in a 4 year course and are applying to progress through to your Honours year, please email cse.enquiries@flinders.edu.au for further instruction.

If you require any further information regarding studying Honours, please contact the relevant College Honours coordinator listed below.

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Classification of breast cancer histology images using Deep Learning techniques

Commencing: July 2020

Principal Supervisor: Dr Mariusz Bajger
Email: mariusz.bajger@flinders.edu.au

Project summary
The project will focus on applications of Convolutional Neural Networks (CNN) to classification of stained breast biopsy images. Different network architectures and parameters would be considered to achieve state-of-the-art performance with classification of tissues into classes such as normal, benign, malignant. Publicly available databases would be used to evaluate performance of the designed networks. The accuracy of such systems is currently about 75-85% leaving significant room for improvement. The project requires access to a PC with a decent GPU.

Location
Flinders University - Tonsley

Assumed knowledge
Basic knowledge of probability, linear algebra and statistics; good programming skills

Further information
flinders.edu.au/people/mariusz.bajger

Medical image segmentation

Commencing: July 2020

Principal Supervisor: Dr Mariusz Bajger
Email: mariusz.bajger@flinders.edu.au

Project summary
In these projects we will look at the methods of segmentation suitable for large images. The most robust segmentation techniques usually involve criterion based on image texture which makes them computationally expensive or even prohibitive. To overcome this issue subsampling is often used. This however leads to loose of information present in the original image which may be critical for further image analysis tasks. Some recent methods have been proposed to deal with this issue for scene images. In this project we will look at ways of applying these methods to medical images.

Location
Flinders University - Tonsley

Assumed knowledge
Basic knowledge of mathematics (first year University level); good programming skills

Further information
flinders.edu.au/people/mariusz.bajger
Medical image segmentation using CNN

Commencing: July 2020

Principal Supervisor: Dr Mariusz Bajger
Email: mariusz.bajger@flinders.edu.au

Project summary
Recently, several systems based on CNNs have been proposed to segment medical images. Systems like V-net, U-net and similar, already show impressive performance on some natural scene images, light microscopy images or MRIs. In this project we will look at the techniques of data augmentation and their impact on the system performance. We may also look at the methods of filter visualization to improve understanding of underlying feature space. The project requires access to a PC with a decent GPU.

Location
Flinders University - Tonsley

Assumed knowledge
Basic knowledge of probability, linear algebra and statistics; good programming skills

Further information
flinders.edu.au/people/mariusz.bajger

Analytical and computational studies of lattice walk generating functions

Commencing: July 2020

Principal Supervisor: Dr Iwan Jensen
Email: iwan.jensen@flinders.edu.au

Project summary
Counting the number of combinatorial objects a(n) of size n and finding the generating function of the sequence is a fundamental pursuit of combinatorics. A time honoured approach is to generate the sequence numerically and then try to "guess" the generating function or one may find functional equations satisfied by the generating function. A number of specific projects related to models of polymer physics is on offer with computational and/or analytical components to meet the interests of any student.

Location
Flinders University - Tonsley

Assumed knowledge
Experience with Matlab or Mathematica, real and complex analysis.

For a computational project, experience with coding in C or Python

Further information
flinders.edu.au/people/iwan.jensen
Computer simulations of non-equilibrium models in statistical physics

**Commencing:** July 2020

**Principal Supervisor:** Dr Iwan Jensen  
**Email:** iwan.jensen@flinders.edu.au

**Project summary**  
Non-equilibrium models originating in statistical physics has been used extensive to study a range of phenomena such as population growth including the spreading of infectious diseases, forest fires, catalytic chemical processes etc. An example is the simple birth-death process in which individuals can reproduce asexually and die. Embedded on a lattice the reproduction is constrained since a new individual can only arise on an empty site of the lattice.

**Location**  
Flinders University - Tonsley

**Assumed knowledge**  
Experience with coding in C or Python

**Further information**  
flinders.edu.au/people/iwan.jensen

BCI for outreach

**Commencing:** July 2020

**Principal Supervisor:** Dr Trent Lewis  
**Email:** trent.lewis@flinders.edu.au

**Project summary**  
The Brain Signals Lab at Flinders does some cool work with brain signals. The problem to be addressed here is how to make that work accessible to a broader audience, but mostly to school aged children. Some effort has been put towards developing some straight forward brain computer interfaces (BCIs) that have shown some promise. For example the “turn a light on with your brain” used the change in the brain’s Alpha rhythm to trigger an event that switch a wifi light switch on or off. This project would investigate ways to creatively display brain activity through either BCIs or visualisation.

**Location**  
Flinders University – Tonsley

**Assumed knowledge**  
Some knowledge of either programming, visualization or signal processing

**Further information**  
flinders.edu.au/people/trent.lewis
Brain connectivity in auditory-visual speech

Commencing: July 2020

Principal Supervisor: Dr Trent Lewis
Email: trent.lewis@flinders.edu.au

Project summary
Speech is a multimodal activity that relies on both auditory and visual sensory input, particularly to enhance understanding speech in noisy situations. This project would investigate the underlying brain mechanisms by applying connectivity and graph analysis, and also machine learning to EEG to examine the causal relationships between the activities of brain regions involved in auditory-visual speech processing of sentences and during varying levels of acoustic noise.

Location
Flinders University – Tonsley

Assumed knowledge
A level of programming proficiency

Further information
flinders.edu.au/people/trent.lewis

Disease diagnosis from EEG using machine learning

Commencing: July 2020

Principal Supervisor: Dr Trent Lewis
Email: trent.lewis@flinders.edu.au

Project summary
There are particular brain-based disorders that do not have any brain structural abnormalities that can be detected using modern brain imaging technologies. However, functionally we might be able to detect subtle differences that lead to the behaviours such as psychosis, anxiety, depression, or dementia. We currently have an EEG dataset that was collected from a variety people with different disorders. The goal of this project is to investigate different machine learning algorithms for classifying and categorizing the EEG data from this dataset.

Location
Flinders University – Tonsley

Assumed knowledge
Programming

Further information
flinders.edu.au/people/trent.lewis
LED Brain Project

Commencing: July 2020

Principal Supervisor: Dr Trent Lewis
Email: trent.lewis@flinders.edu.au

Project summary
The goal of the LED Brain Project is to develop a brain sculpture that reflects in real-time the activity in a person’s brain. A prototype has been developed that demonstrate the various stages involved in the system, but there still much refinement to reach the end product. The stages in the project can be roughly broken down into

- Modelling
  - Software
  - 3D Printing
- Hardware
  - Electronics
  - Power
  - Computing
  - Enclosure Design
- Software
  - Hardware communication
  - User Interface

Location
Flinders University – Tonsley

Assumed knowledge
Some knowledge around programming, 3D modelling, signal processing

Further information
flinders.edu.au/people/trent.lewis

AI: AudioVisual Speech/Face Emotion/Expression Recognition/Generation

Commencing: July 2020

Principal Supervisor: Prof David Powers
Email: david.powers@flinders.edu.au

Project summary
This group of projects aims to add the dimension of emotion and expression to avatar and speech generation as well as to the understanding of the humans the talk to.

- AVSpeechRec - speech recognition is still brittle and emotion, expression and accent are often regarded as noise, but adding lip-reading can improve resilience in high noise condition, and rather than try to factor out emotion and expression, why not try to recognize the emotions and expressions.
- AVSpeechGen - a model for recognizing speech, emotions and expressions can also be used to add this dimension to avatar speech.

Location
Flinders University – Tonsley (AIRL+MMRF)

Assumed knowledge
Some knowledge of a Matlab, Weka, C++ or Python toolbox for Machine Learning, Neural Networks, Natural Language or Speech processing

Further information
flinders.edu.au/people/david.powers
Artificial Intelligence and Language Technologies
Cognitive Linguistics and Psycholinguistics
The Talking Thinking Teaching Head
AI: Applications of machine learning and neural networks in forensics

**Commencing:** July 2020

**Principal Supervisor:** Prof David Powers

**Email:** david.powers@flinders.edu.au

**Project summary**

This group of projects is carried out with cooperation and cosupervision from the Forensics Institute.

DNA: Projects include automatically classifying DNA from electropherograms, identifying DNA-contamination on surfaces to swap, counting the number of cells in a sample.

Handwriting/Speech/Text: Identifying people by the handwriting or speech samples, identifying the author of an anonymous note or call, quantifying the likelihood that a particular person is the author a particular note, call or text.

Computer Security applications.

**Location**

Flinders University – Tonsley (AIRL+MMRF)

**Assumed knowledge**

Some knowledge of a Matlab, Weka, C++ or Python toolbox for Machine Learning, Neural Networks, Natural Language or Speech processing

**Further information**

flinders.edu.au/people/david.powers

Sydney North Health Network

Flinders Forensic Science cleans up at Awards

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AI: Embodied conversational agents for health interventions and training

**Commencing:** July 2020

**Principal Supervisor:** Prof David Powers

**Email:** david.powers@flinders.edu.au

**Project summary**

Flinders is well known for its Talking Head and Health Technologies. Important projects include teaching social skills to children with autism, providing companionship, advice and audiovisual memory assistance to people with dementia, providing counselling to people with social or health problems, and providing training to health professionals in the motivational interviewing techniques that can help people realize the import and effect of their problems, help them own the treatment program, and help them to properly follow the recommended regime.

Tasks
- implement dialogue
- animate AV demos

**Location**

Flinders University – Tonsley (AIRL+MMRF)

**Assumed knowledge**

Background in interactive application development for mobile and/or fixed platforms. A background in artificial intelligence/intelligent systems would be helpful.

**Further information**

flinders.edu.au/people/david.powers

Sydney North Health Network
AI: Improved chance-correct machine learning and boosting algorithms

Commencing: July 2020

Principal Supervisor: Prof David Powers
Email: david.powers@flinders.edu.au

Project summary
Current Machine Learning algorithms and Neural Networks tend to optimize some form of accuracy (maximizing) or error (minimizing) in a way that is easily biased when one of the classes occurs much more than the other. They also tend to be defined fundamentally for the two-class dichotomous case. When a multiclass problem is trained per class with such a classifier, most if not all of the classifiers will be facing exactly the kind of imbalance they are worst at. Later stages of learning on a balanced dataset can also become imbalanced.

• design a classifier/booster to optimize informedness

Location
Flinders University – Tonsley (AIRL+MMRF)

Assumed knowledge
Some knowledge of algorithms and ideally a Matlab, Weka, C++ or Python toolbox for Machine Learning or Neural Networks.

Further information
flinders.edu.au/people/david.powers
Artificial Intelligence and Language Technologies

AI: Multimedia robot world

Commencing: July 2020

Principal Supervisor: Prof David Powers
Email: david.powers@flinders.edu.au

Project summary
This group of projects aims to provide support for grounded learning by giving the learner access to a virtual and/or real world.

• Virtual world - program animated characters and objects to behave in proactive of reactive ways in a virtual world, make animated vignettes matching a story (represented using a tree structure as might be generated from natural language texted)
• Real world - recognize how real world correlates of animated characters and objects more (e.g. 3D print/scan to transfer between worlds) and generate story (tree or text)
• Hybrid world - virtual+real teaching situation

Location
Flinders University – Tonsley (AIRL+MMRF)

Assumed knowledge
Background in interactive application development for mobile and fixed platforms, including ideally 3D graphical design, rendering or interpretation (e.g. of camera input or Kinect of Realsense)

Further information
flinders.edu.au/people/david.powers
Artificial Intelligence and Language Technologies
Cognitive Linguistics and Psycholinguistics
The Talking Thinking Teaching Head
AI: Speech driven applications

Commencing: July 2020

Principal Supervisor: Prof David Powers
Email: david.powers@flinders.edu.au

Project summary
This group of projects offers a top student the opportunity to work with one of our award winning start up companies as well as partners in health and education.

- YourAmigo is known as the world leader in integral search optimisation due to its patented deep web technologies.
- YourAnswer, its new sibling was awarded the WorldWide Most Exciting Tech Award at etai 2019 for its voice over phone search technology and shopping experience.
- Clevertar commercializes our Thinking Talking Teaching Head avatar technologies and has a particular focus on health applications and customer service.

Location
Flinders University – Tonsley (Startups in CBD)

Assumed knowledge
Background in interactive application development for mobile and fixed platforms. Some background in artificial intelligence/intelligent systems would be helpful.

Further information
flinders.edu.au/people/david.powers
youramigo.com/ l youranswer.io/ l clevertar.com/
Sydney North Health Network

Improved high efficiency programming language for multimodal AI, IoT and Robotics

Commencing: July 2020

Principal Supervisor: Prof David Powers
Email: david.powers@flinders.edu.au

Project summary
Current programming languages are extremely inefficient in their memory usage when it comes to dynamic memory and constructs like extensible arrays or lists, object-oriented programming and API layering. The kinds of programs that used to run in a few Kb can now get to Gb, and memory leaks will eventually bring any modern OS to a standstill.

Matrix/Array Functional Inductive Applicative (MAFIA) programming combines the best points of languages like C, Haskell, Matlab, Perl & Prolog by defining a pointer-free array/stream-based OO model that directly exploits the paging features of modern CPU.

Location
Flinders University – Tonsley (Airl+MMRF)

Assumed knowledge
Some knowledge of Matlab &/or Prolog & Programming Language Concepts/Theory of Computation, as well as Computer Architecture, Operating Systems & Computer Networks (knowledge of x64 arch/os and Linux very useful).

Further information
flinders.edu.au/people/david.powers
Decision support for hospital patient flow optimisation

Commencing: July 2020

Principal Supervisor: Dr Shaowen Qin
Email: shaowen.qin@flinders.edu.au

Project summary
Many of Australia’s public hospitals operate at, or near, full capacity, which is commonly assumed to risk the emergence of significant delays during the admission process for emergency arrivals, and the need to cancel or delay planned admissions to create further capacity. This project aims to develop and validate predictive models for hospital occupancy and test "what-if" interventions for minimising congestion episodes using advance data analysis and simulation modelling approaches.

Location
Flinders University - Tonsley

Assumed knowledge
Data analysis and system modelling skills

Further information
flinders.edu.au/people/shaowen.qin

Patient flow data clustering and modular hospital design

Commencing: July 2020

Principal Supervisor: Dr Shaowen Qin
Email: shaowen.qin@flinders.edu.au

Project summary
This project aims to develop a modular hospital design to optimise its service delivery. Data mining/machine learning techniques will be applied to analyse hospital patient flow data for identification and characterization of clusters at various abstraction levels (module, process, and end-to-end care stream) along with their responsibilities and interfaces. The objective is to examine the existing hospital operations and recommend pathways to evolve the hospital to a modular structure for improved patient flow as well as quality and safety of care.

Location
Flinders University - Tonsley

Assumed knowledge
Data analysis skills; programming; object oriented analysis and design

Further information
flinders.edu.au/people/shaowen.qin
Advancing hydro(geo)logical process understanding and modelling for impact assessment

Commencing: July 2020

Principal Supervisor: Prof Okke Batelaan
Email: okke.batelaan@flinders.edu.au

Project summary
For research interest in:
- Regional groundwater modelling
- Catchment hydrology and distributed hydrological modelling
- GIS and Remote sensing applications in hydrological modelling
- Groundwater dependent ecosystems
- Groundwater recharge and discharge estimation
- Groundwater/surface water interaction
- Ecohydrology

contact me and we can discuss a project in more detail.

Location
Flinders University - Bedford Park

Assumed knowledge
None listed

Further information
flinders.edu.au/people/okke.batelaan

Ecological phage therapy: using bacteriophages to rapidly restore native ecosystems

Commencing: July 2020

Principal Supervisor: Dr Martin Breed
Email: martin.breed@flinders.edu.au

Project summary
This project will test the potential of environmental bacteriophages in ecological restoration. Bacteriophages are viruses of their bacterial hosts that are basically everywhere. This project will trial the use of bacteriophages to 'kill the winners' from degraded soil environments, potentially leading to new ways to restore soil microbiomes. This work aligns with the UN's Decade of Ecosystem Restoration, will help improve the return of native biodiversity and valuable ecosystem services from nature such as human health via the microbiome.

Location
Flinders University - Bedford Park

Assumed knowledge
Any of the following would be desirable: Ecology, Evolutionary biology, Microbiology, Statistics, Bioinformatics, Environmental science

Further information
flinders.edu.au/people/martin.breed
FORE, Frontiers of Restoration Ecology
HUMI, Healthy Urban Microbiome Initiative
Rewilding microbiomes for biodiversity and human health co-benefits

Commencing: July 2020

Principal Supervisor: Dr Martin Breed
Email: martin.breed@flinders.edu.au

Project summary
Large-scale restoration efforts are underway globally to help reverse the impact of decades of land degradation, and these efforts aim to return functional and biodiverse ecosystems. The restoration interventions most often employed involve replanting native vegetation, which is expected to result in associated biodiversity returns. However, such restoration interventions often overlook the recovery of the soil microbiome, a mega-diverse and functionally important component of ecosystems. This project will generate microbiome genomic datasets and interrogate the success of their restoration.

Location
Flinders University - Bedford Park

Assumed knowledge
Any of the following would be desirable:
Ecology, Evolutionary biology, Microbiology, Statistics, Bioinformatics, Environmental science

Further information
flinders.edu.au/people/martin.breed
FORE, Frontiers of Restoration Ecology
HUMI, Healthy Urban Microbiome Initiative

Rewilding urban microbiomes for human health

Commencing: July 2020

Principal Supervisor: Dr Martin Breed
Email: martin.breed@flinders.edu.au

Project summary
Half the world’s 7 billion people live in cities, with an increase to >70% expected by 2030. Such rapid urbanisation is at odds with our shared evolutionary history with nature. This project will unravel how urban biodiversity improves human health by characterizing microbiomes across a variety of landscapes in metro Adelaide. This project is novel and with great impact potential as it will help progress the development of ‘green prescriptions’ as an ecosystem service, which can simultaneously reduce health budget spending and improve biodiversity conservation.

Location
Flinders University - Bedford Park

Assumed knowledge
Any of the following would be desirable:
Ecology, Evolutionary biology, Microbiology, Statistics, Bioinformatics, Environmental science

Further information
flinders.edu.au/people/martin.breed
FORE, Frontiers of Restoration Ecology
HUMI, Healthy Urban Microbiome Initiative
Evaluation of the performance of a large high rate algal pond for wastewater treatment

**Commencing:** July 2020

**Principal Supervisor:** Prof Howard Fallowfield

**Email:** howard.fallowfield@flinders.edu.au

**Project summary**
We have championed the acceptance of high rate algal ponds (HRAPS) for wastewater treatment in SA. HRAPs are shallow, mixed ponds where algae provide photosynthetic oxygen to bacteria, which mineralise organic carbon thereby providing CO2 to the algae. Nutrients are removed by the growth of algae. Federal funding enabled construction of two 5000m² HRAPs for treatment of wastewater at Peterborough, SA. This is a unique facility in Australia. This project will characterise the hydrodynamics of the HRAP and determine HRAP nutrient, E.coli and F-RNA coliphage removal.

**Location**
Flinders University - Bedford Park

**Assumed knowledge**
Microbiology, microbial ecology or water chemistry

**Further information**
flinders.edu.au/people/howard.fallowfield
waterpathogens.org/node/3354

Ticks and lizards (various projects)

**Commencing:** July 2020

**Principal Supervisor:** A/Prof Mike Gardner

**Email:** michael.gardner@flinders.edu.au

**Project summary**
I have several potential projects depending on students interests. These can involve more or less fieldwork and more or less genetics and genomics. All the projects involve work on lizards either from a long term study on sleepy lizards and their ticks, or on the establishment of a new population of the endangered pygmy bluetongue lizard. I have several projects involving genes of the Major Histocompatibility Complex (MHC) which are involved in the immune response and mate choice and also on the analysis of SNP data sets. Organise a time to meet with me to discuss your interests.

**Location**
Flinders University - Bedford Park
Field sites – mid-north SA
Labs at SA Museum

**Assumed knowledge**
An interest in molecular ecology. Enthusiasm. Writing skills.

**Further information**
flinders.edu.au/people/michael.gardner
Lab of Evolutionary Genetics and Sociality
Effects of stormwater harvesting on street trees' amelioration of summer microclimate in Adelaide

Commencing: July 2020

Principal Supervisor: A/Prof Huade Guan
Email: huade.guan@flinders.edu.au

Project summary
With a warming climate, Adelaide is very likely to see more extreme hot days. Urban trees, in addition to providing shade, function as natural evaporative air conditioners if they can access moisture. This project will investigate whether stormwater infiltration using TREENET inlets helps to improve urban trees’ amelioration of microclimate. We hypothesize that TREENET Inlet, by enhancing stormwater infiltration, provides more soil moisture for transpiration and therefore moderates summer air temperature. This will be a collaborative project between Flinders University and Mitcham Council.

Location
Flinders University - Bedford Park

Assumed knowledge
A bachelor degree in science or engineering. The project requires field data collection in urban streets.

Further information
flinders.edu.au/people/huade.guan
Mitcham Council - Measuring how much Water our Street Trees Use

Carbon accounting for climate change mitigation

Commencing: July 2020

Principal Supervisor: Dr Jean-Marc Hero
Email: jeanmarc.hero@flinders.edu.au

Project summary
Co-supervised by Prof Corey Bradshaw. Carbon Accounting is a fundamental tenant of Climate Change Action. This project will focus on calculating metrics for carbon emissions that can be used 1) to allow individuals to monitor and reduce their carbon footprint, and 2) calculate their carbon sequestration required to zero their lifetime footprint. This project will investigate the current methods and evidence used to calculate carbon emission and sequestration metrics. The final outcome will be an evidence based methodology for carbon accounting that individuals can use to zero their personal footprint.

Location
Flinders University - Bedford Park

Assumed knowledge
None listed

Further information
flinders.edu.au/people/jeanmarc.hero
flinders.edu.au/people/corey.bradshaw
Ecological knowledge and culture in Australian first nations

Commencing: July 2020

Principal Supervisor: Dr Jean-Marc Hero
Email: jeanmarc.hero@flinders.edu.au

Project summary
Co-supervised by Chris Wilson and Rebecca Phyland.
Indigenous knowledge and skills are urgently required to manage biodiversity in the face of climate change. Aboriginal peoples and nations have lived within the climatic constraints of the Australian landscape for tens of thousands of years. This project will investigate how Aboriginal Australians apply ecosystem management skills and agricultural practices (including cultural burning as a management tool) at landscape and continental scales.

Location
Flinders University - Bedford Park

Assumed knowledge
None listed

Further information
flinders.edu.au/people/jeanmarc.hero
flinders.edu.au/people/christopher.wilson
flinders.edu.au/people/rebecca.phyland

Determining groundwater discharge at Sellick's Beach

Commencing: July 2020

Principal Supervisor: Dr Dylan Irvine
Email: dylan.irvine@flinders.edu.au

Project summary
This project seeks to locate and quantify the rates of groundwater discharge to Sellick's Beach, South Australia. Project will utilise a number of techniques including the use of temperature time series data, thermal cameras and other chemical and hydraulic methods to quantify groundwater discharge.

Work with Prof Adrian Werner and Dr Dylan Irvine.

Location
Flinders University - Bedford Park

Assumed knowledge
Knowledge of hydrogeology. Either groundwater modelling or hydrochemistry would be useful.

Further information
flinders.edu.au/people/dylan.irvine
flinders.edu.au/people/adrian.werner
Impacts of the Carmichael coal mine on groundwater dependent ecosystems

Commencing: July 2020

Principal Supervisor: Dr Dylan Irvine
Email: dylan.irvine@flinders.edu.au

Project summary
The proposed Carmichael coal mine has been contentious on a number of fronts. It has been suggested that proposed mine will impact the ecologically significant Doongmabulla Spring Complex (DSC), located 8 km from the mining lease area.

This project intends to investigate potential impacts of the Carmichael coal mine on the nearby DSC, Mellaluka Springs, and Carmichael River.

Work with Prof Adrian Werner and Dr Dylan Irvine.

Location
Flinders University - Bedford Park

Assumed knowledge
Knowledge of hydrogeology. Either groundwater modelling or hydrochemistry would be useful.

Further information
flinders.edu.au/people/dylan.irvine
flinders.edu.au/people/adrian.werner
dspace2.flinders.edu.au/xmlui/handle/2328/39203

A study of atmospheric cyclones in the South East Tropical Indian Ocean (SETIO)

Commencing: July 2020

Principal Supervisor: A/Prof Jochen Kaempf
Email: jochen.kaempf@flinders.edu.au

Project summary
Kaempf’s research group has recently discovered the existence of short-lived atmospheric cyclones in the South Eastern Tropical Indian Ocean (SETIO). The presence/absence of these cyclones are fundamental in the development of the positive phase of the Indian Ocean Dipole, which influences the monsoonal climate in many countries bordering the Indian Ocean including Australia. The aim of this project is to refine a cyclone-tracking algorithm to statistically analyze the properties of SETIO cyclones.

Location
Flinders University - Bedford Park

Assumed knowledge
Basic knowledge in the natural sciences and mathematics (and enthusiasm)

Further information
flinders.edu.au/people/jochen.kaempf
"Kitchen oceanography": scientific experiments for the classroom

**Commencing:** July 2020

**Principal Supervisor:** A/Prof Jochen Kaempf

**Email:** jochen.kaempf@flinders.edu.au

**Project summary**
The aim of this project is to document (and develop) low-cost physical experiments that can be used in the classroom to demonstrate various oceanographic phenomena or scientific principles involving fluids.

**Location**
Flinders University - Bedford Park

**Assumed knowledge**
Basic knowledge in the natural sciences (and enthusiasm)

**Further information**
flinders.edu.au/people/jochen.kaempf

Upwelling of particulate matter in deep submarine canyons

**Commencing:** July 2020

**Principal Supervisor:** A/Prof Jochen Kaempf

**Email:** jochen.kaempf@flinders.edu.au

**Project summary**
This project employs process-oriented hydrodynamic models to study the newly discovered process of upwelling of particulate matter in deep submarine canyons. To this end, the honours candidate will undertake selected numerical experiments (under the instructions by the supervisor) to enhance the scientific understanding of this process.

**Location**
Flinders University - Bedford Park

**Assumed knowledge**
Basic knowledge in the marine sciences and mathematics (and enthusiasm)

**Further information**
flinders.edu.au/people/jochen.kaempf
Disinfection resistance of mycobacterium avium complex and its control in swimming pools

Commencing: July 2020

Principal Supervisor: Dr Harriet Whiley
Email: Harriet.Whiley@flinders.edu.au

Project summary
Mycobacterium avium complex (MAC) is a group of opportunistic pathogens of major public health concern. It is responsible for a wide spectrum of disease dependent on subspecies, route of infection and patients pre-existing conditions. MAC can maintain long-term contamination of treated water sources through its high resistance to disinfectants, association with biofilms and intracellular parasitism of free-living protozoa. This project will examine common disinfection approaches used to control MAC in swimming pools and identify the best strategies for control. The potential genes enabling disinfection resistance will also be characterised.

Supervisory team: Dr Kirstin Ross, Prof Melissa Brown

Location
Flinders University - Bedford Park

Assumed knowledge
Microbiology

Further information
flinders.edu.au/people/harriet.whiley
flinders.edu.au/water-quality-health

Hospital tap water as a source of antimicrobial resistant hospital acquired infections

Commencing: July 2020

Principal Supervisor: Dr Harriet Whiley
Email: Harriet.Whiley@flinders.edu.au

Project summary
Waterborne pathogens are a significant cause of nosocomial infections. With hospital tap water described as the most overlooked, important and controllable source of hospital acquired infections (HAI). This study will investigate the presence of pathogens responsible for HAI in water and biofilm samples collected from an Australian hospital. Comparison of the microbial communities present at the faucet and drain of basins compared to source water will provide insights into the route of contamination for different pathogens. The antimicrobial resistance of these pathogens will be quantified, and the potential transfer of antimicrobial resistance genes will be explored.

Supervisory team: Dr Kirstin Ross, Prof Melissa Brown

Location
Flinders University - Bedford Park

Assumed knowledge
Microbiology

Further information
flinders.edu.au/people/harriet.whiley
flinders.edu.au/water-quality-health
Microbial pathogens present in reuse water aerosols

**Commencing:** July 2020

**Principal Supervisor:** Dr Harriet Whiley

**Email:** Harriet.Whiley@flinders.edu.au

**Project summary**

The use of reclaimed water and recycled wastewater brings new challenges for the water industry in terms of maintaining water quality while increasing sustainability. Reuse water may contain opportunistic pathogens such as *Legionella pneumophila*, Mycobacterium avium complex and *Pseudomonas aeruginosa*. The aim of this project is to investigate the presence of these pathogens in aerosols generated during the use of reuse water (cooling towers, spray irrigation and toilet flushing). This information will identify the potential human health risks associated with the different practices.

**Supervisory team:** Dr Kirstin Ross, Prof Howard Fallowfield

**Location**

Flinders University - Bedford Park

**Assumed knowledge**

Microbiology

**Further information**

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


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Risk management of misting systems for opportunistic pathogens in biofilm

**Commencing:** July 2020

**Principal Supervisor:** Dr Harriet Whiley

**Email:** Harriet.Whiley@flinders.edu.au

**Project summary**

Water misting systems are currently being used as alternative cooling approach for outdoor environments. Water is pressurised and a superfine mist is created, as the mist evaporates it cools the air. However, these systems could potentially contain biofilm contaminated with opportunistic pathogens such as Mycobacterium avium complex (MAC), *Legionella pneumophila* and *Pseudomonas aeruginosa*. This project will examine the potential public health risks associated with the use of these misting systems and identify control strategies for their safe use.

**Supervisory team:** Dr Kirstin Ross, Prof Melissa Brown and SA Water Scientists

**Location**

Flinders University - Bedford Park

**Assumed knowledge**

Microbiology

**Further information**

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

Aquaporins as anemone toxins

Commencing: July 2020

Principal Supervisor: Prof Cathy Abbott
Email: cathy.abbott@flinders.edu.au

Project summary
Anemones produce both mucus and venom that contain numerous toxic proteins. The aims of this project is to characterize and compare aquaporins, or water channels in different anenome species. These aquaporins form an important part of the anemone’s toxic arsenal.

Location
Flinders University - Bedford Park

Assumed knowledge
BIOL3771 in 3rd year, or 2nd year molecular biology.

Further information
flinders.edu.au/people/cathy.abbott

Enzymes in fish gut health

Commencing: July 2020

Principal Supervisor: Prof Cathy Abbott
Email: cathy.abbott@flinders.edu.au

Project summary
Enzymes found in the gastrointestinal tract of fish are important for their utilisation of nutrients provided in diets. In this project student will use knowledge gained in their CML project in BIOL3771 to clone and characterize their chosen enzyme gene from Yellowtail Kingfish. This could be a lipase, trypsin or a dipeptidyl peptidase gene. The student will also spend time optimising the assay for the fish enzyme.

Location
Flinders University - Bedford Park
Flinders Medical Centre

Assumed knowledge
BIOL3771 in 3rd year

Further information
flinders.edu.au/people/cathy.abbott
Physics and Molecular Sciences (incl Biotechnology)

Measuring volatile organic compounds to monitor fish tissue quality

Commencing: July 2020

Principal Supervisor: Prof Cathy Abbott
Email: cathy.abbott@flinders.edu.au

Project summary
The time it takes for food to get from farm to plate, varies dramatically depending on food type. In some cases food can be frozen to improve shelf life and for transport, but in some markets, fresh is always better. This project aims to use mass spectrometry techniques to measure and monitor volatile organic compounds and grade fish fillets. Initially the methods will be developed for sardines, but they may also be tested on more high value fish like tuna.

Location
Flinders University - Bedford Park
Flinders Medical Centre

Assumed knowledge
Some knowledge of biochemistry or fish. An interest in aquaculture.

Further information
flinders.edu.au/people/cathy.abbott
flinders.edu.au/people/roger.yazbek

Novel breath tests for Environmental Enteric Dysfunction detection

Commencing: July 2020

Principal Supervisor: Prof Cathy Abbott
Email: cathy.abbott@flinders.edu.au

Project summary
Environmental Enteric Dysfunction (EED) is a debilitating condition affecting the small bowel. It is almost ubiquitous among children living in poverty and it is thought that EED is a major contributing cause of the failure of nutritional interventions to improve child growth. There are no robust biomarkers of EED that can be readily measured in resource-constrained areas where EED is prevalent. This project is using a mice model of EED to test the ability of a newly designed breath test to detect EED.

Location
Flinders University - Bedford Park
Flinders Medical Centre

Assumed knowledge
2nd year Molecular Biology and Biochemistry

Further information
flinders.edu.au/people/cathy.abbott
flinders.edu.au/people/roger.yazbek
Function of plant innate immune receptors

Commencing: July 2020

Principal Supervisor: A/Prof Peter Anderson
Email: peter.anderson@flinders.edu.au

Project summary
Plant immune receptors recognize invading pathogen molecules enabling the activation of the plant disease resistance response. This is essential for plant survival and a critical trait that is bred into our major crop plants. Our research aims to understand how these receptors work at the biochemical level and the downstream consequence of resistance activation. Projects will involve protein purification and immunoblot analysis to study the biochemical function of these important plant proteins.

Location
Flinders University - Bedford Park

Assumed knowledge
BIOL2772, BIOL3771, BIOL3762 or similar topics

Further information
flinders.edu.au/people/peter.anderson

Animal NLRs provide structural insights into plant NLR function

Transgenic rice with higher Fe and Zn levels

Commencing: July 2020

Principal Supervisor: A/Prof Peter Anderson
Email: peter.anderson@flinders.edu.au

Project summary
Rice feeds over 2 billion people worldwide. Despite this, the milled grain contains very few nutrients beyond that of starch. Consequently, over reliance on white rice leads to malnutrition in humans. We have increased Fe and Zn levels in the grain by engineering the expression of a sucrose transport protein and an metal chelator (nicotianamine) in the endosperm of transgenic rice. Honours projects aim to further characterise these transgenic plants.

Location
Flinders University - Bedford Park

Assumed knowledge
BIOL2772, BIOL3771, BIOL3762 or similar topics

Further information
flinders.edu.au/people/peter.anderson
Biological membranes

Commencing: July 2020

Principal Supervisor: Prof Gunther Andersson
Email: gunther.andersson@flinders.edu.au

Project summary
Cellular membranes are essential parts of biological cell. They ensure compartmentalisation of the cell and are also a matrix hosting membrane proteins, responsible for many functions of the cell. Malfunctioning of membrane proteins is the origin for many diseases. Performing experiments on natural cell membranes is difficult due to its high complexity. Ingo Koeper’s group has developed a range of model systems, which can mimic structure and function of natural membranes. In collaboration with the Koeper group we are investigating the layered structure of the model systems.

Location
Flinders University - Bedford Park

Assumed knowledge
Basic knowledge in Physics and/or Chemistry

Further information
flinders.edu.au/people/gunther.andersson

Determining sea spray compositions

Commencing: July 2020

Principal Supervisor: Prof Gunther Andersson
Email: gunther.andersson@flinders.edu.au

Project summary
Sea spray aerosols alter climate and the environment in remarkable ways. Marine aerosol particles are created by breaking ocean waves. This top region of the ocean is rich in organic molecules. The breaking waves transfer this biological soup into the droplets as they are jettisoned from the ocean surface. Water droplets can act as miniature catalytic converters for interfacial reactions. The aim of this project is to determine the composition of water droplets directly. Our depth profiling method will be applied in collaboration with Prof Gilbert Nathanson (Madison, USA).

Location
Flinders University - Bedford Park

Assumed knowledge
Basic knowledge in Physics and/or Chemistry

Further information
flinders.edu.au/people/gunther.andersson
Physics and Molecular Sciences (incl Biotechnology)

Dye sensitized solar cells

**Commencing:** July 2020

**Principal Supervisor:** Prof Gunther Andersson

**Email:** gunther.andersson@flinders.edu.au

**Project summary**

Dye sensitized solar cells (DSCs) are one of the promising technologies for photovoltaic cells. The interface of the titania and the dyes in DSCs is the crucial place for their functionality and efficiency. Interfaces in dye sensitized solar cells: the morphology of dye layers on titania (thickness, coverage and homogeneity) and the electronic structure will be investigated with depth profiling techniques and electron spectroscopy. This is a project in collaboration with Prof Lars Kloo (Sweden).

**Location**

Flinders University - Bedford Park

**Assumed knowledge**

Basic knowledge in Physics and/or Chemistry

**Further information**

flinders.edu.au/people/gunther.andersson

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Nano clusters for fabrication of solar fuels

**Commencing:** July 2020

**Principal Supervisor:** Prof Gunther Andersson

**Email:** gunther.andersson@flinders.edu.au

**Project summary**

We are developing catalysts for converting CO2 and H2O back to hydrocarbons, thus develop processes to fabricate solar fuels. The main components are small metal clusters which act as catalysts. The clusters contain only 4 – 100 metal atoms. We can be fabricated the clusters with physical methods in a cluster source or use chemically made clusters. The project is a collaboration between Flinders, Adelaide University, Canterbury University, Newcastle University, the University of Utah (USA) and the National Institute for Material Science (Japan).

**Location**

Flinders University - Bedford Park

**Assumed knowledge**

Basic knowledge in Physics and/or Chemistry

**Further information**

flinders.edu.au/people/gunther.andersson
Eco-friendly preparation of organic solar cells

Commencing: July 2020

Principal Supervisor: Prof Mats Andersson
Email: mats.andersson@flinders.edu.au

Project summary
This project is focused on environmentally friendly preparation of polymer solar cells, exploring the potential for truly eco-friendly solar cells. Normally, harmful chlorinated solvents and additives are used for the preparation of efficient cells but in this project the effect of environmentally friendly solvents on the morphology and on the final device efficiency will be studied. Green solvents and additives will provide a significant and unique manufacturing advantage over current materials for efficient organic solar cells.

Location
Flinders University - Bedford Park

Assumed knowledge
None listed

Further information
flinders.edu.au/people/mats.andersson

Nanoparticles for polymer solar cells

Commencing: July 2020

Principal Supervisor: Prof Mats Andersson
Email: mats.andersson@flinders.edu.au

Project summary
The aim of this project is to prepare water-dispersed nanoparticles (NPs) from conjugated polymers and electron acceptor materials and to use the NP as the photoactive layer in polymer solar cells. Utilising water based NPs ink in the fabrication of solar cells minimises the amount of organic solvents used during the device preparation. The prepared NPs will be coated on a substrate and after a thermal treatment the nanoparticle layer will be evaluated as the active material in polymer solar cells.

Location
Flinders University - Bedford Park

Assumed knowledge
NANO2701 or equivalent

Further information
flinders.edu.au/people/mats.andersson
New marine anti-biofouling surfaces

Commencing: July 2020

Principal Supervisor: Prof Mats Andersson
Email: mats.andersson@flinders.edu.au

Project summary
Fouling (the growth of marine organisms) onto ships or other surfaces is a serious problem that dramatically increases fuel costs, damage and spreading of invasive species. To overcome this problem current method uses antifouling paint containing copper compounds. The problem with this method is that it increases the level of copper in the harbours creating a serious environmental problem. The focus of this project is to develop new coatings and to study the growth of biofilm/marine organisms on the surfaces.

Location
Flinders University - Bedford Park

Assumed knowledge
None listed

Further information
flinders.edu.au/people/mats.andersson

Biofilm Research and Innovation Consortium

Printing polymer solar cells

Commencing: July 2020

Principal Supervisor: Prof Mats Andersson
Email: mats.andersson@flinders.edu.au

Project summary
This project is focused on developing printing techniques of polymer solar cells on flexible plastic substrates. Special emphasis is on developing efficient solar cells using environmentally friendly fabrication processes. This project offers an opportunity to learn about conjugated polymers, how solar cells work and fundamentals of charge generation, as well as getting hands on experience with fabrication (in a Glove box environment as well as on a mini-roll coater) and characterisation of solar cells.

Location
Flinders University - Bedford Park

Assumed knowledge
None listed

Further information
flinders.edu.au/people/mats.andersson
Physics and Molecular Sciences (incl Biotechnology)

Synthesis of electron acceptor polymers for all-polymer solar cells

Commencing: July 2020

Principal Supervisor: Prof Mats Andersson
Email: mats.andersson@flinders.edu.au

Project summary
The materials in organic solar cells normally consist of a blend of an electron donating polymer and electron accepting small molecules. There are many potential advantages to use a polymeric acceptor material instead of small molecules but so far there are only a limited number of acceptor polymers available. In this project, the focus is on modifying and developing new electron acceptor polymers that can be used in all-polymer solar cells. Preparation of solar cells can also be a part of this project.

Location
Flinders University - Bedford Park

Assumed knowledge
CHEM2702 or CHEM3712 or equivalent

Further information
flinders.edu.au/people/mats.andersson

Synthesis of water/alcohol soluble polymers for solar cells

Commencing: July 2020

Principal Supervisor: Prof Mats Andersson
Email: mats.andersson@flinders.edu.au

Project summary
The main goal with this project is to develop truly environmentally friendly polymer solar cells. Polymers are normally soluble in organic solvents and an environmentally friendly preparation requires the materials to be processed from water/alcohol solutions. One possible application is solar cells but there are also many other electronic devices that would benefit from the possibility of preparing the devices from water/alcohol solutions. This demands the development of materials with polar side chains and involves synthesis of new monomers and polymers.

Location
Flinders University - Bedford Park

Assumed knowledge
None listed

Further information
flinders.edu.au/people/mats.andersson
Condensed matter/many-body physics

Commencing: July 2020

**Principal Supervisor:** Dr Boris Blankleider

**Email:** boris.blankleider@flinders.edu.au

**Project summary**
The physics of many-body systems has wide-ranging applications: from descriptions of neutron stars and exotic quark-matter states, to applications in nanotechnology where it provides the theoretical description of metals, semiconductors, superconductors, etc. A number of Honours projects are available that will be of particular interest to Nanotechnology students. One example is the study of in-media two- and three-particle correlations, with applications ranging from particle condensation in quark-gluon plasmas to the formation of quasi-particles like excitons and trions in semiconductors.

**Location**
Flinders University - Bedford Park

**Assumed knowledge**
Quantum Mechanics

**Further information**
flinders.edu.au/people/boris.blankleider

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Lattice Gases

Commencing: July 2020

**Principal Supervisor:** Dr Boris Blankleider

**Email:** boris.blankleider@flinders.edu.au

**Project summary**
Traditionally, the motion of fluids has been described by solving differential equations (e.g. the Navier-Stokes equation). However, modern computer technology enables a very different approach, where the fluid is modeled by fluid "particles" moving on a spatial lattice. The computer then moves and collides these particles according to assumed rules. This approach is known as "cellular automaton lattice gases". Honours projects are available to implement such lattice gases in order to model phenomena (like turbulence) that are difficult to model with differential equations.

**Location**
Flinders University - Bedford Park

**Assumed knowledge**
None listed

**Further information**
flinders.edu.au/people/boris.blankleider
Theoretical nuclear and elementary particle physics

Commencing: July 2020

Principal Supervisor: Dr Boris Blankleider
Email: boris.blankleider@flinders.edu.au

Project summary
One of the great frontiers of scientific knowledge takes place at a scale more than a million times smaller than that of nanometers. This is the realm of nuclear and elementary particles such as quarks, gluons, pions, neutrons, protons, etc., their mysterious interactions governed by the rules of Quantum Field Theory. At Flinders, we are developing novel theoretical models that aim to provide the most accurate descriptions of basic processes that take place at this scale. Honours projects are available that implement these models, leading to a better understanding of this frontier.

Location
Flinders University - Bedford Park

Assumed knowledge
Quantum Mechanics

Further information
flinders.edu.au/people/boris.blankleider

Antiseptic and disinfectant resistance in the hospital superbug Staphylococcus aureus

Commencing: July 2020

Principal Supervisor: Prof Melissa Brown
Email: melissa.brown@flinders.edu.au

Project summary
The golden age of antibiotics is over as multidrug resistant strains of pathogenic bacteria are commonplace in both the hospital environment and community settings. This can be attributed to the multiple mechanisms that bacteria can employ to circumvent the action of antimicrobials. One such mechanism that we investigate is mediated by membrane-bound transport proteins, which actively export compounds out of the cell before they can reach their intracellular target. This project will focus on identifying regions in the staphylococcal QacA protein that are required for resistance to antiseptics.

Location
Flinders University - Bedford Park

Assumed knowledge
Theoretical knowledge of molecular biology and microbiology will be required. Hands-on lab-based training will be provided but experience and skills in aseptic techniques will be assumed.

Further information
flinders.edu.au/people/melissa.brown
Multidrug resistance in the sexually-transmitted human pathogen Neisseria gonorrhoeae

Project summary
Multidrug resistant strains of Neisseria gonorrhoeae have now been classified as one of the worst threats to human health as there are limited treatment strategies available. The mechanism fundamental to this problem is mediated by the MtrD membrane-bound transport protein, which actively exports antibiotics and host defence factors out of the cell. This project will focus on identifying regions/amino acids in the MtrD protein that are required for resistance to a broad range of compounds.

Location
Flinders University - Bedford Park

Assumed knowledge
Theoretical knowledge of molecular biology and microbiology will be required. Hands-on lab-based training will be provided but experience and skills in aseptic techniques will be assumed.

Further information
flinders.edu.au/people/melissa.brown

Survival of the fittest; Acinetobacter persistence strategies

Project summary
Our group focuses on working with pathogenic bacteria, analysing the means they use to defend themselves from, and evade strategies employed by, the host for their elimination. Acinetobacter baumannii is one such bacteria that is becoming more prevalent both in the hospital environment and community setting. This project will look at how Acinetobacter has developed into such a successful pathogen. In particular, we will investigate the strategies it uses to persist in the environment, such as surviving desiccation and the action of antiseptics and disinfectants.

Location
Flinders University - Bedford Park

Assumed knowledge
Theoretical knowledge of molecular biology and microbiology will be required. Hands-on lab-based training will be provided but experience and skills in aseptic techniques will be assumed.

Further information
flinders.edu.au/people/melissa.brown
Physics and Molecular Sciences (incl Biotechnology)

Synthesis and applications of sustainable polymers

Commencing: July 2020

Principal Supervisor: Dr Justin Chalker
Email: justin.chalker@flinders.edu.au

Project summary
This area of research features the synthesis of sustainable polymers. Honours projects are currently available in the following areas:

- Recyclable plastics and rubber
- Pollution control
- 3D printing sustainable polymers
- Sustainable gold recovery from primary and secondary sources
- Self-healing materials
- Renewable construction materials
- Sensors and responsive materials
- Precision fertilisers

Location
Flinders University - Bedford Park

Assumed knowledge
General chemistry and organic chemistry

Further information
chalkerlab.com/

Tools for chemical biology and drug delivery

Commencing: July 2020

Principal Supervisor: Dr Justin Chalker
Email: justin.chalker@flinders.edu.au

Project summary
Chemical biology in the Chalker lab spans the development of probes for oxidative stress and new materials for drug release. Current Honours project include:

- Novel probes for the study of cysteine oxidation
- New tools for medical imaging
- Novel polymers for drug release

Location
Flinders University - Bedford Park

Assumed knowledge
General chemistry; organic chemistry; biochemistry (or allied fields)

Further information
chalkerlab.com/
Mitochondria, growth, Reactive Oxygen Species (ROS) and environmental stress in legumes

Commencing: July 2020

Principal Supervisor: Prof David Day
Email: david.day@flinders.edu.au

Project summary
Legumes are an important crop due to their role in improving soil nitrogen levels through their symbiosis with nitrogen-fixing bacteria. However, commercial cultivars are not ideally suited to growth conditions in Australia, often resulting in stressed plants. Stress results in ROS generation and can cause cellular damage, referred to as “oxidative stress”. Plants have mechanisms for protecting themselves against ROS. This project will investigate these pathways, their relationship with plant growth, and the ability of the plants to form a symbiosis with soil rhizobia.

Location
Flinders University - Bedford Park

Assumed knowledge
DNA to Genome, Protein to Proteome, Integrating Molecular Biosciences, Integrating Biotechnology

Further information
flinders.edu.au/people/david.day
flinders.edu.au/people/kathleen.soole
flinders.edu.au/people/crystal.sweetman

The effects of antimicrobial fatty acids on bacterial physiology

Commencing: July 2020

Principal Supervisor: Dr Bart Eijkelkamp
Email: bart.eijkelkamp@flinders.edu.au

Project summary
Host fatty acids hold dual roles during infection, modulating an immune response and directly killing invading bacteria. Indeed, dietary deficiencies in omega-3 fatty acids have been associated with an increased risk of developing bacterial infections, this projects aims to study how omega-3 fatty acids exert their antimicrobial activity upon the superbug Acinetobacter baumannii. In particular, in this project you will work toward understanding the impact of host fatty acids upon bacterial virulence and antibiotic resistance.

Location
Flinders University - Bedford Park

Assumed knowledge
Basic molecular biology, microbiology (aseptic techniques), lipid biology

Further information
flinders.edu.au/people/bart.eijkelkamp
The role of zinc during infection

Commencing: July 2020

Principal Supervisor: Dr Bart Eijkelkamp
Email: bart.eijkelkamp@flinders.edu.au

Project summary
We have established a murine model of zinc deficiency and have applied this model to study the role of zinc during respiratory infections. We are currently studying the effects of multiple metal fluxes during infection with the superbug Acinetobacter baumannii. This is of major importance as ratios of distinct metals are to be maintained within defined thresholds due to the synergistic antimicrobial activity of particular metal combinations. In this project you will perform in vitro and in vivo analyses to examine the impact of metal ion stress upon A. baumannii.

Location
Flinders University - Bedford Park

Assumed knowledge
Bacterial pathogenesis, basic aseptic techniques

Further information
flinders.edu.au/people/bart.eijkelkamp

Investigating indirect methods to calibrate the spring constant of atomic force microscope cantilevers

Commencing: July 2020

Principal Supervisor: Dr Christopher Gibson
Email: christopher.gibson@flinders.edu.au

Project summary
The calibration of the spring constant of atomic force microscope (AFM) cantilevers is essential when using AFM to measure forces. A paper published in 2011 (Riet et al, Ultramicroscopy vol. 111, pages 1659 - 1666) reported comparing a number of different calibration methods across 8 different laboratories. They found that two methods, known as the Sader indirect and Gibson indirect methods, consistently reported values approximately 20% lower than expected. In this work we shall investigate these indirect methods and determine possible reasons the discrepancy was observed.

Location
Flinders University - Bedford Park

Assumed knowledge
An undergraduate program in Physics, Physical Chemistry, Nanotechnology or Materials Engineering

Further information
flinders.edu.au/people/christopher.gibson
Physics and Molecular Sciences (incl Biotechnology)

Measuring the diameter of carbon nanotubes using atomic force microscopy

Commencing: July 2020

Principal Supervisor: Dr Christopher Gibson
Email: christopher.gibson@flinders.edu.au

Project summary
Carbon nanotubes have novel properties which make them useful in a wide variety of applications. The atomic force microscope (AFM) is now routinely used to characterize the size and diameter (thickness) of carbon nanotubes which is crucial since electronic, optical and mechanical properties of these materials are strongly influenced by their diameter. In this project we will examine the advantages, disadvantages and optimal conditions of different imaging modes available in AFM to determine the diameter of carbon nanotubes.

Location
Flinders University - Bedford Park

Assumed knowledge
An undergraduate program in Physics, Physical Chemistry, Nanotechnology or Materials Engineering

Further information
flinders.edu.au/people/christopher.gibson

Utilising the thermal noise of microcantilevers to calibrate the atomic force microscope

Commencing: July 2020

Principal Supervisor: Dr Christopher Gibson
Email: christopher.gibson@flinders.edu.au

Project summary
This project will investigate using and improving the thermal noise method for the calibration of the spring constant of microcantilevers, typically used in atomic force microscopy (AFM). This is a crucial calibration for measuring forces accurately using the AFM. There are however still some outstanding issues with the thermal noise method, which this project will aim to provide solutions for. These issues include the accurate determination of correction factors, limits of the method in terms of cantilever stiffness and calibration of the AFM scanner.

Location
Flinders University - Bedford Park

Assumed knowledge
An undergraduate program in Physics, Physical Chemistry, Nanotechnology or Materials Engineering

Further information
flinders.edu.au/people/christopher.gibson
A bug's life: Eating steel and making rotten egg gas

Commencing: July 2020

Principal Supervisor: A/Prof Sarah Harmer
Email: Sarah.Harmer@flinders.edu.au

Project summary
Co-supervisor: Ingo Koep
Bio-corrosion of microbiologically induced corrosion is a common problem in water pipes and oil and gas production. Specific bacterial strains found in these environments can produce highly corrosive chemicals including H2S (rotten egg gas) accelerating the corrosion of pipelines. This project will focus on the detection and characterisation of corrosion in water pipes accelerated by the presence of bacteria. The effectiveness of anti-corrosive protection in pipeline systems and early detection corrosion will be investigated.

Location
Flinders University - Bedford Park

Assumed knowledge
None listed

Further information
flinders.edu.au/people/sarah.harmer
flinders.edu.au/people/ingo.koep
Biofilm Research and Innovation Consortium
flinders.edu.au/microscopy

Fe 2p multiplet structure of iron sulfides

Commencing: July 2020

Principal Supervisor: A/Prof Sarah Harmer
Email: Sarah.Harmer@flinders.edu.au

Project summary
This project will involve the interpretation of high resolution Synchrotron X-ray Photoelectron Spectroscopy (SXPS) Fe 2p and X-ray Absorption Near Edge Spectroscopy (XANES) Fe L2,3 spectra from in situ fractured samples combined with 1s2p Resonant Inelastic X-ray Scattering (RIXS) experiments at the European Synchrotron Radiation Facility (ESRF) and multi-configurational self-consistent field (MC-SCF) calculations. The outcomes of these experiments will be used to develop a complete model of the electronic structure of Fe1-xS and curve fitting routines for the Fe 2p XPS spectra of Fe1-xS.

Location
Flinders University - Bedford Park

Assumed knowledge
None listed

Further information
flinders.edu.au/people/sarah.harmer
flinders.edu.au/microscopy
Spatial arrangement of nitrifiers in biofilm using FISH and annular reactors

Commencing: July 2020

Principal Supervisor: A/Prof Sarah Harmer
Email: Sarah.Harmer@flinders.edu.au

Project summary
Co-supervisors: Brendon King, Ben van den Akker
Drinking water disinfection using chloramination has numerous benefits including, but not limited to, better customer aesthetics and improvements on exceedances of regulated Disinfection-By-Products. However, chloraminated distribution systems are susceptible to biological nitrification—problematic for maintaining adequate disinfection. Understanding the spatial arrangement of nitrifying bacteria within biofilms will assist in the management of these systems. An opportunity exists for a student to employ molecular methods that will further our knowledge in this area.

Location
SA Water House/Flinders University - Bedford Park

Assumed knowledge
Microbiology, molecular biology, chemistry

Further information
flinders.edu.au/people/sarah.harmer
Biofilm Research and Innovation Consortium

The Nanoreactor

Commencing: July 2020

Principal Supervisor: A/Prof Sarah Harmer
Email: Sarah.Harmer@flinders.edu.au

Project summary
The project will involve the development of a nanoreactor for Scanning Transmission X-ray Microscopy (STXM) especially designed for high resolution spectroscopic imaging in a hydrated and controlled electrochemical states. The nanoreactor allows for the physicochemical composition of heterogeneous catalysts in their working state at the nanometre scale or the study of microbial interaction with surfaces.

Location
Flinders University - Bedford Park

Assumed knowledge
None listed

Further information
flinders.edu.au/people/sarah.harmer
flinders.edu.au/microscopy
Forensic Chemistry

Commencing: July 2020

Principal Supervisor: Prof Paul Kirkbride
Email: paul.kirkbride@flinders.edu.au

Project summary
I can offer projects in an area of crime investigation of particular interest to you. Research could involve synthesis of illicit drugs and discovery of by-products of manufacture, detection of gunshot residues, analysis of ignitable liquid residues, automotive paint, new methods for detection of explosives and investigation of substances of relevance to forensic toxicology. Let me know which broad area you are interested in and I can tailor a project to suit you. Are you interested in the cross-over between forensic biology and chemistry? See my Forensic Chemistry/Biology listing!

Location
Flinders University - Bedford Park

Assumed knowledge
Depending on the project!

Further information
flinders.edu.au/people/paul.kirkbride

Forensic Chemistry/Biology

Commencing: July 2020

Principal Supervisor: Prof Paul Kirkbride
Email: paul.kirkbride@flinders.edu.au

Project summary
Adrian Linacre and I are involved in joint research that relates to the visualization of DNA deposits present in fingermarks, especially those present on improvised explosive devices. This work contributes strongly to the field of weapons technical intelligence and counter terrorism. Chemistry-based biological research in this field includes investigation of the fluorescence of DNA, materials that cause PCR inhibition and development of counter-measures against the destructive reaction between DNA and copper on items such as electrical/electronic components and cartridge cases.

Location
Flinders University - Bedford Park

Assumed knowledge
Depending on the project, forensic biology knowledge would be useful or mandatory.

Further information
flinders.edu.au/people/paul.kirkbride
flinders.edu.au/people/adrian.linacre
Are you drinking that?  
Microplastics in Water

Commencing: July 2020

Principal Supervisor: A/Prof Ingo Koeper
Email: ingo.koeper@flinders.edu.au

Project summary
In a close cooperation with SA Water, this project will focus on optimising methods for the quantification of microplastics in waste streams from wastewater treatment plants, with particular emphasis on differentiating best solutions for the analysis of solid vs water samples. The results will also be useful to derive a better understanding of the number, size and type of microplastics in South Australian effluents and sludge, providing a baseline to assess potential risks associated with their disposal or re-use.

Location
Flinders University - Bedford Park

Assumed knowledge
None listed

Further information
flinders.edu.au/people/ingo.koeper
Biofilm Research and Innovation Consortium

Quantification and identification of microplastics in wastewater streams (Scholarship opportunity)

Commencing: July 2020

Principal Supervisor: A/Prof Ingo Koeper
Email: ingo.koeper@flinders.edu.au

Project summary
The project will have a focus on optimising methods for the quantification of microplastics in waste streams from wastewater treatment plants, with particular emphasis on differentiating best solutions for the analysis of solid vs water samples. The results will also be useful to derive a better understanding of the number, size and type of microplastics in South Australian effluents and sludge, providing a baseline to assess potential risks associated with their disposal or re-use.

Location
SA Water House/Flinders University - Bedford Park

Assumed knowledge
Microbiology, microscopy, chemistry

Further information
flinders.edu.au/people/ingo.koeper
Biofilm Research and Innovation Consortium
Surface characterisation of X-ray emitters

Commencing: July 2020

Principal Supervisor: A/Prof Ingo Koeper
Email: ingo.koeper@flinders.edu.au

Project summary
In collaboration with Micro-X (company located at Tonsley), we will investigate some surface characteristic and physical-chemistry properties of their X-Ray emitters.

We will also look at ways to improve the formulation of their surface architecture, which is composed of a layer of carbon nanotubes attached to a surface.

Location
Flinders University - Bedford Park

Assumed knowledge
A little bit of physical chemistry

Further information
flinders.edu.au/people/ingo.koeper

Effect of natural extracts in the destabilisation of biofilms

Commencing: July 2020

Principal Supervisor: A/Prof Sophie Leterme
Email: sophie.letterme@flinders.edu.au

Project summary
Biofouling, the unwanted attachment and growth of organisms on a surface, increases the cost and decreases the productivity of reverse osmosis desalination plants. At present there is limited success in removing biofilms from RO membranes using chemical treatments. This project will focus on natural extracts to destabilise biofilms. Single organism to multi organism biofilms will be produced under static and flow cell conditions with a focus on a reduction or increased porosity of biofilm formation.

Location
Flinders University - Bedford Park

Assumed knowledge
Microbiology

Further information
flinders.edu.au/people/sophie.letterme

Biofilm Research and Innovation Consortium
How do electrochemical antifouling treatments impact on marine life?

Commencing: July 2020

Principal Supervisor: A/Prof Sophie Leterme
Email: sophie.letterme@flinders.edu.au

Project summary
Co-supervisor – Prof Mats Andersson
Biofouling causes many issues for the maritime industry, including damage to ships and structures submerged in the marine environment. This issue costs the industry millions of dollars each year and novel coatings are regularly developed to solve it. Novel electrochemical antifouling coatings have been developed at Flinders University by Mats Andersson. While these coatings have shown to efficiently reduce the amount of biofouling under laboratory conditions, how these coatings affect marine life is unknown. The aim of this project is to determine how electrochemical antifouling treatments affect biofilm forming organisms in the water as well as in biofilm state. This research is associated to a current project with Defence and the Australian Submarine Corporation.

Location
Flinders University - Bedford Park

Assumed knowledge
Marine biology, algae culture

Further information
flinders.edu.au/people/sophie.letterme
flinders.edu.au/people/mats.andersson
Biofilm Research and Innovation Consortium

Microplastics in the Gulf: how much of it is generated by us?

Commencing: July 2020

Principal Supervisor: A/Prof Sophie Leterme
Email: sophie.letterme@flinders.edu.au

Project summary
Co-supervisor – Prof Paul Kirkbride
Plastic pollution is one of the biggest threats to marine life and our environment, however there is currently little data available on the state of the pollution in Australian coastal environments. The aim of this project is to quantify and identify the different types of microplastics that are found in Adelaide metropolitan beaches, and identify if these plastics are similar to those found at river mouths along the Gulf St Vincent. This research will complement other projects currently running in my laboratory and will allow for the development of a model of plastic dispersion in the Gulf St Vincent.

Location
Flinders University - Bedford Park

Assumed knowledge
Freshwater/marine ecology, oceanography

Further information
flinders.edu.au/people/sophie.letterme
flinders.edu.au/people/paul.kirkbride
Surface specific biofilm growth

Commencing: July 2020

Principal Supervisor: Prof David Lewis
Email: david.lewis@flinders.edu.au

Project summary
The hypothesis is that "different" biofilms will grow on a surface from a mixed bacteria population in sea water. This project will create a range of different surface chemistries and structures to systematically explore the rate and type of biofilm growth from a mixed population. The surfaces will encompass producing a range of polymeric systems from hydrophillic to hydrophobic properties on substrates with a focus on the characterisation of the biofilms that form.

Location
Flinders University - Bedford Park

Assumed knowledge
Knowledge of biological processes

Further information
flinders.edu.au/people/david.lewis
Biofilm Research and Innovation Consortium

Chemical characterisation of the shrew attracting excretion from Nepenthes lowii

Commencing: July 2020

Principal Supervisor: A/Prof Mike Perkins
Email: mike.perkins@flinders.edu.au

Project summary
The tropical pitcher plant Nepenthes lowii has been reported to gain 57–100% of foliar Nitrogen input as faecal inputs by the shrew, Tupaia montana in its native habitat (Tree shrew lavatories, Biol. Lett. (2009) 5, 632–635. doi:10.1098/rsbl.2009.0311). The lower surface of the lid in the pitchers is covered with coarse bristles and specialized nectar glands that secrete a buttery, white exudate which the shrews feed on and then defaecate into the pitcher. The aim of the project is to fully chemically characterise the exudate. Samples of exudate have been sourced from greenhouse grown plants.

Location
Flinders University - Bedford Park

Assumed knowledge
Knowledge of Organic Chemistry at the level of CHEM3711

Further information
flinders.edu.au/people/mike.perkins
Synthesis of Novel Heterocyclic Compounds (Project 1 & Project 2)

Commencing: July 2020

Principal Supervisor: A/Prof Mike Perkins
Email: mike.perkins@flinders.edu.au

Project summary
Up to two projects in the area of medicinal chemistry will be available for 2020. These projects will involve the development of an approach to the synthesis of a new class of heterocyclic compounds and the preparation of a number of analogues. This new class of compounds may have future potential medical/agrochemical use. The projects are in collaboration with CSIRO Molecular Science (Dr Craig L Francis; CSIRO, Melbourne)

The details of this project are potentially subject to an intellectual property agreement and anyone interested should speak to A/Prof Perkins for further information.

Location
Flinders University - Bedford Park

Assumed knowledge
Knowledge of Organic Chemistry at the level of CHEM3711

Further information
flinders.edu.au/people/mike.perkins

Analysing malignant plastics in museum collections

Commencing: July 2020

Principal Supervisor: A/Prof Rachel Popelka-Filcoff
Email: rachel.popelkafilcoff@flinders.edu.au

Project summary
Museums are confronting plastic or polymer-based collections needing better preservation. With a short life expectancy and contemporary nature of plastics, conservators have comparatively fledgling expertise for facing this issue. Flinders University is contributing to an ARC Linkage between universities, museums and an art gallery to develop methods for predicting and increasing the lifespan of malignant plastics (natural rubber, cellulose nitrate, cellulose acetate, polyurethane, polyvinyl chloride) to study the identification, deterioration and conservation of polymer-based materials.

Location
Flinders University - Bedford Park

Assumed knowledge
Undergraduate in chemistry, physics or related fields

Further information
flinders.edu.au/people/rachel.popelkafilcoff
polymuse.net.au/
Characterisation of Indigenous Australian pigments and analysis of cultural heritage

**Commencing:** July 2020

**Principal Supervisor:** A/Prof Rachel Popelka-Filcoff
**Email:** rachel.popelkafilcoff@flinders.edu.au

**Project summary**
While significant knowledge of past societies is lost to time, we can use analytical and forensic chemistry toward the chemical and physical characterisation of complex cultural materials such as pigments, resins and binders. Aspects of the projects include non-destructive techniques to reconstruct cultural exchange of materials, utilising elemental, microbial DNA and spectroscopic techniques. Opportunities include characterisation of binders in cultural heritage objects (py-GC-MS and IR spectroscopy) and material and pigment analysis by X-ray, microbial DNA and spectroscopic methods.

**Location**
Flinders University - Bedford Park

**Assumed knowledge**
Undergraduate in chemistry, physics, biology or related fields

**Further information**
flinders.edu.au/people/rachel.popelkafilcoff
youtube.com/watch?v=E1BsyjJVGrc

Nuclear forensics of uranium materials

**Commencing:** July 2020

**Principal Supervisor:** A/Prof Rachel Popelka-Filcoff
**Email:** rachel.popelkafilcoff@flinders.edu.au

**Project summary**
Understanding the origin of nuclear material can provide critical intelligence to assist criminal prosecutions and the prevention of further proliferation of material. Uranium ore and uranium ore concentrates (UOCs) contain several chemical, elemental, physical and isotopic signatures that can be used to determine a sample’s provenance. However, the materials themselves are complex due to their original genesis and materials processing and often require multifaceted analytical approaches. This project explores new approaches to provenance nuclear material.

**Location**
Flinders University - Bedford Park

**Assumed knowledge**
Undergraduate in chemistry, physics or related fields

**Further information**
flinders.edu.au/people/rachel.popelkafilcoff
Quantitative analysis of environmental radiation

Commencing: July 2020

Principal Supervisor: A/Prof Rachel Popelka-Filcoff
Email: rachel.popelkafilcoff@flinders.edu.au

Project summary
South Australia has a long-standing legacy in mining uranium, however the effects of this and effects of radionuclides in the environment are not well understood. This project will develop an analytically robust isotope ratio data set for the ERICA model for the arid zone environment, specifically in an Australian context. Measurements of local flora, fauna and soil and water will be investigated and analysed by techniques such as alpha and gamma spectroscopy and ICP-MS as well as methods at ANSTO and ARPANSA. Students may attend field trips to industry sites.

Location
Flinders University - Bedford Park

Assumed knowledge
Undergraduate in chemistry, physics or related fields

Further information
flinders.edu.au/people/rachel.popelkafilcoff
news.flinders.edu.au/blog/2018/08/30/research-expands-mine-site-environs/
nera.org.au/Projects/ImprovingRadiologicalRiskAssessments

Accelerating enzymatic reactions under flow for the pharmaceutical industry

Commencing: July 2020

Principal Supervisor: Prof Colin Raston
Email: colin.raston@flinders.edu.au

Project summary
Enzymatic catalysis is important in the pharmaceutical industry but they are inherently slow. The vortex fluidic device delivers shear stress to liquids which is effective in dramatically accelerating enzymatic reactions, which is understood mechanistically. We are developing such processing where the enzyme is tethered to the surface of the glass tube or is attached to large magnetic particles for ease of separation from the product post VFD processing, or are agglomerated through incorporating the enzymes into metal organic frameworks (MOFs), as strategies for the pharmaceutical industry.

Location
Flinders University - Bedford Park

Assumed knowledge
None listed

Further information
flinders.edu.au/people/colin.raston
Raston Laboratory
Continuous flow chemistry under external electric and magnetic fields

Commencing: July 2020

Principal Supervisor: Prof Colin Raston
Email: colin.raston@flinders.edu.au

Project summary
Controlling the chemical reactivity and selectivity is important in developing processes that are more sustainable, in reducing side reactions and the generation of waste. Applying external fields to liquids has potential to exquisitely control chemical reactions, but this is not possible using conventional batch processing. We have developed a thin film microfluidic device which has liquids in a rapidly rotating tube under continuous flow conditions, as scalable processing. Electric and magnetic fields can be directed uniformly to the liquid with exciting possibilities in controlling chemistry.

Location
Flinders University - Bedford Park

Assumed knowledge
None listed

Further information
flinders.edu.au/people/colin.raston
Raston Laboratory

Redefining organic synthesis under continuous flow

Commencing: July 2020

Principal Supervisor: Prof Colin Raston
Email: colin.raston@flinders.edu.au

Project summary
The pharmaceutical industry is transforming small molecule synthesis from batch processing to continuous flow processing, as more energy efficient, waste reducing, and just in time processes. We have developed thin film continuous flow processing as a paradigm shift in the field, where high shear stress and different types of rotational speed dependent sub-micron fluid dynamic effects drives and controls organic reactions. This unique processing beyond diffusion control has exciting potential in developing benign-by-design reactions, with novel chemistry to be discovered.

Location
Flinders University - Bedford Park

Assumed knowledge
None listed

Further information
flinders.edu.au/people/colin.raston
Raston Laboratory
Physics and Molecular Sciences (incl Biotechnology)

Thin film microfluidics - fundamental and applications

**Commencing:** July 2020

**Principal Supervisor:** Prof Colin Raston

**Email:** colin.raston@flinders.edu.au

**Project summary**
The Raston Clean Technology Laboratory incorporates sustainability in the research at its inception, including scalability. The research covers a wide range of chemistry, materials synthesis, device technology, self-assembly, characterisation techniques, and more, at the interface with physics, biology, medicine, food processing and engineering. Projects on offer feature the in house developed vortex fluidic device, for fabricating functional nano-carbon, controlling chemical reactivity and selectivity, manipulating liposomes and exosomes, and wine and food processing, and more.

**Location**
Flinders University - Bedford Park

**Assumed knowledge**
None listed

**Further information**
flinders.edu.au/people/colin.raston

Molecular approaches to sustainable food production and quality

**Commencing:** July 2020

**Principal Supervisor:** Prof Kathleen Soole

**Email:** kathleen.soole@flinders.edu.au

**Project summary**
Due to climate change and world population growth, it will be necessary to grow crops in sub-optimal soils with increasing environmental pressures (e.g. temperature extremes). We are exploring the molecular mechanisms that allow plants to tolerate and grow in these conditions, and using molecular breeding techniques to find naturally occurring cultivars. We use SNP markers to analyse genetic polymorphisms of candidate genes important for crop breeding. We also use gene editing technology and transgenic plants with altered expression of gene candidates to explore tolerance to abiotic stresses.

**Location**
Flinders University - Bedford Park

**Assumed knowledge**
DNA to Genome, Protein to Proteome, Integrating Molecular Biosciences, Integrating Biotechnology

**Further information**
flinders.edu.au/people/kathleen.soole
flinders.edu.au/people/yuri.shavrukov
Effects of phages on the wound microbial communities

Commencing: July 2020

Principal Supervisor: A/Prof Peter Speck
Email: peter.speck@flinders.edu.au

Project summary
Co-supervisor: Jim Mitchell
The microbial community in a wound, such as a diabetic foot ulcer, includes many microbial species. Phages are species-specific and can remove from the wound microbial community a dominant member such as Staphylococcus aureus. Will this cause the microbial community to collapse, or will other microbes expand and take over? This could be studied either in the setting of actual clinical trials – on humans- or in animal studies, both of which the lab is involved in. DNA sequencing and microbiome analysis techniques would be used to monitor the changes that phage exert in a microbial community.

Location
Flinders University - Tonsley

Assumed knowledge
Virology, either from completion of BIOL2761 or MMED3939

Further information
flinders.edu.au/people/peter.speck
flinders.edu.au/people/jim.mitchell

Biomarker evaluation and quantification in urine and sweat for chronic diseases monitoring

Commencing: July 2020

Principal Supervisor: A/Prof Youhong Tang
Email: youhong.tang@flinders.edu.au

Project summary
Measuring health data in real time by consumers presents a significant opportunity for health improvement and management of chronic illness – but we are yet to unlock its full potential. There are a variety of devices that measure discrete biological compounds, targeted for use by patients with specific diseases. However, there are few underlying platform technologies that enable the measurement and monitoring of a range of biological chemicals and that are simple enough to be used by any individual in place. New biosensors can be developed for purpose, associated with evaluation.

Location
Flinders University - Tonsley

Assumed knowledge
Chemistry synthesis or chemical characterization or biomedical or medical or biological or materials background

Further information
flinders.edu.au/people/youhong.tang
Biofilm Research and Innovation Consortium
Personalised medical device with aggregation-induced emission features

Commencing: July 2020

Principal Supervisor: A/Prof Youhong Tang
Email: youhong.tang@flinders.edu.au

Project summary
Immunochromatography assays (lateral assays) are one of the most convenient and widely applied technologies for the detection of analytes in biological samples (such as viruses, bacteria and human bio-markers). However, many such tests are purely qualitative, indicating only the presence or absence of the particular analyte in the sample. Aggregation induced emission biosensors offer a quantitative solution through the high sensitivity of their fluorescence, creating the opportunity to detect the target of interest with a versatile tool. Personal medical device with AIEgen could be the answer.

Location
Flinders University - Tonsley

Assumed knowledge
Chemical characterization or medical or biological or materials background

Further information
flinders.edu.au/people/youhong.tang
Biofilm Research and Innovation Consortium