Faculty of Science
Summer Vacation Scholarships (2019/20)
RESEARCH TOPICS

Global Centre for Environmental Remediation

School of Environmental & Life Sciences

School of Mathematical & Physical Sciences

School of Psychology

Global Centre for Environmental Remediation:

Topic No.	Title of Research Topic	Description of Research Project	Principal Supervisor Contact Details	Research Group/ Centre	Discipline	Centre
1	**Seagrass: a major 'hot spot' for blue carbon sinks**	Coastal marine ecosystems including seagrass meadows, saltmarshes and mangroves contribute to ~70% of the carbon absorption in marine environments, making them "hot spot" blue carbon sinks. Seagrass habitats could sequester carbon much faster than tropical rainforests. The project aims to quantify seagrass-derived carbon sink and also to characterise the distribution of carbon in various seagrass species.	Prof Nanthi Bolan P: (02) 4913 8750 E: Nanthi.Bolan@newcastle.edu.au	Global Centre for Environmental Remediation	**Environmental Remediation**	GCER
2	**PFAS – Beyond Defence**	Poly- and perfluoroalkyl substances (PFASs) are a diverse group of synthetic fluorinated compounds which are bio accumulative and toxic to humans and the environment. Aqueous film forming foam (AFFF) used in firefighting is a major source of point source of PFAS input to soil and groundwater. Recently, there have been major concerns about contamination of groundwater sources with PFAS compounds in defence sites that have been testing AFFF for firefighting. Since these chemicals are resistant to heat, water, and oil, they have been widely used in general applications (non-stick cookware, grease-resistant paper, fast food wrappers, stain-resistant carpets and fabrics and water-resistant clothing. In addition, PFASs have also been used in different industrial applications (used as surfactants, medical applications, plastic manufacture, textiles, and leather). Incidences of PFAS contamination of soil and groundwater sources have been noticed beyond defence sites that include landfills and wastewater treatment plants. Biosolids and landfills are two other major diffuse sources of PFAS input to soil and groundwater sources. Many studies have found PFAS compounds resulting from aqueous film forming foam (AFFF) used in fire fighting sites, especially in defence sites. There have been limited research on PFAS compounds from other sources and their subsequent contamination in soil and water resources. The aim of this project is to undertake literature review on the sources, distribution, bioavailability and ecotoxicity of PFAS compounds.	Prof Nanthi Bolan P: (02) 4913 8750 E: Nanthi.Bolan@newcastle.edu.au	Global Centre for Environmental Remediation	**Environmental Remediation**	GCER

3	**Biowastes improve soil health**	A large volume of biowastes including biosolids and animal manures ate produced in Australia. These can be used as a major source of nutrient and carbon input to soil. This research project aims to quantify the volume of various biowastes produced in Australia and also to examine their value in improving the physical, chemical and biological fertility of soils.	Prof Nanthi Bolan P: (02) 4913 8750 E: Nanthi.Bolan@newcastle.edu.au	Global Centre for Environmental Remediation	**Environmental Remediation**	GCER
4	**Drug from dirt**	Finding new antibiotics is urgently needed because of antibiotic resistance in bacteria. Soil may help us to solve this problem. Many of the most widely used antibiotics have been derived from soil. For example, Penicillin is derived from *Penicillium*, a fungus/actinomycetes found in soil, and vancomycin is derived from a bacterium found in dirt. This project aims to prepare a review on the history of antibiotics derived from soil, and the current approaches to finding new antibiotics from soil.	Prof Nanthi Bolan P: (02) 4913 8750 E: Nanthi.Bolan@newcastle.edu.au	Global Centre for Environmental Remediation	**Environmental Remediation**	GCER
5	**Cannabis contamination**	Cannabis products can be contaminated with pesticides, heavy metals, plant growth hormones, and microbiological agents including mould and fungi. Contamination of cannabis occurs at various stages that include cultivation, processing and retailing. These contaminants are likely to impact the medicinal value of cannabis products. The project aims to undertake a review on the sources, distribution, bioavailability, toxicity, and risk assessment of various contaminants in cannabis products.	Prof Nanthi Bolan P: (02) 4913 8750 E: Nanthi.Bolan@newcastle.edu.au	Global Centre for Environmental Remediation	**Environmental Remediation**	GCER
6	**Fate and Behaviour of Microplastics in wastewater treatment plants**	In Australia, there are 159 single use plastics used per second. There is an increasing evidence that plastic debris are a potential threat to water and waste water systems. Plastics tend to break down into small particles and these are called microplastics (ranging in diameter from 1 micron to 5 millimetres). The studies from Europe showed that the treated municipal wastewaters contain synthetic textile fibres from washing of clothes and abrasive plastic fragments from cleaning agents. The average fibre concentration was 25 times higher and the particle concentration was three times higher in the effluent compared to the receiving body of water. This indicates that WWTPs may operate as a route for microplastics entering the sea. The objective of this study is to quantify and characterise the microplastics from waste water treatment plants and biosolids.	Dr Thava Palanisami P: (02) 40339411 E: Thava.Palanisami@newcastle.edu.au	Global Centre for Environmental Remediation	**Environmental Remediation**	GCER

7	**Plastic Puzzle: Risk assessment and management of microplastics in the aquatic and terrestrial environment**	Growing use of plastic materials led to a large amount of plastic debris in the environment. Although plastics are regarded as inert materials, concerns have been raised about the small-sized plastic particles, termed as microplastics, found in the environment. Existence of microplastics attracted public concerns because potential harmful effects of microplastic particles and associated chemical contaminants on human and ecological health are suspected. The project aims to investigate the insidious association of microplastics with chemical contaminants and its significance to ecological and human health. This multidisciplinary theme has several topics to choose for a student with any science background.	Dr Thava Palanisami P: (02) 40339411 E: Thava.Palanisami@newcastle.edu.au	Global Centre for Environmental Remediation	**Environmental Remediation**	GCER
8	**Toxicology of Contaminant Transformation Products**	Contaminant Transformation Products (CTPs) are the derivatives of parent chemicals which are often more toxic and bioavailable than parent compounds. These compounds can be formed from the source or transformation reactions inside the organisms. The impact of these chemicals to human health is yet to be understood. The project will focus on *in vitro, in vivo* risk of assessment of the polyaromatic compounds (PACs) related transformation products such as oxygen, nitrogen and sulphur containing PAHs from various sources.	Dr Thava Palanisami P: (02) 40339411 E: Thava.Palanisami@newcastle.edu.au	Global Centre for Environmental Remediation	**Environmental Remediation**	GCER

School of Environmental & Life Sciences:

Topic No.	Title of Research Topic	Description of Research Project	Principal Supervisor Contact Details	Research Group/ Centre	Discipline	School
9	**Female hormones and exercise performance**	During their reproductive years most women are exposed to continuously changing female steroid hormone profiles throughout the menstrual cycle or through oral contraceptive use. These hormone fluctuations have many physiological effects, which may in turn affect exercise performance. There are many opportunities for research projects in this area on a wide variety of topics, such as the effect of oral contraceptive use on muscle strength. Details of specific projects will be determined in consultation with the academic staff.	Dr Xanne Janse de Jonge P: (02) 4349 4566 E: x.jansedejonge@newcastle.edu.au	Exercise & Sport Science	**Applied Sciences (Ourimbah Campus)**	SELS
10	**Adapting training programs to female hormone fluctuations**	During their reproductive years most women are exposed to continuously changing female steroid hormone profiles throughout the menstrual cycle or through oral contraceptive use. These hormone fluctuations have many physiological effects. Oestrogen, for example, is known for its anabolic effects. Therefore, it is expected that conditions for muscle growth are better when oestrogen is elevated. Thus the variability in oestrogen levels due to the menstrual cycle or oral contraceptive use may affect the ability of skeletal muscle to respond to resistance training. This research will investigate how females can adapt their training programs to take advantage of their hormone fluctuations for greater training adaptations.	Dr Xanne Janse de Jonge P: (02) 4349 4566 E: x.jansedejonge@newcastle.edu.au	Exercise & Sport Science	**Applied Sciences (Ourimbah Campus)**	SELS
11	**Applied Sport Science Research in Soccer**	There are opportunities for applied sport science research working with a professional soccer team. Research projects may include topics such as training load monitoring, analysis of match demands using GPS, monitoring and intervention for hydration status. Details of the research project will be determined in consultation with the soccer team's sport science staff.	Dr Xanne Janse de Jonge P: (02) 4349 4566 E: x.jansedejonge@newcastle.edu.au	Exercise & Sport Science	**Applied Sciences (Ourimbah Campus)**	SELS

12	**Can ambient scent promote healthier food choices?**	Food and eating environment have a major impact on food choice and consumed amounts. Therefore, strategically restructuring food environments seems promising to promote population health. Internal physiological signals such as hunger and satiety are often overruled by external factors such as availability, variety, convenience, and portion size. It has been established that room atmospherics, including sensory stimuli, influence shopping behaviour. Recent research has shown that sensory stimuli, including ambient scent, may be used to nudge healthy food choices. Controlled experiments to test this hypothesis are presently lacking, as ambient factors in food purchase and consumption environments are difficult to control in natural settings such as supermarkets and restaurants. This project aims to investigate how ambient scents influence food choice, and to test potential of specific scents to nudge healthy choices in out of home eating situations.	Dr Tamara Bucher E: tamara.bucher@newcastle.edu.au P: 0451 287406	Priority Research Centre for Physical Activity and Nutrition (PRCPAN)	**Food Science** **Consumer Behaviour** **Applied Sciences (Ourimbah Campus)**	SELS
13	**Wine and Health**	Moderate wine consumption may be associated with specific health benefits and a healthy life style. However, increase amounts of ethanol are cytotoxic and associated with adverse health outcomes. Consumers' choices are increasingly influenced by health. In the current project, we aim to investigate the role of health in the wine consumer's decision-making. The project involves a literature review on consumers' perceptions of the health impact of wine, and whether these perceptions influence wine consumption.	Dr Tamara Bucher E: tamara.bucher@newcastle.edu.au P: 0451 287406	Priority Research Centre for Physical Activity and Nutrition (PRCPAN)	**Food Science** **Consumer Behaviour** **Applied Sciences (Ourimbah Campus)**	SELS
14	**Consumer Perception of Eucalyptus Scents**	Mosquito borne diseases are a global problem. Mosquito infestation is also problematic within the UON internal and external campus environments during the peak mosquito breeding season. This project investigates the effectiveness of eucalyptus essential oil as mosquito repellent and assesses consumer perception and acceptability of essential oil diffusion in general and for specific types of Eucalyptus variants. In the long-term, plantation of specific Eucalyptus tree variants may be considered as a sustainable solution to control mosquito infestation.	Dr Tamara Bucher & Dr Bill Budd E: tamara.bucher@newcastle.edu.au P: 0451 287406	Priority Research Centre for Physical Activity and Nutrition (PRCPAN)	**Food Science** **Consumer Behaviour** **Applied Sciences (Ourimbah Campus)**	SELS

15	**Conflicting information on health**	It has never been easier to access health information on various topics including nutrition. However, the quality of this information varies enormously. People encounter sources from research backed public health websites (and the papers they draw on), through to conspiracy theorists and junk science. Moreover, the claims that these varied sources make can be in direct opposition, with one source recommending an action or remedy, and another decrying it. To date, not much is known about how such conflicts or expert disagreements are perceived by lay people. This research project aims to investigate how people navigate conflicting health advice and how this influences their decision-making.	Dr Tamara Bucher E: tamara.bucher@newcastle.edu.au P: 0451 287406	Priority Research Centre for Physical Activity and Nutrition (PRCPAN)	**Food Science** **Consumer Behaviour** **Applied Sciences (Ourimbah Campus)**	SELS
16	**Pre-storage UV-C light treatment to extend postharvest life of fruit and vegetables**	UV-C light treatment has been shown to have beneficial effects in maintaining postharvest quality of fresh fruit and vegetables. In a laboratory scale, UV-C treatment has been reported to delay ripening and senescence in non-climacteric and in climacteric, as well as to delay degreening fruits and vegetables. However, there are few reports of semi-commercial UV-C lights treatment on fruits and vegetables qualities. This project will use semi-commercial UV-C lights treatment to maintain fruit and vegetables quality.	Dr Penta Pristijono E: penta.pristijono@newcastle.edu.au P: (02) 4349 4783 (Ourimbah Campus)	Food Science Horticultural Postharvest	**Applied Sciences (Ourimbah Campus)**	SELS
17	**Low pressure storage as an alternative treatment to maintain fruit and vegetables quality after harvest**	Both qualitative and qualities losses occur in horticultural produces between harvest and consumption. A reduction of postharvest losses can be minimised using different postharvest technologies. This project focuses on using non-chemical low pressure storage as an alternative method to maintain fruit and vegetables quality after harvest.	Dr Penta Pristijono E: penta.pristijono@newcastle.edu.au P: (02) 4349 4783 (Ourimbah Campus) Dr John Golding E: john.golding@dpi.nsw.gov.au P: (02) 4348 1926	Food Science Horticultural Postharvest	**Applied Sciences (Ourimbah Campus)** **NSW DPI**	SELS
18	**Innovative postharvest technologies to control horticultural postharvest pathogens**	Horticultural postharvest qualities losses due to pathogens occur in many fresh fruit and vegetables between harvest and consumption. The effective control of postharvest pathogens significantly reduces postharvest losses and can improve fruits and vegetables quality during storage. This project will use current postharvest technologies alone or in combination to control horticultural postharvest pathogens.	Dr Penta Pristijono E: penta.pristijono@newcastle.edu.au P: (02) 4349 4783 (Ourimbah Campus) Dr John Golding E: john.golding@dpi.nsw.gov.au P: (02) 4348 1926	Food Science Horticultural Postharvest	**Applied Sciences (Ourimbah Campus)** **NSW DPI**	SELS

19	**Measuring changes in mechanical strengthening of canola roots caused by induction of phi thickenings**	Phi thickenings are novel bands of secondary cell wall thickenings found in the root cortex of many plant species. These unusual structures are often induced by abiotic stress, but the role(s) that they play in root physiology remain unclear. In this project, we will determine whether a correlation exists between increased mechanical strength of *Brassica napus* (canola) roots and salt-induced phi thickenings. Using different canola cultivars, one which induces phi thickenings and another which does not, we will determine whether phi thickenings allow roots to penetrate agar media of higher mechanical strengths. Direct measurements will also be made of root mechanical properties.	A/Prof David Collings P: (02) 4921 5702 E: david.collings@newcastle.edu.au A/Prof David McCurdy P: (02) 4921 5879 E: david.mccurdy@newcastle.edu.au	Centre for Plant Science	**Biological Sciences**	SELS
20	**Transcriptional analysis of phi thickening development in roots of the Brassicacea**	This project will use contemporary molecular biology approaches to identify regulatory and biosynthetic genes associated with phi thickening development in roots of *Brassica napus* (canola) and *B. oleracea* (broccoli). Phi thickenings are proposed to play important roles in root development in response to abiotic stress, and understanding the genetic machinery responsible for their induction and deposition has potential applied applications for agriculture. The project will use RT-qPCR to quantify gene expression associated with phi thickening development, and thus is well suited for a student wanting to gain molecular biology skills.	A/Prof David Collings P: (02) 4921 5702 E: david.collings@newcastle.edu.au A/Prof David McCurdy P: (02) 4921 5879 E: david.mccurdy@newcastle.edu.au	Centre for Plant Science	**Biological Sciences**	SELS
21	**Transfer cells in *Arabidopsis thaliana* - primary cell walls, secondary cell walls, or a hybrid cell wall?**	Transfer cells develop in the phloem parenchyma of leaves in *Arabidopsis thaliana*. These cells are thought to contribute to loading of photosynthates into the phloem because of the increased plasma membrane surface area that results from the highly-complex and asymmetric deposition of new cell wall material on the phloem-facing cell walls. This project will determine whether these unusual cell walls are primary or secondary cell walls, or a novel hybrid of both wall types, through the analysis of mutants in which the biosynthesis of either the primary or secondary cell wall has been disrupted, and through targeted disruption of cellulose biosynthesis with drugs.	A/Prof David McCurdy P: (02) 4921 5879 E: david.mccurdy@newcastle.edu.au A/Prof David Collings P: (02) 4921 5702 E: david.collings@newcastle.edu.au	Centre for Plant Science	**Biological Sciences**	SELS

22	**Transcriptional analysis of transfer cell development**	This project will contribute to an on-going study using Illumina-based sequencing (RNA-Seq) to analyse transcriptional changes occurring during induction and wall ingrowth building of transfer cells (TCs). The experimental approach uses the model genetic species *Arabidopsis thaliana* and will involve analysis of selected mutants as well as bioinformatics analysis of selected gene expression. The project will develop a new procedure for isolation of TCs using fluorescence-activated cell sorting of GFP-labelled TCs. The project is suited for a student wanting to gain experience in molecular biology skills, bioinformatics and cell biology.	A/Prof David McCurdy P: (02) 4921 5879 E: david.mccurdy@newcastle.edu.au A/Prof David Collings P: (02) 4921 5702 E: david.collings@newcastle.edu.au	Centre for Plant Science	**Biological Sciences**	SELS
23	**Contribution to Earth Biogenome Project**	The Earth Biogenome Project aims to sequence and characterise the genomes of all of Earth's eukaryotic biodiversity over a period of ten years. A contribution to this remarkable and visionary project is being undertaken by the Sanger Institute in the UK and plans to include a significant number of medicinal plants native to the UK and Australia. This project is a study to establish a priority list of Australian medicinal plant species for sequencing, considered to have efficacious medical properties. A broad survey of literature, grey and otherwise, as well as an investigation of anecdotal information from indigenous sources will be pursued.	Prof Christopher Grof P: (02) 4921 5858 E: Chris.Grof@newcastle.edu.au	Centre for Plant Science	**Biological Sciences**	SELS
24	**Biofuel feedstocks for arid environments**	Lignocellulosic bioethanol derived from plant biomass will provide a cost effective contribution to environmental sustainability and energy security. *Setaria italica* and *Setaria viridis* (foxtail and green millet respectively) are ideal genetic models to dissect biomass quality traits of C_4 monocotyledonous grasses. Genetic engineering of these species is now possible and a very high success rate of transformation of one particular accession of *S. viridis* has recently been reported. This project will endeavour to establish tissue culture and transformation parameters using fluorescent reporter genes, for routine genetic engineering of this accession in our laboratory.	Prof Christopher Grof P: (02) 4921 5858 E: Chris.Grof@newcastle.edu.au	Centre for Plant Science	**Biological Sciences**	SELS

25	**Sustain plant reproductive success under heat stress: A sweet approach**	Plant reproductive processes are highly susceptible to heat stress, which often leads to pollination failure and fruit and seed abortion, hence irreversible yield loss. Our research has established that cell wall invertase (CWIN)-mediated sugar metabolism and signaling may play crucial roles in pollen growth and fruit set under heat stress. This project aims to determine how genetic manipulation of CWIN activity may enhance pollen viability and fruit set under heat stress using tomato as a model. The intended outcome is the generation of critical new knowledge that will advance our understanding on reproductive response to heat stress, thereby providing novel ideas and solutions for improving crop yield under Global Warming.	Prof Yong-Ling Ruan E: yong-ling.ruan@newcastle.edu.au P: (02) 4921 7958 https://www.newcastle.edu.au/profile/yong-ling-ruan	Australia-China Centre for Crop Improvement; Centre of Plant Science	**Biological Sciences**	SELS
26	**Supercharge plants for super performance**	Unfolding their leaves as solar panels, plants use light to spark biochemical reactions that convert atmospheric CO2 into sucrose. This essential nutrient and energy currency not only powers growth, but also fortifies defences against all sorts of stresses, pathogens and pest attacks. The partitioning of plant's sucrose between source (leaves) and sink (non-photosynthetic organs such as seed) determines plant architecture and crop yield. We have recently identified CIN as a key player in regulating sugar signalling for energy production and plant growth. By using molecular and genetic approaches, this project aims to manipulate CIN gene expression in 'engine'-like cells to improve energy use efficiency for fitness and food production.	Prof Yong-Ling Ruan E: yong-ling.ruan@newcastle.edu.au P: (02) 4921 7958 https://www.newcastle.edu.au/profile/yong-ling-ruan	Australia-China Centre for Crop Improvement; Centre of Plant Science	**Biological Sciences**	SELS
27	**Hi, can you see me? -Visualising the crosstalk between sugar- and hormonal signalling**	Sugar and hormonal signalling pathways integrate at the molecular level to regulate plant development. It is, however, technically challenging to assess how the two components cross-talk with each other. This obstacle impedes understating of Plant Biology, hence limiting our avenues to improve plant performance, especially under stress such as heat, cold and drought. Through our prior research and international collaboration, we have obtained a suite of transgenic plants where one of the two components are genetically altered and linked with green or red-fluorescent report proteins (GFP, RFP respectively). We will use these materials and the state-of-art molecular techniques, coupled with advanced microscopy, to visualize the crosstalk between sugar and hormone signalling pathways, thereby shedding a light into this 'black box' in Biology.	Prof Yong-Ling Ruan E: yong-ling.ruan@newcastle.edu.au P: (02) 4921 7958 https://www.newcastle.edu.au/profile/yong-ling-ruan	Australia-China Centre for Crop Improvement; Centre of Plant Science	**Biological Sciences**	SELS

28	**Exploring cyanobacterial specialised metabolism using heterologous expression**	Microbial natural products have served as a major inspiration for the development of novel pharmaceuticals. The search for new natural products is a continuing endeavour, with new niches and microorganisms being probed to determine their ability to produce useful bioactive molecules. Cyanobacteria are a largely untapped phyla that produce a multitude of natural products eliciting a range of pharmaceutically-relevant activities. A large limitation for the exploitation of these molecules is the lack of accessibility in the natural host due to slow growth rates, relatively low production levels, and a inability to genetically manipulate the cyanobacteria. Therefore, this project will involve the isolation of cyanobacterial natural product biosynthesis genes, engineering them for heterologous expression in Escherichia coli, and gene knockouts to characterise the enzymology of biosynthesis.	Prof Brett Neilan E: brett.neilan@newcastle.edu.au P: (02) 4921 5854	Neilan Laboratory of Microbial and Molecular Diversity	**Biological Sciences**	SELS
29	**The puzzling nature of a contemporary fossil**	Hopanoids are bacterial lipids hypothesised to be functional analogues of eukaryotic sterols, and are widely used as bacterial biomarkers in the geological fossil record. Today, hopanoids occur in a wide range of Gram-negative and Gram-positive bacteria, including those that form symbiotic associations with plants, yet large gaps still exist in our understanding of the breadth of the physiological functions of hopanoids. The physiological role and regulation of hopanoid production is diverse across the phyla, making the elucidation of their role somewhat elusive. This project will use hopanoid-deficient mutant strains of cyanobacteria to investigate phenotypic differences to gain a greater understanding of the function of hopanoids in cyanobacterial membranes.	Prof Brett Neilan E: brett.neilan@newcastle.edu.au P: (02) 4921 5854	Neilan Laboratory of Microbial and Molecular Diversity	**Biological Sciences**	SELS

30	**Expression and characterization of sunscreen compounds from environmental microorganisms**	This project addresses the fundamental need and growing demand for novel natural compounds in the cosmetic industry and beyond. It is pivotal in light of the growing ban on sunscreens in places such as Hawaii and moving towards an ecologically sustainable alternative. Ancient bacteria that thrived in high UV environments are an ideal source of sunscreen compounds. The discovery of sunscreen molecules with broad and/or stronger absorbance capacity of ultra-violet radiation will improve the protection against the increasing latent skin cancer.	Prof Brett Neilan E: brett.neilan@newcastle.edu.au P: (02) 4921 5854	Neilan Laboratory of Microbial and Molecular Diversity	**Biological Sciences**	SELS
31	**Discovery and characterisation of novel lanthipeptide biopreservatives**	For thirty years, lantibiotics such as nisin and its derivatives have been used as food preservatives. While nisin has a broad spectrum of action, there are many bacterial species that escape its activity, and it is crucial to identify new molecules with complementary activities to those already used in the food industry. We aim to discover, test and develop a set of previously unknown lanthipeptide compounds for their potential applications in the food industry. To biologically and structurally characterise the novel lantipeptide we aim to clone the genes responsible for the biosynthesis of the lantitpeptide and express them in an heterologous host.	Prof Brett Neilan E: brett.neilan@newcastle.edu.au P: (02) 4921 5854	Neilan Laboratory of Microbial and Molecular Diversity	**Biological Sciences**	SELS
32	**Water quality and harmful algal blooms.**	Around the globe many significant drinking water sources have or will become infested with harmful algal blooms. The past twenty years has witnessed major advances in our understanding of the genetic basis for toxin production in these microorganisms, however research into the formation of blooms and the prediction of toxic bloom events is required to maintain healthy water supply. As a part of our ongoing commitment to water quality research we offer research projects tailored around specific drinking water and water treatment processes. This is an exciting opportunity to learn multidisciplinary and emerging skills such as data processing, bioinformatics and modelling.	Prof Brett Neilan E: brett.neilan@newcastle.edu.au P: (02) 4921 5854	Neilan Laboratory of Microbial and Molecular Diversity	**Biological Sciences**	SELS

33	**Ethnobotany of Samoa: a drug discovery program**	To continue to treat clinical infections in humans and animals it is imperative that we discover new anti-infective agents with novel modes of action. Endophytes have recently generated significant interest in the microbial chemistry community due to their immense potential to contribute to the discovery of new bioactive compounds. Students will work with endophytes isolated from traditional medicine plants used by the people of Samoa, screen these isolates for biosynthetic potential/bioactivity and finally purify compounds of interest for structural determination.	Prof Brett Neilan E: brett.neilan@newcastle.edu.au P: (02) 4921 5854	Neilan Laboratory of Microbial and Molecular Diversity	**Biological Sciences**	SELS
34	**How to cope if you drop your fork: DNA replication repair in bacteria**	DNA replication is prone to being blocked by DNA damage or tightly bound DNA-protein complexes. Prolonged blockage can lead to replication fork collapse and reversal. This project will make a knockout of the exonuclease gene, *exoI*, which is thought to degrade some of the newly synthesised DNA at the replication fork. The effect on viability and replication restart will be determined.	A/Prof Ian Grainge P: (02) 4921 7238 E: ian.grainge@newcastle.edu.au	Priority Research Centre for Chemical Biology and Clinical Pharmacology Priority Research Centre in Digestive Health and Neurogastroenterology	**Biological Sciences**	SELS
35	**Getting cross after dropping your fork: DNA replication repair in bacteria 2**	DNA replication is prone to being blocked by DNA damage or tightly bound DNA-protein complexes. Prolonged blockage can lead to replication fork collapse and reversal that produces a cross-shaped four-way DNA structure- a Holliday Junction (HJ). This project will aim to trap reversed replication forks using a specific peptide that binds to the HJ. The enriched HJs will be identified on a gel and formation followed over time in living cells, and in different mutant backgrounds.	A/Prof Ian Grainge P: (02) 4921 7238 E: ian.grainge@newcastle.edu.au	Priority Research Centre for Chemical Biology and Clinical Pharmacology Priority Research Centre in Digestive Health and Neurogastroenterology	**Biological Sciences**	SELS
36	**Pores in disks**	This project will aim to clone a His-tagged expression vector of the N-terminal domain of the FtsK protein. This protein is involved in cell division and chromosome segregation in bacteria and the N-terminal is thought to form a hexamer in the membrane, and may form a pore through which DNA can be pumped. The tagged protein will be extracted in artificial lipid layers called SMALPs, ready for structural study by cryo-EM.	A/Prof Ian Grainge P: (02) 4921 7238 E: ian.grainge@newcastle.edu.au	Priority Research Centre for Chemical Biology and Clinical Pharmacology Priority Research Centre in Digestive Health and Neurogastroenterology	**Biological Sciences**	SELS

37	**Investigating a novel mechanism for the spread of antibiotic resistance**	*Acinetobacter baumanii* is a human pathogen of the highest concern due to its increasing acquisition of antibiotic resistances. This project will examine a novel mechanism used by plasmids of *A. baumannii* to shuffle antibiotic resistance cassettes leading to the spread of antibiotic resistance among strains.	A/Prof Ian Grainge P: (02) 4921 7238 E: ian.grainge@newcastle.edu.au	Priority Research Centre for Chemical Biology and Clinical Pharmacology Priority Research Centre in Digestive Health and Neurogastroenterology	**Biological Sciences**	SELS
38	**Regulation of the sperm epigenome by extracellular vesicles: a new paradigm**	The prolonged phases of post-testicular maturation and storage of sperm within the male reproductive tract (epididymis) serve as key determinants of gamete quality and fertilisation competence. It has long been held that such processes are driven by dynamic modification of the sperm proteome. However, we have recently shown that the sperm epigenome [i.e. the small non-coding RNAs (sRNAs) carried by sperm cells] is also markedly altered during their epididymal maturation. Such findings are of interest since this complex repertoire of sperm sRNAs are delivered to the oocyte during fertilisation, and can thereafter regulate gene expression and exert substantial influence over early embryonic development. In this project we aim to explore the role of extracellular vesicles in the transfer of sRNAs to maturing spermatozoa; a pathway that would represent a novel mechanism of soma-to-germline communication.	Prof Brett Nixon E: brett.nixon@newcastle.edu.au P: (02) 4921 6977 Dr Andy Eamens E: andy.emanes@newcastle.edu.au	Reproductive Science Group PRC for Reproductive Science	**Biological Sciences**	SELS
39	**Proteomic analysis of koala spermatozoa**	This project forms an important part of our goal to systematically map the proteomic composition of sperm. By focusing on comparative analyses of sperm from representative avian, reptilian, marsupial and eutherian mammals, we hope to identify elements of the sperm proteome that are highly conserved and therefore essential for general sperm physiology as opposed to those proteins that differ and may therefore contribute to species-specific aspects of fertilisation. This specific project will harness cutting edge mass spectrometry to conduct the first comprehensive proteomic analysis of marsupial sperm, focusing on the iconic koala. Practical applications of this knowledge extend to the development of innovative assisted reproductive strategies to help safeguard the 'vulnerable' koala, and their 'critically endangered' relative the Northern hairy-nosed wombat, against future population decline.	Prof Brett Nixon E: brett.nixon@newcastle.edu.au P: (02) 4921 6977 Dr David Skerrett-Byrne E: david.skerrett-byrne@newcastle.edu.au	Reproductive Science Group PRC for Reproductive Science	**Biological Sciences**	SELS

40	**Proteomic characterisation of the mouse seminal vesicle and its secretions**	The seminal vesicle is a male accessory sex gland in all mammalian species whose secretions contribute to the composition of the male ejaculate. These secretions play an important role in male and female reproductive biology, carrying factors which facilitate sperm survival and sperm transport. Additionally, seminal vesicle secretions communicate with the female reproductive tract to influence the quality of pregnancy and health of offspring. Despite the critical role that seminal vesicle secretions play around the period of conception and throughout pregnancy, there are limited studies that have characterized this gland. In this project, students will utilize state of the art proteomic and bioinformatic techniques to characterize the protein composition of the mouse seminal vesicle and its secretions. These studies will improve our understanding of this key male accessory sex gland and may reveal novel functions of the seminal vesicle and its secretions in male and female reproductive health.	Dr John Schjenken E: john.schjenken@newcastle.edu.au P: (02) 4921 6351 Prof Brett Nixon E: brett.nixon@newcastle.edu.au Dr David Skerrett-Byrne E: david.skerrett-byrne@newcastle.edu.au	Reproductive Science Group PRC for Reproductive Science	**Biological Sciences**	SELS
41	**Understanding the impact of heat stress and poor sperm production**	Although not often publicised, many man suffer from infertility and/or subfertility. This leads to a situation where it can take couples years to conceive a child or require the aid of an IVF clinic. A major cause of poor sperm production is heat stress. This project will look at heat stress in two ways. Firstly, mice will be anesthetised and undergo testicular heat stress. We will look at the impact this has on sperm production and where things go wrong. Secondly, we have teamed up with a company to look at the effect of scrotal cooling and the ability to improve sperm parameters. At the end of this project, students will learn how to anesthetise mice, look at immunohistochemically analysis of testis and sperm sections and finally analyse the impact of scrotal as a means for improving male fertility.	A/Prof Mark Baker E: mark.baker@newcastle.edu.au P: (02) 4921 7880 Dr Zamira Gibb E: Zamira.Gibb@newcastle.edu.au	Reproductive Science Group PRC for Reproductive Science	**Biological Sciences**	SELS
42	**The use of CRISPR/Cas9 to understand male-infertility**	Gene editing technology is an important tool to understand biological process, including cancer, immunology and reproduction. Herein, students will learn how to design vectors for the use of CRISPR/Cas9. Using this technology, we will endeavour to produce mouse genetic knockouts to understand the biology of specific genes. In this case, we are particularly interested in genes whose expression only occurs with the testis. This specific project will enable students to better understand CRISPR/Cas9 which has been touted as a major tool for research into all areas of disease management.	A/Prof Mark Baker E: mark.baker@newcastle.edu.au P: (02) 4921 7880	Reproductive Science Group PRC for Reproductive Science	**Biological Sciences**	SELS

43	**Utilising viral vectors to manipulate testis function**	The use of viral vectors for the delivery of gene modification technology is increasing exponentially in both research and clinical fields. Previously in our lab we have explored the use of this technology, specifically Lentiviral and Adenoviral vectors, to target the somatic cells of the adult mouse testis and exploited these methods to both modify gene expression and rescue infertility in mice. We are now investigating Adeno-Associated viral vectors (AAV) and inducible lentiviral vectors (Ind-LV) to determine their capabilities for targeting cells in the adult testis. This project will aim to characterise the targeting of viral vectors in the adult testis when delivered to either the interstitial or the tubular compartments of the adult testis. Techniques will include, but are not limited to: animal dissection, whole tissue imaging (fluorescent), immunohistochemistry (chromogenic and fluorescent), sample preparation and histological methods and stereology.	Dr Annalucia Darbey E: Annalucia.Darbey@Newcastle.edu.au P: (+61) 0249 854598	Reproductive Science Group PRC for Reproductive Science	**Biological Sciences**	SELS
44	**Understanding the androgens pathways**	Androgens are crucial for male development, fertility and wellbeing. Here we plan to decipher the importance of steroidogenic enzymes in the production of key androgens. This project will aim at selectively knocking down genes involved in the steroidogenesis and assess the androgens levels and the potential mechanism of regulation. Techniques will include, but are not limited to: animal dissection, whole tissue imaging (fluorescent), immunohistochemistry (chromogenic and fluorescent), sample preparation and histological methods and stereology.	Dr Diane Rebourcet E: Diane.Rebourcet@Newcastle.edu.au P: (+61) 0249 854598	Reproductive Science Group PRC for Reproductive Science	**Biological Sciences**	SELS
45	**Nervous system of testicular function**	There is evidence that the nervous system influences testicular function. The aim of this project is to investigate the spatial localisation of nerve fibres and receptors for neurotransmitters on each of the testicular cell types. Using state of the art approaches, we will first assess the intricacies of the nervous system network within the testis and identify the relation with testicular cell types during testis development. Plan of work: We will use wild type animals and/or neuronal reporter lines at different ages postnatally (fetal/neonatal, d15-d35 pubertal, d50-80 adult). Each mouse model will be complementary and inform us on different aspects of fibre innervation and potential implications in testis biology. Techniques will include, but are not limited to: animal dissection, whole tissue imaging (fluorescent), immunohistochemistry (chromogenic and fluorescent), sample preparation and histological methods and stereology.	Dr Diane Rebourcet E: Diane.Rebourcet@Newcastle.edu.au P: (+61) 0249 854598	Reproductive Science Group PRC for Reproductive Science	**Biological Sciences**	SELS

46	**Glucocorticoid regulation of testis function**	It has been well established that stress impacts fertility, yet the exact role of glucocorticoid signalling in the testis remains undefined. This project will look at the impact of the glucocorticoid signalling on the morphology and function of the leydig cells in the testis. This will be assessed using novel transgenic mouse models, nanotechnology, dissection, morphology analysis, immunohistochemistry and cell counts. There will also be the opportunity to learn computational biological modelling relating to the results obtained. This project provides the opportunity to learn a wide range of innovative laboratory techniques in a brand new lab.	Dr Anne-Louise Gannon E: Annelouise.gannon@New castle.edu.au P: (+61) 0249 854598	Reproductive Science Group PRC for Reproductive Science	**Biological Sciences**	SELS
47	**Understanding molecular mechanisms that regulate stem cell function in the male germline**	Adult stem cells are the undifferentiated cohort within a tissue that are unique in their capacity for long term self-renewal while also giving rise to differentiating cells within the lineage. Spermatogonial stem cells (SSCs) are unipotent; acting as the driving force behind ongoing sperm production and male fertility, while also providing a tractable model to study molecular mechanisms that dictate self-renewal and lineage specification. Beyond this, SSCs have the potential to be used as a therapeutic tool for fertility restoration in male survivors of childhood cancer that have been rendered permanently infertile by chemotherapy or radiotherapy treatments. Currently, we have a limited understanding of molecular mechanisms that regulate SSC activity, and how these processes may be dysregulated in an in vitro setting (i.e. in preparing these cells for therapeutic use). Thus, in this project, we will use a mouse model to study transcription factor networks that define spermatogonial stem cell activity, and investigate changes in expression of these factors following extended periods of in vitro culture.	Dr. Tessa Lord E: Tessa.lord@newcastle.edu.au P: (02) 4055 3026	Reproductive Science Group PRC for Reproductive Science	**Biological Sciences**	SELS
48	**Protein modelling and drug interactions**	Male infertility effects 1 in 20 Australian men, therefore the development of rational therapies to minimise fertility issues are greatly needed. Oxidative stress in known to be a key driver of poor sperm function, however the origin of this stressor is poorly defined. We now know that lipoxygenase enzymes in spermatozoa, are a potential driver of oxidative stress and therefore is a valuable target for male infertility therapies. This project will involve the use a combination of online databases and platforms together with dedicated molecular modelling software hosted at the UON, to build virtual enzyme structures, which can used to study drug interactions and enzyme activity.	Dr Geoffry De Iuliis E: geoffry.deiuliis@newcasltle.edu.au P: (02) 4921 7295	Reproductive Science Group PRC for Reproductive Science	**Biological Sciences**	SELS

49	**Sperm RNA binding proteins and measuring RNA damage**	MicroRNA species are a key epigenetic factor that contributes not only to fertility but also to normal embryo development. While the importance of these epigenetic factors in reproduction is now established, how these microRNA species are packaged in the male reproductive tract and therefore their vulnerabilities to damage, particularly oxidative damage, is poorly characterised. This project will use a combination of a bioinformatics and protein/RNA isolation techniques to identify RNA binding protein candidates and to assess RNA oxidative damage.	Dr Geoffry De Iuliis E: geoffry.deiuliis@newcasltle.edu.au P: (02) 4921 7295	Reproductive Science Group PRC for Reproductive Science	**Biological Sciences**	SELS
50	**How do the electromagnetic fields used by mobile devices stop sperm motility?**	Electromagnetic energy in the radio and microwave spectrum (non-ionising radiation) are currently used for communications between mobile devices and access points (transmission towers and WiFi points). The ubiquitous nature of mobile device use in today's society has called into question the safety of such devices via the chronic exposure to low level, non-ionising radiation. We have found that experimental simulation of these fields are able to stop human sperm motility. This project will involve the exposure of spermatozoa to electromagnetic energy and the subsequent assessment of perturbed biochemical pathways that may lead to the observed motility loss. Understanding the origins of these effects in biology are critical for informing safety standards, while contributing to an area of science in the public spotlight.	Dr Geoffry De Iuliis E: geoffry.deiuliis@newcasltle.edu.au P: (02) 4921 7295	Reproductive Science Group PRC for Reproductive Science	**Biological Sciences**	SELS
51	**Synthesis of novel, bispidinone-based anticancer peptide analogues.**	Despite a decline in overall cancer death rates, the mortality rate of pancreatic cancer (PC) remains high. The heterogeneity of PC makes the development of effective and wide acting chemotherapy treatments challenging. Peptides are an emerging area of interest in anticancer research as they offer new a range of potential new treatment mechanisms. Cationic antimicrobial peptides (CAPs) are common defence proteins in insect populations. This project aims to develop a new class of small molecule CAP based on the bispidinone ring system. The bispidinone ring is a rigid multiring structure possessing well-defined proximal geometry (equatorial and longitudinal), making it an ideal candidate for drug development.	Prof Mike Bowyer E: Michael.bowyer@newcastle.edu.au P: 0439 643202	Drug Development	**Chemistry**	SELS

52	**Manipulation of lipid nanostructures by protein attachment**	Drug delivery systems are used to maximise the rate and amount of drug delivered to the site of action whilst minimising side effects that can be caused by acute doses of drug. Lipid nanoparticles are used for this purpose not only because they are biocompatible, but also because the nanostructure that they form dictate the rate of release of drug. The nanostructure that they form can be precisely controlled by subtle manipulations of intermolecular interactions. This project is a mixture of colloidal chemistry, light scattering and drug release kinetics where you will design and create lipid particles which provide on-demand release of drug.	Dr Khay Fong E: khay.fong@newcastle.edu.au P: (02) 4921 7449	Self-assembled systems/ Priority Research Centre for Chemical Biology and Clinical Pharmacology (Drug Development)	**Chemistry**	SELS
53	**Microfluidic manufacture of lipid nanoparticles**	Lipid-based nanoparticles have potential for revolutionising the delivery of drugs. However, the production of lipid-based nanoparticles are time consuming and energy intensive. In this project you will develop a new manufacture method by using cosolvents and microfluidic techniques. In this way, you will reduce the cost and time associated with producing these nanomaterials on a large scale.	Dr Khay Fong E: khay.fong@newcastle.edu.au P: (02) 4921 7449	Self-assembled systems/ Priority Research Centre for Advanced Particle Processing and Transport	**Chemistry**	SELS
54	**Water Splitting Perovskite Materials**	Hydrogen is a superior energy source due to its high energy density, ease of storage and transportation, and the fact that it produces water as the only chemical product from combustion. One potential method for producing hydrogen is by splitting water, according to the stoichiometric equation $2H_2O_{(l)} \rightarrow 2H_{2(g)} + O_{2(g)}$. Being able split water photocatalytically – i.e. using solar irradiation – is the ultimate goal of hydrogen energy technologies. Recently, a new class of photocatalysts – perovskites – have begun to show significant potential in this area. Perovskites are binary metal oxides with chemical structure ABO_3, where a metal cation A occupies 12-coordinate interstitial sites within octahedral BO_6 units. The aim of this project is to optimise new perovskite materials for photocatalytic water-splitting using computational chemistry.	Dr Khay Fong E: khay.fong@newcastle.edu.au P: (02) 4921 7449	Page Computational Chemistry Group	**Chemistry**	SELS
55	**Development of MIPs for Aldehydes and Ketones**	This is a novel project that will tackle imprinting of aldehydes and ketones by utilising their characteristic reaction with hydrazines forming hydrazones. Work will entail literature review, design of polymerisable hydrazines/hydrazones and synthesis of MIPs. Extraction will depend on the reversibility of the reaction hence it is also necessary to study the kinetics of the formation and hydrolysis of hydrazones. Potential application of this MIPs is in fragrance industry.	A/Prof Clovia Holdsworth P: (02) 4921 5481 E: clovia.holdsworth@newcastle.edu.au	Priority Research Centre for Organic Electronics Priority Research Centre for Chemical Biology and Clinical Pharmacology (Drug Development)	**Chemistry**	SELS

56	**Molecular Imprinting Sans Functional Monomer**	This project will further examine the feasibility of preparing molecularly imprinted polymers (MIP) sans functional monomers but in the presence of functional chain transfer agents (CTA). Briefly, the template and crosslinker will be mixed with a chain transfer agent which when functionalised with a group capable of interacting with the template (e.g. COOH), will have the ability to retain and imprint the template within the polymer. As a model system, thiogycolic acid CTA has been tested using R,S-propranolol as the template. Work on controlled radical polymerisation employing reversible-addition fragmentation transfer agents (RAFT) has also been initiated. . Further characterisation of these novel MIP systems is required and will be undertaken in this project.	A/Prof Clovia Holdsworth P: (02) 4921 5481 E: clovia.holdsworth@newcastle.edu.au	Priority Research Centre for Organic Electronics Priority Research Centre for Chemical Biology and Clinical Pharmacology (Drug Development)	**Chemistry**	SELS
57	**Preparation of Copolymers for Extraction of Membrane Proteins**	The challenge with the studies of membrane proteins is their extraction while preserving their native lipid environment. Styrene maleic acid copolymers (SMA) copolymers have been found to be successful in solubilising and stabilising the membrane proteins by encapsulation by forming SMA-lipid particles (SMALPs). Other polymer variants to form SMALP-like particles have also been studied. While the performance of the SMA copolymers could be optimised by controlling their lengths and composition, their efficacy is limited to near neutral pH. In this project, we will target copolymers with SMA-like properties which will potentially work at low pH. This project will involve synthesis of copolymers by radical polymerisation, molecular weight determination by size-exclusion chromatography and determination of copolymer composition by ^{1}H NMR. Once the copolymers have been characterised and purified, their efficacy in stabilising lipids that contain membrane proteins will be tested, if time permits. This part of the project will supervised by Dr Karl Hassan and group (Biological Sciences).	A/Prof Clovia Holdsworth P: (02) 4921 5481 E: clovia.holdsworth@newcastle.edu.au	Priority Research Centre for Chemical Biology and Clinical Pharmacology (Drug Development)	**Chemistry**	SELS

58	**Electrospinning method to prepare composite nanofibers**	Ammonia is a crucial media for fertilizer production and energy storage. At present, ammonia is produced through the Haber-Bosch process involving the reaction of highly pure N_2 and H_2 at considerably high pressures and temperatures (200-300 atm. and 300-500 ºC), needing a substantial energy input and yielding a great deal of greenhouse gas owing to the production of hydrogen as proton sources (involving carbon-intensive reforming of fossil fuels). Accordingly, reducing energy consumption and developing carbon-free and environment-friendly processes for sustainable ammonia production have become unprecedented issues of vital priority. Recently, electrochemical N_2 reduction reaction (NRR) has been proposed as a prospective alternative technology to synthesize ammonia. In this project, metal and nonmetal active sites will be supported and well dispersed on Ni foam, Cu foil or carbon fiber papers leading to self-supported and free-standing electrodes for the NRR process under mild conditions.	Dr Tianyi Ma P: (02) 4913 8038 E: Tianyi.Ma@newcastle.edu.au	NIER	**Chemistry**	SELS
59	**Small molecules targetting epilepsy**	The Mccluskey team in collaboration with researchers in Sydney and Melbourne have identified a novel, druggable target for the potential treatment of epilepsy. These studies have demostrated efficacy in two animal models of epilepsy. This project seeks to further develop a range of small molecule chemical compounds with improved potency and selectivity for the target. This project addresses a global need whereby 1% of the global population suffers from epilepsy and of these 1 in 3 fail to respond to any of the current drugs.	Prof Adam McCluskey E: adam.mccluskey@newcastle.edu.au P: (02) 4921-6486	Priority Research Centre for Chemical Biology and Clinical Pharmacology (Drug Development)	**Chemistry**	SELS
60	**Flow Chemistry Access to Novel Chemical Scaffolds for Druig Development**	Expanding the range of chemical building blocks available to develop new drugs is critical to accessing novel properties and new drug motifs. Flow chemistry represents a recent paradigm change in chemical synthesis enabling continuous production of chemical materials, often in unprecedented purity and using reagents otherwise neglected due to cost and safety issues. This project will introduce students to cutting edge chemical synthesis approaches and provide critical building block across a wide range of drug targets under exploration in the McCluskey group: Kidney disease, cancer, epilepsy being the main three.	Prof Adam McCluskey E: adam.mccluskey@newcastle.edu.au P: (02) 4921-6486	Priority Research Centre for Chemical Biology and Clinical Pharmacology (Drug Development)	**Chemistry**	SELS

61	**Carbon Nanotube "Nanoreactors"**	A carbon nanotube is a sheet of carbon atoms in a chicken wire pattern, rolled up into a cylinder. Although they are only ~1 nanometer in diameter, they can be several millimeters in length, are ~100 times stronger than Kevlar, and can transport ~1000 times as much electricity as copper wires. Recent experiments have shown that carbon nanotubes may act as 'nanoreactors', or vessels, in which surprising and unexpected chemical processes can take place. While these processes have been demonstrated experimentally, no study of *how* these processes take place has been performed to date. Such study is critical if these processes are to be optimised and applied on commercial/industrial scales. This project will use computational chemistry to simulate how chemical reactions occur inside carbon nanotubes, and what the effects of confinement on chemistry are.	A/Prof Alister Page P: (02) 4033 9357 E: alister.page@newcastle.edu.au	Page Computational Chemistry Group	**Chemistry**	SELS
62	**How do Carbon Nanotubes Grow?**	A carbon nanotube is a sheet of carbon atoms in a chicken wire pattern, rolled up into a cylinder. Although they are only ~1 nanometer in diameter, they can be several millimeters in length, are ~100 times stronger than Kevlar, and can transport ~1000 times as much electricity as copper wires. They can also be both electrically conducting and semiconducting, depending on how the carbon atoms in their structure are arranged. Development of future carbon nanotube-based technologies is currently prevented by our inability to synthesise particular carbon nanotubes selectively. This project will determine how selective carbon nanotube "growth" can be achieved, and will pave the way for the future development of carbon nanotube-based devices.	Dr Alister Page P: (02) 4985 4585 E: alister.page@newcastle.edu.au	Page Computational Chemistry Group	**Chemistry**	SELS
63	**Origins of Hofmeister Effects**	In the late 1800s, Franz Hofmeister discovered that, while some salts would decrease the solubility of egg whites in water, others increased their solubility. This phenomenon is known as the Hofmeister effect. Despite its apparent simplicity, consensus over the origins of the Hofmeister effect still has not been reached. In the century since Hofmeister's discovery, the Hofmeister effect has been observed in a wide range of other dissolved solutes, from DNA, enzymes, surfactants and colloidal suspensions. This project will use molecular simulations to understand the origins of the Hofmeister effect in condensed phases, and how dissolved salts influence the solid-liquid interfaces.	A/Prof Alister Page P: (02) 4033 9357 E: alister.page@newcastle.edu.au	Page Computational Chemistry Group	**Chemistry**	SELS

64	**Electrostatic formation of liquid marbles**	Liquid marbles are liquid droplets coated with colloidal particles such that a collection of these objects has the appearance of a dry powder, but is largely liquid. They have inspired a variety of applications, including pollution and gas sensors, actuators, microreactors and drug delivery vehicles. In a novel electrostatic formation process we are establishing a new design paradigm for liquid marble manufacturing, accessing marble geometries and compositions not previously possible through traditional production methods. This project is a combination of colloid and interface science, particle electrostatics and materials science.	Prof Erica Wanless P: (02) 4033 9355 E: Erica.Wanless@newcastle.edu.au	Priority Research Centre for Advanced Particle Processing and Transport	**Chemistry**	SELS
65	**Smart polymeric coatings**	Polymer films can radically change the surface of a material while leaving the bulk properties of the material intact. The polymer surface coating controls the interaction with other objects through nanoscale forces. We will fabricate a new generation of polymer films that contain an inbuilt molecular-scale switch from attractive to repulsive interactions, offering a means for dictating macroscopic character such as the wettability, adhesion or friction of a surface. Academic and industrial interest in these coatings is increasing rapidly, for potential application as low-friction coatings for confined parts or rheology modifiers. This project can have either a polymer synthesis, characterisation, or materials engineering focus. You will join the group effort aimed at synthesising and studying these smart polymer coatings and perform state-of-the-art surface characterisation that will ultimately determine their use!	Prof Erica Wanless P: (02) 4033 9355 E: Erica.Wanless@newcastle.edu.au	Priority Research Centre for Advanced Particle Processing and Transport	**Chemistry**	SELS
66	**Quantifying the fraction of broken waves in the surf zone**	This project will quantify the percentage of waves in the surf that are breaking using field data. Knowing this is a crucial step in improving coastal models that are used for predicting beach change, such as erosion, and for coastal management. The project will use a combination of video data and pressure transducer records to provide clear estimates of the fraction of broken waves and how it varies between beaches. In this project you will learn how to collect and analyse coastal field data. You will also learn computer programming and image analysis techniques.	Dr Hannah Power P: (02)4921-5606 EHannah.Power@newcastle.edu.au	Environmental and Climate Change Research Group	**Earth Sciences**	SELS

67	**Water velocities and wave heights in the surf zone**	Understanding the link between wave heights and water velocities in the surf zone is crucial for understanding sediment transport on beaches. In this project you will investigate why two waves of the same height can suspend different amounts of sediment. You will conduct a field experiment to obtain data on wave heights, water velocities, and suspended sediment concentrations, and analyse this data to identify which waves suspend the most sediment. In this project you will learn how to collect and analyse coastal field data. You will also learn computer programming techniques.	Dr Hannah Power P: (02) 4921-5606 E: Hannah.Power@newcastle.edu.au	Environmental and Climate Change Research Group	**Earth Sciences**	SELS
68	**Storm erosion on beaches: A case study of the June 2016 storm**	This project will investigate how beaches respond to storms using the June 2016 east coast low storm as a case study. This storm caused the greatest coastal erosion observed on NSW beaches in over 40 years. This project will use topographic and bathymetric datasets collected before and after the storm to investigate beach change including how beach profiles changed and the magnitude of shoreline erosion. In this project you will learn to use GIS to combine topographic and bathymetric datasets and to conduct your data analyses.	Dr Hannah Power P: (02) 4921-5606 E: Hannah.Power@newcastle.edu.au	Environmental and Climate Change Research Group	**Earth Sciences**	SELS
69	**Barrier overtopping and dune erosion on NSW beaches**	This project will use a range of data to identify beaches in NSW that are most at risk of wave overtopping due to extreme runup during storms. The project will use high resolution coastal LiDAR data to obtain dune elevations for several study sites. Offshore wave height data will then be used to obtain runup elevations based on standard formulations. The sites at risk of dune overtopping and erosion will then be identified to inform state-wide coastal management. In this project you will complete a thorough literature review of methods for predicting coastal runup and the causes of dune erosion and wave overtopping. You will use GIS to analyse the LiDAR data and NSW offshore wave height data to obtain the input parameters for the runup models.	Dr Hannah Power P: (02) 4921-5606 E: Hannah.Power@newcastle.edu.au	Environmental and Climate Change Research Group	**Earth Sciences**	SELS

70	**Wave runup on beaches and rock platforms**	This project will examine wave runup on beaches and rock platforms using field data. Understanding wave runup on beaches is crucial for coastal management including being used for predicting beach erosion during storms and for predicting coastal barrier overtopping due to waves. Understanding wave runup on rock platforms is important for understanding the hazards associated with rock platforms and for coastal management. It is also relevant for other factors such as defining biological habitat zones. The project will use a combination of video data and pressure transducer records to investigate wave runup. In this project you will learn how to collect and analyse coastal field data. You will also learn computer programming and image analysis techniques.	Dr Hannah Power P: (02) 4921-5606 E: Hannah.Power@newcastle.edu.au	Environmental and Climate Change Research Group	**Earth Sciences**	SELS
153	Investigation and Sampling of East Australia's Continental Margin Submarine Landslides and their deposits	Submarine landslides have been occurring intermittently on the eastern Australian coastal margin for about 15 million years and can be expected to reoccur in the future. Some of these slides probably generated tsunami similar in size to, or possibly larger than, the 1998 Aitape PNG submarine landslide event (~2000 deaths). Identifying landslide sites, the morphology of their slide scars, and the characteristics of the slope they moved over will help to determine their size and frequency of occurrence. This information will improve evaluation of the hazard and risk to the eastern Australian seaboard communities posed by locally-generated, submarine-landslide induced tsunami. As part of this project, students will be required to spend 11 days at sea in July 2020 on a transit leg voyage of the Marine National Facility, the RV Investigator (https://mnf.csiro.au/). Preference will be given to students who have an interest in pursuing further studies (honours or postgraduate research) using the data collected on board the Investigator during the voyage. All students who wish to apply for this Scholarship must have discussed their application with Dr Hannah Power prior to applying. Students who have not spoken to Dr Hannah Power will not be considered for this scholarship.	Dr Hannah Power P: (02) 4921-5606 E: Hannah.Power@newcastle.edu.au	Environmental and Climate Change Research Group	**Earth Sciences**	SELS

71	**Identification and assessment of potential koala breeding habitat in Port Stephens**	Koalas are considered 'vulnerable' in NSW and recent reports indicate that the low-density Port Stephens population is at risk of regional extinction. We are seeking a student with an interest in developing skills in arboreal mammal ecology to detect koalas and help define active breeding habitat near the suburbs of Soldiers Point and One Mile. This project will assist in developing a dataset that will be used to inform habitat important to koalas, and answer questions of koala density and recruitment.	A/Prof John Clulow E: john.clulow@newcastle.edu.au P: 0401 349 767 Dr Ryan Witt E: ryan.witt@newcastle.edu.au P: 0421 606 222	Conservation Biology Research Group	**Environmental Science and Management**	SELS
72	**Estimating koala presence and density on the Tilligerry Peninsula – a historical comparison**	Koalas are persisting on the Tilligerry Peninsula despite urban growth and several anthropogenic drivers of decline. However, it largely remains unclear how many koalas remain and if recruitment (successful breeding) is occurring. We are seeking a student with an interest in developing skills in arboreal mammal ecology to detect koalas and help define active breeding habitat. This project will assist in developing an updated dataset that will be used to complete a historical analysis of the koala population on the peninsula.	A/Prof John Clulow E: john.clulow@newcastle.edu.au P: 0401 349 767 Dr Ryan Witt E: ryan.witt@newcastle.edu.au P: 0421 606 222	Conservation Biology Research Group	**Environmental Science and Management**	SELS
73	**Developing and testing a method to detect the presence of chytrid using environmental DNA**	Determining chytrid prevalence is traditionally undertaken using qPCR for skin swabs taken from frogs in the wild. We are seeking a student with a keen interest in laboratory analysis to develop and test a method for detecting the presence of eDNA of the frog pathogen chytrid (Batrachochytrium dendrobatidis) from soil and water field samples. Ultimately it would also be useful to determine whether infection load can also be identified using eDNA from field samples.	A/Prof Matt Hayward E: matthew.hayward@newcastle.edu.au P: (02) 4921 7472 Dr Alex Callen E: alex.callen@newcastle.edu.au P: 0412 286 048	Conservation Biology Research Group	**Environmental Science and Management**	SELS
74	**Monitoring the threatened Green and Golden Bell Frog within compensatory habitat on Ash Island**	The Green and Golden Bell frog breeding season is upon us and the frogging season is set to begin. We are seeking a keen student who is interested in learning unique skills used to monitor the Green and Golden Bell Frog at a compensatory habitat built on Ash Island. The student will assist in acoustic monitoring of frog chorusing, visual encounter surveys (VES), fyke netting to presence of tadpoles and other aquatic species. The student will also have the opportunity to process frogs for weight and measurement data and analyse acoustic data to identify species.	A/Prof John Clulow E: john.clulow@newcastle.edu.au P: 0401 349 767	Conservation Biology Research Group	**Environmental Science and Management**	SELS

75	**Finding frogs in far-flung places**	Many Australian frog populations are in decline. Habitat modification, disease and stream pollution are identified as key threats to population viability of these frog populations. However, most remnant populations are not monitored in terms of population numbers or quantification of threats. This means that we are unable to determine appropriate management responses to protect the viability of threatened frog populations in the wild. In this project we will visit seven coastal NSW national parks (east of the Great Dividing Range) to rediscover historical populations of frogs and determine their population size and health. This includes Davies' Tree Frog which is only recently described and for which very little is known. Transport and accommodation provided (sometimes camping). National Parks include New England, Dorrigo, Werrikimbe, Barrington Tops, Watagans, Blue Mountains and Kanangra-Boyd.	A/Prof John Clulow E: john.clulow@newcastle.edu.au For further information contact: Dr Alex Callen Alex.callen@newcastle.edu.au	Conservation Biology Research Group	**Environmental Science/ Biology**	SELS
76	**Characterising water quality in NSW National Parks**	Water quality is long thought to impact frog populations – particularly as tadpoles may not survive in hospitable aquatic environments. While National Parks are identified as the primary conservation system for NSW biodiversity (where species are protected), water may move through national parks from outside areas that entrain contaminants into aquatic systems, thus affecting stream biodiversity. This project involves visiting seven coastal NSW national parks (east of the Great Dividing Range) and collecting water samples, before bringing them back to the laboratory to analyse them for heavy metals and nutrients to determine the water quality of streams in national parks that are known for their freshwater biodiversity values. Understanding the water quality of aquatic systems will bring us one step closer to understanding the threat that water pollution poses to the survival of Australia's threatened stream-breeding frogs. Transport and accommodation provided (sometimes camping). National Parks include New England, Dorrigo, Werrikimbe, Barrington Tops, Watagans, Blue Mountains and Kanangra-Boyd.	A/Prof John Clulow E: john.clulow@newcastle.edu.au For further information contact: Dr Alex Callen Alex.callen@newcastle.edu.au	Conservation Biology Research Group	**Environmental Science/ Biology**	SELS

77	**Chasing crayfish – do invasive crayfish displace native crayfish in freshwater ecosystems?**	The native crayfish Cherax destcructor has been introduced to a number of freshwater stream systems outside of its natural range. Invasive species such as this one have the ability to alter natural foodwebs through process of habitat exclusion, predation and competition, as well as changes to water quality. This project involves visiting seven coastal NSW national parks (east of the Great Dividing Range) and determining the extent of invasion by predatory aquatic organisms. Collecting this information, together with information about the diversity of local native aquatic populations will allow us to determine the effect they may be having on freshwater systems. Understanding this problem will lead to the development of effective management solutions to address the issue of invasive freshwater organisms on the natural stream biodiversity values in national parks. Transport and accommodation provided (sometimes camping). National Parks include New England, Dorrigo, Werrikimbe, Barrington Tops, Watagans, Blue Mountains and Kanangra-Boyd.	A/Prof John Clulow E: john.clulow@newcastle.edu.au For further information contact: Dr Alex Callen Alex.callen@newcastle.edu.au	Conservation Biology Research Group	**Environmental Science/ Biology**	SELS
78	**Of frogs and fungus – is there a summertime impact of fungal disease in high altitude environments?**	The chytrid fungus (caused by the pathogen Batrachochytrium dendrobatidis) has caused a global pandemic on frogs. It is known to thrive in freshwater environments when air temperatures range between 18 and 250C (that is, it is a winter dominant pathogen). While we have a reasonable understanding of the impact of this pathogen on populations of frogs in coastal environments in mild climates, we have little understanding on the extent of its proliferation in high altitude areas where temperature ranges may be suitable all year round for its growth and spread. The aim of this project is to collect skin swabs from five threatened frog species in high altitude NSW national parks and quantify the extent of infection using qPCR analysis. This will allow us to quantify the extent of disease in these populations to assist in developing appropriate management responses. Transport and accommodation provided (sometimes camping). National Parks include New England, Dorrigo, Werrikimbe, Barrington Tops, Watagans, Blue Mountains and Kanangra-Boyd.	A/Prof John Clulow E: john.clulow@newcastle.edu.au For further information contact: Dr Alex Callen Alex.callen@newcastle.edu.au	Conservation Biology Research Group	**Environmental Science/ Biology**	SELS

79	**Impacts of coal mine on environmental water chemistry.**	Mining practices often affect the water quality of nearby freshwater systems. This study looks at how an underground coal mine has impacted stream water quality on the Woronora plateau, near Wollongong. Within this mine site, there are high levels of iron flocculent staining caused by water being diverted underground and then resurfacing, potentially carrying high levels of heavy metal contamination. These streams are breeding habitat for threatened frog species and changes in water quality risk affecting tadpole development. The student will join our team on field trips to the mine site and national park control sites to survey for tadpoles and collect water samples. These water samples will then be subjected to chemical analysis to determine the metal content. Co supervision will be provided by A/Prof Clovia Holdsworth from Chemistry.	Dr Kaya Klop-Toker E: kaya.klop-toker@newcastle.edu.au P: 0450 127 544	Conservation Biology Research Group	**Environmental Science and Management**	SELS
80	**Freshwater community response to coal mining.**	Invertebrate species that inhabit freshwater environments are often sensitive to water quality parameters (e.g. pH, salinity, dissolved oxygen, pollution). The abundance and distribution of these species are, therefore, regularly used to measure the "health" of freshwater ecosystems. In our study investigating the impacts of underground mining on threatened stream breeding frogs, we are interested to explore how the mine also impacts the broader aquatic community. For this study, a student will join our team on three 5-day fieldtrips to participate in tadpole and invertebrate surveys. Surveys are done at the mine site and national park control sites near Wollongong. Invertebrate samples will then be brought back to the lab for further identification.	Dr Kaya Klop-Toker E: kaya.klop-toker@newcastle.edu.au P: 0450 127 544	Conservation Biology Research Group	**Environmental Science and Management**	SELS
81	**Using sound to monitor threatened species.**	Using sound recording devices to detect cryptic species in remote locations is rapidly becoming a standard methodology for biodiversity monitoring. This project uses sound recorders to monitor for the threatened Littlejohn's tree frog in pristine habitats and areas impacted by mining. This project will involve using the latest audio recognition software to detect calls of our target species. Focus questions will include determining if frog populations are reduced above mined land compared to control habitats, and what is the breeding phenology for this species (i.e. what times of the year does our species call/breed, and what factors drive these patterns). This will be a computer-based project with flexible time requirements, and options to join our team in the field if desired.	Dr Kaya Klop-Toker E: kaya.klop-toker@newcastle.edu.au P: 0450 127 544	Conservation Biology Research Group	**Environmental Science and Management**	SELS

82	**Is diet quality limiting the reproductive success of urban parrots?**	This project is part of a large study in which we are examining whether diet quality limits the reproductive success of native parrots in our cities. The project will involve fieldwork in and around Newcastle checking nest boxes and managing nest box cameras to record the foods parents feed to chicks.	Dr Andrea Griffin P: (02) 4348 4393 E: Andrea.Griffin@newcastle.edu.au	Conservation Biology Research Group	**Psychology**	PSYC
83	**Habitat use by Eastern curlew in Port Stephens estuary**	This project is part of a long-term study in which we are using automated radiotelemetry to record the movements of Eastern curlew in Port Stephens and Hunter estuaries to understand which areas they use to feed at low-tide and to roost at night. The project will involve field work on migratory shorebirds in and around Swan Bay, NSW.	Dr Andrea Griffin P: (02) 4348 4393 E: Andrea.Griffin@newcastle.edu.au	Conservation Biology Research Group	**Psychology**	PSYC
84	**Scavenging as an indicator of ecosystem function**	Ecosystem function can be assessed in many different ways however, this usually involves conducting complex field experiments. Ecosystem functioning is also important in the assessment of ecosystem health. This project will use scavenging by secondary consumers as an indicator for ecosystem functioning. This project will involve fieldwork using underwater video systems.	Dr Troy Gaston P: (02) 4349 4569 E: Troy.Gaston@newcastle.edu.au (Ourimbah Campus)	Coastal and Marine Science Research Group	**Environmental Science and Management**	SELS
85	**Faunal assemblages associated with an endangered soft coral**	Dendronephthya australis is a soft coral that is only known to inhabit Port Stephens and the Brisbane Water estuary. Preliminary studies have shown that other endangered species, such as seahorses, are known to be associated with the soft coral. This project will use underwater technologies such as an ROV to map the population of soft corals and determine the associated faunal assemblages.	Dr Troy Gaston P: (02) 4349 4569 E: Troy.Gaston@newcastle.edu.au (Ourimbah Campus)	Coastal and Marine Science Research Group	**Environmental Science and Management**	SELS
86	**Crustaceans as an indicator of nutrient source in coastal lagoons**	Sustainable management of coastal lagoons relies upon the identification of stressors to that system. This involves the determination of nutrient sources to these coastal systems so that any adverse impacts due to nutrient loading can be mitigated. Stable isotope analysis is a tool that can identify the dominant source of nutrients to a waterway. This project focuses on using crustacean species as an indicator of nutrient source to coastal lagoons.	Dr Troy Gaston P: (02) 4349 4569 E: Troy.Gaston@newcastle.edu.au (Ourimbah Campus)	Coastal and Marine Science Research Group	**Environmental Science and Management**	SELS

87	**Ecosystem health reporting for coastal lagoons**	Ecosystem health reporting has become a requirement at the local, state and federal government level, however, there is some debate over the definition of ecosystem health. The components of ecosystem health include: key processes operating to maintain stable and sustainable ecosystems, zones of anthropogenic influence do not expand or deteriorate, and critical habitats remain intact. This project will use water quality data to assess the ecosystem health of coastal lagoons.	Dr Troy Gaston P: (02) 4349 4569 E: Troy.Gaston@newcastle.edu.au (Ourimbah Campus)	Coastal and Marine Science Research Group	**Environmental Science and Management**	SELS
88	**Novel 3D modelling of oyster shape as an indicator of health**	Wallis Lake is the major oyster growing estuary for NSW. Recent work has shown that growout methods can affect shell shape and oyster size and that hatchery vs wild spat respond differently to environmental conditions. This project will use 3D photogrammetry and modelling software to develop an indicator of oyster health using shape and size.	Dr Troy Gaston P: (02) 4349 4569 E: Troy.Gaston@newcastle.edu.au (Ourimbah Campus)	Coastal and Marine Science Research Group	**Environmental Science and Management**	SELS
89	**Ecological effects of oyster infrastructure**	Oyster aquaculture is worth over $35M in NSW with 3200 leases in operation. This represents a significant amount of infrastructure within these estuaries. This project will use novel techniques, such as ROV's and underwater cameras, to determine the effect of infrastructure on the abundance, diversity and recruitment of commercial species in the Wallis Lake estuary.	Dr Troy Gaston P: (02) 4349 4569 E: Troy.Gaston@newcastle.edu.au (Ourimbah Campus)	Coastal and Marine Science Research Group	**Environmental Science and Management**	SELS
90	**Improving adoptions of sustainable crab trap designs**	The NSW Blue Swimmer Crab fishery uses baited traps which often result in high undersized crab catches. This project will use underwater video and laboratory experiments to determine the effectiveness of trap modifications to inform trap design. Experiments will include the effect of different baits and trap entry gaps on crab behaviour in the laboratory and field .	Dr Troy Gaston P: (02) 4349 4569 E: Troy.Gaston@newcastle.edu.au (Ourimbah Campus)	Coastal and Marine Science Research Group	**Environmental Science and Management**	SELS
91	**Monitoring of water quality and ecosystem health**	Coastal lakes and estuaries represent valuable resources. Despite their importance, coastal ecosystems are being increasingly threatened and disturbed by growing urbanisation resulting in overfishing and intensification of nutrient, sediment and pathogen loads from stormwater, agriculture and sewage. Sources of microbial contamination have been a contentious issue in both the Northern Beaches of Sydney as well as in a number of coastal water bodies on the Central Coast of NSW. This project will involve working alongside the NSW Department of Planning, Industry and Energy in order to assess microbial contamination associated with poor water quality in coastal lagoons on the Central Coast and Northern Beaches of Sydney.	A/Prof Bill Leggat P: (02) 4348 4021 E: bill.leggat@newcastle.edu.au (Ourimbah Campus)	Coastal and Marine Science Research Group	**Environmental Science and Management**	SELS

92	**Invertebrates as indicators of change in marine systems**	Seafloor invertebrates provide a window to understanding the effects of human-induced changes on ecosystems. Collections of invertebrate samples from under and around an offshore Yellowtail Kingfish farm in Port Stephens enable the assemblage and population characteristics to be addressed and interpreted against known spatial and temporal information, including the stocking and growth of fish within seacages. This project will involve supervised laboratory activities and a possibility of field work. An exciting opportunity for you to develop further your taxonomic and analytical skills in the marine space, and for to optimise (or find!) your own research interests.	Dr Margaret Platell P: (02) 4349 4809 E: Margaret.Platell@newcastle.edu.au (Ourimbah Campus)	Coastal and Marine Science Research Group	**Environmental Science and Management**	SELS
93	**Urban and Regional Studies**	Project to advance knowledge in the area of social, cultural, or political aspects of urban and regional studies, including urban regeneration, home and homemaking, homelessness, social housing (including community housing), living in new suburbia, and geographies of mobility.	A/Prof Kathy Mee P: (02) 4921 6451 E: Kathy.Mee@newcastle.edu.au	Centre for Urban and Regional Studies	**Geography & Environmental Studies**	SELS
94	**Urban and Regional Studies**	Project to advance knowledge in the area of social, cultural, or political aspects of urban and regional studies, including Indigenous geographies and natural resource management, community development and geographies of asylum seeking and migration.	Dr Paul Hodge E: paul.hodge@newcastle.edu.au P: (02) 4921 5092	Centre for Urban and Regional Studies	**Geography & Environmental Studies**	SELS
95	**Urban and Regional Studies**	Project to advance knowledge in the area of social, cultural, or political aspects of urban and regional studies, including vegan political ecologies, homelessness and mutual aid, anarchist geographies, and the political economy of contemporary Cambodia.	Prof Simon Springer E: simonspringer@gmail.com *Note Prof Springer will be arriving to take up his appointment in December.*	Centre for Urban and Regional Studies	**Geography & Environmental Studies**	SELS

School of Mathematical & Physical Sciences:

Topic No.	Title of Research Topic	Description of Research Topic	Principal Supervisor Contact Details	Research Group/Centre	Discipline	School
96	**Self-similar expander graphs**	Expander graphs are finite graphs which, in some precise sense, are sparse (have relatively few edges) but highly connected (they cannot be disconnected without removing many edges).These graphs have applications in engineering and computer science, among other areas, so it is desirable to find concrete constructions of them. Infinite groups with certain properties are a good source of infinite families of regular expander graphs. This project will examine a general construction of infinite self-similar groups (groups which are fractal in some algebraic sense) that produce infinite families of regular expander graphs. Key points will be investigating the algebraic structure of some concrete examples, visualising the graphs produced (with the aid of computer software if desired) and examining the dynamics on the infinite families of expander graphs. Students working on this project will extend their knowledge of algebra, combinatorics, some dynamics and mathematical software. Only a good knowledge of group theory and some basic graph theory is required.	Dr Alejandra Garrido E: Alejandra.garrido@newcastle.edu.au	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	MAPS
97	**Two-dimensional data fitting**	This project is related to fit a two-dimensional piecewise function to the medical imaging data. We would like to find a suitable fitting technique that also works outside the interpolation region. The student needs some programming skill of MATLAB and will work closely with Michael Barnes (RHD student at Mater Hospital).	Dr Bishnu Lamichhane P: (02) 4921 5529 E: Bishnu.Lamichhane@newcastle.edu.au	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	MAPS
98	**Image reconstruction of optical tomography problem**	We will apply some partial differential techniques to reconstruct images arising from the optical tomography. This project is done jointly with A/Prof John Holdsworth from Physics Discipline. The student will develop some techniques to reconstruct images and implement the techniques within MATLAB..	Dr Bishnu Lamichhane P: (02) 4921 5529 E: Bishnu.Lamichhane@newcastle.edu.au	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	MAPS

99	**Numerical approximation method for singularly perturbed boundary-value problems**	The student will develop a robust numerical technique to approximate solution of a boundary-value problem involving a small parameter. Programming skill using MATLAB is required.	Dr Bishnu Lamichhane P: (02) 4921 5529 E: Bishnu.Lamichhane@newcastle.edu.au	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	MAPS
100	**SEELAB**	Visualisation of Mathematical Structures is an increasingly important part of both Mathematics Research, eg Aragon et al (2012) and Mathematics Education, eg Tall (2001). CARMA's Seelab enables visualisation through computer simulation (2D and 3D projected) and through the production of physical models using 3D printing. This project may be placed entirely within Mathematics Disciplinary Research or may have a Mathematics Education Research aspect, according to the interests of the participant. Either way, the participant is challenged to come up with areas of Mathematics whose understanding may be enhanced by the creation of visualisations and models. These may either be entirely new projects to CARMA's Seelab, or there is the opportunity to build on existing SEElab projects. Note that in addition to the Visualisation Opportunities, there is also the potential for a person with a strong programming background to work on the Inverse Symbolic Calculator (Plouffe), which is an online tool in which users input a partial decimal expansion of a number, and the program "intelligently guesses" a closed form, eg 23.14049 should return e^pi. Aragon, F. J. A., Bailey, D. H., Borwein, J. M., & Borwein, P. B. (2012). Walking on real numbers. S. Plouffe, The Inverse Symbolic Calculator, www.cecm.sfu.ca/projects/ISC/. Tall, D.O. (2001). "Cognitive Development in Advanced Mathematics Using Technology", Mathematics Education Research Journal, Vol. 12, No. 3, pp 196-218.	Dr Judy-anne Osborn E: Judy-anne.Osborn@newcastle.edu.au P: (02) 4921 5543 (with Dr David Allingham)	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	MAPS

101	**How much Randomness do Bees need?**	**Problem:** Colony Collapse Disorder is killing bees, threatening our food supplies. (40% of the world's food depends on bees for pollination.) Common theories to explain this include: • Monoculture and loss of habitat • Electromagnetic radiation • GMOs and Herbicides • Neurotoxin Pesticides • Trachea and Varroa Mites These are probably all having an effect. However, curiously, factors such as Varroa Mites are devastating European bees *(Apis Mellifera)* but have long coexisted with Asian Bees. Some authors are considering the possibility that the reason bees are falling prey to threats that hadn't been so devastating before, is that modern selective breeding is undermining their main defence, which is the rapidity with which they can evolve, given unusual factors of their reproduction including their haplodiploid sex system in which male bees have only one parent. Supporting this idea, Puerto Rico evolved some remarkable disease and heat resistant bees in the wild after an escape from a selective breeding program. **Hypothesis:** Might bee species survival depend on rapid genetic mixing as happens in wild swarms but not in selection breeding programs? **Research Questions:** • Can discrete mathematical models of bee evolution be designed? • Can threats and successful genetic adaptation to threats be incorporated? • Can `amount of randomness for successful adaptation' be characterized?	Dr Judy-anne Osborn E: Judy-anne.Osborn@newcastle.edu.au P: (02) 4921 5543 (with Dr David Allingham)	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	MAPS

102	**Mathematical Systems Theory**	Lyapunov functions associate "energy" to states of a dynamical systems, which can originate from differential or difference equations. They can be used to show that the equilibrium state of a system is asymptotically stable, that is, if a trajectories starting close to the equilibrium and converge to it asymptotically. The difficult part with Lyapunov functions is to find them in the first place. But once you have one, proving asymptotic stability becomes relatively easy. Your help is needed for the difficult part. Possible topics involving Lyapunov functions could be: ▪ Find Lyapunov functions for queuing networks (various levels of difficulty are possible here); or ▪ Investigate how well so-called sum- and max-separable Lyapunov functions can approximate each other (knowledge of linear algebra is desirable). ▪ Using Lyapunov functions to investigate the convergence of optimization algorithms like Douglas-Rachford. (Skills in some programming language required, preferrably MATLAB or python.)	Dr Björn Rüffer P: (02) 4913 8989 E: bjorn.ruffer@newcastle.edu.au	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	MAPS

103	**PageRank for Tournaments (Graph Theory and Linear Algebra)**	PageRank is the name Google uses for the algorithm it uses to rank web pages. This algorithm is what started Google's success, and it assigns higher rank to web pages that receive links from other highly ranked web pages. The web pages and links between them can be modelled as a directed graph, and the Perron-Frobenius theorem then asserts the existence of what could be considered an invariant probability distribution of the vertices (or web pages) in that graph by way of a positive eigenvector of the graph's adjacency matrix. The entries of this eigenvector are the PageRank. The objective of this project is to develop a group tournament system that could be used for sport events or other competitions to determine a fair ranking among all players, based on a fixed number of matches each player engages in. In contrast, a knockout tournament system is divided into successive rounds, and the winner of each round progresses towards a final match that determines the overall winner. A shortcoming of knockout tournament systems is that there is no canonical way of ranking among each other those players who lost early. In the tournament system to be developed here, the graph modelling the matches between players would be set ahead of time, say each player plays exactly three matches. Your task will be to help answer the following questions: How can the match-graph be weighted with game scores without violating important assumptions of the Perron-Frobenius Theorem? What happens if these assumptions do get violated? What conditions ensure a unique ranking of the participants? How important is the number of matches each player participates in for their rank? Prerequisites: Linear Algebra and a bit of programming for numerical experiments.	Dr Bjorn Ruffer P: (02) 4913 8989 E: bjorn.ruffer@newcastle.edu.au	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	MAPS

104	**Parameter Estimation**	Many situations in the physical, life and behavioural sciences; engineering; and economics/finance are modelled by differential equations. For example, the growth of a hatchery trout is approximately described by, $\frac{dw(t)}{dt} = \alpha w(t)^{2/3} - \beta w(t), \quad w(0) = w_0,$ where $w(t)$ is the weight of the fish after t days, w_0 is the initial weight at day 0 and α, β are parameters. As with many differential equations an explicit solution is not possible. Nonetheless, given a set of observations of a fish's weight on successive days, say $w(n) = w_n$ for $n = k, k+1, k+2, \cdots, K$, we wish to determine values for α and β that best fit the observations. This is one instance of a *parameter estimation* problem. The project involves exploring the efficacy of a proposed way of doing this for a variety of different differential equations. This project falls within the realm of *experimental mathematics* and have both a theoretical and computational aspect. Besides encountering some new and interesting mathematics they will involve the vacation scholar learning and applying various computer software: • Maple (or Mathematica) • *Cinderella* A dynamic geometry package, see http://www.cinderella.de/tiki-index.php and possibly • Python (or C++)	Conjoint A/Prof Brailey Sims P: (02) 4921 5540 E: Brailey.Sims@newcastle.edu.au	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	MAPS

Mathematics applied to Nanotechnology ***(see Projects 105 to 107)***		Various projects involving mathematics applied to nanotechnology are listed below:	Prof Ngamta (Natalie) Thamwattana P: (02) 4985 4081 E: Natalie.Thamwattana@newcastle.edu.au	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	MAPS
105	***Project 1:*** **Modelling carbon nanostructures**	This project will consider geometries of carbon nanostructures. Their geometry enables the use of an averaging technique to determine the interaction between two molecules yielding an analytical expression for the interaction energy which generally involves hypergeometric functions. The project will also explore the use of calculus of variations to model joining of two carbon nanostructures.	Prof Ngamta (Natalie) Thamwattana P: (02) 4985 4081 E: Natalie.Thamwattana@newcastle.edu.au	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	MAPS
106	***Project 2:*** **Modelling cell-cell interactions**	This project will investigate the interacting force between cells and how the force term plays a role in determining the solution for a partial differential equation (PDE) for cell population density model. Both analytical and numerical solutions will be developed for the PDE.	Prof Ngamta (Natalie) Thamwattana P: (02) 4985 4081 E: Natalie.Thamwattana@newcastle.edu.au	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	MAPS
107	***Project 3:*** **Modelling binding between dye and TiO2 in dye-sensitized solar cells**	This project will look at how dye molecules bind to TiO2 and how we can control the orientation of dye molecules to optimize sunlight exposure for dye-sensitized solar cells.	Prof Ngamta (Natalie) Thamwattana P: (02) 4985 4081 E: Natalie.Thamwattana@newcastle.edu.au	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	MAPS

108	**Groups acting on trees**	The concept of symmetry is pervasive in mathematics and formalised in the algebraic notion of a 'group'. It is often natural to equip a group with a 'topology' - a generalisation of distance functions - which, in a sense, gives groups a shape. For example, the symmetry groups of infinite networks, or 'graphs', become zero-dimensional. A versatile and accessible class of these groups was defined by Burger-Mozes and refined by this project's supervisor: Picture an infinite graph in which every vertex has the same number of neighbours and consider only those symmetries of the graph which in a neighbourhood of every given vertex act like one of finitely many allowed 'local actions'. In order for the resulting family of symmetries to reflect these restrictions accurately, the local actions need to satisfy certain conditions. 1. Compatible local actions The aim of this project is to find more general constructions of such local actions and use them to test the sharpness of an existing rigidity theorem. A student who takes this project will extend his/her knowledge of algebra and learn how to use computer algebra systems designed for computations in group theory, including coding skills. 2. Groups acting on trees without involutive inversions The aim of this project is to define a new class of groups acting on said graph by restricting the local action on edge neighbourhoods rather than vertex neighbourhoods, and thereby gain a new perspective on existing examples of graph symmetry groups relating to the Weiss conjecture. A student who takes this project will extend his/her knowledge of algebra and topology, and develop proofs intertwining both.	Dr Stephan Tornier E: stephan.tornier@newcastle.edu.au	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	**MAPS**

109	**Optimisation in Operations Research**	My interest is optimisation, in particular, mixed integer programming. Some possible project topics investigate the strength of mixed integer programming formulations for problems arising in production planning and scheduling. ***(1) Lot sizing on a cycle.*** This project extends the work started by Riley Cooper in his 2017 AMSI Vacation Research Scholarship. ***(2) Bounded length sequences in production planning and scheduling problems.*** This project extends some work started by Riley Clement in his 2015 PhD thesis. ***(3) Bucket indexed formulations for single machine scheduling problems***. This project extends some work started by Riley Clement in his 2015 PhD thesis. Please arrange a time to meet with me to discuss these topics in more detail, or another potential project, prior to submission of your application.	Dr Hamish Waterer P: (02) 4921 5951 E: hamish.waterer@newcastle.edu.au	Centre for Optimal Planning and Operations (C-OPT)	**Mathematics**	MAPS

110	**Symmetry of graphs**	A graph (a network of vertices and edges) is *vertex-transitive* if it `looks' the same at all vertices. In algebraic terms, this means that, for any pair of vertices, there is an automorphism of the graph which maps the first vertex to the second. A necessary, but not sufficient, condition for a graph to be vertex-transitive is that all vertices should have the same valency. Analysing graph symmetry therefore involves a deeper study of the relationship between graphs and their automorphism groups than vertex valencies. Vertex-transitive graphs need not be edge-transitive, for example, the horizontal edges of a triangular pyramid lie on 3-cycles in the graph but the vertical edges do not. The particular question investigated in this project is how its symmetry group changes as edges are added to, or removed from, a graph. For finite graphs, a classical theorem of Burnside is relevant when the graph has prime order and, for infinite graphs, the goal is to reduce the vertex valency since this number controls important features of the symmetry group. Students taking this project will extend their knowledge of combinatorics and algebra, and how these two topics interact. The project will be jointly supervised by Brian Alspach.	Prof George Willis E: george.willis@newcastle.edu.au P: (02) 4921 5666	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	MAPS

111	**Symmetries of rooted trees**	Self-similar symmetry groups of rooted trees contribute to the study of totally disconnected, locally compact (or 0-dimensional) groups in much the same way as eigenvalues and eigenvectors contribute to linear algebra. Whereas eigenvalues are complex numbers and we have a complete picture of what they all are, we are still at the stage of trying to describe self-similar symmetry groups of rooted trees. It is not necessary to understand the link with the theory of 0-dimensional symmetry or with eigenvalues in order to describe these groups. This project aims to find an alternative geometric interpretation of some of the symmetry groups of trees. The idea being that describing these geometries might be a more natural approach to describing the groups. Computer algebra software will be used to analyse how the groups act on pairs, triples, *etc.* of vertices of the trees and then study the polyhedra in which these are edges, faces, *etc.* Observed patterns in the geometries may be able to be extrapolated to produce new families of groups. Students taking this project will extend their knowledge of algebra, graph theory and mathematical software. `Group' is an algebraic notion and `rooted tree' is a combinatorial one which arises in the study of data structures in computer science. `Totally disconnected' and `locally compact' are topological notions which, although relevant to the background, are not needed for this project.	Prof George Willis E: george.willis@newcastle.edu.au P: (02) 4921 5666	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	MAPS

112	**Visualising 0-dimensional symmetry**	The word `symmetry' brings to mind visual images and geometry. It has a broader meaning in mathematics, where we think of regularly repeating patterns and invariance under transformations as displaying symmetry, and where the language of algebra is used to describe symmetry. Visualising the patterns or the dynamics of the transformations remains an effective tool for understanding the algebra however. This project aims to develop software for visualising various aspects of 0-dimensional symmetry, which is the symmetry of infinite networks and arises in number theory and other parts of algebra as well. The aim is to produce software which may be used by researchers and which will be made available on web-pages of the 0-Dimensional Symmetry project. Students taking this project will extend their knowledge of algebra, analysis, mathematical software and coding skills. `Totally disconnected' and `locally compact' are topological notions; `group' is an algebraic one; and other concepts will be met in the course of the project.	Prof George Willis E: george.willis@newcastle.edu.au P: (02) 4921 5666	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Mathematics**	MAPS
113	**Nanoparticle synthesis for bioelectronics**	Artificial retinas can readily replace damaged retinal tissue and restore vision thus curing retinal disorders (blindness). Semiconducting nanoparticles are biocompatible and have advantageous optoelectronic properties, which make them a prime candidate for retinal applications. The aim of this project is to design, fabricate and characterise semiconducting nanoparticles for use in artificial retinas. This project is suitable for students with backgrounds in Physics, Chemistry, Biology and Engineering.	Dr Krishna Feron E: Krishna.Feron@newcastle.edu.au P: (02) 4985 4378	Priority Research Centre for Organic Electronics (PRCOE)	**Physics**	MAPS

114	**Inkjet printing for bioelectronics**	Bioelectronic devices have the potential to aid in curing blindness, nerve cell regeneration and neuronal disorders. These devices provide an interface between living tissue and conventional electronics. Such a bioelectronic interface is established by a biocompatible conducting material that can be readily printed. The aim of this project is to inkjet print electrode arrays using biocompatible inks. This project is suitable for students with backgrounds in Physics, Chemistry, Biology and Engineering..	Dr Matthew Griffith E: matthew.griffith@newcastle.edu.au P: (02) 4033 9191	Centre for Advanced Biomedical Physics Priority Research Centre for Organic Electronics (PRCOE)	**Physics**	MAPS
115	**Printable Ion Pumps for Biocompatible Smart Drug Delivery Systems**	Many biomolecules are charged and may therefore be transported through a medium with ionic currents. Such ionic currents are the basis for chemical drug delivery systems inside the human body. Control of this ionic transport process for clinically useful drug systems would represent an enormous advancement in personalized and localized treatment of disease. As a step toward addressable ionic delivery circuits, this project will develop an ion pumping system that is suitable for implanting into animal tissue and can be triggered and controlled by an electronic input signal. The pump will be created from printable electroactive polymer inks, which are ideal for this application as the semiconducting polymers are mechanically soft and carbon-based, and thus seamlessly integrate with soft carbon-based tissue without biocompatibility problems. The goal will be to create the optimal device design, establish the printing fabrication procedure and demonstrate proof of principle controlled ionic transport in this revolutionary bioelectronics device. This project is suitable for students with backgrounds in Physics, Chemistry, Biology and Engineering.	Dr Matthew Griffith E: matthew.griffith@newcastle.edu.au P: (02) 4033 9191	Centre for Advanced Biomedical Physics Priority Research Centre for Organic Electronics (PRCOE)	**Physics**	MAPS

116	**Flexible Biocompatible Devices for Clinical Drug Detection**	Detection and dosimetry measurements of drugs used in a range of clinical applications is a rapidly emerging area of research. A key challenge facing work in this area is developing electronic detection systems that are biocompatible and can be implanted within the human body. The human body facilitates communication of such drug detection signals (e.g. from sensory neurons to the brain) through the exchange of ions, while standard electronic communication is solely mediated by the exchange of electrons. Since the biotic and abiotic worlds speak different languages, a translator is required. Organic electronic materials are uniquely capable of both ion and charge transport and is thus an ideal class of materials for interfacing with living tissue. In this project a drug delivery device will be developed from printable bioelectronics inks that will be targeted at detecting penicillin. The project will explore the biochemistry of an enzymatic reaction triggered through contact with penicillin and the manner in which the products of this reaction can be used as a drug detection device. This project is suitable for students with backgrounds in Physics, Chemistry, Biology and Engineering.	Dr Matthew Griffith E: matthew.griffith@newcastle.edu.au P: (02) 4033 9191	Centre for Advanced Biomedical Physics Priority Research Centre for Organic Electronics (PRCOE)	**Physics**	MAPS

117	**Fully Printable Nanoparticle Systems for X-ray Detection in Clinical Environments**	Rapid growth in the utilization of ionizing radiation in modern life has created a growing demand for new hybrid electronic materials that can readily detect such radiation. Existing X-ray detectors are fabricated from rigid materials and suffer from severe limitations with processing into large-area pixelated detector matrices, an inability to conform to various regions of the human body and also require correction factors to measure the radiation dose delivered to biological species because the device materials do not have a water-equivalent density.To address the limitations, this project will develop new hybrid nanomaterials that combine organic radiation sensing materials with traditional semiconducting polymer photodetectors. Combining the materials inside a nanoparticle allows the absorbed radiation to be efficiently transmitted from scintillator to photodetector through Förster resonance energy transfer (FRET). A combination of steady state and time resolved absorbance and photoluminescence measurements will be used to monitor the nanoparticle performance after fabrication. This project is suitable for students with backgrounds in Physics, Chemistry, Biology and Engineering.	Dr Matthew Griffith E: matthew.griffith@newcastle.edu.au P: (02) 4033 9191	Centre for Advanced Biomedical Physics Priority Research Centre for Organic Electronics (PRCOE)	**Physics**	MAPS
118	**Restoring sight to the blind: Nanoparticle synthesis for artificial retinas**	Neurostimulation plays a critical role in state-of-the-art bioelectronic devices designed to transmit information to and from the neural network of a living host. Such bioelectronic devices are integral to a wide range of current and future medical applications. One extremely exciting application of neurostimulation is to artificially stimulate the optical nerve through an implantable electronic device. Such artificial retinas could readily replace damaged retinal tissue through relatively straightforward surgical procedures, restore vision and thus curing retinal disorders (blindness). Semiconducting nanoparticles are biocompatible and have advantageous optoelectronic properties such as tuneable colour absorption, which make them a prime candidate for retinal applications. The aim of this project is to design, fabricate and characterise semiconducting nanoparticles for use in artificial retinas. This project is suitable for students with backgrounds in Physics, Chemistry, Biology and Engineering.	Dr Matthew Griffith E: matthew.griffith@newcastle.edu.au P: (02) 4033 9191	Centre for Advanced Biomedical Physics Priority Research Centre for Organic Electronics (PRCOE)	**Physics**	MAPS

119	**Curing Cancer with Hyperthermia: Modelling the Transfer of Energy from External Sources to Implanted Biocompatible Nanoparticles**	Hyperthermia (also called thermal therapy or thermotherapy) is a type of cancer treatment in which body tissue is exposed to high temperatures (up to 45°C). Research has shown that high temperatures can damage and kill cancer cells, usually with minimal injury to normal tissues. By killing cancer cells and damaging proteins and structures within cells, hyperthermia may shrink tumours. Hyperthermia is under study in clinical trials (research studies with people) and is not widely available due to a lack of information regarding biological effects of this new treatment. This project will test the feasibility of a novel hyperthermia treatment for blastoma (brain cancer) that involves surgically implanted nanoparticle arrays that absorb energy from an external energy field and convert this to thermal energy inside the body for cancer therapy. The project will model the energy absorption, transmission and conversion to thermal processes and monitor how these parameters are influenced by particle dielectric constant and nanoparticle size. This project is suitable for students with backgrounds in Mathematics, Physics, and Engineering.	Dr Matthew Griffith E: matthew.griffith@newcastle.edu.au P: (02) 4033 9191	Centre for Advanced Biomedical Physics Priority Research Centre for Organic Electronics (PRCOE)	**Physics**	MAPS
120	**Developing a 'Build Your Own Solar Cell' kit for high schools**	At the Centre for Organic Electronics (COE) we are developing a self-contained solar cell fabrication kit suitable for use in both undergraduate teaching classes and high school laboratories for demonstration purposes. Usually, organic solar cell fabrication requires the use of expensive laboratory equipment only found in a university or industry environment, such as fume hoods, spin coaters, nitrogen glove boxes and metal evaporation systems. We are developing a 'Build Your Own Solar Cell' kit which avoids the use of expensive and highly technical equipment, and also eliminates toxic printing solutions from fabrication. Our solar cell fabrication kit comprises a 3D printed portable mini spin coater, patterned ITO electrode glass substrates, pre-fabricated Field's Alloy top electrode, and coating solutions of PEDOT:PSS hole transport material, TQ1:$PC_{61}BM$ semiconducting materials, and ZnO electron transport material.	Dr Natalie Holmes E: natalie.holmes@newcastle.edu.au **P:** (02) 4921 5134	Priority Research Centre for Organic Electronics (PRCOE)	**Physics**	MAPS

121	**Exploring non-fullerene acceptors PNDIT10 and N2200 in nanostructured photoactive layers for all-polymer solar cells**	The development of non-fullerene acceptors (NFAs) has opened the door for the incorporation of a new class of organic semiconductor material into nanoparticulate photoactive layers, for high performance all-polymer solar cells processed from eco-friendly coating solutions. NFAs, such as PNDIT10 and N2200, have emerged as promising OPV materials with tuneable HOMO and LUMO levels, broad and strong light absorption, and superior morphological stability. This project will involve the fabrication and characterisation of NFA-based all-polymer solar cells at the Centre for Organic Electronics.	Dr Natalie Holmes E: natalie.holmes@newcastle.edu.au P: (02) 4921 5134	Priority Research Centre for Organic Electronics (PRCOE)	**Physics**	MAPS
122	**Surface Plasmons in Metal Nanostructures**	Surface plasmons are collective excitations of valance electrons that propagate along a surface. They are currently of enormous technological interests for applications such as single molecule detection, sub-wavelength optics and even tumour therapy. Surface plasmons can be generated by light or by fast electrons. There are clear connections between the two types of excitations because both can be represented by time-varying electric fields. However the time and spatial dependence of these fields is distinctly different. Having computational models available to simulate the plasmonic interactions is essential for development in the field. This project will develop computer codes for the calculation of plasmonic interactions. The project is suitable for a student with strong mathematical and programming skills.	A/Prof Vicki Keast P: (02) 4921 6653 E: vicki.keast@newcastle.edu.au	Surface and Nanoscience Group	**Physics**	MAPS

123	**Preparation and Characterization of Streptavidin-conjugated P3CT Thin Film for OTFT Biosensors**	With an attempt to prepare for the imminent healthcare revolution, which will bring new clinical testing technologies, the development of biosensors for point-of-care testing (POCT) is attracting tremendous interest. However, until now, biosensors have not entered the market, this might be due to high manufacturing costs. Organic semiconductors can be produced at low cost by use of screen printing and inkjet printing. They can also be easily chemically tailored to adjust their properties, which is crucial for biosensors where the bio-recognition elements have to be attached or grafted. Organic thin-film transistor (OTFT)-based biosensor can contribute to these goals because of their biocompatibility, property tunability, light-weight device, and low-cost fabrication. Streptavidin and biotin will be used as a testbed here. OTFT-based biosensors hold great potential for the commercialization of next-generation biosensor devices in the healthcare industry. Poly[3-(3-carboxypropyl)thiophene-2,5-diyl] (P3CT) is another class of poly(thiophene)s bearing carboxylic acid groups. There has been no study of how the nature of the streptavidin side chains affects the performance of the resulting thin film. In an effort to establish P3CT as suitable donor materials for OTFT-based biotin biosensor, this project focuses on the immobilization of Streptavidin onto P3CT thin film and characterization of resulting film for OTFT application.	Dr Swee Lu Lim E: swee.lim@newcastle.edu.au P: (02) 4033 9253	Centre for Organic Electronics (COE)	**Physics**	MAPS

124	**Screening Organic molecules for redox flow batteries**	Redox flow batteries have emerged as a promising energy storage technology for large scale applications, especially for the renewably sourced grid. However, the cost to performance incentives for such batteries are not yet practical. The paradigm shift from metal based redox active materials (such as for Vanadium flow batteries) to organic molecules has been promising, however, high cost, low conductivity, solubility limitations of organic electrolytes limit practical implementation of Organic redox flow batteries. Research on novel electrolyte systems at the Nann group, has led to the development of an aqueous based electrolyte system which is highly tuneable to suit the needs of specific organic redox molecules. These low-cost electrolytes can be tuned to suit the redox pair in terms of solubility and stability. More interestingly, these aqueous based electrolytes exhibit an electrochemical window (voltage over which the electrolyte is stable) much higher than the theoretical limit for water splitting i.e. 1.23 V. The versatility of these electrolytes combined with the potential for extracting high cell voltages, using cost effective components makes it a promising class of electrolytes for organic redox flow batteries of the future.	Prof Thomas Nann P: (02) 4055 3003 E: Thomas.nann@newcastle.edu.au	Thomas Nann Research Group	**Physics/ Chemistry**	MAPS
125	**Nanomaterial composites for high-performance Al-ion batteries**	Aluminium-ion batteries (AIBs) are a very promising alternative to Lithium-based systems for grid-level energy storage, thanks to the low-cost, non-flammability and three-electron redox chemistry of aluminium. AIBs could in principle offer better cost-effectiveness, high capacity and safety, which would lead to a substantial advance in energy storage technology. Currently, one of the biggest challenges in this field is to extend the cycling stability of the cathode material by preventing its dissolution in the electrolyte medium. One possible way to achieve this result is by creating nanocomposite materials, which can inhibit the diffusion of the active material through different mechanisms. This project will involve the investigation of novel nanostructured cathode materials or Al-ion batteries and the assessment of their performance through the preparation of prototype battery devices. The student will be in charge of fabricating nanomaterials using wet chemistry techniques, which will be then used in the assembly of prototype cells, to assess their electrochemical performance.	Prof Thomas Nann P: (02) 4055 3003 E: Thomas.nann@newcastle.edu.au	Thomas Nann Research Group	**Physics/ Chemistry**	MAPS

126	**Machine Learning, Big Data and Randomised Numerical Linear Algebra**	Matrices have extensive applications in applied mathematics, statistics and computer science. Motivated by technological developments that generate extremely large scientific data sets, recent years have witnessed exciting developments in the theory and practice of matrix algorithms. Particularly remarkable is the use of randomisation as an algorithmic or computational resource for the development of improved algorithms for fundamental matrix problems. Randomised Numerical Linear Algebra (RandNLA) is an interdisciplinary research area that exploits randomisation as a computational resource to develop improved algorithms for large-scale linear algebra problems. It is a vital new tool for statistics, optimisation and machine learning and promises a sound algorithmic and statistical foundation for modern largescale data analysis. There are a few projects available to develop and implement RandNLA algorithms for analysing big data.	Dr Ali Eshragh E: Ali.Eshragh@newcastle.edu.au P: (02) 4921 5427	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA) International Computer Science Institute (ICSI) at the University of California, Berkeley	**Statistics**	MAPS
127	**Time Series Mining and Applications**	(a) Time Series Mining: Clustering; Visualisation; and Anomaly Detection; (b) Applications of Time Series and Dynamic Systems in Modelling and Forecasting: statistical methods; signals, systems and control methods; computational intelligence and machine learning methods.	Prof Ricardo J. G. B. Campello E: ricardo.campello@newcastle.edu.au P: (02) 4921 6762	Priority Research Centre for Computer Assisted Research in Mathematics and its Applications (CARMA)	**Statistics and Data Science**	MAPS

School of Psychology:

Topic No.	Title of Research Topic	Description of Research Project	Principal Supervisor Contact Details	Research Group/ Centre	Discipline	School
128	**Effectiveness of Eucalyptus essential oil as consumer friendly mosquito repellent.**	This aim of this research is to reduce the incidence of mosquito infestation within the internal and external campus environments during the peak mosquito breeding season. The primary outcome of the research will be to determine the effectiveness of commercial eucalyptus essential oil diffusers within staff and student areas of university buildings. This research incorporates knowledge of mosquito sensory and perceptual behaviour together with the established mosquito repellent properties and biodiversity of the Eucalyptus species together with measures of consumer acceptance and preference.	Dr Bill Budd P: (02) 4348 4135 E: Bill.Budd@newcastle.edu.au	Biological Psychology Research Group Priority Research Centre for Brain and Mental Health	**Psychology**	PSYC
129	**Sensory and affective processing of odours.**	The aim of the following research is to gain further understanding of how peripheral psychophysiological measures reflect different aspects of the odour perception. Eucalyptus oils will be used as they are chemically similar to each other but have differences in odourant composition. Although different, eucalyptus oils are a similar class of odours, and they produce similar reactions in the trigeminal and olfactory systems in the brain, which impacts perceptual and affective differences. This project will help develop our understanding of the sensory and affective processes underlying odour discrimination.	Dr Bill Budd P: (02) 4348 4135 E: Bill.Budd@newcastle.edu.au	Biological Psychology Research Group Priority Research Centre for Brain and Mental Health	**Psychology**	PSYC
130	**Addressing physical health risk behaviours among persons with a mental illness**	People with a mental illness experience high levels of a range of health risk behaviours, including smoking, poor nutrition, inadequate physical activity and sleep issues. Consequently, this group experiences a high level of preventable morbidity and mortality from associated chronic diseases. There is a relative paucity of research reporting on chronic disease risk behaviours among people with a mental illness, despite a clear need for greater understanding of contributing factors and the development of interventions. This summer scholarship will provide an opportunity to work across a number of descriptive and intervention-based projects being undertaken by the Physical Health in Mental Illness (PHiMI)	Prof Jenny Bowman P: (02) 4921 5958 E: jenny.bowman@newcastle.edu.au	Health and Clinical Psychology Research Group Priority Research Centre for Health Behaviour HMRI Public Health Program	**Psychology**	PSYC

		team. There may be scope to contribute to the development of survey instruments to be administered to staff or clients of mental health services, undertake literature searches to inform grant submissions, and assist in preparing manuscripts for publication.				
131	**Community managed organisations: an opportunity to improve the physical health of people with a mental illness?**	People with a mental illness have high levels of a range of chronic disease health risk behaviours, including smoking, poor nutrition and inadequate physical activity. The increasing focus on Community Managed Organisations (CMOs) in the delivery of mental health care may offer a significant opportunity to provide preventative care for health risk behaviours to consumers with a mental illness. However, research is required to understand how the potential of this opportunity may be realised. This summer scholarship will involve contributing to a large collaborative project exploring the current practices, barriers and facilitators to CMOs providing care for health risk behaviours. The project is using mixed methodologies, and there may be opportunity to contribute to the design of in-depth interviews for CMO managers, to assist with analysis of quantitative data obtained from an online survey tool for CMO staff, and assist in preparing manuscripts for publication.	Prof Jenny Bowman P: (02) 4921 5958 E: jenny.bowman@newcastle.edu.au	Health and Clinical Psychology Research Group Priority Research Centre for Health Behaviour HMRI Public Health Program	**Psychology**	PSYC
132	**The human face as an evolved signalling system.**	Human faces convey a wide range of information about identity, age, sex, health, fertility, etc. and movements of the face operate as complex social signals. The summer scholarship student will help to run a project investigating non-verbal dynamic signalling in a variety of social contexts - the way people's facial movements communicate a wealth of subtle information to their social partners. You will help to run participants in the study and to analyse the resulting video footage. Given that we currently know very little about what kinds of signals are conveyed in these contexts, there is an opportunity for you to make a significant intellectual contribution to the project.	Dr Darren Burke P: (02) 4348 4158 E: Darren.Burke@newcastle.edu.au (Ourimbah campus ONLY)	Sensory, Cognitive and Affective Neuroscience Research Group Priority Research Centre for Translational Neuroscience and Mental Health	**Psychology**	PSYC

133	**Tourism motivations: Design of a measure**	Some people are happy travelling to the same familiar spot every year, while others are looking for an adventure. People are motivated by different needs when choosing their next holiday, but the tools we use to measure these different motivations are poorly designed and remain invalidated. This project will involve literature review of the tourism motivations research, to design a measure of tourism motivations.	Dr Heather Douglas E: heather.douglas@newcastle.edu.au P: (02) 4913 8773	Social, Organisational and Personality Research Group (SOPRG) Centre for Brain and Mental Health Research (CBMHR)	**Psychology**	PSYC
134	**Imposter Phenomenon at work: Validating a measure of under-confident embedded in intelligence tests**	Imposter phenomenon (IP) is the feeling of perceived fraudulence in the face of achievement related tasks. Individuals with IP procrastinate, over-prepare for tasks when they do start, and might be at more general risk of burnout at work. Existing measures of IP are self-report and therefore prone to impression management. This study seeks validate a measure of IP embedded within an intelligence test. A literature review will be conducted to find survey-based measures of key antecedents of IP.	Dr Heather Douglas E: heather.douglas@newcastle.edu.au P: (02) 4913 8773	Social, Organisational and Personality Research Group (SOPRG) Centre for Brain and Mental Health Research (CBMHR)	**Psychology**	PSYC
135	**The effect of past outcomes on current performance: 'Hot Hand' in computer games.**	The 'Hot Hand' phenomenon in basketball (Kahneman & Tversky), or other sports, refers to one's ability to make a successful shot after a sequence of successful shots, compared to her or his chances of making the next shot after unsuccessful shot(s). Presumably, high confidence after a successful trial improves performance on subsequent trial(s). We shall test if the 'Hot Hand' phenomenon exists in computer games, and focus on whether or not gamers are willing to take higher risks after successful trials.	Dr Ami Eidels P: (02) 4921 7089 E: Ami.Eidels@newcastle.edu.au	Cognitive Psychology Research Group	**Psychology**	PSYC
136	**Is this female builder fixing my house?: Stereotypes and counter-stereotypes**	People hold strong views about the likelihood of certain traits. We expect female nurses and male builders, but not so much the opposite. In this project you will study the cognitive mechanisms associated with stereotypical and counter-stereotypical views. [With Dr Mark Rubin, Social and Organisational Psychology Research Group].	Dr Ami Eidels P: (02) 4921 7089 E: Ami.Eidels@newcastle.edu.au	Cognitive Psychology Research Group	**Psychology**	PSYC

137	**Human behaviour and decision making in Dutch Auctions**	In a Dutch auction scenario, multiple participants observe a particular item for a limited, fixed amount of time. The monetary value of the product starts at some maximum level and goes down with time. In this project you will use computer-based tasks to study the factors affecting bidding decisions. [with Dr Marc Adam, School of Creative Industries]	Dr Ami Eidels P: (02) 4921 7089 E: Ami.Eidels@newcastle.edu.au	Cognitive Psychology Research Group	**Psychology**	PSYC
138	**Cognitive workload: exploring information processing and decision making under increased load**	Pilots and drivers in particular need to make quick and accurate decisions. Yet the modern environment bombards us with an overwhelming amount of information. This overload can potentially compromise the speed and accuracy of our responses. In this project you will use state-of-the-art modelling techniques to study how people are affected by information overload [with Dr Scott Brown - Psychology; and Dr Keith Nesbitt – School of Electrical Engineering & Computing/IT]	Dr Ami Eidels P: (02) 4921 7089 E: Ami.Eidels@newcastle.edu.au	Cognitive Psychology Research Group	**Psychology**	PSYC
139	**The impact of father-child play on child development**	Most research looking at child development focusses on maternal influences. This research project instead looks at the unique contributions that father-child play interactions have on child outcomes. The research will require a student to code the father-child play interactions, which will then be used to determine which aspects of play (e.g., dominance, sensitivity etc.) promote healthier child development trajectories.	Dr Emily Freeman P: (02) 4921 6115 E: emily.freeman@newcastle.edu.au	Cognitive Research Group Priority Research Centre for Brain and Mental Health Research	**Psychology**	PSYC
140	**Understanding drivers' critical takeover capacity in simulated self-driving cars**	Increasing vehicle automation promises to improve road crash rates both in Australia and around the world. As self-driving technology becomes a commercially available reality, it is clear that this promised improvement to crash rates will come at the cost of human control over the vehicle system in all-but-critical scenarios. This project evaluates the capacity for a supervising driver to resume control of a simulated automated vehicle in the event of a critical takeover before and after periods of extended fatigue-inducing supervision. Novel measures of driver situation awareness as well as physiological measures of arousal are used to assess and predict a supervising driver's response to these critical scenarios. This project involves working closely with the School of Psychology's motion-base driving simulator and may include basic programming of simulated scenarios if the student expresses interest in this area, however programming experience is **not** required.	Dr Cassandra Gauld P: (02) 4055 3046 E: cass.gauld@newcastle.edu.au	Psychology Driving Lab PRC for Brain and Mental Health Research/PRC for Health and Behaviour	**Psychology**	PSYC

141	**Simple and complex decisions**	We routinely make hundreds of decisions every day, but how do we make them? Do we use the same or different psychological processes to make simple decisions – like judging the colour of a flower – and complex decisions – like which mobile phone to purchase? In this project you will undertake a series of experiments and analyses to examine the commonalities and tease apart the differences in the cognitive operations people use to make simple and complex decisions. This research will contribute to a deeper theoretical understanding of human decision processes.	Dr Guy Hawkins E: Guy.Hawkins@newcastle.edu.au P: (02) 4985 4493 W: guyhawkinsresearch.com	Cognitive Psychology Research Group	**Psychology**	PSYC
142	**Understanding mechanisms of inflammation-associated anxiety**	Anxiety affects 14% of Australians and has an onset during childhood or adolescence. Available pharmacological treatments only stabilise or modulate brain chemistry without necessarily targeting the root causes of the disorder. Furthermore, treatment is often ineffective and can lead to a worsening of symptoms, including suicide. We and others have shown that often the vulnerability to anxiety is laid down in early life. Thus, it is critical to uncover the biological mechanisms responsible for this to develop novel treatment options. We have preliminary evidence that neonatal infection causes lifelong changes in the kynurenine pathway. This research project will investigate the role of early life infection in influencing the immune response and the production of neurotransmitters that are abnormal in anxiety disorders. Understanding how early life infection can influence our mental state will help develop safe treatment options for children and adolescents suffering with anxiety disorders.	Dr Sharon Hollins E: Sharon.hollins@newcastle.edu.au P: (02) 4921 6858	Neuroimmunology Research Group Priority Research Centre for Brain and Mental Health Research HMRI	**Psychology**	**PSYC**
143	**Do you smile when you are on messenger?**	This study looks at what happens physiologically when we are communicating online. Do you get sweaty palms, does your heart race and do you mimic your communication partner with your facial expressions. Here we want to know whether presence or absence of some of these factors plays a role in cyberbullying	Dr Michelle Kelly P: (02) 49216838 E: Michelle.Kelly@newcastle.edu.au	Sensory, Cognitive and Affective Neuroscience Research Group Priority Research Centre for Brain and Mental Health Research. HMRI	**Psychology**	PSYC

144	**Arts as you Age**	This research aims to look at factors of lifestyle that may offer some cognitive protection as we age. Does engagement in creative activities lifelong or in older adulthood help us age better. Does it have benefits for cognition, mood and social support?	Dr Michelle Kelly P: (02) 49216838 E: Michelle.Kelly@newcastle.edu.au	Sensory, Cognitive and Affective Neuroscience Research Group Priority Research Centre for Brain and Mental Health Research. HMRI	**Psychology**	PSYC
145	**The effects of various substances on cognitive processes**	Many substances have effects on cognitive processes and the effects of combinations of substances are likely to be greater than the sum of the effects of two individual substances. These effects can be either positive (resulting in enhanced performance) or negative (resulting in decrements in performance) depending on the nature of the substance. Studies will be conducted to further explore the effects on cognitive processes of substances such as alcohol and caffeine using electrophysiological and/or behavioural measures in the general population.	Prof Frances Martin P: (02) 4348 4121 E: Frances.Martin@newcastle.edu.au (Ourimbah Campus)	Sensory, Cognitive and Affective Neuroscience Research Group Priority Research Centre for Translational Neuroscience and Mental Health	**Psychology**	PSYC
146	**Emotion and attention**	The literature is divided as to whether emotion affects cognitive processes or whether our cognitive processes affect emotion with some of the literature suggesting that both can occur depending on the nature of the stimuli and the task. The majority of studies investigating the perception (rather than the experience) of emotion have used the International Affective Picture System stimuli, however very few studies have investigated the effects on emotional processing of the various semantic contents of the stimuli. Studies will be conducted to further explore the differences in responses to varying semantic stimuli using electrophysiological, measures.	Prof Frances Martin P: (02) 4348 4121 E: Frances.Martin@newcastle.edu.au (Ourimbah Campus)	Sensory, Cognitive and Affective Neuroscience Research Group Priority Research Centre for Translational Neuroscience and Mental Health	**Psychology**	PSYC

147	**Behavioural Addiction**	Recent advances in the field of addiction have given greater emphasis to subjective experience and compulsive behaviour. This signifies an important shift from focusing on the object of addiction to acknowledging that behaviours, which can induce changes in physical arousal and subjective experience, have the propensity to be overused and lead to addiction. Gambling, video-arcade games, computer games, and the Internet have therefore been identified as potentially addictive activities, which like drug use, also exist on a continuum of addiction, ranging from no symptoms of addiction to addiction. Researchers have also emphasised the need to distinguish high engagement in activities and addiction. Studies will be conducted to further explore the nature of internet use and the potential for addiction to occur to the internet.	Prof Frances Martin P: (02) 4348 4121 E: Frances.Martin@newcastle.edu.au (Ourimbah Campus)	Sensory, Cognitive and Affective Neuroscience Research Group Priority Research Centre for Translational Neuroscience and Mental Health	**Psychology**	PSYC
148	**Seeking or avoiding diversity? Investigating the predictive role of personality and situational variables including anxiety, self-expansion, and self-knowledge**	Extensive evidence indicates that intergroup contact between individuals of opposing groups (e.g., Anglo-ethnic individuals, straight and gay individuals, young-old people, etc.) diminishes prejudiced attitudes (e.g., racism, homophobic attitudes, ageism, stigma towards mental illness etc.) and increases social integration in society (see Pettigrew & Tropp's 2016 meta-analysis). Willingness to engage with diversity naturally precedes any meaningful contact between people of opposing groups, yet research investigating the determinants of people's seeking/avoiding diversity is surprisingly scant. Research in Dr Paolini's social psychology tackles this socially important and academically novel issue. Among other factors, it currently investigates the role that intergroup anxiety, the anxiety experienced when engaging or anticipating and intergroup interaction, has in deterring intergroup contact but at times in propelling people towards diversity (i.e., an ironic effect; for a review of recent studies in her research laboratory, see Paolini, Harris, & Griffin, 2016). Her current work also investigates the role that individuals' need for self-expansion (the desire to expand the resources, perspectives, and identities of the self), and the need for self-knowledge (the desire to expand one's knowledge of the self; for recent empirical work, see Paolini, Wright, Dys-Steenbergen, & Favara, 2016) have in triggering curiosity and interest in diversity. The relative predictive powers of these and other critical factors is currently examined in a variety of research projects with a variety of	A/Prof Stefania Paolini P: (02) 4921 5938 E: stefania.paolini@newcastl.edu.au	Social Psychology Laboratory Social Psychology and Organisational Psychology Research Group Priority Research Centre for Translational Neuroscience and Mental Health	**Psychology**	PSYC

		international and national research collaborators. This multi-prong line of research that is sponsored by an Australian Research Council grant uses a mixed-model approach: A combination of natural observation, surveys in the field, experimentation in the laboratory (including physiological responses) or online to investigate individual difference variables and contextual factors that affect people's willingness to engage with or avoid diversity. Dr Paolini's lab is a vibrant environment and welcomes research students at different levels of research training (e.g., undergraduate research volunteers, honours, overseas research visitors, PhD students and Clinical Masters students).				
149	**Testing Novel Research Questions on Social Integration Dynamics using Meta-analytical Tools Capable of Synthetising Extensive Data from Extant Research**	This research internship will provide first-hand experience with real time cutting-edge research on intergroup and social cognition processes. Solving social justice issues requires an understanding of the factors and dynamics behind prejudice, including the role that contact between members of opposing groups play in these phenomena. Intergroup contact is the focal area of psychological inquiry this research internship will focus on and contribute to. The internship student will have the opportunity to contribute to ongoing collaborative research projects testing negativity biases in impact and frequency in the intergroup contact literature, which run cross-institutionally and internationally. As part of the research internship, the student will be exposed to various tasks associated with meta-analysis projects within the social psychology laboratory, including be qualitative analysis and coding of published and unpublished studies, results reporting and an assortment of tasks contributing to the meta-analyses (and related research projects in the social psychology laboratory).	A/Prof Stefania Paolini E: stefania.paolini@newcastl.edu.au P: (02) 4921 5938	Social Psychology Laboratory Social Psychology and Organisational Psychology Research Group Centre for Brain and Mental Health Research	**Psychology**	**PSYC**
150	**Leading Social Change**	When groups of people come together to change the world, it is important to ask how and why 'we' are moved to get off the couch and onto the street. Yet, that question is curiously absent from social psychological analysis of mobilisation for social change. This project will examine social influence and leadership dynamics when it comes to collective action mobilisation—with a particular emphasis on new and emerging, perhaps unlikely, leaders that despite their 'minority' position have the capacity to transform 'majority' opinions and behaviours.	Dr Emina Subasic P: (02) 4985 4597 E: Emina.Subasic@newcastle.edu.au		**Psychology**	PSYC

151	**Solidarity for Gender Equality**	Gender inequality persists in part because traditional approaches to addressing this issue focus primarily on women's experiences and women's role in achieving equality (e.g., negotiation and assertiveness training, mentoring programs, etc.). In this project we instead argue that gender inequality is a problem for our society as a whole—and one that can only be addressed if men and women work together, as leaders and champions of change. This project will examine how redefining who 'we' are—as men and women, but also as citizens, colleagues, friends—also has the capacity to shape engagement with this important social issue beyond gender boundaries.	Dr Emina Subasic P: (02) 4985 4597 E: Emina.Subasic@newcastle.edu.au		**Psychology**	PSYC
152	**Filtering event relevance**	Summer students would join a team using neuroimaging methods to study cognitive and perceptual processes addressing how the brain filters the relevance of events around us to prioritise certain sources of information while filtering out others. This process is altered in certain conditions such as schizophrenia and changes as we age. Summer students would: (1) gain experience in the experimental designs used to study this process; (2) be trained in the methods; (3) collect data on pilot projects; and (4) be exposed to how be analyse the data to obtain meaningful measures of brain processes. In addition the student would learn about the studies we are conducting to assess how this filtering process works from the neonate through adulthood and into older ages and clinical groups.	Prof Juanita Todd Juanita.Todd@newcastle.edu.au (02) 49215977	Sensory Cognitive and Affective Neuroscience	**Psychology**	PSYC