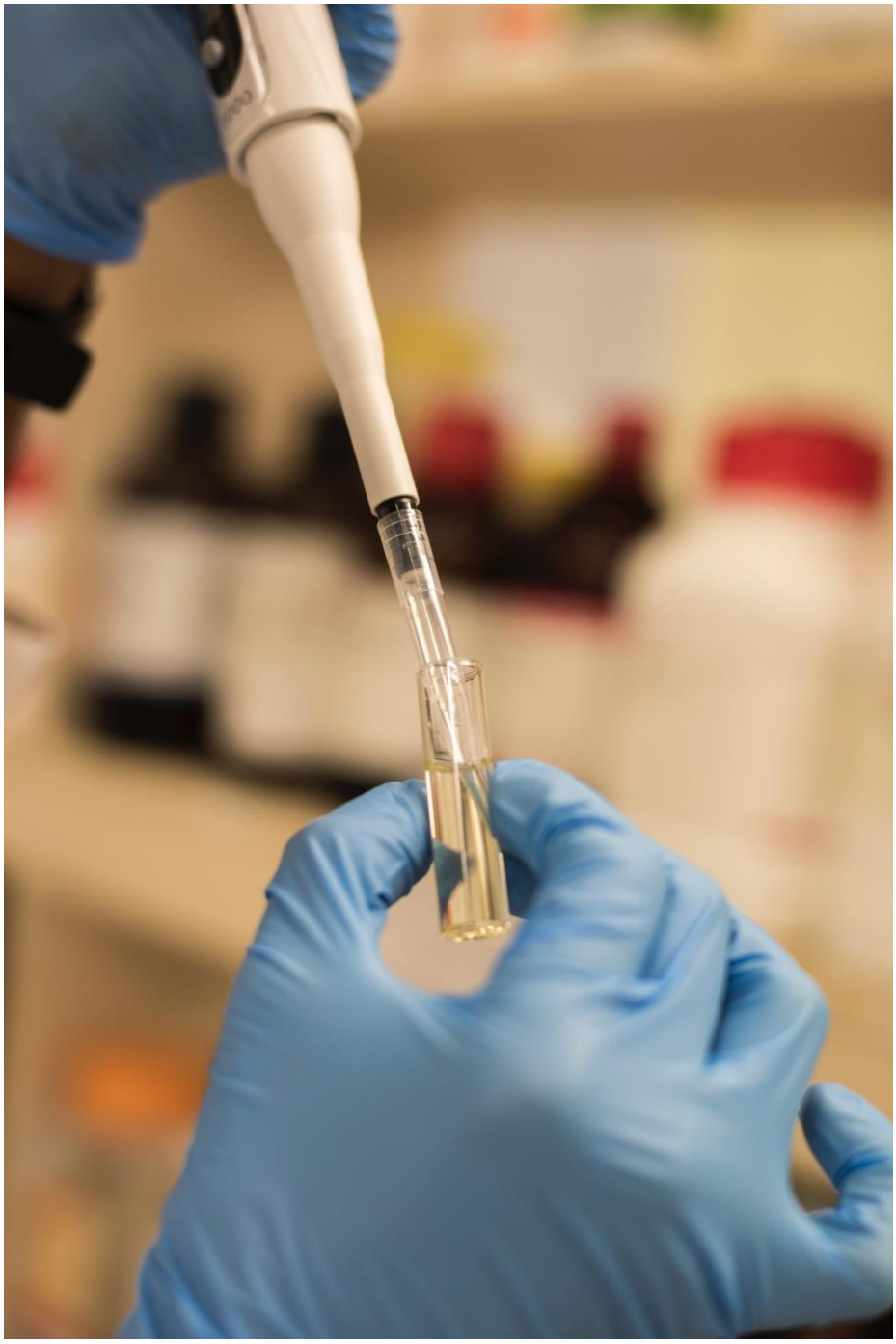
School of Medical Sciences (SOMS)

2021 Honours Projects



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Welcome to School of Medical Sciences (SOMS) Honours 2021

Work on a real problem that affects real people

During an Honours year in Medical Sciences you can participate in world leading research in cancer, drug discovery, infectious diseases, neuroscience, respiratory medicine, stem cell biology and more. We have projects available across our Camperdown and Westmead precincts, as well as affiliated research institutes.

Please join us at our Honours information session, **2-4pm** on **25th September**

Please register for the session here:
uni-sydney.zoom.us/webinar/register/WN_B2OuyJyASpSpzPRNtVpF8w

2-3pm - During the first hour we will provide an overview of the Medical Sciences Honours program. We will cover the research project, coursework components, assessments, eligibility, and how to apply. There will be an opportunity for questions.

3-4pm - During the second hour you will have the opportunity to meet with individual supervisors over Zoom. Supervisors who wish to connect with students on the day have provided **meeting ID codes** (see end of booklet). Please enter the meeting room of a supervisor(s) whose project interests you to find out more. Please be polite when entering a room as a conversation may be in progress. Please wait for an appropriate opportunity to introduce yourself and ask questions. It is a good idea to prepare by reading some recent papers published by the supervisor, so you understand the kind of research they undertake.

All available projects are organized by Discipline and research institute and are presented at the end of the booklet. If a project interests you, **please email supervisors directly**. *Note, not all supervisors are available to Zoom on the day, but they are still very interested to hear from you!*

Once you have found a supervisor willing to take you on, please complete an expression of interest (EOI) form and submit it to: **soms.education@sydney.edu.au**

The EOI form can be found here: **sydney.edu.au/medicine-health/study-medicine-and-health/undergraduate-courses/honours/honours-in-medical-sciences.html**

Please complete the EOI in consultation with your supervisor, by selecting BAS (Honours) in an appropriate discipline area and choosing appropriate research modules that you would like to complete as part of SOMS4101. SOMS4101 unit and module descriptions can be found on the next page.

SOMS Honours Working Group Chair: Dr Paul Austin
Contact details: **paul.austin@sydney.edu.au**

SOMS Honours Co-Coordinator:

SOMS4101/Deputy Chair: Dr Najla Nasr (najla.nasr@sydney.edu.au)
Anatomy and Histology/Neuroscience: Dr Paul Austin (paul.austin@sydney.edu.au)
Applied Medical Science: A/Prof Andrew Harman (andrew.harman@sydney.edu.au)
Infectious Diseases/Immunology: A/Prof Jim Manos (jim.manos@sydney.edu.au)
Pathology: A/Prof Lenka Munoz (lenka.munoz@sydney.edu.au)
Pharmacology: Prof Michael Murray (michael.murray@sydney.edu.au)
Physiology: Dr Dan Johnstone (daniel.johnstone@sydney.edu.au)

SOMS4101: Research Skills for Medical Sciences

Unit description

We face major health challenges in today's society that require new insights and approaches from bright minds. Tackling the big questions in medical sciences and health requires the research skills that will inform tomorrow's health outcomes for individuals and populations. Immersed in a multidisciplinary medical science and health research environment, you will develop the core skills required to undertake laboratory, clinical and population health research. You will learn how to design, execute, evaluate studies, and how to scrutinise data and research outcomes. You will work individually and collaboratively in small teams of students from different areas of specialisation to learn theoretical and practical aspects of specific research techniques, as well as the ethical and regulatory frameworks relevant to medical and health research. The practical classes, face-to-face workshops and online learning activities will equip you with knowledge and skills that will enable you to play an active role in finding meaningful solutions to difficult problems in a technical or research setting.

Unit overview

Week 1 (25%)	Week 2 (25%)#	Week 3 (25%)#	Week 4 (25%)#
Work Health and Safety (5%) **Westmead** - Workshop	**3.** PCR/Genomics **Westmead** - Workshop & Practical	**7.** Flow cytometry **Westmead** - Workshop & Practical	**11.** Molecular and chemical probes in research **Camperdown** - Workshop
Research Integrity (5%) **Camperdown** - Workshop	**4.** Qualitative Research Methods **Westmead** - Workshop	**8.** How to write a Systematic Review **Camperdown** - Workshop	**12.** Advanced immunostaining - Labelling specific components of cells and tissues **Camperdown** - Workshop & Practical
An introduction to Biostatistics (7.5%) **Camperdown** - Workshop	**5.** Tissue preparation & Histological stains **Camperdown** - Workshop & Practical	**9.** Data analysis and data visualisation **Camperdown** - Workshop	**13.** Western blotting/proteomics **Westmead** - Workshop & Practical
1. Human Ethics (7.5%)* **Westmead** - Workshop	**6.** Cell culture **Camperdown** - Workshop & Practical	**10.** Mass Spec & HPLC (clinical and experimental application) **Camperdown** - Workshop	**14.** Epidemiology **Westmead** - Workshop
2. Animal Ethics (7.5%)* **Westmead** - Workshop	*Blank*	*Blank*	**15.** Animal Handling **Camperdown** - Workshop & Practical

*In week 1 students will choose module 1 or 2.
#In weeks 2-4, students will choose 1 module from those available.

Module descriptions

Week 1 Compulsory modules

Work Health and Safety, WHS (5%)-Westmead

This module aims to define why WHS is important and will introduce you to your responsibilities in the workplace. There will be a 2-hour interactive group workshop, where you will identify hazards via inspection of the workplace, consultation on health and safety issues and review of available information. You will also use a risk matrix to assess a risk by considering how hazards may cause harm, the likelihood of harm occurring and how severe the harm could be. You will also identify the hierarchy of risk controls from elimination to substitution, isolation, usage of engineering/administrative controls and personal protective equipment (PPE).

Research Integrity (5%)

This module will introduce the research integrity considerations that you face as a new researcher, as well as the responsibilities that you have under the Research Code of Conduct. You will complete an introductory online workshop on Responsible Research Practices. Teaching will include a 2-hour interactive workshop, where you will work through case studies in small groups focusing on common issues, such as authorship, collaborative research, data management, conflicts of interest and plagiarism. Through group and class discussion you will learn the best practices and solutions for navigating all facets of research integrity.

Introduction to Biostatistics (5%)

This module will demonstrate a set of common tools in biostatistics including comparing distributions, performing linear and logistic regression, and constructing Kaplan-Meier estimates for survival analyses. Focusing on the presentation of results in research reports, you will learn how to report statistical analyses in research reports, including summarising data using descriptive statistics, hypothesis testing, and calculating relative risks, odds ratios, and confidence intervals. Teaching includes two 2-hour workshops where students are provided examples from published literature and work through examples with scripts/code in SAS/Python/R available in advance.

Week 1 Optional modules (select one)

1. Human Ethics (7.5%) – Westmead

OR

2. Animals Ethics (7.5%) – Westmead (does not replace the introduction to Animal Research (ITAR) courses)

These modules aim to introduce the basic concepts of **ethics and governance** and outline the code of **ethics and code of conduct**. Teaching will include 3-hour interactive workshop discussions, where you will work through different scenarios to acquire the required principles in animal or human research and the frameworks, guidelines and government authorities they fall under. Through class discussion, you will also identify your key accountabilities for conducting research and evaluate your understanding of how to conduct research responsibly according to the institutional requirements and as set by legislation at both the state and federal levels.

Week 2 (select one)

1. PCR/Genomics (25%) – Westmead

This module will introduce the key concepts of gene expression analysis. In workshops (4h), you will identify components of a PCR reaction, design appropriate controls, compare and contrast PCR, qPCR, digital droplet PCR, RNA-Sequencing, NanoString and single cell RNA sequencing, articulate differences between relative and absolute qPCR and their key applications, design primers and a qPCR experiment. In practical classes (4h), you will execute the designed experiment. In the analysis session (4h), you will evaluate key parameters for high quality PCR data, learn how to present the data in a written report covering the experimental design, results, figures, discuss strategies to circumvent failed experiments, limitations and data validation.

2. Qualitative Research Methods (25%) - Westmead

This module will focus on research strategies in the evaluation of health promotion interventions. We will cover key stages of health promotion evaluation, focusing on qualitative research methodologies for formative and process evaluations. Both types of evaluations are important steps for understanding health promotion intervention effectiveness, especially in complex, multi-component programs. Teaching includes two 3-hour interactive workshops where students are provided examples of published literature for critical evaluation and students will work through real-world case studies presented by guest researchers. Through pre-workshop activities and workshop discussions you will learn the importance of these evaluations for implementation and dissemination of health promotion programs.

3. Tissue Preparation and Histological Stains (25%) - Camperdown

In this module you will gain a basic understanding of histological techniques, starting with fixation and paraffin-embedding of tissues, followed by cutting your own sections using a microtome. You will gain an understanding of how stains bind to different tissue types, and carry out staining protocols, including the haematoxylin and eosin stain. Using light microscopy, you will capture publication-quality images of your stained tissue, and learn how to recognise artefacts.

4. Cell culture (25%) - Camperdown

Cell culture is a core laboratory technique in biomedical research, cellular and molecular biology, drug discovery and biotechnology laboratories. This module will include both practical and workshop components and will provide students with the necessary technical and critical reasoning skills to successfully perform cell culture. It is intended as an introduction to cell culture basics, covering topics such as getting familiar with the requirements of a laboratory dedicated to cell culture experiments, laboratory safety, aseptic techniques, microbial contamination of cell cultures, as well as teaching basic methods for passaging, freezing, and thawing cultured cells.

Week 3 (select one)

1. Flow Cytometry (25%) - Westmead

This module aims to introduce the key concepts that underpin flow cytometry. In workshops (4h), you will learn about the key components of flow cytometers, how to design flow panels, identify controls and how to achieve high quality flow and cell sorting. In a laboratory practical (7h), you will prepare cells and controls according to the panel design of the workshop, perform flow acquisition and record data on a flow cytometer. In the analysis session (4h), you will analyse, interpret and learn how to present your data in a written report spanning from the experimental design, results, figures to discussing strategies to circumvent potential failed experiments, limitations and data validation.

2. How to Write a Systematic Review (25%) – Camperdown

In this module, you will be introduced to the theory and methodology required to undertake a systematic review of the research literature. You will gain an understanding of the PRISMA guidelines and PROSPERO registry and be trained in techniques for accessing and searching databases and the appropriate use of reference management software. You will also gain hands-on experience in the use of powerful software platforms (e.g. Covidence) for collaborative review work. This module will equip you with the tools required to more efficiently extract and manage research studies from the published literature in order to generate a systematic review or the Introduction to your Honours thesis.

3. Advanced Biostatistics (data analysis and visualisation) (25%) - Camperdown

This module will introduce common tools and methods used in the analysis and visual representation of large and complex datasets. You will use practical datasets published in recent research articles that are relevant to Anatomy & Histology, Applied Medical Sciences, Infectious Diseases and Immunology, Pathology, Pharmacology, Physiology, or Neuroscience. You will acquire analysis methods including multivariable modelling and clustering using unsupervised machine learning methods. Using R, Python, or SAS, you will access the scripts/code needed to import, process, and visualise data from raw sources, and learn how complex data generated in biomedical sciences are analysed, interpreted, and effectively communicated in research reports.

4. Mass spectroscopy and HPLC (clinical and experimental application) (25%) – Camperdown

This module is designed for honours students whose projects will leverage liquid chromatography (HPLC) and/or mass spectrometry (MS) – advanced analytical techniques, which are used for the identification, isolation and purification of biomolecules (small molecules, peptides, lipids or proteins). The theoretical component will introduce basic concepts relevant in chromatography, instrument configuration, method development and data analysis. The practical component will give students the opportunity to acquire their own data for samples (either an analyte provided or their own) on an LCMS system in the Sydney Mass Spectrometry CORE facility. These data will be analysed and discussed in detail to extract valuable information on the analyte. The objective of this module is for students to familiarize themselves with these powerful and ubiquitous techniques that underpin much of the life sciences and medical research done today. Basic knowledge in chromatographic methods is beneficial, but not required.

Week 4 (select one)

1. Molecular and Chemical Probes in Research (25%) - Camperdown

Molecular and chemical probes are important tools widely used to modify - usually to inhibit - the activity of individual proteins in cells or organisms and hence to determine their function. However, none of the probes are perfectly specific and sufficient on their own. Combined use of molecular (e.g. siRNA, shRNA, sgRNA) and chemical (e.g. inhibitors) probes is required to reach conclusions regarding the function of an investigated protein. Through a series of interactive workshops, this module will introduce students to the field of molecular and chemical probes, and teach them how to use online resources in order to make a fully informed choice on probes and how to identify incorrect data in the published literature.

2. Advanced immunostaining - Labelling Specific Components of Cells and Tissues (25%) - Camperdown

In this module you will learn how specific proteins, organelles and other components of cells and tissues can be selectively labelled and then visualized using optical and fluorescence microscopy. You will gain a broad theoretical knowledge of the diverse ways that fixed and live cells can be probed and imaged and in the practical component of the module you will design and perform an immunolabelling experiment on fixed cultured cells or on fixed tissue sections. Workshops will include important aspects of experiment design, controls and antibody selection. We will finish with an introduction to fluorescence microscopy, image analysis and publication.

3. Western Blotting/Proteomics (25%) – Westmead

This module will introduce Western blotting, a common technique for protein analysis. In workshops (4h), you will learn about different types of antibodies, design an experiment using fluorescent antibodies and compare it to other detection methods, discuss whether western blot data support the conclusions drawn in published papers and whether it failed to meet required reporting and image integrity standards. In practical classes (4h), you will execute the designed experiment. During analysis (2h), you will critically interpret and generate a figure using best practice reporting, learn how to present the data in a written report covering the experimental design, results, figures, discuss strategies to circumvent failed experiments, limitations and data validation.

4. Epidemiology (25%) – Westmead

In this module, you will develop an understanding of epidemiologic inquiry, distinguishing between disease description and inference. You will evaluate the spectrum of epidemiologic study designs based on the research question, the control of bias, and feasibility. You will also measure and evaluate associations between exposures and outcomes based on data obtained from epidemiologic studies. Finally, you will evaluate causal reasoning and inference in epidemiologic research, as contextualized by person, time, and place.

5. Animal Handling (25%) - Camperdown

This module is for students who will be using live animals in their honours projects. Students will learn the foundational principles of experimental design and practice for *in vivo* experiments using rodents. In the theory section of the module, students will learn about reducing bias, choosing appropriate endpoints, ethics, drug injections, and statistical analysis of behavioural data. In the practical section of the module, students will have small-group (max 4) lessons to learn the basic principles and best practice of husbandry (mouse and/or rat), to understand environmental variables and stressors that impact data, and to perform live mouse health checks, basic handling, anaesthesia and euthanasia, and monitoring.

Anatomy and Histology Honours 2021

Laboratory	Laboratory of Neuroimmunology & Behaviour
Laboratory Head	Paul Austin
Supervisor	Paul Austin
Email address	paul.austin@sydney.edu.au
Phone	0293515061
Location	Brain & Mind Centre (M02F, Room 507)
Zoom ID code	928 1395 3632
Project name	**Investigating the inflammatory mechanisms of chronic pain**
Project (100 words)	My laboratory is focused on investigating neuro-immune interactions, and their behavioural consequences, such as pain and depression. Projects are available to investigate the inflammatory mechanisms of chronic neuropathic pain or the childhood dementia, Sanfilippo Syndrome. These *in vivo* studies will focus on changes in glial activation, and the effects of therapeutic interventions, such as microglial inhibition and photobiomodulation, to reduce neuroinflammation. You may also have the opportunity to participate in clinical studies to uncover immune biomarkers in chronic pain conditions, such as diabetic neuropathy. The laboratory uses a variety of neuroanatomical, immunohistochemical and cytometric approaches to probe the inflammatory mechanisms of these conditions.

Anatomy and Histology Honours 2021

Laboratory	Autism Clinic for Translational Research
Laboratory Head	Professor Adam Guastella
Supervisor	Professor Adam Guastella
Email address	Adam.guastella@sydney.edu.au
Location	BMC Camperdown or Westmead Children's Hospital
Zoom ID code	**503 531 5944**
Project name	**1. Understanding predictors of social cognition in young adults with autism spectrum disorder** **2. Early detection of social delay in the first year of life** **3. Improving the assessment of neurodevelopment and well-being in children attending hospital and community services**
Project (100 words)	**1.** Autism spectrum disorders are associated with difficulties in understanding the emotions of others. The aim of this study is to explore the cognitive and physiological predictors of social cognition in young adults with autism spectrum disorder. A battery of tests has been collected of cognitive and physiological assessments and well validated measures of social cognition (emotion recognition, theory of mind). The student will need to assist collection of data and analysis to determine features of cognition and physiology that contribute to social cognition. Comparisons against collected neurotypical control and psychiatric control populations will be made. **2.** Social delay associated with Autism Spectrum Disorder can typically be identified by 18 months of age. There is growing recognition that early markers of speech, physiological reactivity and eye gaze responsiveness may help identify such delay in the first year of life. The aim of this project is to review the literature relating to early life social detection and to collect data in a sample of children attending high risk screening clinics for markers of social delay. Data will be compared against a typically developing cohort. The project may provide insights into social development in the first year of life, with potential for earlier detection than what is currently possible. **3.** There is a growing need to improve the assessment of children attending neurodevelopmental clinics. The aim of this project is to examine one aspect of the assessment process (physiology, eye tracking, child social and cognitive development, anxiety, parental mental health) and examine how this contributes to the diagnosis of Autism Spectrum Disorder in these clinics and links to disability. The student will be able to choose a domain that is of particular interest to them and integrate the collection of data into existing platforms at Westmead Children's Hospital.

Anatomy and Histology Honours 2021

Laboratory	Behavioural Neurobiology
Laboratory Head	Dr David Mor
Supervisor	Dr David Mor
Email address	David.mor@sydney.edu.au
Phone	02 86278874
Location	Camperdown
Zoom ID code	
Project name	**Alteration CRF receptors expression in cognitive dysfunction following chronic stress**
Project (100 words)	Physical or psychological stress have direct effects on cognitive processes such as behavioural flexibility and motivation. These symptoms characterise many stress-related pathologies such as depression and anxiety disorders. The neural circuitry regulating these processes include forebrain structures such as the prefrontal cortex and striatum. These circuits are highly regulated by monoamine projections such as dopamine, serotonin and noradrenaline from the brainstem. My Lab focuses on how stress and pain alter the interactions between the CRF system and the brainstem monoaminergic nuclei, leading to altered forebrain function and dysfunctions in behavioural flexibility, decision making and motivation.

Anatomy and Histology Honours 2021

Laboratory	Neurodegeneration Laboratory
Laboratory Head	Eleanor Drummond
Supervisor	Eleanor Drummond
Email address	Eleanor.drummond@sydney.edu.au
Phone	9351 0597
Location	Brain & Mind Centre
Zoom ID code	https://uni-sydney.zoom.us/j/96709880390
Project name	**Identifying Proteins that Cause Selective Vulnerability in Alzheimer's disease**
Project (100 words)	One of the most intriguing features of Alzheimer's disease is that some brain regions are particularly vulnerable in disease, while others remain unaffected. Why this happens is unknown. We are currently using proteomics to identify the protein changes in human brain tissue examine this question. In this honours project you will analyse our recently generated proteomic results to identify key proteins responsible for selective vulnerability in Alzheimer's disease. You will then use multiplexed immunohistochemistry to confirm these key protein differences in human brain tissue and to determine if these proteins co-localize with neuropathological features in early Alzheimer's disease. Results from this project has the potential to identify new drug targets for early stage Alzheimer's disease.

Anatomy and Histology Honours 2021

Laboratory	Lens Research Laboratory
Laboratory Head	Professor Frank J. Lovicu
Supervisor	Professor Frank J. Lovicu
Email address	frank.lovicu@sydney.edu.au
Phone	93515170
Location	Anderson Stuart Building (F13)
Zoom ID code	917 7232 1071
Project name	**Growth factor-induced regulation of ocular lens development, growth and pathology.**
Project (100 words)	The work of the Lens Research Laboratory is primarily directed at identifying the molecules and mechanisms that govern the behaviour of cells of the ocular lens, in health, ageing and disease. Studies conducted by this laboratory have identified a number of molecules that play key roles in both normal and pathological lens development and growth. Currently this laboratory is working to gain a better understanding of how these molecules are regulated in the eye. This is fundamental to identifying new therapeutics for retarding or preventing cataract and blindness, one of the most common and costly diseases of ageing.

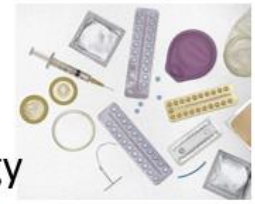
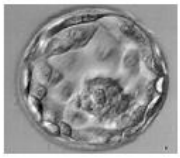
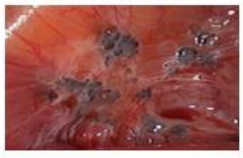
Anatomy and Histology Honours 2021

Laboratory	Corneal Research
Laboratory Head	Dr Jingjing You; Prof Gerard Sutton
Supervisor	Dr Jingjing You
Email address	jing.you@sydney.edu.au
Phone	0433573055
Location	Save Sight Institute, Sydney Eye Hospital
Zoom ID code	728 197 8515
Project name	1. **Developing a sensitive detection platform to detect and monitor tear proteins for eye diseases** 2. **Using Graph-central neuronal network to analyse fundus images**
Project (100 words)	1. It is established that human tears contain hundreds of proteins. In this project, the student will have a chance to work on specific proteins using a gene and/or protein interaction method to help develop a platform technology for research and clinical use. 2. Artificial intelligent based neuronal network system is a common AI method for image analysis. This project uses a new graph-central neuronal network method to examine hundreds of publicly available fundus image. The student will learn how to read fundus image, how to develop a graph central neuronal network platform and use it to reveal new information.

Anatomy and Histology Honours 2021

Laboratory	Sunlight and Cancer Group
Laboratory Head	Dr Katie Dixon
Supervisor	Dr Katie Dixon
Email address	Katie.dixon@sydney.edu.au
Phone	9351 4633
Location	Medical Foundation Building
Zoom ID code	https://uni-sydney.zoom.us/j/97085015455
Project name	**Prevention of skin cancer with novel photoprotective agents**
Project (100 words)	Skin cancer is highly prevalent in Australia, with two in three people being diagnosed by age 70. While non-melanoma skin cancers are more common, melanoma is responsible for the majority skin cancer deaths. This project involves the investigation of the molecular mechanisms of ultraviolet radiation-induced skin carcinogenesis, and modulation with novel photoprotective agents.

Anatomy and Histology Honours 2021

Laboratory	Cell and Reproductive Biology Laboratory
Laboratory Head	Dr Laura Lindsay and Dr Sam Dowland
Supervisor	Dr Laura Lindsay and Dr Sam Dowland
Email address	laura.lindsay@sydney.edu.au sam.dowland@sydney.edu.au
Location	Medical Foundation Building
Zoom ID code	994 2675 7531
Project name	**Understanding Pregnancy: The Role of Uterine Epithelial Cells**
Project (100 words)	Are you interested in female reproductive biology? IVF  Novel contraceptives  Uterine Biology  Placental Biology  Embryology  Uterine pathology – endometrial cancer, endometriosis  Design a **student-led** project that you are interested in We already have honours students for 2021, but come and chat to us if you're interested in Honours for 2022 For further information contact Dr Laura Lindsay (laura.lindsay@sydney.edu.au) Dr Sam Dowland (sam.dowland@sydney.edu.au)

Applied Medical Science Honours 2021

Laboratory	Dermatology Department Laboratory
Laboratory Head	Prof Pablo Fernandez-Penas
Supervisor	Prof Pablo Fernandez-Penas and Dr Ali Azimi
Email address	pablo.fernandezpenas@sydney.edu.au ali.azimi@sydney.edu.au
Phone	0403736011 (Ali Azimi)
Location	Westmead Hospital & Westmead Institute for Medical Research
Zoom ID code	91021508626
Project name	**Proteomic studies in skin cancer (multiple projects)**
Project (100 words)	Our honours projects available for the 2021 intake mainly involve the use of state-of-the-art mass spectrometry to investigate the proteome profile of skin cancers. The overall aims of these projects are to improve our understanding of the melanoma and non-melanoma skin cancer mechanisms and to aid in the development of molecular diagnostics, targeted therapies and personalized medicines. By joining our team, you will be part of a dedicated team of skin researchers and clinicians at the Westmead Hospital and across the University of Sydney. To find out more, please attend our Zoom session where we can provide you with more information and answer your questions.

Applied Medical Science Honours 2021

Laboratory	Stem Cell Medicine
Laboratory Head	Dr Anai Gonzalez Cordero
Supervisor	Dr Anai Gonzalez Cordero
Email address	agonzalez-cordero@cmri.org.au
Phone	+61 2 8865 2980
Location	Children's Medical Research Institute
Zoom ID code	https://cmri.zoom.us/j/93049375634?pwd=K2NvK1duaFNvWmNTc2ZCNnBNSEFLUT09&from=msft#success Meeting ID: 930 4937 5634 Passcode: 699655
Project name(s)	**Understanding Birdshot Uveitis using iPSC-derived microglia and organoids.** **Summary:** Disease modelling using cells and organoids derived from patient-specific human induced pluripotent stem cells (iPSCs) provide a valuable tool for understanding disease. In this study students will learn how to culture iPSCs, retinal organoids and microglia cells to form complex organoids. These models will then be used to investigate Birdshot Uveitis, a progressive retinal inflammation, in the dish. Our hypothesis is that Uveitis microglia and retinal organoids will have different markers of inflammation when compared to control cells. The student will be exposed to a number of techniques, such as RNA sequencing, immunohistochemistry, confocal microscopy and cytokines screenings. The results will aid the development of new therapies for Uveitis. **Developing a novel treatment for blindness using electrical stimulation and cell therapy.** **Summary:** Many degenerative diseases of the eye due to loss of photoreceptor cells lead to progressive vision impairment and eventually total blindness. For advanced conditions, where the light-sensing (photoreceptor) cells in the retina have been lost, cell therapy by cell transplantation is one of the only options. Proof-of-concept studies have demonstrated that transplantation of photoreceptor cells can rescue vision. However, integration of the transplanted cells with the endogenous retinal circuitry is not efficient. Thus, innovative approaches to improve the connectivity of transplanted cells are essential in order to move to clinical trials. There is also convincing evidence from numerous studies that electrical stimulation (E-Stim) improves cell migration, proliferation, and axonal outgrowth. In this study the student will evaluate the effect of E-Stim on stem cell-derived retinal organoids in vitro to test the hypothesis that E-Stim enhances their maturation.

Applied Medical Science Honours 2021

Laboratory	Zoellner Lab
Laboratory Head	Prof Hans Zoellner
Supervisor	Dr Belal Chami
Email address	Belal.chami@sydney.edu.au
Phone	0420901899
Location	Westmead Adult Hospital – Centre of Oral Health
Zoom ID code	988 3416 4740
Project (100 words)	**Myeloperoxidase and NET formation in IBD patient samples.** The relationship between oxidative stress/damage in the evolution of tissue damage in acute and chronic inflammatory conditions, namely Inflammatory Bowel Disease (IBD) is critical in developing new strategies to treat these diseases. Myeloperoxidase (MPO), produced primarily by neutrophils, is known to produce a powerful two-electron oxidant called hypocholorous acid (HOCl) which is linked to host-tissue damage in various disease settings including rheumatoid arthritis, acute myocardial infarctions and IBD. Interestingly, MPO has recently been shown to be crucial to the development of neutrophil extracellular traps – a DNA/elastase scaffold backbone embedded with histones and myeloperoxidase which has demonstrated antimicrobial activity. Despite this, little is known regarding its role in the pathogenesis of inflammatory bowel disease (IBD). **Oral Submucosal Fibrosis: The IL-33/IL-13 axis in promoting arecoline-induced fibrosis.** Oral Submucosal Fibrosis(OSF)is a chronic fibrinolytic oral condition with malignant propensity. In moderate and severe cases,OSF significantly impairs oral function with patients reporting impairment of mastication due to stiffing of associated muscoskeletal muscles. Inappropriate fibrinolytic activity of fibroblasts in the oral muscoa is the central pathophysiological characteristic of the disease. Recently, a new member of the IL-1 superfamily, IL-33, has been discovered and a subsequent plethora of reports have highlighted it's role in several fibrinolytic conditions. Moreover, the IL-33/IL-13 axis has recently been shown to induce collagen III deposition in subcutaneous fibrosis. This research has the potential to identify new therapeutic targets for the treatment of OSF.

Applied Medical Science Honours 2021

Laboratory	Directed Evolution
Laboratory Head	Dr Daniel Hesselson
Supervisor	Dr Daniel Hesselson
Email address	d.hesselson@centenary.org.au
Phone	0404456830
Location	Centenary Institute - CPC Level 5
Zoom ID code	483 118 6836 TWE4OFRyQ04ra0o0elVwdjJNN2Qxdz09
Project name	**Blocking follistatin in ovarian cancer to prevent chemoresistance and recurrence**
Project (100 words)	In the Directed Evolution laboratory, we harness the power of Darwinian selection to evolve proteins with new therapeutic activities. We have discovered that that blocking follistatin activity could increase the sensitivity of ovarian cancer to primary chemotherapeutics. However, existing anti-follistatin antibodies lack the potency to fully neutralise follistatin activity *in vivo.* Thus, we will evolve high affinity single-domain antibodies (nanobodies) against follistatin, to disrupt its signalling. This work will pave the way for new adjunctive therapies which could enhance the efficacy of primary chemotherapeutics in a wide range of cancers.

Applied Medical Science Honours 2021

Laboratory	
Laboratory Head	Dr Ellis Patrick
Supervisor	Dr Ellis Patrick
Email address	Ellis.patrick@sydney.edu.au
Phone	0402 159 424
Location	Westmead and/or Camperdown
Zoom ID code	988 4248 9754
Project name	**Data-intensive science to understand the molecular aetiology of disease.**
Project (100 words)	Biotechnological advances have made it possible to monitor the expression levels of thousands of genes and proteins simultaneously promising exciting, ground-breaking discoveries in complex diseases. This project will focus on the application and/or development of statistical and machine learning methodology to analyse a high-dimensional biomedical experiment. Our lab works on projects spanning multiple diseases including melanoma, ovarian cancer, acute myeloid leukemia, Alzheimer's disease, multiple sclerosis and HIV. We also work with various high-throughput technologies including single-cell RNA-Seq, SWATH-MS, flow cytometry, CyTOF, CODEX imaging and imaging mass cytometry.

Applied Medical Science Honours 2021

Laboratory	Centre for Kidney Research, Kids Research Westmead
Laboratory Head	Professor Stephen Alexander
Supervisor	Dr Geoff Zhang/Dr Yuan Min Wang
Email address	Stephen.alexander@sydney.edu.au
Phone	02 98453430
Location	Centre for Kidney Research
Zoom ID code	https://uni-sydney.zoom.us/j/97752030836
Project name	**A Kidney Transplant for Life**
Project (100 words)	Currently patients receiving kidney transplants are on lifelong immunosuppression and expect to lose the kidney to immune and other injury and to develop complications related to the immunosuppression. This project is based on a number of strategies in our lab to genetically alter the kidney to improve its function including using kidneys deficient in GSDM and MHC. It is also looking at strategies to enhance immune tolerance, including cytokine based expansion of Tregs and the development of screens for chemicals that enhance Tregs. It will involve skills in genetics, immunology and animal models of transplantation.

Applied Medical Science Honours 2021

Laboratory	Centre for Immunology and Allergy Research / Immunogenetics
Laboratory Head	Dr Grant Parnell
Supervisor	Dr Grant Parnell
Email address	grant.parnell@sydney.edu.au
Phone	0423 349 286
Location	The Westmead Institute for Medical Research
Zoom ID code	96564465122
Project name	**Vitamin D and the Immune System in Multiple Sclerosis**
Project (100 words)	The genetic and environmental evidence that vitamin D activity is low in Multiple Sclerosis is compelling, but in clinical trials supplementation has not proven effective. We have discovered features of vitamin D response that indicate the form of vitamin D used in supplementation is unlikely to be useful. Here we aim to find out how to avoid these limits to response by tracking the vitamin D pathway in immune cells, especially identifying the processes important in making immune cells less active. This should lead to better ways to exploit vitamin D for therapy. Techniques used: qPCR, flow-cytometry, next-gen sequencing, bioinformatics.

Applied Medical Science Honours 2021

Laboratory	Telomere Length Regulation
Laboratory Head	Prof Hilda Pickett
Supervisor	Prof Hilda Pickett
Email address	hpickett@cmri.org.au
Phone	02 8865 2928
Location	Children's Medical Research Institute, Westmead
Zoom ID code	https://cmri.zoom.us/j/99439123444?pwd=RzVJY202cmVWb09FUStnc3M2RExYQT09
Project name	**Telomere dynamics in cancer cells**
Project (100 words)	Telomeres are specialized DNA and protein structures at the ends of human chromosomes that function to maintain the integrity of the DNA. Telomeres shorten with each round of cellular division, and telomere length is indicative of the proliferative potential of the cell. Two distinct mechanisms exist to counteract telomere shortening. First, the enzyme telomerase synthesizes telomeric DNA onto the chromosome ends. Second, alternative lengthening of telomeres (ALT) uses homologous recombination-directed pathways to extend telomeres. We offer a variety of projects investigating telomere length regulation, DNA damage and repair pathways at telomeres, and therapeutic opportunities that target telomeres in cancer cells.

Applied Medical Science Honours 2021

Laboratory	Telomere Length Regulation
Laboratory Head	Prof Hilda Pickett
Supervisor	Prof Hilda Pickett
Email address	hpickett@cmri.org.au
Phone	02 8865 2928
Location	Children's Medical Research Institute, Westmead
Zoom ID code	https://cmri.zoom.us/j/99439123444?pwd=RzVJY202cmVWb09FUStnc3M2RExYQT09
Project name	**Telomere dynamics in cancer cells**
Project (100 words)	Telomeres are specialized DNA and protein structures at the ends of human chromosomes that function to maintain the integrity of the DNA. Telomeres shorten with each round of cellular division, and telomere length is indicative of the proliferative potential of the cell. Two distinct mechanisms exist to counteract telomere shortening. First, the enzyme telomerase synthesizes telomeric DNA onto the chromosome ends. Second, alternative lengthening of telomeres (ALT) uses homologous recombination-directed pathways to extend telomeres. We offer a variety of projects investigating telomere length regulation, DNA damage and repair pathways at telomeres, and therapeutic opportunities that target telomeres in cancer cells.

Applied Medical Science Honours 2021

Laboratory	Centre for Kidney Research, Kids Research Westmead
Laboratory Head	Professor Stephen Alexander
Supervisor	Dr Hugh McCarthy/Dr Yuan Min Wang
Email address	Hugh.McCarthy@sydney.edu.au
Phone	02 98453430
Location	Centre for Kidney Research
Zoom ID code	https://uni-sydney.zoom.us/j/97752030836
Project name	**Genetics and Immunology of Idiopathic Nephrotic Syndrome**
Project (100 words)	The aim of the project is to investigate the circulating factors in patients with nephrotic syndrome and their effect on the main cell of the kidney filter: the podocyte. Nephrotic syndrome is a rare disorder in children where their kidneys leak protein due to a circulating factor that causes podocytes to become leaky. In this project, you will study the mechanism of disease using patient samples to identify genetic and immunological basis of disease. Including analysis of peripheral blood white cells and using human conditionally immortalized podocytes (ciPods) cells and the effect of .serum on these cells.

Applied Medical Science Honours 2021

Laboratory	Melanoma Institute Australia Supportive Care and Survivorship
Laboratory Head	Dr Iris Bartula
Supervisor	Dr Iris Bartula
Email address	iris.bartula@sydney.edu.au / iris.bartula@melanoma.org.au
Phone	(02) 9911 7398
Location	Poche Centre, Wollstonecraft
Zoom ID code	https://uni-sydney.zoom.us/j/92719359050
Project name	**Supportive Care and Survivorship in melanoma**
Project (100 words)	Melanoma is the 3rd most diagnosed cancer in Australian males and females. Survival has improved over the recent years, increasing the importance of psychosocial, quality of life and survivorship issues. Melanoma Institute Australia is a world-leader of melanoma research and we are interested in answering the following questions: • Why don't melanoma patients access psycho-social support when needed? • How prevalent is fatigue in melanoma patients on immunotherapy? • How to best measure fatigue? By asking patients or clinicians? • Does immunotherapy impact patients' body image? Who is most at risk? We will consider any other questions students are interested in.

Applied Medical Science Honours 2021

Laboratory	Fungal Pathogenesis Group, Centre for Infectious Diseases and Microbiology, WIMR.
Laboratory Head	Associate Professor Julie Djordjevic
Supervisor	Associate Professor Julie Djordjevic
Email address	julianne.djordjevic@sydney.edu.au
Phone	02 8627 3420
Location	Westmead Institute for Medical Research, Westmead Campus
Zoom ID code	5174044924
Project name	**Understanding how fungal pathogens adapt to the host via cell signaling.**
Project (100 words)	Using the model fungal pathogen, *Cryptococcus neoformans*, projects are available to investigate how key signalling pathways promote fungal infection in various niches of the mammalian host (e.g. lungs, blood, phagocytes and brain). Methods include targeted gene deletion using biolistics, mutagenesis, fluorescent tagging of reporter proteins, overlap PCR, quantitative PCR, phagocyte co-culture, phagocytosis assays, flow cytometry, fluorescence microscopy, mouse and moth larvae infection models and biochemistry-based virulence assays. Outcomes will help drive future antifungal drug development aimed at preventing deadly fungal meningitis.

Applied Medical Science Honours 2021

Laboratory	Cancer Research Unit
Laboratory Head	Prof Roger Reddel
Supervisor	A/Prof Karen MacKenzie
Email address	kmackenzie@cmri.org.au
Phone	
Location	Children's Medical Research Institute
Zoom ID code	993 9385 0588
Project name	**Novel telomere maintenance mechanisms, biomarkers and therapeutics in immortal cancer cells**
Project (100 words)	Uncontrolled cell replication (cellular immortality) is a hallmark of most malignancies, and a defining feature of the subset of tumour cells that drive cancer relapse. Cancer cell immortality is dependent on the maintenance of chromosomal end structures called telomeres, which function to ensure chromosomal stability in replicating cells. Our Group's research is focused on characterizing the diversity of mechanisms involved in telomere maintenance, identifying biomarkers of different telomere maintenance mechanisms and investigating strategies for undermining telomere maintenance as a therapeutic approach for cancer. Therapeutic exploitation of the mechanisms involved in cell immortality holds promise for a broad spectrum of malignancies, including rare sarcomas that have not been addressed by the new generation of molecular targeted therapeutics.

Applied Medical Science Honours 2021

Laboratory	HSV and Vaccine Adjuvants Group
Laboratory Head	Prof Tony Cunningham
Supervisor	Dr Kerrie Sandgren
Email address	kerrie.sandgren@sydney.edu.au
Phone	0422 126 681
Location	The Westmead Institute
Zoom ID code	986 6343 0898
Project name	**How does the promising vaccine adjuvant AS01 work in humans?**
Project (100 words)	Part of our lab's research is focused on improving vaccines. A new, vaccine for shingles has proven to be outstandingly effective, even in older adults (>70 years old), who typically respond weakly to vaccination. We are intrigued to know whether the immune-stimulating component of this vaccine (the adjuvant AS01) may be used in other vaccines to boost their efficacy. This may be particularly important in the development of a COVID-19 vaccine, as older adults are the most vulnerable to severe COVID-19 disease and may not respond well to the first round of available vaccines. We have a collaboration with the global pharma developers to test AS01B in extracted human lymph nodes to investigate how it works. This knowledge could facilitate the development of new vaccines or improve existing vaccines to be more effective, particularly in the ageing population.

Applied Medical Science Honours 2021

Laboratory	Herpes Neuropathogenesis
Laboratory Head	Monica Miranda-Saksena
Supervisor	Kevin Danastas
Email address	kevin.danastas@sydney.edu.au
Phone	02 8627 3627
Location	Westmead Institute for Medical Research
Zoom ID code	
Project name	**Immune response against HSV-1 infections in nerves**
Project (100 words)	HSV-1 causes lifelong infections, hiding from the host immune system in sensory nerves. The virus can sporadically reactivate to travel back along nerves causing recurrent lesions. This project aims to explore how immune cells influence HSV-1 transport and exit from nerves. Specifically, we aim to identify the mechanism by which interferons control HSV-1 release from nerve endings and any changes induced by interferons in these nerves. This project will involve the addition of interferon to primary neuronal cultures, as well as CD4 and CD8 T-cells, to assess their effects on HSV-1 release from nerve endings.

Applied Medical Science Honours 2021

Laboratory	Viral Hepatitis Pathogenesis Group
Laboratory Head	A/Prof Mark Douglas
Supervisor	A/Prof Mark Douglas
Email address	mark.douglas@sydney.edu.au
Phone	02 8627 3532
Location	Westmead Clinical School / Westmead Institute for Medical Research
Zoom ID code	969 3198 7136
Project name	**Hepatitis C Virus Drug Resistance - using Next Generation Sequencing to monitor for increasing community transmission**
Project (100 words)	New treatments cure hepatitis C after 8-12 weeks of tablets, but some patients fail treatment and develop drug-resistant virus. To cure everyone with hepatitis C we need to monitor resistant viruses in the community to ensure that new treatments keep working. At Westmead we have established the NSW Reference Laboratory for hepatitis C resistance testing, using an automated next generation sequencing platform. This project will analyse drug-resistant virus in people who have failed treatment and in people recently diagnosed with hepatitis C. We will work with Public Health to monitor for increasing resistance in the community and reduce its transmission.

Applied Medical Science Honours 2021

Laboratory	Synapse Proteomics
Laboratory Head	Mark Graham
Supervisor	Mark Graham
Email address	mgraham@cmri.org.au
Phone	0288652989
Location	Children's Medical Research Institute, Westmead
Zoom ID code	N/A. Email preferred.
Project name	**How do molecules make memories? Understanding learning and memory at the level of cellular signalling.**
Project (100 words)	This project aims to discover and validate new molecular mechanisms of how synaptic plasticity, which underlies learning and memory, is regulated by protein interactions and phosphorylation-based signalling. The Synapse Proteomics group uses cutting edge technology, biochemical and molecular biology techniques to understand brain function. Many aspects of how brains adapt at the cellular and molecular level are unknown. We study cellular signalling (protein phosphorylation) as a marker of proteins and pathways that are involved in neuronal activity. Phosphoproteomics is being applied as a tool to screen for key proteins and pathways that mediate presynaptic plasticity. Screens are followed by biochemical analysis and functional assays to discover new mechanisms that can potentially be exploited to develop therapeutics for neurological diseases. Epilepsy research is a focus and relates to brain plasticity because of the homeostatic mechanisms that are engaged following seizure activity.

Applied Medical Science Honours 2021

Laboratory	Bioengineering laboratory
Laboratory Head	Munira Xaymardan
Supervisor	Munira Xaymardan
Email address	Munira.Xaymardan@sydney.edu.au
Phone	404345236
Location	Westmead Orla Health, Level 2 Westmead Hospital, NSW
Zoom ID code	
Project name	**Role of Transcription Factor Nkx2-5 in Orofacial Muscle Development**
Project (100 words)	Our laboratory has found that the orofacial region is the largest extra-cardiac expression site for the cardiac transcription factor Nkx2-5. Indicating that the tongue muscle is more similarity to the heart muscle than to skeletal muscles of the limb and truck and may be used to repair the damaged heart. This study will use a hypomorphic strategy to specifically address the role of Nkx2-5 in tongue development. Briefly, the hypomorphic Nkx2-5 condition is achieved by crossing two genetically modified mice to generation embryos that are “knockdown” phenotype. These embryos will be analysed morphologically in comparison to the wild-type siblings.

Applied Medical Science Honours 2021

Laboratory	Stem cell and cancer biology group
Laboratory Head	Dr Naisana Seyedasli
Supervisor	Dr Naisana Seyedasli
Email address	Naisana.seyedasli@sydney.edu.au
Phone	+61 2 88904818
Location	Westmead
Zoom ID code	834 992 7733
Project name	**Establishing novel 3D models and treatments for human epithelial cacinoma**
Project (100 words)	**Within the overarching aim stated above, three projects will be offered in our group:** 1 Molecular dissection of radiation-induced tumour remodelling in human epithelial carcinoma 2 Cracking the code of chemotherapy resistance in human epithelial carcinoma 3 The role of extracellular matrix in cancer: more than a scaffold

Applied Medical Science Honours 2021

Laboratory	Centre for Transplant and Renal Research, Kidney Injury Group
Laboratory Head	A/Prof Natasha Rogers
Supervisor	A/Prof Natasha Rogers
Email address	Natasha.rogers@health.nsw.gov.au
Phone	86273510
Location	Westmead Institute for Medical Research
Zoom ID code	Meeting ID: 738 754 6064 Passcode: natasha
Project name	**Investigating mechanisms of kidney injury**
Project (100 words)	Acute kidney injury (AKI) is characterized by the abrupt decline in renal function and occur in both native and transplanted kidneys. Episodes of AKI are associated with significant morbidity and mortality. Despite the apparent resolution of AKI, we now know from epidemiological studies and experimental models that molecular and genetic changes within the kidney lead to reprogramming and impaired healing. This eventually manifests as chronic kidney disease (CKD). The field of Nephrology is characterized by a lack of effective therapeutic interventions for either AKI or CKD My laboratory is interested in - studying the biological pathways that drive acute and/or chronic kidney injury - drug re-purposing studies to identify new pharmacological treatments effective in AKI or CKD - using novel models of AKI, such as machine perfusion of donor human kidneys (we are the only group in Australia with this capability) - using animal models of kidney transplantation to understanding aspects how AKI affects transplant function in the short- and long-term - using bioinformatics approaches to identify mechanistic phenotypes that inform our understanding of AKI and CKD

Applied Medical Science Honours 2021

Laboratory	Computational Systems Biology
Laboratory Head	Pengyi Yang
Supervisor	Pengyi Yang
Email address	pengyi.yang@sydney.edu.au
Phone	0452536773
Location	Westmead and The University of Sydney
Zoom ID code	https://uni-sydney.zoom.us/j/94468141917
Project name	**Analysing DNA-binding profiles to understand epigenomic regulation of transcription in cell types**
Project (100 words)	Epigenome and transcriptome are key layers of the molecular hierarchy in governing cell identities and fate decisions. We have previously developed PAD (http://pad2.maths.usyd.edu.au/) and analysed a large collection of ChIP-seq data in which a compendium of more than 100 DNA binding proteins (e.g. transcription factors (TFs), chromatin remodellers (CRs) and transcription co-factors (TCs)) were profiled in embryonic stem cells (ESCs). In this project, we will extend the compendium across cell types and perform integrative analysis of the extended collection of ChIP-seq data to identify key regulators in controlling transcription of genes in ESCs and specialised cell types.

Applied Medical Science Honours 2021

Laboratory	Allergy and Immunology
Laboratory Head	Dr Peter Hsu
Supervisor	Dr Peter Hsu
Email address	Peter.hsu@health.nsw.gov.au
Phone	(02)98453420
Location	The Children's Hospital at Westmead
Zoom ID code	
Project name	**Exploring mechanisms of immune dysregulation in allergy and infectious diseases**
Project (100 words)	Control or restraint of the immune activity is an important aspect of any immune response, whether it is towards infectious agents, self-antigens or common ingested/inhaled antigens. Excessive, uncontrolled immune responses lead to immunopathologies such as allergies, autoimmunities and infection induced hyper-inflammatory syndromes. Our lab focuses on delineating the phenotype, function and molecular pathways of immune regulatory cells, such as regulatory T and B cells, in various contexts such as children with food allergies or in acute viral infections (including COVID-19), using a variety of techniques including flow cytometry, in vitro cultures and RNA sequencing. Interested students are welcome to enquire.

Applied Medical Science Honours 2021

Laboratory	Centre for Transplant and Renal Research, The Westmead Institute for Medical Research
Laboratory Head	Prof Philip O'Connell
Supervisor	Prof Philip O'Connell and Dr Min Hu
Email address	philip.oconnell@sydney.edu.au min.hu@sydney.edu.au
Phone	8627 3005 and 0432827010
Location	Westmead
Zoom ID code	990 649 5169
Project name	**Induction of Kidney and Islet Transplantation- Towards Fully Immunosuppressive Drug-free**
Project (100 words)	Currently kidney transplantation is the preferred treatment for patients with end-stage kidney disease. Islet transplantation is an established procedure with well-documented efficacy for patients with brittle type 1 diabetes and hypoglycaemia unawareness. However, current immunosuppressive regimens for kidney and islet transplantation are associated with cumulative and serious side effects, including increased risks of infection and cancer, and result in 50% graft loss within 15 years of transplantation. We have multiple studies that are investigating the mechanisms of graft rejection in kidney and islet transplantation and are developing new therapeutic strategies to achieve transplant tolerance without the use of long-term immunosuppressive drugs. Multiple immunological and molecular biology methods are used in these studies.

Applied Medical Science Honours 2021

Laboratory	Embryology Unit
Laboratory Head	Prof Patrick Tam
Supervisor	Dr Pierre Osteil & Dr. Pragathi Masamsetti
Email address	posteil@cmri.org.au ; pmasamsetti@cmri.org.au
Phone	
Location	Children's Medical Research Institute (CMRI)
Zoom ID code	https://cmri.zoom.us/j/96623876835?pwd=Q3VrQVRlU1lvaGxjNy9ybWFXYW92UT09
Project name	**2 Projects: Mouse Gastrulation and Human Intestinal organoids**
Project (100 words)	The aim of the first project is to identify the progenitor cells of the endoderm lineages in the embryo and characterize the trajectory of differentiation of these multi-lineage progenitors and to survey their contribution to multiple cell types in the embryonic gut. The second project will see the development of Human Intestinal organoids (HIO) that are instrumental for phenotypic validation of genes of interests involved in Intestinal Bowel Disease. Edits will be conducted by CRISPR in human pluripotent stem cells, to mimic the known mutations, then the edited cells will be further differentiated into HIOs and characterized.

Applied Medical Science Honours 2021

Laboratory	Translational Neurogenomics
Laboratory Head	A/Prof Seo-Kyung Chung
Supervisor	A/Prof Seo-Kyung Chung
Email address	seokyung.chung@sydney.edu.au
Phone	0433987315
Location	Kids Research
Zoom ID code	979 4787 3633
Project name	**Identifying the genetic causes of neurological disorders using *in silico* and *in vitro* platforms.**
Project (100 words)	**Key Words: Neuroscience, Human Genetics, Bioinformatics, Next Generation sequencing data analysis, Model and Organoid systems, Cellular (live-cell) imaging, 3D protein modelling, Computer programming** This research proposes to identify new genes underlying neurological disorders using the latest genetic technologies including whole genome / exome sequencing. This study will also investigate disease mechanisms at molecular and cellular level using various in silico and in vitro analysis platforms. This multi-disciplinary project is in collaboration with a well-established international network. A student will gain a wide-range of modern skills that will be transferable to further studies and research posts.

Applied Medical Science Honours 2021

Laboratory	Centre for Kidney Research, Kids Research Westmead
Laboratory Head	Professor Stephen Alexander
Supervisor	Stephen Alexander/Dr Yuan Min Wang
Email address	Stephen.alexander@sydney.edu.au
Phone	02 98453430
Location	Centre for Kidney Research
Zoom ID code	https://uni-sydney.zoom.us/j/97752030836
Project name	**1) Cell Therapy Cure for Cystinosis** **2) Memory Mouse CRISPR**
Project (100 words)	**Project 1** Cystinosis is a lysosomal storage disease that causes kidney failure due to the accumulation of crystals. It is caused by mutations in the CTNS gene. The aim of the project is to develop ex vivo correction of gene defects in Dendritic Cells that can then be reinfused, with a focus on developing potential translational cell therapies. **Project 2:** CRISPR is a system where bacteria record genetic information about previous infections. It utilises a series of proteins that record the sequence of phages in palindromic repeats acting as template for host defence against phage infection. This involves cell studies to develop record of infections in mammalian cells through DNA editing.

Applied Medical Science Honours 2021

Laboratory	Molecular Viral Hepatitis Lab
Laboratory Head	Dr Thomas Tu
Supervisor	Dr Thomas Tu
Email address	t.tu@sydney.edu.au
Phone	02-8627-3912
Location	Westmead Institute for Medical Research (WIMR)
Zoom ID code	680 346 7928
Project name	**Curing Hepatitis B virus infection and preventing liver cancer**
Project (100 words)	Chronic infection with Hepatitis B virus affects ~350 million people worldwide (*including myself*) and is the most common cause of liver cancer. Our research is focused on finding out how the virus persists in the liver for a person's lifetime, and disrupting these pathways to induce a cure. We also dissect out how the infection slowly causes liver cancer over decades. Our approaches use clinical samples to ensure that all of our results are translatable. This made possible by our working within the Storr Liver Center, which also includes the hepatology unit of the Westmead Hospital.

Applied Medical Science Honours 2021

Laboratory	Genome Integrity Unit
Laboratory Head	Anthony (Tony) Cesare
Supervisor	Tony Cesare
Email address	tcesare@cmri.org.au
Phone	8856 2800
Location	Children's Medical Research Institute (CMRI), Westmead
Zoom ID code	Meeting ID: 983 1296 6956
Project name	There are two projects on offer in our lab. Please see below
Project	**The replication stress response and genome instability.** Genome instability is a hallmark of cancer. A major driver of genome instability in oncogenesis is DNA "replication stress". Replication stress is broadly defined as any phenomena that negatively impacts copying of the genetic material and can arise through exogenous (e.g. low nutrient environment, genotoxic agents) or endogenous (e.g. oncogene expression) sources. Cells cope with replication stress through the "replication stress response" which arrests cell growth and mediates repair of the underlying lesions. Because tumour cells typically have high levels of endogenous replication stress, targeting the replication stress response is an opportunistic target in cancer therapy. Our research focuses on three aspects of the replication stress response. 1) Understanding how physical forces inside the nucleus alter nuclear architecture to mediate replication stress repair; 2) Understanding how chromatin is altered in the nuclear environment to enable replication stress repair; and 3) Understanding how replication stress is mediated in rapidly dividing pluripotent stem cells. Opportunities are available in all three trajectories and projects will be tailored to applicants' interests and strengths on an individual basis. **Cell death in radiotherapy.** Radiation therapy is responsible for 40% of cancer cures. Development of new technologies enables administration of high dose radiation within precise spatial targeting to kill tumour cells while sparing the surrounding healthy tissue. While it is clear high dose radiation therapy kills cells, the mechanism of cell death, and the genetic pathways that promote radiation therapy sensitivity and resistance are unknown. Our research is focused on creating a roadmap that will determine with certainty how tumour cells die following ART. To do this, we are determining the role of DNA damage response and repair pathways, cell cycle regulation, inflammatory signalling, and environmental factors in radiation therapy induced cell death. Opportunities are available in this project will be tailored to applicants' interests and strengths on an individual basis.

Applied Medical Science Honours 2021

Laboratory	Cell Biology Unit, Children's Medical Research Institute
Laboratory Head	Professor Tracy Bryan
Co-Supervisor	Dr Ashley Harman
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Phone	02 8865 2909
Location	CMRI, Westmead
Zoom ID code	934 1508 6809
Project name	**Investigating the links between telomerase and the DNA damage response in cancer cells**
Project (100 words)	The enzyme telomerase counteracts telomere shortening in a majority of cancers, allowing for unlimited cell division. Most normal cells do not express telomerase, so inhibition of telomerase is a promising avenue for development of specific anti-cancer treatments. Telomerase action can be inhibited by blocking the cellular pathways that recruit telomerase to telomeres. This process is highly regulated, but factors that regulate it are incompletely understood. We have demonstrated that the recruitment of telomerase to telomeres is controlled by the pathways that regulate the cellular response to DNA damage. This project will elucidate the mechanistic links between these two vital cellular pathways, using advanced microscopy techniques, genome editing and biochemical analyses.

Applied Medical Science Honours 2021

Laboratory	Molecular Mycology Research Laboratory, CIDM
Laboratory Head	Prof Wieland Meyer
Supervisor	Prof Wieland Meyer, Dr Michelle Bull, Dr. Laszlo Irinyi, Dr Belinda Chapmen
Email address	wieland.meyer@sydney.edu.au michelle.bull@quantalbioscience.com laszlo.irinyi@sydney.edu.au
Phone	Prof W Meyer: 86273430; Dr L. Irinyi: 86273431
Location	Westmead Institute for Medical Research and Quantal Biosciences
Zoom ID code	https://uni-sydney.zoom.us/j/92643376757 20/10/2020 from 10.30-11.30 am
Project name(s)	**Project 1: Improving rapid species identification of clinically relevant fungi from beach sand using DNA Metabarcoding with MinION™ Sequencing** **Project 2: Finding the link between the environment and the patient – environmental sampling and phylogenetic studies**
Project (100 words)	***Project 1:*** Taxonomic resolution of fungi from high-throughput sequencing (HTS) of complex fungal communities is currently limited by the use of short DNA reads and single amplicon targets. The most commonly used HTS technology enables sample multiplexing but sample analysis remains expensive and time consuming. The MinION™ sequencing device from Oxford Nanopore offers a platform for quicker fungal community analysis with improved species resolution by utilising long DNA reads and multiple amplicon targets. This Honours project will generate mock fungal communities of clinically relevant fungi derived from beach sand to benchmark species resolution using the primary and secondary ITS-DNA fungal barcodes and compare different bioinformatics pipelines. A multi-amplicon DNA sequencing approach will then be applied to evaluate the contribution of organic matter load to the prevalence of clinically important fungal species distribution and diversity in Sydney beach sand. ***Project 2:*** Yeasts of the artificial genus *Candida* include plant endophytes, insect symbionts, and opportunistic human pathogens. A better knowledge on the evolutionary relationships of *Candida* species is vital to understand the ecology, clinical relevance, and diagnosis of these yeasts. Recently, we studied the phylogeny of selected *Candida* species, with special emphasis on clinical isolates, using the sequence of five genes. We showed six major clades resolving part of the *Candida* phylogeny. However, the genus *Candida* is complex and need more study. Now our next objective is to increase the number of strains obtained from the environment to gain a better robustness of the phylogeny of this genus and also to understand the relationship between environment and clinical infections. For this reason, the first part of this project will be to collect as many samples as possible from a number of environmental sources: soil, flowers, plants, hospital environment and isolate the cultures in specific media. The second part of this project will be to identify these strains to the species level, using molecular techniques, find new species and to study their phylogeny relationships within the artificial genus *Candida*, to improve the phylogenetic overall resolution.

Applied Medical Science Honours 2021

Laboratory	Centre for Kidney Research Kids Research Westmead
Laboratory Head	Professor Stephen Alexander
Supervisor	Dr Yuan Min Wang
Email address	Yuan.wang@health.nsw.gov.au
Phone	98453106
Location	Centre for Kidney Research
Zoom ID code	https://uni-sydney.zoom.us/j/97752030836
Project name	**1. AAV Gene Therapy in Genetic Kidney Disease**
Project (100 words)	This project is evaluating two genetic conditions affecting children due to two gene mutations: 1) AGXT is expressed in the liver and encodes the enzyme alanine-glyoxylate aminotransferase. Mutation of AGXT gene leads to oxalate stones forming in the kidneys. 2) Complement factor H (CFH), a liver-secreted protein that dampens the complement pathway and its mutation predisposes atypical haemolytic uraemic syndrome (aHUS). We have defined mouse models and are evaluating treatments.

Applied Medical Science Honours 2021

Laboratory	Centre for Immunology and Allergy Research / EBV Molecular Lab
Laboratory Head	Dr Sanjay Swaminathan
Supervisor	Dr Sanjay Swaminathan
Email address	sanjay.swaminathan@sydney.edu.au
Phone	02 8890 6791
Location	The Westmead Institute for Medical Research
Zoom ID code	7478267558
Project name	**EBV and the Immune System in Systemic Lupus Erythematosus**
Project (100 words)	Systemic Lupus Erythematosus (SLE) is a relatively rare autoimmune disorder that predominantly affects young women. It can potentially involve any organ and leads to significant morbidity and mortality. There is also a significant association between SLE risk and Epstein-Barr virus (EBV) infection. This project aims to better define the links between SLE genetic risk genes and EBV infection. Gender differences in risk gene expression following EBV infection will also be studied. We are also investigating targeting EBV directly with molecular techniques as a novel way of treating (and possibly preventing) SLE. Techniques used: Cell culture, qPCR, flow-cytometry.

Applied Medical Science Honours 2021

Laboratory	Bone Marrow Transplant & Cell Therapies Group
Laboratory Head	Prof David Gottlieb
Supervisor	Prof David Gottlieb Dr Elham Hosseini-Beheshti (co-supervisor)
Email address	elham.beheshti@sydney.edu.au
Phone	9036 3260
Location	The Westmead Institute for Medical Research Medical Foundation Building
Zoom ID code	986 4808 1039
Project name	**Extracellular vesicles in treatment of cancer and infection**
Project (100 words)	Extracellular vesicles (EV) are membrane-enclosed vesicles that are released from all cell types and can transfer information to other cells, thereby influencing their function. EV include 3 subcategories: exosomes, microvesicles and apoptotic bodies. **In this project we will focus on investigating the role of T cell derived EV as potential therapeutic agent in cancers.** This project is a great opportunity for a driven student who would like to tackle a very novel and fast growing area, and learn techniques such as cell culture, EV isolation, flow cytometry, western blot analysis and electron microscopy.

Biomedical Informatics and Digital Health Honours 2021

Laboratory	Westmead Advanced digital health and Nociception Group
Laboratory Head	Dr Audrey P Wang
Supervisor	Dr Audrey P Wang
Email address	audrey.wang1@sydney.edu.au
Phone	+61 2 8627 3908
Location	Westmead Health Precinct / remote
Zoom ID code	Meeting ID: 95602141189
Project name	**Resting states in fMRI for complex regional pain syndrome systematic review**
Project (100 words)	**Project 1:** Complex regional pain syndrome (CRPS) is a debilitating chronic pain condition with poorly understood multi-factorial pathophysiology that frequently affects the upper limb and hand. This project will require the candidate to provide a rapid systematic review on the state of resting state fMRI analysis in pain conditions. The student or students will have access to a select previously collected dataset on healthy controls and complex regional pain syndrome patients to do all the stages of pre-processing and fMRI analysis, informed by updates from the rapid systematic review. The project would best suit students who are independent and have skills in data analysis in R or similar.

Biomedical Informatics and Digital Health Honours 2021

Laboratory	Translational Australian Clinical Toxicology (TACT) group
Laboratory Head	Nicholas Buckley
Supervisor	Firouzeh Noghrehchi, Nicholas Buckley, Rose Cairns, Thanjira Jiranantakan
Email address	firouzeh.noghrehchi@sydney.edu.au
Phone	+61 2 9351 8960
Location	K06, 1-3 Ross Street
Zoom ID code	Meeting ID: 810 841 8242
Project name	**Epidemiology of seasonal poisonings in Australia**
Project (100 words)	**Project 1:** This project is an epidemiological investigation to determine how seasonal poisonings e.g., from mushrooms or spider bites, are distributed in time and space in Australia, and how weather patterns (temperature and rainfall) affect the likelihood of poisonings. The Honours student will work with the team to analyse data collected from the New South Wales Poisons Information Centre (NSWPIC) and from the Australian Bureau of Meteorology (BOM) website. The Honours student will learn how to link poisonings to weather data using automated software as well as how to examine geographic and weather-based distributions of seasonal poisonings calls in Australia.

Biomedical Informatics and Digital Health Honours 2021

Laboratory	Human factors in health care team, BIDH
Laboratory Head	Melissa Baysari
Supervisor	Melissa Baysari
Email address	Melissa.baysari@sydney.edu.au
Phone	8627 9245 (some days)
Location	Charles Perkins Centre
Zoom ID code	Not available for session on 25th Sept
Project name	**Drug-drug interaction pop-up alerts in electronic medical records – do they work?**
Project (100 words)	Drug-drug interaction (DDI) alerts trigger at the point of prescribing in an eMR to warn doctors of potential DDIs in their medication orders. In principle, this sounds like a good idea, but in reality, prescribers are presented with hundreds of alerts a day. The result is that doctors begin to ignore the alerts presented. **Project 1:** Are DDIs really a problem? This project involves the review and analysis of chart-review data from multiple NSW hospitals to determine what serious DDIs are occurring and should be the target of DDI alerts. **Project 2:** How do DDI alerts work in practice? This project involves observations and interviews with clinicians to understand how and why alerts are impacting on doctor decisions.

Biomedical Informatics and Digital Health Honours 2021

Laboratory	TACT – Translational Australian Clinical Toxicology
Laboratory Head	Nicholas Buckley
Supervisors	Nick Buckley, Kate Chitty, Jacques Raubenheimer, Firouzeh Noghrehchi, Rose Cairns, Danni Zhang, Andrew Dawson
Email address	Nicholas.buckley@sydney.edu.au
Phone	
Location	Camperdown - K06
Zoom ID code	
Project name	**Which drugs are over-represented in suicide and poisonings?**
Project (100 words)	**Project 1:** The Honours student will analyse patient-level dispensing claims from Pharmaceutical Benefits Scheme (PBS) 10% sample data, calculating the proportion of Australians using various therapeutic medicine classes on a given day. The student will compare these to the agents involved in poisoning and suicide (from Poisons centre, hospital and coronial data). They will have the scope to focus on particular areas of interest, such as particular drug classes or specific age/gender groups. This project will introduce PBS data, and teach epidemiological and statistical analytical skills whilst the student gains an overview of a leading cause of death from prescription medicines. This project is suited to students interested in moving into research areas of epidemiology, public health, or clinical medicine.

Biomedical Informatics and Digital Health Honours 2021

Laboratory	Computational BioMedicine Lab
Laboratory Head	Dr Ulf Schmitz
Supervisor	Dr Ulf Schmitz
Email address	u.schmitz@centenary.org.au
Phone	02 9565 6209
Location	Centenary Institute
Zoom ID code	Meeting ID: 7041731049 (Code: 739361)
Project name	**Deciphering the cross-talk between microRNAs and retained introns in cancer gene regulation**
Project (100 words)	These are all bioinformatics projects, and working from home arrangements can be made. **Project 1:** Pre-mRNA splicing is a ubiquitous process that is crucial for correct gene expression in eukaryotic cells. Perturbations to this highly calibrated system can have severe consequences and cause diseases including cancer. In this project we explore cross-talk between microRNA-mediated gene regulation and alternative splicing in cancer cells using bioinformatics analyses of next generation sequencing data. **Project 2:** Mirtrons are microRNA molecules that stem from spliced introns. Intron retention on the other hand is a form of alternative splicing by which introns are retained in mature mRNA transcripts. In this project we explore the impact of intron retention on mirtron expression by analyzing multi-omics data of chronic myeloid leukemia cells. **Project 3:** Core transcriptional networks are essential drivers and determinants of cell-fate transitions. To date, our mechanistic understanding of these essential regulatory layers is very limited, especially in the context of trans-differentiation, despite being one of the most promising therapeutic cell replacement strategies in regenerative medicine. In this project we will reconstruct gene-regulatory networks involving non-coding RNAs and mRNAs that drive trans-differentiation of human cells and identify key alternative splicing events during cell-fate transitions.

Biomedical Informatics and Digital Health Honours 2021

Laboratory	Neurogenetics and Epigenetics Research Group
Laboratory Head	Associate Professor John Kwok
Supervisor	Dr Zac Chatterton
Email address	zac.chatterton@sydney.edu.au
Phone	0435 218 832
Location	Brain and Mind Centre
Zoom ID code	https://uni-sydney.zoom.us/j/93210563091
Project name	**Epigenetics of the Human Brain**
Project (100 words)	Our research aims to reduce the burden of neurodegenerative diseases by understanding genomics/ epigenomics. Epigenetic modifications interact with DNA to switch genes “off” or “on”. **Project 1:** This project aims to catalogue the epigenetic landscape of human brain cells across various brain regions (frontal cortex, cerebellum, hippocampus etc.) using next generation sequencing and bioinformatics.

Infectious Diseases and Immunology Honours 2021

Laboratory	Microbial Pathogenesis and Immunity
Laboratory Head	Professor Jamie Triccas
Supervisor	Professor Jamie Triccas
Email address	Jamie.triccas@sydney.edu.au
Phone	9036 6582
Location	Charles Perkins Centre
Zoom ID code	https://uni-sydney.zoom.us/j/91404531651
Project name	**A BCG-based vaccine platform to enhance anti-pathogen immunity**
Project (100 words)	The aim of our group is to develop new vaccines for important human pathogens. Our recent data has shown that Bacille Calmette-Guérin (BCG), the tuberculosis (TB) vaccine, can be used as a vaccine platform to enhance immunity when combined with COVID-19 antigens. This project will determine if this vaccine platform can be broadened to develop effective vaccines against other pathogens, particularly those where strong T cell immunity and neutralising antibodies are required. This project will give the student experience in cell culture, animal handling, vaccination strategies and various immunological techniques (assays of T cell activation e.g. ELISPOT, multi-parameter flow cytometry).

Infectious Diseases and Immunology Honours 2021

Laboratory	Varicella Zoster Virus (VZV) Research Group
Laboratory Head	Professor Allison Abendroth
Supervisor	Professor Allison Abendroth
Email address	allison.abendroth@sydney.edu.au
Phone	93516867
Location	Charles Perkins Centre
Zoom ID code	982 8789 2815
Project name	**Alphaherpesvirus manipulation of human immune cells and identification of novel immune evasion strategies**
Project (100 words)	The overall aim of Prof Abendroth's work is to define molecular mechanisms underlying VZV infection and the host response to infection. VZV and herpes simplex virus (HSV) are medically important human alphaherpesviruses. These viruses encode a number of functions that modulate a range of immune cell functions that limit the efficacy of both innate and adaptive arms of the anti-viral immune response. This project will explore how alphaherpesvirus can manipulate key human immune cell types and identify novel immune evasion strategies. This project provides a student the opportunity to learn a variety of virology techniques and cellular and molecular immunological techniques.

Infectious Diseases and Immunology Honours 2021

Laboratory	Cytomegalovirus (CMV) Research Group
Laboratory Head	Associate Professor Barry Slobedman
Supervisor	Associate Professor Barry Slobedman
Email address	barry.slobedman@sydney.edu.au
Phone	9351 4334
Location	Charles Perkins Centre
Zoom ID code	https://uni-sydney.zoom.us/j/94300503718
Project name	**Defining novel strategies that human herpesviruses use to manipulate host defences to cause life-threatening disease**
Project (100 words)	CMV often causes devastating disease in the congenital infection setting and in transplant recipients. Treatment options are limited and there are fundamental unanswered questions about how this virus interacts with, and evades, host defences. The lab focusses on CMV and other human herpesviruses and how they manipulate host defences to cause disease. We use a range of cutting edge technologies to study manipulation of host defences utilizing clinical samples and infection models. This project will encompass a range of cell biology, immunology and virological techniques and will build on our novel discoveries in the field, and will be fine-tuned in consultation with the student and their interests.

Infectious Diseases and Immunology Honours 2021

Laboratory	Vascular Biology
Laboratory Head	Prof Jennifer Gamble
Supervisor	Prof Jennifer Gamble
Email address	j.gamble@centenary.org.au
Phone	02 9565 6225
Location	Centenary Institute
Zoom ID code	https://uni-sydney.zoom.us/j/92150607835
Project name	**Alzheimer's disease: Determining the role of aged perivascular macrophages in blood-brain barrier dysfunction.**
Project (100 words)	Alzheimer's disease (AD) is an age-related disease that affects brain function. Breakdown of the blood-brain barrier (BBB) results in neuroinflammation involved in cognitive decline, a feature of AD. In a mouse model of AD, we have identified aged vascular cells. These cells are thought to be perivascular macrophages, which are known to regulate BBB permeability and neuroinflammation. The project aims to: 1. Confirm the identity of aged (senescent) perivascular macrophages in AD. 2. Investigate the consequence of the senescent perivascular macrophages on BBB function.

Infectious Diseases and Immunology Honours 2021

Laboratory	Manos Lab, Level 5 East Charles Perkins Centre
Laboratory Head	Associate Professor Jim Manos
Supervisor	Associate Professor Jim Manos
Email address	jim.manos@sydney.edu.au
Phone	02 9351 8942
Location	Room 5514 Level 5 East CPC
Zoom ID code	https://uni-sydney.zoom.us/j/92610863592 **3-3.45pm**
Project name	Bacterial Vaginosis biofilms - hiding under the good guys!
Project (100 words)	Bacterial Vaginosis (BV) is a difficult to treat and recurrent infection for women. The main causative species is *Gardnerella vaginalis*, a Gram-variable anaerobe that forms biofilms under the endogenous aerobic Lactobacilli (the good bacteria**!**). Our lab has developed and demonstrated methods to disrupt bacterial biofilms, thus enhancing antibiotic effectiveness. *G. vaginalis* represents an exciting challenge as its biofilms must be disrupted and cleared without disturbing the normal flora (Lactobacillus). We have the technology to do this and the student will be central to overcoming *this unique challenge.* Techniques include: Culturing anaerobic biofilms, Confocal Laser Scanning Microscopy, fluorescent imaging and other.

Infectious Diseases and Immunology Honours 2021

Laboratory	Dendritic Cell Research
Laboratory Head	A/Prof Georgina Clark
Supervisor	Dr Pablo Silveira
Email address	pablo.silveira@sydney.edu.au
Phone	0432618512
Location	ANZAC Research Institute, Concord Hospital
Zoom ID code	92502699104
Project name	**Investigating the function of the C-Type Lectin Receptor CD302 in Dendritic Cells**
Project (100 words)	Dendritic cells (DC) survey all tissues for pathogens and initiate adaptive immune responses. Our group discovered the C-type lectin receptor CD302, generating the first knockout (KO) mouse to reveal its role in DC migration. This project will provide valuable experience in different immunological techniques and contribute significantly to the understanding of this important DC molecule. Confocal, intra-vital and Hyperion microscopy will be used to study DC migration in CD302KO and normal mice. You will learn to generate a monoclonal antibody to mouse CD302 and examine DC expression by flow cytometry. Finally, you will explore how CD302 ligands regulate DC migration.

Infectious Diseases and Immunology Honours 2021

Laboratory	Liver Immunology Group
Laboratory Head	A/Prof Patrick Bertolino and A/Prof David Bowen
Supervisor	A/Prof Patrick Bertolino and A/Prof David Bowen
Email address	p.bertolino@centenary.org.au; d.bowen@centenary.org.au
Phone	+ 61 2 9565 6186
Location	Centenary Institute (University of Sydney Campus)
Zoom ID code	https://uni-sydney.zoom.us/j/8692990043
Project name	**Role of monocyte-derived macrophages in liver development and homeostasis**
Project (100 words)	This project will characterize the role of macrophages in the development of the liver vasculature during embryogenesis. The host group is internationally recognized for its innovative research and key discoveries in liver immunology and for having recently identified a new population of liver macrophages. The project will characterize a unique mouse line generated in the group selectively deficient in monocyte-derived macrophages and displaying abnormal development of the liver vasculature. The student will use high resolution confocal microscopy, and state of the art imaging and flow cytometry techniques to identify the exact contribution of macrophages during this process.

Infectious Diseases and Immunology Honours 2021

Laboratory	Tuberculosis Research Laboratory, Centenary Institute
Laboratory Head	Prof Warwick Britton
Supervisors	Prof Warwick Britton and Dr Diana Quan
Email address	warwick.britton@sydney.edu.au
Phone	0414 981 003
Location	Centenary Institute, Level 3
Zoom ID code	Meeting ID: 912 8058 9751 Passcode: 133981
Project name	**How silica dust makes TB worse?**
Project (100 words)	The lung is one of the most important organs exposed to environmental pollution and pathogens. Lung inflammation and disease is a leading cause of death and disability globally, and an overlooked area is the intersection of silicosis and tuberculosis (TB). Well-known as a disease of miners and stonemasons, silicosis has resurged in the sandstone basin which cups the Sydney region and continues to afflict millions of workers in hazardous occupations around the world. Silicosis predisposes to TB and patients with silicosis who develop active TB have poor outcomes. As 25% of the world's population is infected with *Mycobacterium tuberculosis,* this is a serious problem. The mechanisms by which silicosis impacts the body's defenses against mycobacteria are poorly understood. This project will use a mouse model of silicosis and mycobacterial infection to examine how silicosis affects innate (dendritic cell and macrophage) and adaptive immune responses. The student will be part of a stimulating research team and develop skills in immunology, cellular biology and flow cytometry.

Pathology Honours 2021

Laboratory	Redox Biology
Laboratory Head	Paul Witting
Supervisor	Professor Paul Witting/Dr Gulfam Ahamd
Email address	**Paul.witting@sydney.edu.au**
Phone	02-9114-0524
Location	Charles Perkins Centre – Level 4 west
Zoom ID code	https://uni-sydney.zoom.us/j/93525395463?pwd=UnppaFlta3M2TllKellBYnJIV2NkQT09 Meeting ID: 935 2539 5463 Password: 988413
Project name	**Identifying a new class of inhibitors of inflammatory bowel disease**
Project (100 words)	Inflammatory Bowel Disease (IBD) is a chronic condition typified by relapsing inflammation in the gastrointestinal tract (GI) with limited therapeutic options. The overarching feature of IBD is severe bowel inflammation induced by an immune cell- mediated response. Infiltrating leukocytes (primarily neutrophils) are a striking feature of early IBD pathology. Neutrophil activity yields the powerful oxidant, hypochlorous acid. Levels of the 3-chloro-tyrosine (a specific biomarker for HOCl-damage) are elevated in the colon and serum of IBD subjects. This study will use an animal model of IBD to investigate whether inhibiting neutrophil-HOCl damage to the colon can ameliorate the pathogenesis of IBD**.**

Pathology Honours 2021

Laboratory	Immunopathology
Laboratory Head	Professor Bob Bao
Supervisor	Professor Bob Bao
Email address	bob.bao@sydney.edu.au
Phone	9356156
Location	CPC Level 4 West, D17
Zoom ID code	3340526285
Project name	**The role of novel cytokines contribute to sudden death in premature Australia**
Project (100 words)	Coronary artery disease is a common cause of sudden death in Australia, despite extensive research/clinical interventions. The main issue is due to acute rupture of chronic artery plaques in the unstable patients. We have shown previously that pro-inflammatory cytokines are closely related to the sudden death in Australia, particularly in the relatively young, e.g. <50yr. Understanding the precise underlying mechanism of anthogenesis will be extremely useful in development of therapeutic target(s) in management of such a devastating disease. We will explore novel cytokines involved in the development atherosclerosis in the coronary artery plaques from sudden, using immunohistochemistry.

Pathology Honours 2021

Laboratory	Gene & Stem Cell Therapy Program
Laboratory Head	Professor John Rasko AO
Supervisor	Dr Charles (Chuck) Bailey
Email address	c.bailey@centenary.org.au charles.bailey@sydney.edu.au
Phone	02 95656171
Location	Centenary Institute
Zoom ID code	https://uni-sydney.zoom.us/j/95811984523
Project name	**Understanding cancer causation and gene therapy mechanisms**
Project (100 words)	1: Gene regulation is frequently dysregulated in cancer. The tumour suppressor CTCF, an essential regulator of transcription and master organiser of chromatin architecture, is frequently mutated in endometrial cancer. This project will focus on the functional impact of somatic mutations in CTCF, protein-protein interactions and CTCF haploinsufficiency. 2: Adeno-associated virus (AAV) is widely used as a gene delivery vector for corrective gene therapies. Our research focuses on modulating cellular host factors to improve gene therapy efficacy. This project will focus on an essential host factor KIAA0319L by using molecular, genetic and proteomics approaches to increase AAV-mediated gene transfer. **Techniques:** recombinant DNA cloning, cell culture, Western blotting, CRISPR/Cas9 genome editing, ChIP, qRT-PCR, RNA-Seq, mass spectrometry, flow cytometry, confocal and super-resolution microscopy, mouse models

Pathology Honours 2021

Laboratory	Gene & Stem Cell Therapy Program
Laboratory Head	Professor John Rasko AO
Supervisor	Professor John Rasko AO/ Dr Dannel Yeo
Email address	j.rasko@centenary.usyd.edu.au dannel.yeo@sydney.edu.au
Phone	02 9565 6286
Location	Centenary Institute
Zoom ID code	https://uni-sydney.zoom.us/j/7364268558
Project name	**CAR-T Therapy in Pancreatic Cancer**
Project (100 words)	Chimeric antigen receptor-engineered T-cell (CAR-T) therapy is an exciting new cellular immunotherapy for the treatment of cancer. Modified T-cells are injected back into the patient, targeting a specific tumour surface antigen. CAR-T therapy will be evaluated in pancreatic cancer using cells (2D and 3D organoids) and mice models to examine the cytotoxicity of the CAR-T cells, immune activation/persistence, and mechanisms of resistance. Strategies to increase the efficacy of CAR-T therapy will be explored including immune-modulating therapies and different delivery methods. In addition, blood samples will be used to monitor the host/tumour changes.

Pathology Honours 2021

Laboratory	Greg Brown Diabetes & Endocrinology Research Laboratory
Laboratory Head	Prof Stephen Twigg
Supervisor	Primary Supervisor: Dr Danqing Min Co-Supervisor: Prof Stephen Twigg
Email address	**danqing.min@sydney.edu.au**
Phone	8627 1706
Location	Level 3W, Charles Perkins Centre D17
Zoom ID code	935 8174 3452
Project name	**The role of monocyte and macrophage in diabetes and its complications**
Project (100 words)	Migration of monocytes from the circulation followed by their subsequent accumulation in tissue as differentiated macrophages is a process thought to be important in many diabetes complications such as liver disease and foot ulcer. This ***Honours project*** is to investigate the effects of diabetes environments on monocytes/macrophages and whether the profile changes of monocytes/macrophages contribute to pathophysiology of diabetes complications. The project will be carried out in association with a team of enthusiastic and experienced scientists and clinicians and would involve study monocyte/macrophage profiles by flow cytometry, immunohistochemistry or western blot, measurement of gene expression by quantitative real time RT-PCR.

Pathology Honours 2021

Laboratory	Alcoholic Liver Disease Research Program, Centenary Institute
Laboratory Head	Associate Professor Devanshi Seth
Supervisor	Associate Professor Devanshi Seth
Email address	**d.seth@sydney.edu.au**
Phone	0422619895
Location	Centenary Institute
Zoom ID code	Meeting ID: 970 2860 0604 Meeting URL: https://uni-sydney.zoom.us/j/97028600604?from=msft
Project name	**Role of lipid metabolism in alcohol-induced liver cirrhosis**
Project (100 words)	Risky drinking continues to be a major concern in Australia. The major medical consequence of risky drinking is alcohol-induced liver cirrhosis (AC). We are engaged in identifying or predicting who amongst risky drinkers are at high risk of developing cirrhosis. Interestingly, Our recent novel discovery of single nucleotide polymorphisms (SNPs) associated with risk of AC, are involved in lipid droplet/metabolism. My group is interested to understand the mechanisms of action of these genes in development of cirrhosis. The project will be using our established zebrafish model of alcohol-induced liver injury, CRISPR gene editing technology to elucidate these mechanisms. https://www.centenary.org.au/cen_news/gene-discovery-linked-to-alcohol-induced-liver-disease/

Pathology Honours 2021

Laboratory	Vascular Immunology Unit
Laboratory Head	Dr Elham Hosseini-Beheshti
Supervisor	Dr Elham Hosseini-Beheshti
Email address	elham.beheshti@sydney.edu.au
Phone	9036 3260
Location	Medical Foundation Bldg, K25
Zoom ID code	986 4808 1039
Project name	**Extracellular Vesicles in Cancer**
Project (100 words)	Extracellular vesicles (EV) are membrane-enclosed vesicles that are released from all cell types and can transfer information to other cells, thereby influencing their function. EV include 3 subcategories: exosomes, microvesicles and apoptotic bodies. **In this project we will focus on investigating the role of EV as potential cancer biomarkers and therapeutic targets in thoracic cancers.** This project is a great opportunity for a driven student who would like to tackle a very novel and fast growing area, and learn techniques such as cell culture, EV isolation, flow cytometry, western blot analysis, mass spectrometry, electron microscopy, and vibrational spectroscopy.

Pathology Honours 2021

Laboratory	Vascular and Immunology Unit
Laboratory Head	Dr Elham Hosseini Beheshti
Supervisor	Dr Elham Hosseini Beheshti
Email address	elham.beheshti@sydney.edu.au
Phone	9036 3260
Location	The Medical Foundation Building
Zoom ID code	986 4808 1039
Project name	**High-throughput extracellular vesicles sorting using affibody functionalized beads and inertial microfluidics**
Project (100 words)	Tissue and disease specific extracellular vesicles (EV) have emerged as an alternative source of diagnostic and prognostic biomarkers in liquid biopsies. Isolating and purifying EV in the clinical setting has remained a major challenge, mainly due to the inefficiency of existing technologies for EV isolation such as ultracentrifugation, nanofiltration. In this project, we are planning to develop an integrated workflow for isolation and purification of tissue and disease specific EV using affibody functionalized microbeads and inertial microfluidics. This project is a great opportunity for a driven student who would like to tackle a very novel and fast growing area, and learn techniques such as cell culture, EV isolation, flow cytometry, western blot analysis and electron microscopy.

Pathology Honours 2021

Laboratory	Forefront
Laboratory Head	Professor Matthew Kiernan
Supervisor	Dr Emma Devenney
Email address	Emma.devenney@sydney.edu.au
Phone	0451 226 806
Location	Brain and Mind Centre
Zoom ID code	964 9194 3315
Project name	**The C9orf72 – a pathway between neurodegenerative and neuropsychiatric disorders**
Project (100 words)	This project will focus on the *C9orf72* expansion, the most common cause of familial FTD and MND. We have already shown that the *C9orf72* expansion is a risk factor for familial psychiatric disorders and psychotic symptoms as part of the spectrum of FTD and MND. This project will expand on these findings to characterise the psychiatric features of the *C9orf72* expansion in comparison to non-genetic neurodegenerative disorders and explore the individuals lifetime risk for psychiatric and neurodegenerative disorders. This project will include exposure to cognitive neuroscience across the range of clinical, neuroimaging, neuropsychology genetics and pathology.

Pathology Honours 2021

Laboratory	Liver Enzymes in Metabolism and Inflammation [LEMI]
Laboratory Head	Prof Mark D Gorrell
Supervisor	Dr Hui Emma Zhang
Email address	e.zhang@centenary.org.au
Phone	0295656152
Location	Centenary Institute
Zoom ID code	https://uni-sydney.zoom.us/j/99348209766
Projects name	**Proteases in liver cancer**
Projects (100 words)	Our team is the first to find that the protease DPP9 is a druggable target in hepatocellular carcinoma (HCC). This project aims to better understand the roles of DPP9 in the pathogenesis of HCC. **Projects** will be these, or similar based on student interests**:** 1. To elucidate molecular mechanisms of DPP9 using liver cancer cell lines. 2. To generate cell-specific DPP9 depletion in mice to study the role of DPP9 in the immune system. 3. To measure growth of orthotopic tumours in DPP9 inhibitor treated mice. **Skills** that the student can learn: cell culture, histopathology, immunohistochemistry, immunoblotting, qPCR, flow cytometry, confocal microscopy.

Pathology Honours 2021

Laboratory	Haematology, Heart Research Institute, Charles Perkins Centre
Laboratory Head	Freda Passam
Supervisor	Freda Passam
Email address	freda.passam@sydney.edu.au
Phone	02 86277492
Location	Level 3E, Charles Perkins Centre
Zoom ID code	969 6480 7660, Sep 25th 3-4 pm
Project name	**Defining the diabetic plateletome**
Project (100 words)	Platelets are integral in forming and sustaining thrombus formation in healthy and diseased states. In patients with type 2 diabetes mellitus, platelets are more likely to form clots at baseline and with stimulation compared to normal. The differences in platelet function are predominantly due to changes in protein expression and post-translational modifications, given their anucleate nature. Elucidating the plateletome (proteomic-metabolomic-lipidomic-transcriptomic phenotype) of platelets in patients with diabetes can therefore provide valuable insight in this population at high risk of thrombotic complications and lead to the identification of biomarkers of thrombotic risk and of new therapeutic targets.

Pathology Honours 2021

Laboratory	Vascular Immunology Unit
Laboratory Head	Prof Georges Grau
Supervisor	Prof Georges Grau
Email address	ggrau@med.usyd.edu.au
Phone	9036 3260
Location	Medical Foundation Bldg, K25
Zoom ID code	910 4853 6491
Project name	**Extracellular Vesicles in Multiple Sclerosis (MS)**
Project (100 words)	MS is a disease of the immune system affecting the central nervous system. Extracellular vesicles (EV) are membrane-enclosed vesicles released from all cell types, with essential roles in intercellular communication. In this project we will: 1) Characterise EV subtypes (exosomes, microvesicles and apoptotic bodies) in MS patients' plasma. 2) Investigate the modulation of leucocyte transmigration by EV, using our blood-brain barrier model. This project is a great opportunity for a driven student who wants to tackle a very novel and fast growing area, and learn cell culture, EV isolation, flow cytometry, nanoparticle tracking analysis, and vibrational spectroscopy.

Pathology Honours 2021

Laboratory	Dendritic Cell Research
Laboratory Head	A/Prof Georgina Clark
Supervisor	A/Prof Georgina Clark
Email address	georgina.clark@sydney.edu.au
Phone	0411140101
Location	ANZAC Research Institute, Concord Hospital
Zoom ID code	92502699104
Project name	**CD300e as a novel immune regulatory molecule to control tumour growth.**
Project (100 words)	CD300e is a sphingolipid binding immunoregulatory molecule that is expressed on monocytes and some macrophages. Its restricted expression makes it an attractive therapeutic target for manipulation of monocyte responses, including tumour suppressor myeloid cells. This honours project will require a student to perform experiments to compare the ability of our CD300e-deficient mice and wildtype mice to control tumour growth using lung carcinoma and melanoma models. The student will learn broad laboratory skills including flow cytometry, real-time PCR, cell culture, isolation of leucocyte populations through magnetic- and fluorescence-activated cell sorting and optimisation of mouse tumour models. The studies will contribute to our understanding of the mechanism by which CD300e modulates anti-tumour responses.

Pathology Honours 2021

Laboratory	Sydney Brainomics
Laboratory Head	A/Prof Greg Sutherland
Supervisor	A/Prof Greg Sutherland
Email address	g.sutherland@sydney.edu.au
Phone	(02) 9036 7233
Location	Rm 6211 Charles Perkins Centre D17
Zoom ID code	
Project name	**1) Genetic risk factors in alcohol-related brain injury** **2) Do statins reduce lipid damage in the alcoholic brain?** **3) A neuropathological atlas of Alzheimer's disease.**
Project (100 words)	**Project 1**. Alcohol-related brain injury (ARBI) results in the widespread loss of white matter and regional neuronal loss. There have been a number of genetic risk factors identified that promote alcohol abuse but it is unclear if and how genetic factors influence the extent and severity of ARBI. Our laboratory has genotyped post-mortem brain tissue from 300 alcoholics and controls. In this project we intend to determine whether common variants of genes expressed in microglia and oligodendrocyte, in particular, affect ARBD and then select high-risk and low-risk donors for functional studies using immunohistochemistry and molecular techniques. **Project 2.** Alcohol-related brain injury (ARBI) results in deficits in attention and working memory. The major pathological correlate is the widespread loss of white matter. White matter is chiefly composed of myelin, a lipid rich insulating layer around axons. Our laboratory has recently use mass spectrometry (MS) and MS Imaging to define the changes in lipid profiles in post-mortem brain tissue from individuals with ARBI. In this project we want to determine if and how statins, that lower peripheral cholesterol levels and are also anti-inflammatory, affect lipids in ARBI. This project will utilize immunohistochemistry and western blotting to quantify inflammatory and lipid peroxidation markers. **Project 3.** Alzheimer's disease (AD) is the second leading cause of death in Australia. AD spreads in a predictable pattern across the brain and at post-mortem there are brain regions that are differentially affected by the disease process. Our laboratory is interested in using mildly affected regions of the AD brain as a model for the early stages of the disease. In this project you will use multi-spectral imaging and automated image analysis to quantify AD pathology and inflammatory glia subtypes in the mildly affected parietal cortex of AD patients and controls.

Pathology Honours 2021

Laboratory	Immune Imaging, Centenary Institute
Laboratory Head	Assoc Prof Guy Lyons
Supervisor	Assoc Prof Guy Lyons
Email address	guy.lyons@sydney.edu.au
Phone	0437 660 395
Location	Centenary Institute
Zoom ID code	https://uni-sydney.zoom.us/j/95251236025
Project name	**How the cornea responds to UV radiation**
Project (100 words)	The cornea is covered by a multi-layered (stratified) sheet of clear epithelial cells. Like the skin, the cornea is exposed to damaging ultraviolet radiation (UVR) from sunlight. This project will investigate how epithelial stratification occurs and the signalling pathways activated by UVR. It will use advanced microscopy and image analysis methods to visualise the epithelial cells of living corneas as they divide, migrate and stratify. The corneas from novel reporter strains of genetically modified mice will be used to locate and measure signalling responses in the living tissue, and probed with pathway-specific drugs to determine their importance.
Project name	**Genes and cell-cell interactions in tumour progression**
Project (100 words)	Cancer cells within a tumour often have different mutations from neighbouring cells. This genetic heterogeneity enables novel cell-cell interactions to occur that are not possible in homogenous tumours. We have identified clones of cells that interact to promote cancer cell growth in an experimental model of oral cancer. This project will investigate the molecular genetic basis for this interaction, using cell culture, image analysis, deep sequencing and mouse models.

Pathology Honours 2021

Laboratory	Translational Immunology Group
Laboratory Head	Prof Barbara Fazekas de St Groth
Supervisor	Dr Helen McGuire
Email address	helen.mcguire@sydney.edu.au
Phone	02 8627 9071
Location	Level 5, Charles Perkins Centre, Camperdown USYD
Zoom ID code	https://uni-sydney.zoom.us/j/97886903816
Project name	**Taking on melanoma and beyond – with personalised immunology**
Project (100 words)	The immune system in very complex and made up of distinctive cell populations which must work together to protect us from diseases. The recent introduction of “Checkpoint Inhibitor therapy” in cancer has revolutionised the treatment of many previously untreatable tumours. This honours project will investigate whether ‘immune signatures’ can predict successful response of cancer patients to Immune Checkpoint Inhibitor therapy. Using Mass Cytometry to quantify more than 30 markers simultaneously across a multitude of individual cells in a single experiment, this project will allow you to take a novel systems level approach to understanding how the immune system controls cancer**.**
Project name	**Discovery of Novel Markers of Inflammation for Earlier Diagnosis of Heart Disease**
Project (100 words)	Atherosclerosis (build-up of cholesterol in arteries) is the leading cause of death worldwide. Of particular concern is the growing number of patients presenting with a heart attack in the absence of traditional risk factors (diabetes, high cholesterol, high blood pressure and smoking). This project will use mass cytometry- a highly innovative single cell characterisation technique, coupled with a unique biobank resource from patients with comprehensive CT coronary angiogram assessment of plaque burden, to understand the role systemic inflammation plays in this disease process, and assess how systemic cues of immune dysfunction may help identify individuals at risk.

Pathology Honours 2021

Laboratory	NSW Health Statewide Biobank
Laboratory Head	Prof Jennifer Byrne
Supervisor	Prof Jennifer Byrne
Email address	jennifer.byrne@health.nsw.gov.au
Phone	0410 518 062
Location	NSW Health Statewide Biobank, Level 1, 67-73 Missenden Road, Camperdown 2050 NSW
Zoom ID code	
Project name	**Identifying the misuse of nucleotide sequence reagents within biomedical research publications**
Project (100 words)	Incorrect published research results are a major problem in scientific research. This project will apply a semi-automated screening tool Seek & Blastn (3) to identify incorrect nucleotide sequence reagents within biomarker publications. The project will involve performing automated Seek & Blastn analyses of publications in biomedical journals, and then manually checking these screening outputs. Publications that describe misidentified nucleotide sequence reagents will then be analysed to identify features that may help to explain their origins. In summary, this project aims to measure the prevalence of incorrect nucleotide reagents within the biomarker literature, to reliably identify potentially flawed research publications. 1. Labbé C, Grima N, Gautier T, Favier B, **Byrne JA** (2019). Semi-automated fact-checking of nucleotide sequence reagents in biomedical research publications: the Seek & Blastn tool. PLOS ONE. 14:e0213266.

Pathology Honours 2021

Laboratory	ACRF Centenary Cancer Research
Laboratory Head	Professor Philip Hogg
Supervisors	Dr Joyce Chiu, Prof Philip Hogg
Email address	joyce.chiu@sydney.edu.au
Phone	02 86274852
Location	Charles Perkins Centre Level 4 West
Zoom ID code	https://uni-sydney.zoom.us/j/95627339185
Project name	**Disulphide mediated control of thrombosis in cardiovascular diseases**
Project (100 words)	Cardiovascular disease is the leading cause of death worldwide accounting for 31% of all deaths per year. Thrombosis or clot formation in the arteries obstructs blood flow, and underlies the pathology of ischemic heart disease, ischemic stroke, and venous thromboembolism. Emerging evidence shows that blood coagulation is also regulated by cleavage of disulphide bonds in clotting factors. We have discovered a novel disulphide switches in a platelet receptors that control platelet activation and clot formation. Using cell-based assays, flow cytometry, fluorescence microscopy and mass spectrometry, this project will determine how this redox switch controls protein-protein interactions and signaling events in clot formation.

Pathology Honours 2021

Laboratory	Hypoxia Lab
Laboratory Head	Dr Kristina Cook
Supervisor	Dr Kristina Cook
Email address	Kristina.cook@sydney.edu.au
Phone	02 8627 4858
Location	Charles Perkins Centre, Level 3
Zoom ID code	
Project name	**Hypoxia and Disease**
Project (100 words)	Hypoxia (low oxygen), is a common condition in many diseases due to rapid cell proliferation (cancer), decreased blood flow (ischemia/heart attack) or pauses in breathing (sleep apnea). Hypoxia activates the transcription factor HIF (hypoxia inducible factor). The fundamental importance of HIF in human health is highlighted by the award of the 2019 Nobel Prize in Physiology or Medicine for its discovery. My lab studies the molecular pathways that regulate HIF and other recently discovered oxygen sensing proteins and develops drugs to target these pathways. I have projects in cancer and cardiovascular disease using molecular and cellular biology techniques. See webpage below for a list of Honours opportunities: **https://www.sydney.edu.au/medicine-health/about/our-people/academic-staff/kristina-cook.html#collapseprofilehonorsopportunities**

Pathology Honours 2021

Laboratory	Cell Signalling Laboratory
Laboratory Head	A/Professor Lenka Munoz
Supervisor	Lenka Munoz
Email address	Lenka.munoz@sydney.edu.au
Phone	9351 2315
Location	Charles Perkins Centre
Zoom ID code	990 9047 7083
Project name	**The role of histone demethylases in glioblastoma dormancy**
Project (100 words)	Glioblastoma, the most common and aggressive brain tumour, is propagated by glioblastoma stem cells refractory to chemotherapy. We have identified that the incomplete efficacy of chemotherapy is not caused by drug-resistant cells but rather by glioblastoma stem cells that resonate between proliferative drug-sensitive and dormant drug-tolerant states. We also discovered that changes in histone methylation enable glioblastoma stem cells to induce dormancy in order to survive treatments with chemotherapeutic drugs. This project will investigate epigenetic mechanisms of glioblastoma dormancy, focusing on histone demethylases and develop novel approaches to eradicate dormant glioblastoma cells.

Pathology Honours 2021

Laboratory	Northcott Neuroscience Laboratory, ANZAC Research Institute
Laboratory Head	Professor Marina Kennerson
Supervisor	Professor Marina Kennerson
Email address	marina.kennerson@sydney.edu.au
Phone	9767 9119
Location	ANZAC Research Institute Gate 3 Hospital Rd, Concord 2139
Zoom ID code	942 7927 6933
Project name	**Investigating the Cellular Mechanisms Causing the Death of Motor Neurons**
Project (100 words)	I am team leader of the Gene Discovery and Translational Genomics Inherited Peripheral Neuropathies Program at the ANZAC Research Institute. Our research focus is to identify genes causing both fatal and non-fatal motor neuron disease and then generate disease models mimicking the human condition. Our projects use both induced pluripotent stem cells (iPSC) and *C. elegans* to model the disease mutations and investigate the pathogenic cellular processes causing the death of motor neurons. Our Hons projects contribute to identifying therapeutic gene targets and investigating cellular disease mechanisms that will help to characterise the pre-clinical models for developing treatment therapies. Depending on the specific project, students will gain experience in molecular biology and cell biology techniques, tissue culture, confocal microscopy, live cell imaging, drug screening, C. elegans husbandry, biochemical and behavioural studies and next generation sequencing and bioinformatics. For more information on our research visit: www.anzac.edu.au/research/neurobiology

Pathology Honours 2021

Laboratory	Liver Enzymes in Metabolism and Inflammation [LEMI]
Laboratory Head	Prof Mark D Gorrell
Supervisor	Prof Mark D Gorrell
Email address	m.gorrell@centenary.usyd.edu.au
Phone	02 9565 6152
Location	Centenary Institute
Zoom ID code	https://uni-sydney.zoom.us/j/98422004546
Projects name	**Proteases in liver cancer and Covid**
Projects (100 words)	I study human proteases. Fibroblast Activation Protein (FAP) is associated with fibrosis in human liver diseases including fatty liver and cancer. TMPRSS2 is essential for SARS infections. **Projects** will be these, or similar based on student interests**:** **1.** TMPRSS2 inhibitors are needed for the many people who wont otherwise be protected from Coronaviruses. **2.** Immunostaining on paraffin sections of human liver cancer to localise FAP and major leucocyte subtypes. **3.** Identify human proteins that inhibit FAP enzyme activity. **Skills** you can learn: Histopathology, quantitative immunohistochemistry, enzymology, protein biochemistry, cell culture.

Pathology Honours 2021

Laboratory	Cardiometabolic Proteomics
Laboratory Head	Dr Melanie White
Supervisor	Dr Melanie White
Email address	Melanie.white@sydney.edu.au
Phone	+61-2-9036-7918
Location	Level 4 East, The Hub, Charles Perkins Centre
Zoom ID code	945 3501 2173
Project name	**Why does the diabetic heart behave differently**
Project (100 words)	Patients with pre-existing type 2 diabetes (T2DM) have significantly impaired clinical outcomes following an acute cardiovascular event (e.g. ischemia), in comparison to otherwise 'healthy' individuals. We have seen that the T2DM heart undergoes molecular adaptations that subsequently increase cell death, even prior to a cardiovascular event. Our group aims to characterize these adaptations in T2DM hearts to determine the molecular 'priming' that results in poor outcomes in response to cardiovascular stress. By improving our understanding of the changes unique to diabetic hearts, we can provide develop pharmacological interventions to improve cardiovascular outcomes for these patients.

Pathology Honours 2021

Laboratory	Immunopathology Laboratory, Discipline of Pathology
Laboratory Head	Professor Nicholas King
Supervisor	Professor Nicholas King
Email address	nicholas.king@sydney.edu.au
Phone	0422 008 747
Location	Charles Perkins Centre
Zoom ID code	https://uni-sydney.zoom.us/j/91894736938
Project name	**Using IMPs to reduce inflammation in virus infections**
Project (100 words)	Why the immune response causes lethal damage to the host is unknown, but many viruses, including mosquito-borne flaviviruses (*e.g.,* dengue, zika or West Nile viruses), influenza and coronaviruses induce an *over-exuberant* immune response, resulting in severe illness, even death. In our laboratory, we can interfere with this response by using immune-modifying nanoparticles (IMPs). This reduces the massive inflammation by sidelining blood monocytes (macrophages of the blood) in the spleen, and turns them into anti-inflammatory cells. This in turn also reduces their migration to e.g., the brain. We believe these quietens the immune response. We are investigating this change in detail at the cellular and molecular level. Understanding how this works could give us an additional weapon in highly inflammatory disease.

Pathology Honours 2021

Laboratory	Platelet Biology/Thrombosis Research Unit: Heart Research Institute *[in collaboration with* the Cardiovascular Signalling & Drug Discovery Unit]
Laboratory Head	Shaun Jackson
Supervisor	Simone Schoenwaelder, Xuyu (Johnny) Liu, Jessica Maclean,
Email address	simone.s@hri.org.au ; jessica.maclean@hri.org.au ; xuyu.liu@hri.org.au
Phone	8627 04117 ; 0408 393 630
Location	Level 3 East, Charles Perkins Centre
Zoom ID code	https://uni-sydney.zoom.us/j/9675888429?pwd=eStlRVpnekNLVEtDYVVSVVl6d3Z0UT09 Password: Thrombosis; Meeting ID: 967 588 8429; Password: 4005825970
Project name	**Developing safer anti-clotting agents derived from "Mother Nature" for the treatment of stroke**
Project (100 words)	***The Thrombosis Research Group aims to understand events leading to occlusion of both macro- and micro- vasculature, precipitating thrombosis and ischaemia reperfusion injury (IR) in cardiovascular disease*.** To approach these research questions, we examine the interactions between blood cells and injured blood vessels, in vitro and ex vivo, as well as in vivo using mouse models of thrombosis, ischaemic stroke and IR injury. We combine these approaches with cutting-edge technologies including: Advanced microscopy techniques (intravital imaging, confocal, TIRF, super resolution, 2-photon, tissue clearing); molecular mouse models and genome editing; Omic studies; and Biomechanical studies. **Projects include**: (i) A new thromboinflammatory mechanism triggered by dying endothelium and platelets; (ii) Understanding mechanisms leading to microvascular dysfunction and poor cerebral perfusion in stroke; (iii) Discovery/ preclinical development of novel antiplatelet and/or anticoagulant treatments for stroke. **Project details:** Thrombin is by far the most robust activator of blood clotting in both physiological haemostasis and pathological thrombotic response. Fibrin clots contain a large amount of thrombin, which is released into the circulation following administration of clot busting drugs to treat stroke (rtPA, thrombolysis). This pool of thrombin remains highly active and is responsible for the rethrombosis. While a strong rationale exists for the use of thrombin inhibitors as effective antithrombotic agents in enhancing clot lysis, all current thrombin inhibitors lead to severe bleeding complications, precluding their use in stroke, due to risk of intracerebral haemorrhage. We have identified novel anticlotting agents derived from naturally occurring proteins found in saliva of the bush tick. Our studies have demonstrated that these bug-derived proteins are able to dissolve blood clots in a disease model of thrombosis with fewer bleeding complications. This project will characterise the mechanisms use by this novel anti-clotting protein to safely dampen thrombin generation, and test whether administration of this novel drug in combination with rtPA provides for a safe approach to treatment of thromboembolic diseases such as stroke in the future.

Pathology Honours 2021

Laboratory	Cancer Metastasis and Tumour Microenvironment Program
Laboratory Head	Dr Zaklina Kovacevic
Supervisor	Dr Zaklina Kovacevic
Email address	zaklina.kovacevic@sydney.edu.au
Phone	0415 720 902
Location	Medical Foundation Building K25
Zoom ID code	970 0156 6101 https://uni-sydney.zoom.us/j/97001566101
Project name	**Investigating the cross-talk between cancer cells and the tumour microenvironment.**
Project (100 words)	Late recurrence is a significant clinical problem for breast cancer (BC) patients. A major contributor to BC recurrence and metastasis is the tumour microenvironment (TME), with stromal cells producing growth factors that promote metastasis. At the bone metastatic niche, BC cells can remain dormant for many years before being re-activated by surrounding stroma. Importantly, tumour cells can “re-program” surrounding stromal cells to ensure a favourable TME. This project will investigate the role of the metastasis suppressor NDRG1 in BC cell dormancy and communication with the TME, which may lead to a novel strategy to overcome BC recurrence.

Pharmacology Honours 2021

Laboratory	Chemical Biology in Drug Design Laboratory
Laboratory Head	Professor Rachel Codd
Supervisor	Professor Rachel Codd
Email address	rachel.codd@sydney.edu.au
Phone	9351 6738
Location	Molecular Bioscience Building G08
Zoom ID code	921 3126 2629
Project name	**1. Dissecting the enzyme-mediated biosynthesis of therapeutics** **2. Streamlining the labeling of radio-metal imaging agents**
Project (100 words)	Project 1. This project aims to understand the capacity to use enzymes to produce new fragments and molecules to inspire pathways towards generating new therapeutics. This is significant since this could: (i) open access to more structurally diverse molecules with new properties; and (ii) circumvent the need to use complex multi-step chemical syntheses. This project will study the enzyme DesC from the DesABCD cluster that directs the biosynthesis of clinical bacterial metabolites known as 'siderophores'. Siderophores have a high affinity towards iron(III) and are used to manage secondary iron overload disease in patients with transfusion-dependent blood disorders. You will produce recombinant DesC in partnership with a collaborating laboratory and prepare using simple and robust chemical syntheses a group of different substrates as a prelude to examining the enzyme-mediated production of new siderophore molecular fragments. This cross-discipline project will support knowledge gain and skills development across molecular biology, chemical biology, and chemistry. Project 2. The ability to capture high-definition images of cancer is important for patient diagnosis, treatment and follow-up. Radiometal-based imaging agents are useful in this capacity, with a new radiometal – zirconium-89 – gathering traction for immunological positron-emission tomography (PET) imaging. Ongoing improvements to the use of these agents requires technology advances in the design of organic compounds, known as 'ligands' tailored for each radiometal and in efficient ligand production and radiolabeling processes. This project will explore a new technology predicted to support the efficient radiolabeling of ligands with zirconium-89. The cross-discipline project will provide the student with new knowledge of chemical synthesis, analytical chemistry and innovation in technology development for medical imaging. The student will ideally have completed a major in (Medicinal)/Chemistry.

Pharmacology Honours 2021

Laboratory	Woolcock Institute of Medical Research
Laboratory Head	Prof Ron Grunstein
Supervisor	A/Prof Craig Phillips
Email address	craig.phillips@sydney.edu.au
Phone	91140004
Location	Woolcock Institute - Glebe
Zoom ID code	
Project name	**Functional Near Infrared Spectroscopy for exploring the neurovascular basis for cognitive deficits in Obstructive Sleep Apnoea (OSA)**
Project (100 words)	OSA is a sleep related breathing disorder characterised by intermittent hypoxia and fragmented sleep. People with OSA often have associated sleepiness, problems with memory and attention and cardiovascular complications. This project will use Near Infrared Spectroscopy to non-invasively measure changes in brain tissue oxygenation in response to: 1. Obstructed breathing during sleep 2. Cognitive and Neurobehavioral tasks The project will explore whether neurovascular dysfunction explains poorer cognitive and neurobehavioral function in untreated OSA. Patients will also be studied after OSA treatment to determine whether the extent of improvement in cognition can be explained by improved neurovascular function.

Pharmacology Honours 2021

Laboratory	Drug Discovery Laboratory
Laboratory Head	Prof Michael Kassiou
Supervisor	Dr Eryn Werry
Email address	eryn.werry@sydney.edu.au; michael.kassiou@sydney.edu.au
Phone	02 9351 8634
Location	Rm 751, G08
Zoom ID code	https://uni-sydney.zoom.us/j/94633739055
Project name	**Drug discovery for CNS disorders**
Project (100 words)	The Drug Discovery Lab is interested in finding new treatments and detection methods for CNS diseases, like frontotemporal dementia, amyotrophic lateral sclerosis, autism spectrum disorder, social anxiety disorder and disorders involving neuroinflammation. We use techniques such as tissue culture, iPSCs, transfection, cellular assays, immunohistochemistry, radioligand binding, PCR, sequencing and western blots to find new drug targets and therapeutics for these diseases.

Pharmacology Honours 2021

Laboratory	Lambert Initiative for Cannabinoid Therapeutics
Laboratory Head	A/Prof Jonathon Arnold
Supervisor	A/Prof Jonathon Arnold
Email address	jonathon.arnold@sydney.edu.au
Phone	0409744 724
Location	Brain and Mind Centre
Zoom ID code	https://uni-sydney.zoom.us/j/95348583877?from=msft
Project name	**Unlocking the medicinal potential of cannabis**
Project (100 words)	Cannabis has been used for millennia to treat various medical conditions. In recent times opinion has shifted towards acceptance of the plant's therapeutic potential, and there is an increasing list of countries, including Australia, that have legalised medicinal cannabis. More than ever there is a strong need to advance our scientific understanding of medicinal cannabis and the naturally occurring cannabinoid system. Please join me and my colleagues at the Lambert Initiative in helping revolutionize the innovative development of medicinal cannabis and cannabinoid therapeutics. This project will examine cannabinoids for their anticonvulsant properties in mouse models of epilepsy and seizure generation.

Pharmacology Honours 2021

Laboratory	Pain Management Research Institute
Laboratory Head	Karin Aubrey
Supervisor	Karin Aubrey
Email address	Karin.aubrey@sydney.edu.au
Phone	9926 4962
Location	Kolling Institute, Royal North Shore Hospital
Zoom ID code	https://uni-sydney.zoom.us/j/99222910572
Project name	**Brain circuits that contribute to pain signaling**
Project (100 words)	Chronic pain is defined as pain that extends beyond the time that it takes an injury to heal and can even occur in the absence of an injury. You probably know someone with chronic pain, as it affects up to 20% of Australians and can involve changes in brain regions responsible for sensory, homeostatic and emotional signalling. We are looking for a motivated honours student with an interest in continuing to postgraduate study to join our research group investigating how the brain processors pain signals, and what changes when pain becomes a chronic disease. Our projects assess brain function using techniques including; electrophysiology, immunohistochemistry, circuit tracing, optogenetics and animal behavioural models. If you have a strong interest in neurobiology and think you might enjoy carrying out laboratory research about how the brain works, please get in contact.

Pharmacology Honours 2021

Laboratory	Neurodegeneration research
Laboratory Head	Professor Kay Double
Supervisor	Professor Kay Double, Dr Benjamin Rowlands
Email address	kay.double@sydney.edu.au
Phone	9114 4292
Location	Brain and Mind Centre, Mallett St, Camperdown
Zoom ID code	https://uni-sydney.zoom.us/j/96734533522?pwd=Wm5qd0tMT3JuSEdveE02bDVHd2hldz09
Project name	**Pharmacological treatment of a new proteinopathology in Parkinson's disease**
Project (100 words)	We identified a new pathway to neuronal death in Parkinson's disease -a protein pathology not previously described in this disorder involving abnormal aggregation and deposition of the antioxidant protein superoxide dismutase 1 (SOD1). We recently developed a novel mouse model with Parkinsonism that expresses this pathology in the brain. In 2021 we offer an opportunity to join our team to help us investigate if pharmacological approaches now in clinical trials in Parkinson patients can reduce this pathology and alleviate movement symptoms in our model. This is an NHMRC-funded project and student data are expected to contribute to future publications.

Pharmacology Honours 2021

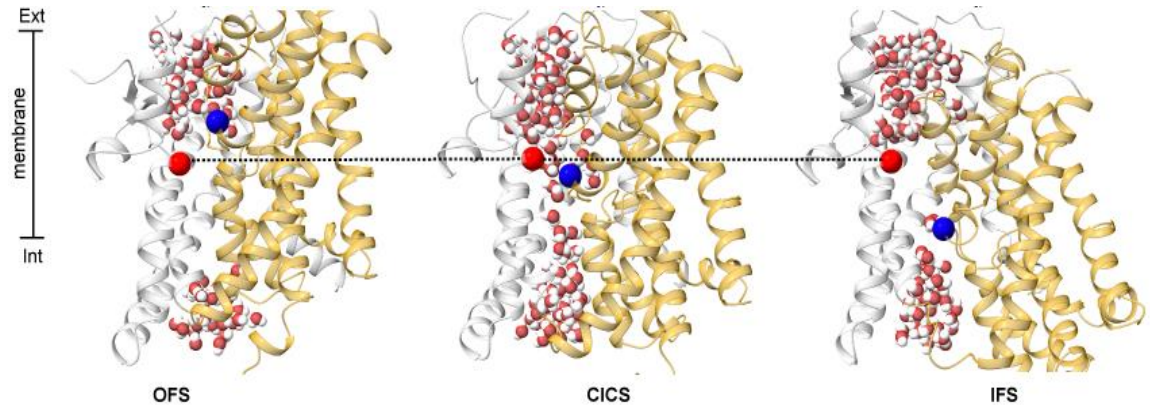
Laboratory	Functional Amyloid Biology Laboratory (FABLab)
Laboratory Head	A/Prof Margie Sunde
Supervisor	A/Prof Margie Sunde
Email address	Margaret.sunde@sydney.edu.au
Phone	9351 6955
Location	Building G08 Molecular Bioscience
Zoom ID code	961 7268 7908
Project name	**Amyloid fibril interactions in health and disease**
Project (100 words)	Amyloid fibrils are protein complexes that form when 1000's of copies of a single protein or peptide self-assemble into a stable fibril form. Some amyloid fibrils are associated with diseases, including Alzheimer's disease, diabetes and heart failure. Some functional amyloid fibrils play a role in detecting pathogens. The Sunde Lab studies the structure, biological interactions and impact of different amyloid fibrils. In disease, we are focusing on understanding the interactions between amyloid fibrils and cardiomyocytes that lead to cardiomyopathy and heart failure. In health, we are focused on understanding how cells harness functional amyloids to defend against pathogens.

Pharmacology Honours 2021

Laboratory	Pharmacogenomics and Drug Development
Laboratory Head	Professor Michael Murray
Supervisor	Prof Michael Murray and A/Prof Fanfan Zhou
Email address	michael.murray@sydney.edu.au
Phone	9036-3259
Location	Medical Foundation Building and Pharmacy Building
Zoom ID code	N/A
Project name	**Novel drugs for the treatment of Uveal melanoma**
Project (100 words)	Uveal melanoma (UM) is the most common form of primary eye cancer. Although rare, it is deadly. Visual impairment/loss or loss of eye(s) are common in patients and there are no effective therapies. This project will identify novel drugs to treat UM and evaluate the molecular mechanisms for the most effective agents. Techniques to be used will include cell culture, cell-based assays for the assessment of cancer cell viability (energy metabolism, cell cycle analysis by flow cytometry, cell death assays), immunoblotting and immunoprecipitation to evaluate altered protein expression in treated cells, and real-time PCR to evaluate gene expression.

Pharmacology Honours 2021

Laboratory	Transporter Biology Group
Laboratory Head	Professor Renae Ryan
Supervisor	Professor Renae Ryan
Email address	renae.ryan@sydney.edu.au
Phone	9351 2669
Location	Molecular Biosciences Bldg (G08), Camperdown Campus
Zoom ID code	989 1879 1926
Project name	**Molecular mechanisms of glutamate transporters**
Project (100 words)	My group uses structural biology and biophysical techniques to investigate the structure and molecular mechanisms of neurotransmitter/amino acid transporters. Our main focus is the dual function glutamate transporter family (SLC1A) which includes the human glutamate transporters (EAATs) and neutral amino acid transporters (ASCTs) that can also function as chloride channels. The aim of our research is to develop a structural model for how these transporters work and to understand how they malfunction in disease states such as neurodegenerative disorders, episodic ataxia and cancer. This information can be used to develop therapeutics that are both transporter-specific and subtype selective to treat these disorders.



Pharmacology Honours 2021

Laboratory	Biomedical Education Research Group
Laboratory Head	A/Prof Tina Hinton
Supervisor	A/Prof Tina Hinton & Dr Rania Salama
Email address	tina.hinton@sydney.edu.au & rania.salama@sydney.edu.au
Phone	N/A
Location	Charles Perkins Centre D17 & Molecular Biosciences Building G08
Zoom ID code	Meeting URL: https://uni-sydney.zoom.us/j/94990123872?from=msft Meeting ID: 949 9012 3872
Project name	**Exploring the motives for engagement in higher education medical science online learning**
Project (100 words)	This is a literature based qualitative systematic review project suitable for the possibly extended COVID-19 restrictions on research facilities. You will explore what motivates students to join an online course and/or what keeps them motivated and engaged when enrolled in an online unit. The findings of this study will inform practice in online education and can be taken further to a PhD project. To learn more about this opportunity please contact Dr Rania Salama on rania.salama@sydney.edu.au

Pharmacology Honours 2021

Laboratory	Transporter Biology Group
Laboratory Head	Robert Vandenberg
Supervisor	Robert Vandenberg
Email address	robert.vandenberg@sydney.edu.au
Phone	0412 470 388
Location	Room 510, Molecular Biosciences Building, G08
Zoom ID code	974 6732 3455
Project name	**Discovery of glycine transport inhibitors for the treatment of pain**
Project (100 words)	Our lab has discovered a new class of glycine transport inhibitors that show particular promise as drugs for the treatment of chronic pain. We can offer a range of projects that will contribute to a better understanding of how these drugs work leading to the development of new therapeutics. The scope of the project will be developed based on the interests of the student and would be suitable for students with interests in biochemistry, pharmacology, drug discovery or neuroscience. The group collaborates with scientists from USA, ANU, UTS and USYD and is funded by NHMRC and NIH (USA).

Pharmacology Honours 2021

Laboratory	Pain and Drug Addiction Laboratory
Laboratory Head	Prof Macdonald Christie
Supervisor	Dr Sarasa Mohammadi
Email address	sarasa.mohammadi@sydney.edu.au
Phone	+61 2 8627 6648
Location	Level 3 West, Charles Perkins Centre, D17
Zoom ID code	974 6471 5371 https://uni-sydney.zoom.us/j/97464715371
Project name	**Targeting glycine transporters and receptors to treat pain: analgesic and side effect testing *in vivo***
Project (100 words)	Chronic pain can be debilitating and difficult to manage, severely reducing quality of life. New analgesics are desperately needed that act through new mechanisms of action. Our group uses behavioural neuroscience to improve our understanding of existing analgesics, test new drugs and drug classes, and better understand pain physiology. This project uses mouse models to investigate a new class of analgesic drugs; glycine transporter inhibitors, or dual action glycine transporter inhibitors/glycine receptor stimulators. The project uses pre-clinical screening methods to determine the analgesic efficacy in chronic pain models, any possible side-effects, and any abuse liability of these novel compounds.

Pharmacology Honours 2021

Laboratory	Quality Use of Respiratory Medicines Group
Laboratory Head	Professor Sinthia Bosnic-Anticevich
Supervisor	Professor Sinthia Bosnic-Anticevich Dr Biljana Cvetkovski
Email address	Sinthia.bosnic-anticevich@sydney.edu.au; biljana.cvetkovski@sydney.edu.au
Phone	9114 0145
Location	Woolcock Institute of Medical Research
Zoom ID code	989 8364 8814
Project name	**Quality Use of Respiratory Medicines**
Project (100 words)	The Quality Use of Respiratory Medicines Groups focuses on understanding the way in which people use their respiratory medicines, the factors affecting their use and developing and evaluating solutions that optimize respiratory medicines use and healthy, social and economic outcomes associated with that. We work across the continuum of health care settings, utilising a multi-dimensional and inter-professional approach to better understand and improving health outcomes for patients using respiratory medicines. Our group has produced evidence that has changed the landscape of inhaler technique research; impacting on national and international treatment guidelines and contributed to the concept of precision medicine in the respiratory field. In 2021, we are offering a number of Honours opportunities in the areas of: 1. Mild Asthma 2. Severe Asthma 3. Digital health and risk prediction in respiratory disease 4. Upper airways disease and self-management

Pharmacology Honours 2021

Laboratory	Computational Pharmacology & Toxicology Laboratory
Laboratory Head	Dr Slade Matthews
Supervisor	Dr Slade Matthews
Email address	Slade.matthews@sydney.edu.au
Phone	0403 463 347
Location	Rm 479, Molecular Bioscience Bldg (G08)
Zoom ID code	https://uni-sydney.zoom.us/j/92704658825
Project name	**Computational Toxicology**
Project (100 words)	Toxicology information is traditionally gathered using animal studies. These experiments are forbidden in cosmetic safety assessment in Australia and other developed nations creating an imperative to employ other toxicological assessment techniques. Computational toxicology is already being used in pharmaceutical development and by governmental regulators. In our lab we are developing real-world technologies for toxicological assessment in collaboration with Australian Federal regulators.

Physiology Honours 2021

Laboratory	Diabetes and Insulin Secretion Laboratory
Laboratory Head	Professor Peter Thorn
Supervisor	Professor Peter Thorn
Email address	p.thorn@sydney.edu.au
Phone	8627 4629
Location	Charles Perkins Centre
Zoom ID code	
Project(s)	**1) Understanding how the pancreatic beta cell synapse controls insulin secretion.** Our discovery that beta cells secrete insulin via a synaptic-like connection with blood vessels in the islet challenges accepted models of insulin secretion. Ongoing work in the lab is showing the synapse changes in type 2 diabetes, suggesting it may be significant in disease. The next step in this work is to prove that functional interactions in the synapse have significance for the control of insulin secretion. To this end, in this project we will stain for the key proteins in the beta cell synapse and use super resolution microscopy to determine their relative position. This approach will be complemented by live-cell two-photon imaging of insulin secretion. The outcomes of the project will be significant for both understanding and treatment of diabetes. **2) Refining cell-based therapies to cure type 1 diabetes.** We are working to engineer induced pluripotent stem cells to make them secrete insulin. Our experiments are testing some of the factors we are finding to be important in the control of beta cells in the islet with an aim to enhance the control of insulin secretion. For diabetic patients, cell replacement therapies have the promise, one day, to provide a cure for disease.

Physiology Honours 2021

Laboratory	Signal processing in the visual system
Laboratory Head	Alan Freeman
Supervisor	Alan Freeman
Email address	Alan.Freeman@sydney.edu.au
Phone	8627 8860
Location	Mills Building, Camperdown Campus
Zoom ID code	998 8917 5018
Project name	**Colour vision**
Project (100 words)	Colour vision is a vital part of our sensory repertoire. While subcortical signals contributing to colour vision are well known, the cortical circuits that process the signals are less well understood. This project will explore cortical mechanisms responsible for colour vision by extending an existing computational model (Nguyen and Freeman, 2019): you will find the cortical connections required to reproduce empirical observations. The short-term aim is to understand more about colour vision and, longer-term, the aim is to construct a biological front end for a machine vision system. You will need strong mathematical skills to successfully undertake this project.

Physiology Honours 2021

Laboratory	Lipid Metabolism Laboratory
Laboratory Head	Dr Andrew Hoy
Supervisor	Dr Andrew Hoy
Email address	andrew.hoy@sydney.edu.au
Phone	9351 2514
Location	Charles Perkins Centre
Zoom ID code	95987327094
Project name	**Cancer cell metabolism**
Project (100 words)	Targeting metabolism has emerged as a potentially effective therapeutic strategy for many cancer types, which are driven by genetic alterations that are not tractable drug targets. To date, glucose and amino acid metabolism have received most attention and are well characterised, with lipid metabolism being the poor cousin, despite the numerous interactions between the metabolic pathways of these substrates. This project will exploit the heterogeneous genotypes of a diverse panel of cancer cell lines to assess substrate (glucose, glutamine, fatty acids) utilisation. This project will a range of techniques including cell culture, biochemical and radiometric metabolic analysis, and stable isotope labelling in combination with mass spectrometry.

Physiology Honours 2021

Laboratory	Cardiovascular Medical Devices
Laboratory Head	Dr Anna Waterhouse
Supervisor	Dr Anna Waterhouse
Email address	anna.waterhouse@sydney.edu.au
Phone	02 8627 5648
Location	Charles Perkins Centre
Zoom ID code	https://uni-sydney.zoom.us/j/96309788774
Project name	**Biomimetic Medical Devices**
Project (100 words)	The Cardiovascular Medical Devices Group aims to improve and develop new medical devices and diagnostics. We offer a number of multidisciplinary projects to create biomimetic micro-systems to study medical device materials, DNA nanorobot function and new adhesive or slippery surface coatings in the laboratory. These projects involve a range of techniques including microfabrication, fluorescence and confocal microscopy, and scanning electron microscopy.

Physiology Honours 2021

Laboratory	Systems Neuroscience
Laboratory Head	Atomu Sawatari
Supervisor	Atomu Sawatari
Email address	Atomu.sawatari@sydney.edu.au
Phone	+612 9036 7127
Location	Camperdown
Zoom ID code	
Project name	**Music, Empathy, and Plasticity**
Project (100 words)	1) Projects focused on determining whether music can augment neural activation associated with an appreciation of empathy in young children will be offered. 2) Projects determining whether environmental enrichment can affect or otherwise augment visual function will be offered.

Physiology Honours 2021

Laboratory	Cardiovascular Discovery Lab
Laboratory Head	Prof Gemma Figtree
Supervisor	Prof Gemma Figtree
Email address	gemma.figtree@sydney.edu.au
Phone	(02) 9926 4915
Location	Kolling Institute, RNSH
Zoom ID code	993 8836 4480
Project name	**Exploring the "junk" of our DNA to understand heart disease**
Project (100 words)	Only a few decades ago, it was believed that DNA portions between our genes had no function, even though they represented 98% of our genome. We now know that this "junk" DNA plays an important role in human physiology. In our laboratory, we identified an undocumented micro-RNA that is unique to humans and synthesised from this "junk". We have shown that it regulates the expression of a major molecular player in cardiac function and is involved in the growth of new blood vessels. This project will continue the exploration of the microRNA role in cardiovascular cells and tissues.

Physiology Honours 2021

Laboratory	Cardiovascular Discovery Group
Laboratory Head	Prof Gemma Figtree
Supervisor	Dr Belinda Di Bartolo
Email address	Belinda.dibartolo@sydney.edu.au
Phone	99264916
Location	Kolling Institute
Zoom ID code	998 888 1011
Project name	**Do hardened blood vessels accelerate ageing?**
Project (100 words)	Vascular calcification is the build-up of arterial plaque causing the hardening of blood vessels. Vascular smooth muscle cells (VSMCs) play important roles in the physiological functioning of blood vessels, and their dysfunction may lead to vascular disease. Increased dysfunctional VSMCs leads to attempts at repair by continued proliferation, reducing the population of progenitor cells, and leading to premature ageing through the critical shortening of telomeres- the protective ends of DNA. Markers of cellular ageing include cell senescence and DNA damage. In this project we will examine the DNA damage response in VSMCs to further elucidate the underlying molecular mechanisms of vascular calcification.

Physiology Honours 2021

Laboratory	Islet Biology and Metabolism Group
Laboratory Head	Melkam Kebede
Supervisor	Belinda Yau
Email address	Belinda.yau@sydney.edu.au
Phone	0415 838 782
Location	Charles Perkins Centre, 5 West
Zoom ID code	https://uni-sydney.zoom.us/j/99121823133
Project name	**Pathways to beta-cell failure in Type 2 Diabetes**
Project (100 words)	The insulin-producing beta-cells of the pancreas undergo huge metabolic changes in the progression to diabetes. In the face of genetic factors and environmental stressors such as obesity, whole body insulin resistance drives the beta-cells into a state of compensation. Beta-cells increase their insulin production and secretion in their efforts to maintain blood glucose homeostasis. However, eventual beta-cell dysfunction – in the mitochondria, the ER, and the insulin secretory pathway – can all result in beta-cell failure, and ultimately Type 2 diabetes. Our project aims to study key metabolic pathways – identifying novel target proteins – in the switch between beta-cell compensation and failure.

Physiology Honours 2021

Laboratory	Parkinson's Disease Research Clinic, Brain & Mind Centre
Laboratory Head	Prof Simon Lewis
Supervisor	Dr Claire O'Callaghan
Email address	claire.ocallaghan@sydney.edu.au
Phone	0402 245 053
Location	Brain and Mind Centre, 94 Mallett Street, Camperdown, 2050
Zoom ID code	Meeting ID: 918 6999 5305
Project name	**Neuroimaging in Parkinson's disease visual hallucinations**
Project (100 words)	Visual hallucinations are a common and intriguing symptom of Parkinson's disease (PD). Our group has developed novel hypotheses about how brain network abnormalities contribute to hallucinations in PD. This project will focus on applying an exciting new neuroimaging technique to further understand brain network changes in hallucinations (you can read about the technique here https://www.pnas.org/content/113/44/12574.short). The project is an opportunity to learn about neuroimaging and cognitive neuroscience, as well as psychiatric symptoms in PD. The project will use an existing data set we have previously collected, however interested students would have the opportunity to gain some experience with patients as part of the PD clinic.

Physiology Honours 2021

Laboratory	James Lab – Metabolic Cybernetics
Laboratory Head	Prof David James
Supervisor	Primary supervisor: Prof David James Co-supervisor: Dr Guang Yang & Dr James Burchfield
Email address	david.james@sydney.edu.au guang.yang@sydney.edu.au james.burchfield@sydney.edu.au
Phone	+61 2 8627 5731
Location	Charles Perkins Centre
Zoom ID code	Meeting ID: 912 0010 8092
Project name	**Mapping new functions of insulin and exercise**
Project (100 words)	Insulin and exercise activate extensive signalling cascades to regulate an array of cellular processes. Identifying the composition of these signalling networks and the proteins responsible for eliciting specific functions of insulin and exercise is essential in understanding the defects that cause metabolic disease where insulin signalling is defective, and in harnessing the power of exercise to promote health. We have recently interrogated the insulin and exercise-regulated phosphoproteome, revealing the extent of these signalling networks and a number of new phosphorylation sites on proteins modified in response to these stimuli. This project aims to characterise the function of novel insulin or exercise-regulated phosphosites and to identify the upstream kinase. One key regulatory node of particular interest is the nutrient sensor, mTORC1. This project will involve cell culture, molecular biology, microscopy, immunoprecipitation, western blot and protein-protein interaction analysis.

Physiology Honours 2021

Laboratory	James Lab – Metabolic Cybernetics
Laboratory Head	Prof David James
Supervisor	Primary supervisor: Prof David James Co-supervisor: Dr Soren Madsen & Dr Marin Healy
Email address	david.james@sydney.edu.au soren.madsen@sydney.edu.au marin.healy@sydney.edu.au
Phone	+61 2 8627 5731
Location	Charles Perkins Centre
Zoom ID code	Meeting ID: 912 0010 8092
Project name	**The interaction between diet and the genome in mice**
Project (100 words)	We have a highly unique population of diversity outbred mice that we are screening for gene x environment interactions to better understand complex biological problems and diseases. The project will entail learning how to do genetic mapping, tissue proteomics and pQTL analysis and integrating this information with metabolic phenotypes such as obesity and/or diabetes. Our goal is to identify genes and molecular pathways that are fundamentally linked to metabolic diseases.

Physiology Honours 2021

Laboratory	James Lab – Metabolic Cybernetics
Laboratory Head	Prof David James
Supervisor	Primary supervisor: Prof David James Co-supervisor: Dr Jacqueline Stoeckli
Email address	david.james@sydney.edu.au jacqueline.stoeckli@sydney.edu.au
Phone	+61 2 86275731
Location	Charles Perkins Centre
Zoom ID code	Meeting ID: 912 0010 8092
Project name	**Mechanism by which insulin regulates lipolysis in adipocytes**
Project (100 words)	One of the most important actions of insulin in mammals is to suppress lipolysis or fatty acid release in adipocytes. Indeed, an impairment in this process may play a major role in diseases including non-alcoholic fatty liver disease and steatohepatitis. We have recently discovered a novel regulator of lipolysis in fat cells. This project will explore how insulin regulates the function of this protein to coordinate the release of fatty acids from the lipid droplet. Students will learn basic cell biology techniques, molecular cloning and the use of mass spectrometry to measure protein-protein interactions.

Physiology Honours 2021

Laboratory	James Lab – Metabolic Cybernetics
Laboratory Head	Prof David James
Supervisor	Primary supervisor: Prof David James Co-supervisor: Dr Sean Humphrey & Dr Alexis Diaz
Email address	david.james@sydney.edu.au sean.humphrey@sydney.edu.au alexis.diaz@sydney.edu.au
Phone	+61 2 8627 5731
Location	Charles Perkins Centre
Zoom ID code	Meeting ID: 912 0010 8092
Project name	**Mechanism of insulin resistance**
Project (100 words)	Insulin resistance is a risk factor for the development of a number of diseases including type 2 diabetes, cardiovascular disease and some cancers. Our group has discovered several links between how nutrients are processed and insulin resistance. This project aims to investigate the molecular basis for how mitochondrial metabolism affects insulin responses. Students will learn a wide range of techniques including molecular biology, cell culture, metabolic/biochemical assays, mitochondrial bioenergetics, microscopy and western blotting.

Physiology Honours 2021

Laboratory	Cardiovascular Control Laboratory
Laboratory Head	Dr Jaimie Polson
Supervisor	Jaimie Polson
Email address	Jaimie.polson@sydney.edu.au
Phone	9351 4559
Location	Anderson Stuart N640
Zoom ID code	https://uni-sydney.zoom.us/j/93553876715
Project name	**Effect of pharmaceutical drugs on embryonic cardiovascular function in vitro and in vivo**
Project (100 words)	Many drugs taken during pregnancy can cause hypoxia in the embryo, with potentially devasting outcomes in both the short- and long-term. Hypoxia can be caused by direct effects on the embryonic heart, that reduce cardiac output despite a normal oxygen level, or indirectly by slowing the blood flow through the placenta to reduce embryonic blood oxygenation. This project will examine the effects of some drugs on embryonic heart rate (measured by ECG and mechanical movements) using whole rat embryo culture in vitro and on embryonic and placental blood flow using high frequency ultrasound in vivo. **Collaboration with Dr Helen Ritchie**

Physiology Honours 2021

Laboratory	Laura Piccio
Laboratory Head	Dr Laura Piccio
Supervisor	Dr Laura Piccio
Email address	Laura.piccio@sydney.edu.au
Phone	02 9351 0717
Location	Charles Perkins Centre/Brain and Mind Centre
Zoom ID code	333 095 8263
Project name	**Role of diet in the experimental model of multiple sclerosis**
Project (100 words)	Multiple sclerosis (MS) is a complex disease of the central nervous system due to a combination of genetic and environmental factors. Diet is a potential environmental factor that could be implicated in MS. Dr Piccio's group has shown that intermittent fasting (IF) ameliorates experimental autoimmune encephalomyelitis (EAE), the main MS animal model. They have investigated several mechanisms, including changes in blood adipokines and in the gut microbiome, all leading to a reduction of inflammation. The project will study the effects of diet on immune cells, circulating metabolites or metabolites derived from the gut microbiote in the EAE model.

Physiology Honours 2021

Laboratory	Nutritional Immunometabolism
Laboratory Head	A/Prof Laurence Macia
Supervisor	A/Prof Laurence Macia
Email address	Laurence.macia@sydney.edu.au
Phone	02 8627 6525
Location	Charles Perkins Centre
Zoom ID code	93693897751
Project name	**Manipulate Diet and Gut microbiota to treat diseases**
Project (100 words)	The recent rise of non-communicable diseases in developed countries such as autoimmune diseases and allergies remain unexplained. Changes in the nutritional landscape with the high consumption of unbalanced diets and processed food, as well as detrimental changes in the gut microbiota are believed to contribute to disease development. My team investigates the relationship between dietary components, gut bacteria and immune function to define novel strategies to prevent and treat diseases. During Honours you will identify the potential health benefits of defined gut bacteria as well as the mechanisms involved.

Physiology Honours 2021

Laboratory	Developmental Physiology Laboratory
Laboratory Head	A/Prof Margot Day
Supervisor	A/Prof Margot Day
Email address	Margot.day@sydney.edu.au
Phone	9036 3312
Location	Medical Foundation Building (Rm 232)
Zoom ID code	987 7707 5086
Project name	**Improving assisted reproduction**
Project (100 words)	4% of babies born in Australia result from assisted reproduction involving fertilization and culture of the embryo in vitro. The embryo culture environment can cause significant alterations in gene expression, epigenetics, metabolism and cell proliferation during preimplantation development and that these alterations may have effects on later life. Our studies aim to help us to understand the impact of the culture environment on pre-implantation embryonic development in order to improve reproductive outcomes via assisted reproduction. We study the physiological processes involved in fertilization of the oocyte and proliferation of the cells in the preimplantation embryo. We use a range of techniques including in vitro fertilization, isolation and culture of preimplantation mouse embryos, gene expression, cell signalling, electrophysiology and live cell imaging.

Physiology Honours 2021

Laboratory	Developmental & Cancer Biology Laboratory
Laboratory Head	A/Prof Matt Naylor
Supervisor	A/Prof Matt Naylor
Email address	matthew.naylor@sydney.edu.au
Phone	02 9351 4267
Location	Charles Perkins Centre
Zoom ID code	Please contact me directly for more information as I am teaching during the Honours information session
Project name	**Characterisation of novel regulators of breast & prostate cancer**
Project (100 words)	Control of cell fate and normal cell function is critical during development and is perturbed during carcinogenesis and tumour progression. We have developed a number of new mouse and cell based models to investigate a novel function for a number of new targets not previously implicated in breast or prostate cancer. Techniques employed can include a combination of in vitro based techniques such as cell culture, morphology, migration, proliferation and biochemical assays, shRNA, and in vivo based approaches such as genetic mouse models and xenografts. There are multiple projects available that can be tailored to your specific interests.

Physiology Honours 2021

Laboratory	Cardiovascular Neuroscience
Laboratory Head	Dr Melissa Farnham
Supervisor	Dr Melissa Farnham
Email address	melissa.farnham@hri.org.au
Phone	0415 821 096
Location	Heart Research Institute
Zoom ID code	92701590604
Project name	**Sleep Apnoea And Cardiometabolic Disease: What Goes Wrong In The Brain?**
Project (100 words)	Repetitive, or intermittent, hypoxia caused by repetitive airway collapse, is a key feature of OSA. Patients with OSA frequently develop additional cardiometabolic diseases such as hypertension and diabetes. It is imperative that we understand the mechanisms driving these pathological cardiometabolic changes so that we can detect OSA earlier and develop more effective treatment strategies for the future. Work from our lab has shown that the early cardiometabolic effects of intermittent hypoxia are dependent upon a neuropeptide acting at its receptors in specific areas of the brain and spinal cord. We hypothesise that neuropeptides are driving the chronic, maladaptive responses, leading to hypertension and development of type 2 diabetes in human OSA conditions. In this project you will be using rodents that will undergo an intermittent hypoxia protocol with and without pharmacological or genetic manipulation of central neurotransmission. You will assess the effects of these manipulations on blood pressure and glucose homeostasis. At the conclusion of the physiological experiments tissues and blood will be collected for further assessment of the neurocircuitry involved, and the downstream effects on target organs. This will use a range of techniques including small animal surgery, immunohistochemistry, ELISA, qPCR, Western Blot, and metabolomics.

Physiology Honours 2021

Laboratory	Kebede Islet Biology and Metabolism Lab
Laboratory Head	Melkam Kebede
Supervisor	Melkam Kebede and Belinda Yau
Email address	melkam.kebede@sydney.edu.au
Phone	8627 0164
Location	Charles Perkins Centre, Level 5 west
Zoom ID code	99121823133
Project name	**Insulin Secretory Granules and Diabetes**
Project (100 words)	High amounts of circulating proinsulin levels and reduced insulin response to a glucose challenge have been associated with human type 2 diabetes. Insulin is produced as a precursor, proinsulin, which is processed to mature insulin. Under normal conditions, only mature insulin is secreted into the blood stream in response to a rise in blood glucose levels. In patients with type 2 diabetes, an increased demand for insulin (usually from insulin resistance) confronts a failure of beta-cells to meet this demand. A common characteristic of this failure is a reduction in glucose stimulated mature insulin secretion and increased proinsulin secretion. This can be due to defects in proinsulin sorting into secretory vesicles prior to its processing to mature insulin. The mechanism of proinsulin sorting into secretory vesicles is unknown and this project aims to study novel candidate proteins, that may be responsible for this process. Insights from this work could lead to the development of novel therapeutic approaches aimed at proper trafficking of proinsulin resulting in efficient processing to insulin and hence availability of insulin for secretion.

Physiology Honours 2021

Laboratory	Sleep and Circadian Group, Woolcock Institute
Laboratory Head	Ron Grunstein
Supervisor	Ron Grunstein
Email address	ron.grunstein@sydney.edu.au
Phone	9114 0438
Location	Woolcock Institute, Glebe
Zoom ID code	**https://uni-sydney.zoom.us/j/92921595803**
Project name	**Sleep Spindles and Sleep Apnea in Schizophrenia and Controls**
Project (100 words)	Sleep spindles are bursts of neural oscillatory activity generated by the thalamic reticular nucleus (TRN) during stage 2 NREM sleep. Spindles play an essential role in both sensory processing and long-term memory consolidation. Sleep spindle abnormalities occur commonly in schizophrenia and we hypothesise this is worse in patients with co-existing obstructive sleep apnea (OSA). We have a database of sleep studies in patients with schizophrenia with and without OSA and controls. The project involves measuring spindle characteristics in the EEG to determine the influence of sleep apnea in schizophrenia using well established automated analytics in our centre.

Physiology Honours 2021

Laboratory	Solon-Biet
Laboratory Head	Dr Samantha Solon-Biet
Supervisor	Dr Samantha Solon-Biet
Email address	Samantha.biet@sydney.edu.au
Phone	0404 329 445
Location	D17 Level 4 East
Zoom ID code	97698428309
Project name	**Diet, sex and fertility -**
Project (100 words)	Our team is running a large macronutritional trial in mice exploring how diet can be used to optimize fertility, offspring and maternal health, and lifespan. Recently, we found that the simple act of mating can trick the body into thinking it is pregnant, a phenomenon called 'pseudopregnancy'. In this project, you will work in our team and lead your own research project investigating how diet interacts with mating to drive body composition, hormonal fluctuations, and fertility in mice.

Physiology Honours 2021

Laboratory	Thrombosis Research Group
Laboratory Head	Shaun Jackson
Supervisors	Shaun Jackson; Yuping Yuan; Mike Wu
Email address	shaun.jackson@sydney.edu.au; yuping.yuan@hri.org.au mike.wu@hri.org.au
Location	Level 3 East, Charles Perkins Centre
Zoom ID code	https://uni-sydney.zoom.us/j/9675888429?pwd=eStlRVpnekNLVEtDYVVSVVl6d3Z0UT09 Password: Thrombosis Or Meeting ID: 967 588 8429 ; Password: 4005825970
Project name	Cell death pathways regulating vascular dysfunction
Project (100 words)	*The **Thrombosis Research Group** aims to understand the events leading to blood vessel occlusion of the macro- and micro-vasculature, precipitating thrombosis and ischaemia reperfusion injury (IR) in cardiovascular disease*. There is increasing evidence that genetically-regulated cell death pathways (necroptosis, apoptosis, pyroptosis, autophagy) play an important role in regulating the cardiovascular system in health and disease. We have recently uncovered new roles for apoptosis and necroptosis in regulating microvascular dysfunction during IR injury. Our ongoing studies aim to identify/characterise the cell death pathways promoting IR injury, and identify/test novel therapeutic targets which may reduce the impact of IR injury on end-organ function (heart, brain and gut). This is particularly important given that dysregulation of these pathways may also help explain the vascular problems experienced by COVID-19 patients. Our approach to these research questions is to examine interactions between blood cells (platelets, leukocytes, erythrocytes) and injured blood vessels (primarily endothelial cells), in vitro and ex vivo, as well as in vivo using mouse models of thrombosis, ischaemic stroke and IR injury. We combine these approaches with cutting-edge technologies including: Advanced microscopy techniques (intravital imaging, confocal, TIRF, super resolution, 2-photon, tissue clearing); molecular mouse models and genome editing; Omic studies; Biomechanics/microfluidics, biomembrane force probe (BFP) studies. **Current projects include**: (i) Investigating a new thromboinflammatory mechanism triggered by dying endothelium and platelets; (ii) Understanding mechanisms leading to microvascular dysfunction and poor cerebral perfusion in stroke; (iii) Discovery/preclinical development of novel antiplatelet and/or anticoagulant treatments for stroke. *Relevant publications:* Yuan et al, Sci. Trans. Med, 2017 ; Sep 27;9(409); doi:10.1126/scitranslmed.aam5861; Jackson et al, ***Blood***, **133**(9):906-918. doi: 10.1182/blood-2018-11-882993; Jackson SP. *Nat Med.* 17(11) :1423-1436, 2011; Jackson et al, ***Nat Med***, 11(5):507-514, 2005.

Physiology Honours 2021

Laboratory	Applied Materials/Wise Lab
Laboratory Head	A/Prof Steven Wise
Supervisor	A/Prof Steven Wise
Email address	Steven.wise@sydney.edu.au
Phone	86279458
Location	D17 Charles Perkins Center
Zoom ID code	913 8020 8926
Project name	**Next Generation Immunomodulatory Cardiovascular Devices**
Project (100 words)	Although it is well established that chronic inflammation is central to the progression of cardiovascular disease (CVD), immunotherapies are not routinely used for clinical management. Large clinical trials have shown that *systemically* delivered broad-spectrum immunotherapies can compromise patient immune function. Immunotherapy *localisation* to sites of disease may increase effectiveness and safety, revolutionising the treatment of CVD. This project will design and develop new bioactive vascular materials that modulate local inflammation, representing a promising new way to treat underlying pathology, thereby establishing safe, effective, and lasting immunotherapies. The project will include design and engineering of bioactive material surface coatings, evaluation in cell culture models, with the potential for evaluation of devices in established pre-clinical models. The focus will be to increase our understanding of how materials can be designed to reduce pathological inflammation.

Physiology Honours 2021

Laboratory	Blood Cell Development Lab
Laboratory Head	Stuart Fraser
Supervisor	Stuart Fraser
Email address	Stuart.fraser@sydney.edu.au
Phone	9036-3313
Location	Medical Foundation Building
Zoom ID code	https://uni-sydney.zoom.us/j/93651709337
Project name	**Bursting Chordoma's Bubble**
Project (100 words)	Chordoma is a rare, life-threatening spinal cord tumour. Chordoma, the nucleus pulposus and notochord possess large vesicles termed physaliferous vacuoles (PV). We have discovered a transporter and a potassium channel regulates the formation of PV. When Bgt1/SLC6A12 was inhibited, chordoma cells rapidly apoptose. This project will dissect the physiological roles of Bgt1/SLC6A12 and KCNK2 in PV which may serve as novel chemotherapy targets.

Physiology Honours 2021

Laboratory	Molecular Neuroscience
Laboratory Head	William (Bill) Phillips
Supervisor	Bill Phillips
Email address	William.phillips@sydney.edu.au
Phone	02 9351 4598
Location	Physiology (Camperdown Campus)
Zoom ID code	645 882 0104
Project name	**MuSK and muscular dystrophy**
Project (100 words)	Duchenne muscular dystrophy (DMD) is a fatal disease of boys caused by a null mutation in the dystrophin gene. The *mdx* line of mice has a similar mutation and serves as a model for studying potential treatments for DMD. We have recently found that muscle damage can be reduced in *mdx* mice by injecting an adeno-associated viral vector that encodes Muscle Specific Kinase (MuSK; Trajanovska et al 2019 *Journal of Physiology* 597, 4831-4850). This project will study the effects of AAV vectors that encode other components of the MuSK signaling pathway to develop this a potential new therapy for DMD.

Physiology Honours 2021

Laboratory	Embryonic Stem Cell Laboratory
Laboratory Head	Dr Michael Morris
Supervisor	Dr Michael Morris
Email address	m.morris@sydney.edu.au
Phone	9036 3276
Location	Medical Foundation Building
Zoom ID code	977 269 6272
Project name	**Modelling early embryo development and neurogenesis using embryonic stem cells**
Project (100 words)	Embryonic stem (ES) cells have the potential to differentiate into any cell type of the developing embryo and adult. So, they are invaluable in understanding the molecular mechanisms that drive normal development and can provide a window into what happens during abnormal development. ES cells also have great potential in treating a large number of currently incurable or poorly treatable human diseases and injuries, including neuropathies, brain and spinal injuries, muscular diseases, and diabetes. We use ES cells as an *in vitro* model to understand the key molecular mechanisms underpinning critical developmental milestones forming the nervous system.

AMED General Q&A

Andrew Harman “AMED General Q&A” session 3-4pm
https://uni-sydney.zoom.us/j/99967094199

SOMS4101 General Q&A

Najla Nasr “SOMS4101 General Q&A” session 3-4pm
https://uni-sydney.zoom.us/j/92417106652