Celebrating Research Scholarships and Expeditions 2017
Wednesday 29th November
Introduction to Research Scholarships and Expeditions 2017

Newcastle University places a high value on students pursuing new knowledge, developing independence of thought, and being exposed to the culture of research. The University supports undergraduate students with scholarships to work alongside researchers on summer vacation projects and, through its expeditions scheme, to undertake field research in other countries. Both these schemes enable students to experience research-led learning and to develop key skills through a wide range of activities, such as researching new archival material in Newcastle or further afield, working on archaeological material, collecting, analysing and interpreting social data, working on a laboratory project alongside members of a research team, travelling to another part of the world to undertake a research project in an unfamiliar and challenging environment.

Conducting independent research with the support of more experienced researchers can have a very positive impact on the confidence and motivation of students. By giving students the opportunity to work closely with staff through these schemes students are able to understand the research activities of academic staff, and to have a window on the research environment.

Whatever the domain of activity, a Research Scholarship provides an opportunity for students to find out what research is like, to develop research and problem solving skills and to engage in enquiry based learning. The production of a poster at the end of the project helps to develop the student’s presentational skills and underline the importance of being able to communicate research findings to a variety of audiences.

I hope that all of the students who were successful in gaining a Research Scholarship or Expedition funding will have benefited from their experience through an enhanced understanding of the value of research, and an increased confidence in their research and professional skills.

Professor Suzanne Cholerton
Pro-Vice-Chancellor (Learning & Teaching)
The history of student expeditions at Newcastle dates back to 1948 when a small group of Geography undergraduates took part in a pioneering expedition to Iceland, guided by Hal Lister, who later became a Reader in the Geography Department and a noted Arctic and Antarctic explorer. Subsequent expeditions over the past sixty-nine years have been organised and conducted by students from a wide range of disciplines from each of the three University faculties to countries as diverse as Brazil, Greenland, Iceland, Israel, Kenya, Kyrgyzstan, Norway, the Maldives, Papua New Guinea, South Africa, Tibet and Zambia. Research has been carried out on a wide range of topics including biodiversity, ethnography and rock art, tropical diseases, medicinal plants, nursing care, melting glaciers, territoriality and identity, forest tribes, and nomadic communities.

Organising an overseas expedition is a challenging exercise, requiring students to develop research aims and objectives, identify study sites, learn new techniques, obtain field equipment, and liaise with research counterparts and institutions overseas. An additional challenge is that overseas expeditions usually require substantial funding which the students must raise themselves, including from external professional bodies such as the Royal Geographical Society and commercial sponsorship.

The students who rise to these challenges gain a wide range of valuable skills and also benefit from team-working and leadership experience. In addition to the hugely rewarding experience that students gain throughout the whole expedition process from planning through to successful completion and write-up, they always return with new skills, a huge sense of satisfaction and fulfilment, and increased confidence and maturity.
Newcastle University’s thriving Research Scholarship and Expeditions programmes go from strength to strength.

Once again this year there has been enormous interest in student Research Scholarships and around 100 projects were undertaken across most schools in all three faculties – Humanities and Social Sciences, Medical Sciences and Science, Agriculture and Engineering. While many Research Scholarships were funded by the University, 12 students received external funding from other organisations, including the Physiological Society, the Royal Society of Chemistry and the Wellcome Trust. Successful scholarships were also undertaken by Newcastle University students at Monash University, Australia and by students based at the University’s branch campuses in Malaysia and Singapore.

In 2017 four Expeditions were undertaken by students from the Faculty of Humanities and Social Sciences, Science, Agriculture and Engineering and the Faculty of Medical Sciences. Funding towards these expeditions was awarded by the University’s Expeditions Committee, as well as other external organisations, such as the Royal Geographical Society, the Harry Collinson bequest and the Gilchrist Educational Trust.

The continuing success of the University’s Research Scholarships and Expedition schemes demonstrate the strength of the University’s reputation both for the quality of the research training provided, and for the creativity of our students and staff in putting forward ideas for interesting and useful research projects to foster personal development, enhance future career prospects and widen the academic experience of many students.

The projects undertaken during 2017 are described in this brochure and academic posters can be viewed both before and after the oral presentations.
Reception and Presentation Evening

The presentation evening celebrating recent student research scholarships and expeditions takes place on Wednesday 29th November 2017. From 4:15pm in the Lindisfarne Room, King's Road Centre, a display of posters will show student research scholarship and expedition achievements and provide an opportunity to speak to the students who have carried out the research. From 5:30pm, in the Curtis Auditorium, Herschel Building, a number of students will make presentations about five selected research scholarship projects and expeditions describing their aims, how they conducted their research and the outcomes. At the conclusion of the presentations the winning student posters for 2017 will be announced by the Pro-Vice Chancellor for Learning and Teaching and winners will be presented with certificates and prizes.

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<td>Academic posters available for public viewing</td>
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<td>Welcome and introductions by Prof Suzanne Cholerton and Dr Gordon Port</td>
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<td>7:05-7:15pm</td>
<td>Announcement of poster winners by Prof Suzanne Cholerton (PVC Learning and Teaching) and presentation of awards to students</td>
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<td>7.20pm</td>
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Simon Hirst  
**BA (Hons) Music**  
Interactive Music in the Student Forum  

Music is viewed by many in society as either groups of highly skilled musicians playing or singing classical pieces in expensive concert halls or performing musical shows in up-market theatres. Musicians need to try to challenge perceptions and educate society that music is neither elitist nor X-Factor, but a medium that everyone can take part in, be inventive and enjoy. Interactive music provides a novel mechanism to engage young, old, those with a musical training and those with none, and allow them to experiment, uninhibited, with musical sounds in everyday locations. In this project the student will create a digital interactive instrument within the student forum to allow the public to create music that reflects their movement. The zone will contain movement sensors, which, when triggered, will result in sounds being played back live according to how the user interacts. Once the user has experienced the instrument they will complete a short questionnaire about their experience focusing on their personal experience of the zone to investigate whether this method could be as a new form of music therapy.

**Funding source: Newcastle University**

**Supervisor: Dr Bennett Hogg**
Hayley Andrews, Holly Chubb, Emily Cave, Callum Cochrane, Connor Downes, William Ogden, Carl Giardina, James Dickinson

Bsc (Hons) Geography

Understanding the geomorphological processes of a glaciated region, Svalbard.

Svalbard is a scientifically important location to study as it is a particularly temperature-sensitive glaciated region and has a range of different glaciological and climatic environments. Previous research indicates that the area is rapidly responding to climate change and increasing air and water temperatures, which could have global ramifications including flooding and restricted access to freshwater resources.

Our research will make a significant contribution to geographical knowledge by improving understanding of Svalbard glaciers and their response to changes in global climate. This research project aims to tie together a range of scientific focuses to better understand the geomorphological processes taking place in high arctic glaciers. Although this research is specific to Longyearbreen glacier, Svalbard, the concepts identified and findings discovered may be applicable to other, less accessible, high artic glaciers.

Research was conducted over a total of 22 days, using a variety of field techniques such as, GPS mapping, water chemistry analysis and hydrology measurements. Despite the decline in Longyearbreen glacier elevation, the rate of thinning under high debris thickness has reduced from previous years. Discharge of the proglacial stream of Longyearbreen glacier increased over the study period whereas melt rates remained relatively consistent, most likely due to the release of previously stored meltwater. Suspended sediment present in the proglacial system increased throughout the study period alongside a gradual increase in discharge and cross-sectional area.

Through understanding the processes of the Longyearbreen glacial system, we can better understand how the system, and other relatable systems, may evolve in the future.

Funding sources: Newcastle University Expedition Committee, Royal Geographic Society (with IBG), The Arctic Club, Gino Watkins Award, The Scottish Arctic Club, Lord Mayor’s 800th Anniversary Fund, Sir Philip Reckitt Educational Trust, Gilchrist Educational Trust.

Project Supervisors: Prof. Andy Russell, Dr. Andrew Henderson and Dr. Neil Ross
Timothy Rodaway  
BSc (Hons) Geographic Information Science  
A case study of visualising environmental monitoring data: Northumberland Street Regeneration  
This project will look into the development of a workflow for turning environmental data into useable information, specifically using data from ten air quality sensors deployed as part of the Newcastle City Council’s Northumberland Street Regeneration program in conjunction with the UKCRIC and Science Central funded Urban Observatory Programme (http://urbanobservatory.ac.uk). Open source software will be used to perform a preliminary analysis and initial processing of the data. 3D gaming software will then be used to finalise the data processing and generate visualisations of the data, in a format accessible to end users, and useable by the general public, retailers, Newcastle City Council, and partners of the Northumberland Street Regeneration program.  
Funding source: Newcastle University  
Supervisor: Mr Phil James
Max Henderson Alexander Liddington and Yannick Thompson

BSc Hons (Biology/Zoology)

Investigating ecological responses to changing environments, Palo Verde National Park, Costa Rica

This student-led expedition encompassed 3 studies, all of which were designed to investigate the effects of environmental change on a vast 184 km² expanse of pristine wetland and dry forest habitat in Costa Rica.

Max collected and analysed blood samples and body measurements from American Crocodiles to assess levels of chronic stress within the population, and investigate its potential causes. Crocodiles play an extremely important role as ecosystem engineers, apex predators, and keystone species for conservation efforts, and chronic stress levels could provide a valuable insight into the health of populations once causal mechanisms are better understood.

Yannick used baited pitfall traps to study the community composition and abundance of dung beetles in various different habitats, such as mango groves, meadows, and secondary forest. Dung beetles can act as pollinators, nutrient cyclers, and improve fertility of soil. Assessment of their habitat preference can provide information to help predict and mitigate environmental impacts of land development.

Alexander swabbed amphibians to test for the presence of Chytrid fungus, a widespread disease which is destroying global amphibian populations. Due to little being known about factors affecting spread of chytrid through different habitats, Palo Verde and its habitat diversity provides a near-perfect site to study drivers of spread among different species, habitats, and populations.

Funding sources: Royal Geographical Society (with IBG), Newcastle University Expeditions Committee, James Marshall Foundation and Hertfordshire Travel Fund

Supervisors: Dr Richard Bevan, Dr Marion Pfiefer & Dr Darren Evans

Eleanor Johnston

BSc (Hons) Pharmacology

Assessment of the pathological hallmarks of neurodegenerative age-related diseases. Comparison of quantification methodologies

As life expectancy increases, age-related diseases such as Alzheimer’s disease and vascular dementia are becoming more common within the population. These conditions are debilitating and have a devastating impact on patients and their families. Currently, there is no cure. In order to overcome dementia, a better understanding of the underlying disease processes is needed.

The blood-brain barrier (BBB) is an essential protective mechanism that restricts the entry of harmful substances in the blood into brain tissue. Previous studies have linked increased leakiness of the blood-brain barrier to age-related disease.

This project aims to assess the amount of BBB leakage in both brains affected by Alzheimer’s disease and age-matched control brains. This was done by chemically labelling a protein in the blood (called fibrinogen) and using microscope imaging to determine the amount of this protein in the brain, followed by a statistical analysis of the data.

Funding source: Newcastle University

Supervisor: Prof Johannes Attens
When it comes to liver cancer, there’s one burning question that is yet to be answered: What is the key driver mutation or the first defect point in cells to become cancerous for liver cancer? Unlike other types of cancer like breast cancer that has a specific key driver mutation, the exact point in liver cancer is still blurry. This is mainly because every liver cancer has many different mutations, making it difficult to find a common point in them. Hence, we are still unable to have one single universal biomarker that can detect every liver cancer. This project studied a panel of liver cancer biomarkers and their prevalent in liver cancer patients blood samples. The impacts on knowing the most prevalent biomarker enable early detection for liver cancer or targeting this biomarker for drug development. Furthermore, perhaps someday leads to the discovery of the universal biomarker for liver cancer?

Funding source: Newcastle University
Supervisor: Dr Helen Reeves

Laura Atkinson
BSc (Hons) Physiological Sciences
Evaluation of Extended Spectrum β-Lactamases (ESBL) and Carbapenem Resistant Enterobacteriaceae (CRE) in the local domestic wastewater of Johor Bahru, Malaysia.

Wastewater treatment is expensive and infrequent in areas of Malaysia. Agricultural water run-off and sewage outlet waste feeds into rivers. Antibiotic distribution is less regulated than in the UK, resulting in higher proportions of antibiotic use which ultimately results in a build-up of antibiotics in water sources. The associated low levels of waterborne antibiotics can cause an increase in antibiotic resistance in bacteria which survive in aquatic environments. These resistant bacteria can then end up infecting the local population.

In a collaborative project using engineering and bioscience, the microbial agents present in river water will be identified prior to water treatment then after water treatment. The aim of the project is to determine if the treatment plant is effective in reducing infectious agents, and determining the level of antibiotic resistance in strains present in the river water.

Funding source: Newcastle University
Supervisor: Dr Roshan Mascarenhas

Gaby Barran
BSc (Hons) Biomedical Sciences
Understanding the role of cross-reactive T cells in transplantation.

Chronic transplant rejection remains a leading cause of organ transplant failure. In such cases, immune cells from the transplant recipient attack the donor tissue; recognising it as foreign and eventually causing the donor organ to fail. The project I was involved in aimed to understand the role of cross-reactive T cells within the clinical setting of organ rejection, hopefully providing new blood monitoring tools for the prognosis and prevention of transplant rejection in the future.

My specific role within the project focused on functionally testing a cross-reactive model to confirm a virus-specific T cell receptor (TCR) isolated from a patient sample recognised the allogenic (capable of eliciting an immune response) HLA (human leukocyte antigen) molecule from the donor tissue. I developed skills using many molecular and cellular techniques to study the TCR in question while also gaining significant understanding of analysis used in research acquired by flow cytometry.

Funding source: Newcastle University (Undertaken at University of Monash, Australia)
Supervisor: Dr Nicole Mifsud

Victoria Atkinson
MPhys (Hons) Physics
A Study of the Non-Linear Optical Properties of Low-Dimensional Materials.

This project will see the development of a bespoke measurement tool for the determination of the higher order optical properties of low-dimensional materials. The atomically thin nature of low-dimensional materials, and thus the limited manner in which they interact with probe light, makes the measurement of their higher order optical properties very difficult. Our approach of using a modified z-scan technique will overcome these inherent problems by using highly focused intense light as the probe. There is the potential for this project to provide new insights into the optical properties of low-dimensional materials and open them up to new optoelectronic applications.

Funding source: Newcastle University
Supervisor: Dr Alton Horsfall

Rabbiaatul Addawiyah bt Imawana
MBBS (NUMed Malaysia)
Exploring the Potential of Prognostic and Predictive Biomarkers in Circulating Tumour Cells in Patients with Hepatocellular Carcinoma.

When it comes to liver cancer, there’s one burning question that is yet to be answered: What is the key driver mutation or the first defect point in cells to become cancerous for liver cancer? Unlike other types of cancer like breast cancer that has a specific key driver mutation, the exact point in liver cancer is still blurry. This is mainly because every liver cancer has many different mutations, making it difficult to find a common point in them. Hence, we are still unable to have one single universal biomarker that can detect every liver cancer. This project studied a panel of liver cancer biomarkers and their prevalent in liver cancer patients blood samples. The impacts on knowing the most prevalent biomarker enable early detection for liver cancer or targeting this biomarker for drug development. Furthermore, perhaps someday leads to the discovery of the universal biomarker for liver cancer?

Funding source: Newcastle University
Supervisor: Dr Helen Reeves
Connor Bourne  
*MChem (Hons) Chemistry*  
Towards earth abundant replacements for precious metal catalysts.

A key challenge in current chemistry is the replacement of the rather scarce and expensive precious metals which are used as catalysts in many commercially important reactions. Recent reports indicate that some main group elements are potential candidates for replacing precious metals with cheaper, earth abundant materials. This project aims to develop a fundamentally new class of novel molecules which have the potential, in the longer term, to act as main group element catalysts. This will represent a significant advance in the field of main group chemistry, with the potential to substantially alter current practice.  
**Funding source: Newcastle University**  
**Supervisor: Dr Keith Izod**

Megan Brown  
*BSc (Hons) Zoology*  
Investigating individual learning and the role of strategic error on decision making during hermit crab contests.

The purpose of this project was to investigate contest behaviours and assessment strategy of hermit crabs and explore their associative learning capabilities using classical conditioning. Hermit crabs compete in fights of shell rapping in which an attacking crab repeatedly brings its shell into contact with a defending crab's shell during rapid bouts which may result in a shell exchange. In this experiment, fighting behaviour was observed post-conditioning to observe whether an individual's learning could affect their contest behaviour.  
Using classical conditioning, individuals were exposed to high/low quality shells painted either black/white. Two groups were trained under different conditions. One group with a constant association of shell colour and quality (Group Consistent) and crabs with random pairings of colour and quality (Group Inconsistent).  
If hermit crabs are capable of learning the association between shell colour and quality, their opponent's shell colour should influence their motivation during the fight, depending on whether the hermit had associated the colour with high or low quality during conditioning.  
**Funding source: Newcastle University**  
**Supervisor: Dr Domhnall Jennings**

Thomas Bryant  
*BSc (Hons) Zoology*  
The neural basis of addiction in honey bees (Apis mellifera).

I have carried out caged experiments examining the generation of nicotine addiction in honeybees. Various feeding schedules were used to elucidate the feeding regime required to generate an addictive like state. When fed nicotine chronically for 3 days, bees displayed no preference for low concentrations, and displayed aversion to high concentrations of nicotine. Whereas, following an intermittent feeding schedule, either 48 h chronic access followed by 24 h abstinence; or alternating 12h periods of access/abstinence to the drug, bees displayed a robust preference to the low concentrations of nicotine.  
Addiction is thought to be generated by a cycle of repeated periods of both positive and negative reinforcement. The lack of preference observed in the chronic feeding regime, opposed to the robust preference observed in the intermittent feeding regime; suggests that bees, similar to mammals, require periods of abstinence (i.e. withdrawal) to generate a preference for the drug.  
**Funding source: Newcastle University**  
**Supervisors: Jen Scott and Professor Geraldine Wright**

Peter Brookes Chambers  
*MPhys (Hons) Physics*  
Characterisation of aerosol through particle position detection in optical tweezers.

In this research project, potential methods for examining microscopic aerosol droplets will be explored. These have possible applications in cloud formation, pollution, and human health. Specific focus will be placed on measuring the size and refractive index of an aerosol droplet. Current methods for analysis are extremely costly, and not always precise; we aim to find a cheaper, more reliable alternative.  
Possible solutions will be explored computationally, to develop an analysis technique which can then be tested in a laboratory: a droplet will be trapped in focused laser light (optical levitation), and the relevant properties measured (such as movement and scattered light). These measurements will then be used to verify the accuracy of the computational techniques.  
**Funding source: Newcastle University**  
**Supervisor: Dr Toni Carruthers**
Ovarian cancer is a common cause of cancer death from gynaecologic tumours. Although treatments are available, the 5-year survival rate is poor. Once patients relapse from first line chemotherapy, they may be offered gemcitabine. Gemcitabine stops cells copying their DNA but can activate DNA damage response (DDR) in cells and confer resistance. The DDR is a defence mechanism that allows cells to protect themselves from naturally occurring DNA damage. To see if gemcitabine can be more effective by inhibiting repair of damage it causes, we used inhibitors of ATR and DNA-PKcs. Inhibiting ATR made cells 3.6 times more sensitive to gemcitabine but inhibiting DNA-PKcs did not sensitise the cells to gemcitabine. Further investigation of the combination of ATR and DNA-PK inhibitors in ovarian cancer models is warranted.

**Funding source:** Newcastle University

**Supervisor:** Prof Nicola Curtin

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Over accumulation of oxalates in the body might lead to the formation of kidney stones. Oxalates are plant compounds that can combine with metal ions to form insoluble precipitates. Oxalate Degrading Bacteria (ODB) that can speed up the breakdown of oxalate are used for waste paper pulp treatment, or as probiotic treatment for kidney stones. Thus, screening and identifying new species of ODB will grant better industrial and clinical applications. The project aims to screen and characterize ODB from pea plant root nodules. Yeast-Mannitol (YEM) agar plates were used to grow the bacteria isolated from different legume root nodules. The growth of bacteria on agar plates or broth that contain YEM or ammonium oxalate (AO) was compared by measuring the diameter of colonies on agar plates and cell density of broth cultures. Five strains of bacteria with increased growth in the presence of ammonium oxalate were observed with preliminary characterization.

**Funding source:** NUMed Malaysia

**Supervisor:** Dr Roshan Mascarenhas

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**Funding source:** NUMed Malaysia

**Supervisor:** Dr Roshan Mascarenhas

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Most types of bacteria surround themselves with a layer of protective structure known as cell wall. It provides mechanical strength to the bacteria due to its rigidity with a considerable amount of flexibility. There are a lot of extensive studies on the enzyme-complexes responsible for the synthesis of cell wall with the hope of discovering new antibiotics. An enzyme needs to be extracted from the bacteria before it can be studied. Normally, the enzyme is placed in detergent to protect it from denaturing. However, detergent is a synthetic agent and may affect the enzyme in many ways. Thus, nanodisc is proposed as a substitution because it mimics the nature of bacterial cell membrane where the enzymes are originally located. This research aims to determine the feasibility of incorporating an enzyme into a nanodisc. This can improve future research tremendously on the structures and enzymatic activities of various bacterial enzymes.

**Funding Source:** Newcastle University

**Supervisor:** Prof Waldemar Vollmer

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This project made a sustained attempt to identify what types of material culture and ‘stuff’ is perceived valuable today by Middle Eastern minority groups and why. The project aimed to investigate the possessions belonging to people from contemporary war-torn Middle Eastern communities and the stories and messages that these possessions present. In order to research these communities, individuals and belongings most important to them, I consulted the Gertrude Bell archives at Newcastle University, spoke and met with refugees from the Middle East who are clients at St Luke’s Church, Wallsend, and participated in Mark Jackson’s AHRC project. The key outcome that was brought to light from my research is that sentimental material culture such as photographs and wedding rings are most significant to these individuals.

**Funding source:** Newcastle University

**Supervisor:** Dr Mark Jackson
Samantha Cooke
BA (Hons) Linguistics
Relativizer variation amongst BAME London adolescents

A relative clause modifies a head noun and is introduced by a relativizer such as “that”, “who”, “which”, “what”, or no relativizer at all. Research into how speakers choose between these relativizers has found some similarities across varieties of British English, but these studies have focused exclusively on white speakers. My project asks: do black, Asian and minority ethnic (BAME) adolescents in London share the same constraints on relativizer choice as white speakers? I analysed 1302 relative clauses produced by London BAME speakers and compared them with previous results for white speakers? I found that BAME speakers share with white speakers constraints argued to facilitate the processing of complex relative clauses. Relative clauses are crucial to successful communication because they specify exactly who or what speakers are talking about. Therefore, my results suggest that mitigating unsuccessful intra- and inter-ethnic communication is an overriding principle governing relativizer choice.

Funding source: Newcastle University
Supervisor: Dr Heike Pichler

Emma Corbin
BSc (Hons) Biochemistry
Role of Hypoxia Inducible Factors in Liver Fibrosis

Fibrosis of the liver is the build-up of scar tissue involved in most chronic liver diseases that is initiated by the activation/differentiation of hepatic stellate cells (HSCs). Defining molecular pathways that lead to stellate cell activation is essential to direct the development of pharmaceuticals to therapeutically intervene in liver diseases.

In collaboration with the Fibrosis Group at Newcastle University the Kenneth Lab has identified a link between the stimulation of the hypoxia inducible family of transcription factors referred to as HIF and the activation of stellate cells. Here we investigated how HIF signaling is “switched on” during HSC differentiation and what role it plays in the fibrotic phenotype.

Funding source: Wellcome Trust
Supervisor: Dr Niall Kenneth

Kallpana Ghandi Dhas
MBBS
Evaluating haptico-visual observation and drawing (HVO&D) as an educational approach

Previous research has shown that the processes of observation, touch, visualisation and drawing can enhance learning. This project aims to show how the utilisation of all four aspects, through a process known as Haptico-Visual Observation and Drawing (HVO&D), can aid in the learning and understanding of anatomical structures. HVO&D is intended to increase the understanding and memorisation of the structure of an object through observation using multiple senses. This allows the individual to utilise that memory to draw the object even without actually looking at it. This technique will be taught to individuals with an anatomy background in a HVO&D workshop to investigate how well their observational skills, understanding of anatomy, spatial and haptic abilities are improved and retained. The study will also investigate how their experience of HVO&D impacts upon their future teaching and therefore how it benefits their students.

Funding Source: Newcastle University
Supervisor: Dr Iain Keenan

Kate-Louise Ferguson
BSc (Hons) Biology
Plant Plumbing: How Do Leaves Design Their Vein Networks?

Plant leaves sweat in day-time temperatures; losing water through the pores which they open to ‘breathe’. This has led to the evolution of CAM, an adaptation allowing some species to conserve water and tolerate drought by ‘breathing’ during the night, when it is cooler. As CAM plants minimise water loss, it was hypothesised that they would have lower leaf vein density; as fewer veins will be required to replace the water that is lost. Vein density was measured for 10 species of non-CAM, intermediate-CAM and full-CAM species of Clusia tree. The species which used the most CAM to ‘breathe’ more during the night had leaves with a significantly lower vein density, which supported the hypothesis. With changing rainfall patterns expected in future, this knowledge will help researchers to choose host plants with suitable vein networks for engineering CAM into drought sensitive crops. This will make for a more sustainable future.

Funding source: Newcastle University
Supervisor: Prof Anne Borland
Research Scholarships and Expeditions 2017

**Foo Qun Zhen Cherelyn**
*BSc (Hons) Food & Human Nutrition*
Efforts of Seaweed on the Digestibility of Carbohydrates

Obesity is a condition affecting millions of people worldwide. It is categorised as an abnormal increase in body fat due to reasons such as unhealthy diets and physical inactivity. Obesity is linked with numerous negative health issues such as type 2 diabetes and cardiovascular disease. In recent years, research (including studies done by Newcastle University) has shown that the consumption of seaweed is associated with the reduced digestibility of carbohydrates in humans. This has potential applications in treating people with obesity as the total amount of nutrients absorbed by the body is reduced. Therefore, this proposed research makes use of an in vitro Model Gut System (MGS), to replicate the processes that occur in the human gastrointestinal tract to study the effects of encapsulated seaweed on the digestibility of carbohydrates. Seaweeds are encapsulated to mask its unique taste and texture that not many enjoy.

**Funding source:** Newcastle University
**Supervisor:** Professor Jeff Pearson

**Felicity Frank**
*MChem (Hons) Chemistry*
Circularly Polarised Luminescence from Helically Chiral N,N,S,S-Boron Chelated BODIPYs

Light can be created with a unique property known as circularly polarization. In circularly polarized light individual photons can be thought of as describing a right-handed helical (or corkscrew like) or a mirror image left-handed helical path. Circularly polarized light is made in nature, where it is used by scarab beetles to give them their highly iridescent shells, and can be made, where is it is used to show 3D films at the cinema (the two images needed for the 3D effect being projected in either right- or left-handed light and recombined by the 3D glasses). In this project we will make a series of molecules with a special propeller like shape which can impart circular polarization on the light they emit. We will experiment with the construction of these molecules to maximize the efficiency of the emission of circularly polarized light. Highly efficient emitters of this type have yet to be developed, however if achievable would lead to significant advances in many fields, including medical imaging. The project involves creating helically chiral boron chelated dyes for the development of future chiral fluorophores. The aim of the project is to change the oxygen functional groups on the central Boron atom to obtain a higher efficiency of circularly polarized luminescence (CPL). Through this project I will be able to get real experience of working in a non-teaching laboratory and working independently which will hugely improve my lab skills. I find this topic extremely interesting and I hope to also improve and broaden my knowledge of the subject as a whole.

**Funding source:** Newcastle University
**Supervisor:** Dr M Hall

**Maria Frazer**
*BSc (Hons) Biology*
Is there evidence of senescence (aging) in reef-building corals?

This study focuses on aging mechanisms of reef-building corals. These corals form inter-connected colonies which produce a skeleton. Previous studies indicate that these colonies grow continuously over centuries and that fragments of these colonies resettle after damage and continue to grow. This has led people to believe these corals are immortal. Recent studies show many corals have finite lifespans and show characteristics of aging (senescence). A fundamental aspect of these studies is to be able to understand and trace the creation and death of individual polyps within a colony, this information can be used to accurately measure mutation rates. This research aims to assess the senescence of coral polyps using time-lapse photography and x-rays of coral skeletons to measure growth patterns and rates.

**Funding source:** Newcastle University
**Supervisor:** Professor John Bythell

**Stuart Fulton**
*MSci Biomedical Sciences*
Development of an assay to investigate functionally relevant protein mutations such as those in the DNA binding domain of IRF4.

Mutations are changes to a DNA sequence, which can influence a protein’s function and its DNA binding. Understanding such mutations can help us investigate related diseases. Such mutations can change DNA interactions with proteins in cells, altering their function. Gel Shift Assays are used to observe Protein-DNA interactions, and represent a rapid, sensitive method of detection. They do however require significant optimisation and can be inconsistent.

Development of protocols for more consistent or alternative assays for observation of Protein-DNA interactions would be beneficial for the investigation of DNA binding with numerous further proteins.

In this case, techniques were optimised through investigation of the DNA binding of IRF4. It is a protein involved in Multiple Myeloma, a cancer of the white blood cells. Given IRF4 mutations have been proposed to affect the aggressiveness of multiple myeloma, the studies aimed to examine how different mutations affect IRF4 DNA binding.

**Funding source:** Newcastle University
**Supervisor:** Prof Ian Hickson
Connor Gilkes-Imeson  
MSci Biomedical Sciences  
DNA repair status and drug sensitivity of a novel patient derived cell line

NUCOLL43 is a new cell line derived from tumour cells taken from a patient with ovarian clear cell carcinoma (CCC). CCC are difficult to treat because they are resistant to current standard chemotherapy for ovarian cancer. NUCOLL43 is very similar genetically and biochemically to the tumour from which it was derived, so it is a good tool to investigate novel treatments for CCC. The aim of my 8-week project at the Northern Institute for Cancer Research was to investigate the sensitivity of NUCOLL43 to standard platinum-based chemotherapy, whether this could be increased by using a novel drug (ATR inhibitor), to radiotherapy and whether that could be increased by new drugs (PARP inhibitor) and to a drug that acts on cell signalling (PI3-kinase inhibitor). The cells were very sensitive to cell killing by the PI3K inhibitor and the ATR and PARP inhibitors approximately doubled the sensitivity to platinum and to radiation.

Funding source: Wellcome Trust  
Supervisor: Prof Nicola Curtin

Monisha Joy Gomez  
BSc (Hons) Food & Human Nutrition NUIS  
Investigating the Presence of Pathogenic Bacteria in Conventional and Hydroponic Iceberg Lettuce in Singapore

Commercially-sold green leafy vegetables in Singapore are grown conventionally, hydroponically, and organically. In general, less bacteria is found on conventionally-grown vegetables due to the routine use of chemical pesticides to prevent microbial decay and to increase shelf-life. Furthermore, some bacteria are pathogenic and can cause foodborne illnesses when consumed. In this project, the bacterial profile of conventional and hydroponic iceberg lettuce samples in Singapore were investigated over 30 days. Specialised biochemical tests were conducted on single colony bacterial isolates to characterize the different strains observed. Conventional lettuce samples exhibited significant bacterial growth only after 3 weeks of purchase. This could be attributed to the chemical-intensive growth conditions of soil-based agriculture. On the other hand, the hydroponic variety consistently showed the growth of only 1 strain, Pseudomonas spp, throughout the 30-day period. Further biochemical analysis is needed to confirm the six different strains isolated from conventional lettuce.

Funding source: Newcastle University  
Supervisor: Dr Saloni Kaur Dang

Olivia Gittins  
BSc (Hons) Pharmacology  
Cellular responses to DNA and STING agonists

Multiple Sclerosis (MS) is a debilitating and life-threatening disease, in which nerve cells are attacked by the patient’s own immune system. Why the immune system attacks healthy nerves is unclear. Current treatment options are limited and many cause undesirable side effects such as chronic pain. DNA nanoparticles are a promising new way to treat MS, as they alleviated a disease similar to MS in mice. The goal of this project is to improve DNA nanoparticles to increase their ability to alleviate MS-like disease in mice and to reduce their undesirable side effects. To this end, we tested two different kinds of DNA nanoparticles and measured immune responses compatible with our overall research goals.

Funding source: Newcastle University  
Supervisor: Prof Andrew Mellor

Eleanor Harrison  
BA (Hons) Archaeology  
The Lost Art of the Picts: A Survey of Pictish Symbol Stones in Eastern Scotland

During the early medieval period, the Picts were a powerful kingdom inhabiting Northern Britain although relatively little is known about them. Perhaps the artefacts most emblematic of the Picts are the symbol stones: standing stones inscribed with an enigmatic series of symbols first crafted in the 5th century. These stones were important to local communities both in the past and present. The conservation of these stones is an ongoing problem. Many are in remote locations in Eastern Scotland where they are lost on private land or left exposed to damage yet in museums much of their significance is lost. This project aims to survey a sample of these Pictish symbol stones to produce an open access 3D database using photogrammetry software. These models will be displayed online for those who cannot travel to see them and to provide a permanent record for those wishing to study them.

Funding source: Newcastle University  
Supervisor: Dr Patrick Gleeson
**Luke Guilliam**  
**BA (Hons) Ancient History and Archaeology**  
Social Organisation in the Mirabello Bay in the Late Minoan IB Period

During the Late Minoan period on Crete (1600-1400 BC), we see the emergence of a complex urban society. With this increasing degree of complexity come new and fascinating social structures, not just at the famous palatial sites on Crete, but also in the smaller towns/villages connected to the palatial cities, such as those surrounding the Mirabello Bay. Over the past 20 years or so, there have been a large number of excavations in this particular area of Crete. But the interpretation and study of the excavation results is still in a very preliminary stage. This research aims to look at the distribution of objects relating to particular social and economic activities through the houses of the region’s towns and villages. These patterns will allow us to investigate the social structure within these communities which will contribute to the bigger debate about the overall structure of Minoan society.

_Funding source: Newcastle University_  
_Supervisor: Dr Matthew Haysom_

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**James Hammerton**  
**MChem (Hons) Chemistry with Study Abroad**  
Rapid visual detection of colorectal causing BAT15 mutations

Early detection of colorectal cancer is vital to give patients a high chance of survival of the disease. We as chemists can do this by analysing mutations in single base pairs to see if a patient is more susceptible to these cancers so that they can be prevented before invasive surgery is required. One way to detect these mutations in the DNA is by immobilising DNA on to a range of surfaces (glass, silicon, graphene oxide) that have complementary strands to the mutated sequences. Here, we are looking for changes in a sequence with 24, 25 and 26 Adenine bases, 25 repeats being the healthy chain and 24/26 being the mutated sequence. In this project we will need the complementary T base strand of equal length immobilised on a suitable substrate to match the target DNA. If these strands bind they will be observed by the addition of a fluorescent intercalator dye, creating a simple visual test for the recognition of the mutated DNA sequence.

_Funding source: Newcastle University_  
_Supervisor: Dr Andrew Pike_

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**Thomas Harper**  
**BSc (Hons) Ecology and Environmental Biology**  
Is binocular vision involved in trajectory control in the Praying Mantis strike?

The praying mantis is a predatory ambush insect, known for its powerful raptorial legs used to catch prey. The praying mantis uses both eyes to trigger its strike once prey is in reach. Mantids have stereoscopic vision which allows both eyes to work together to tell the mantis when the prey, in front of its eyes, is within reach. We looked earlier in the hunt, when the prey is first detected, and asked if both eyes are still needed when the mantis makes a precise turn to face and track the prey, ready for a successful strike.

_Funding source: Newcastle University_  
_Supervisor: Dr Claire Rind_

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**Joely Hawke**  
**BSc (Hons) Biomedical Sciences**  
Investigating the physiological factors affecting development in early life

I spent 8 weeks shadowing the work of Prof. Helena Parkington, whose research focusses mainly on the early stages of life and what can go wrong. I worked under her supervision and contributed to two of her current studies:

1. I spent a lot of time analysing the myometrium (muscular layer of the uterus) and measuring its contractility under several conditions. We tested how long the tissue could survive outside the body (in vitro) and if its functionality remained normal. We also studied how stretching the muscle can influence the muscles’ sensitivity to oxytocin and how long it can survive outside the body. This is was part of Helena’s current investigations into the causes of failure to progress in labour.

2. I also had the chance to work with renal arteries harvested from sheep, and investigated the link between hypertension and being born with only one kidney.

_Funding source: Newcastle University (undertaken at Monash University, Australia)_  
_Supervisor: Professor Helena Parkington_
Grace Heavey
BA (Hons) Geography
Inspirational Women in Geography’s past: the Hidden Half of the Tyneside Geographical Society

In 2018 Geography will celebrate 90 years at Newcastle University. The aim is to celebrate the enduring significance of this wide-ranging subject and to show from the history of geography a journey of radical transformation. This is apparent in the archives of the Tyneside Geographical Society, established in 1887 yet predictably shrouded in white, male, military, middle-class constructions of relevance and ‘authority’. The Geography archives include an Attendance Book signed by Winston Churchill and abstracts describing ‘distant colonies and foreign lands’. The proposed research will explore this unpublished material for the first time with the express purpose of uncovering hidden stories from the neglected contributions of women and minorities in Geography’s past. As a result, the 90th celebrations will benefit from a suite of new textual, audio and visual accounts based on these historic archives. In addition, the studentship will contribute to the School Equality and Diversity agenda.

Funding source: Newcastle University
Supervisor: Dr Helen Jarvis

Raif Hebishi
BSc (Hons) Biomedical Sciences
Is there a protomap of the subdivisions of the thalamus in early human fetal development?

I have always been interested in the human brain and its complications and fascinating functions as well as genetics. Being able to work both in the laboratory and in mapping gene expression to model brains by computer would be a great opportunity for me to experience the laboratory environment as well as develop the different skills required to become a scientist. This project would help achieve the project aim which is establish the expression profile of the candidate disease genes in the embryonic and foetal human pulvinar. Being granted a research scholarship would give me the opportunity to work on this project and develop the skills that scientists need as well as revealing my strengths and weaknesses so I can focus on them and become a better scientist.

Funding source: Newcastle University
Supervisor: Dr Gavin Clowry

Sydney Henderson
BSc (Hons) Marine Biology
Thermal acclimation dynamics and heat hardening in fiddler crabs (genus Uca)

I will be designing and carrying out my own research project to study how rising temperatures, as a result of climate change, will affect the population of fiddler crabs inhabiting the Ambeua mangrove on Kaledupa island, Indonesia. The Ambeua mangrove boasts the highest diversity of fiddler crabs anywhere in the world, and the crabs provide an invaluable service to the mangrove environment through their burrowing and foraging which retains key nutrients within the system. Fiddler crab species exhibit spatial distribution within the mangrove and experience varying degrees of sunlight exposure. With predicted increasing temperatures, the effect of the habitual exposure to sunlight and temperature may affect the crab’s response to a warmer climate.

Little is known about the thermal ecology of fiddler crabs, and it will be very relevant to study how rising temperatures will affect them.

Funding sources: Newcastle University and Lord Mayor’s Trust
Supervisor: Dr Sara Marsham

Natania Hew
BSc (Hons) Food & Human Nutrition
How does consumption of dietary antioxidants affect plasma antioxidant capacity in the body?

The aim of this research was to measure the differences in blood plasma antioxidant capacity at different time points after consuming an antioxidant containing drink. To do this, two different antioxidants – vitamin C and epicatechin (an antioxidant found in green tea), were used as treatments and compared with a blank drink (the control). The treatment drinks were given at random to 13 healthy volunteers (BMI 18-35) who were asked to undergo a restricted diet during the study. Blood samples were collected from the volunteers throughout the day and were later analysed. The results were then checked to see whether antioxidants tend to accumulate in the blood or if the body system maintains the balance of antioxidants in the blood. It was found that the consumption of the two antioxidant drinks appeared to have no effect on plasma antioxidant capacity when compared with the control.

Funding source: Newcastle University
Supervisor: Dr Kirsten Brandt
Research Scholarships and Expeditions 2017

Joel Holland  
BEng (Hons) Electrical and Electronic Engineering  
Implant biocompatibility: Creating an automated system to determine the optical degradation of genetically enhanced bionic pacemakers for epilepsy

CANDO (www.cando.ac.uk) is a £10 million project to develop a new type of pacemaker to treat epilepsy. It involves genetically engineering light sensitivity into the target brain tissue and then inserting optoelectronic probes to perform closed loop control methodologies. The biological aspects of the project are being developed in the Newcastle medical school, whereas the engineering is a collaboration between Newcastle EEE, Imperial and UCL.  
The aim of this internship is to develop a new degradation test rig to check the long term durability of the probes in aqueous (brain-like) conditions. This will support and speed-up ongoing efforts considerably – allowing automation of the key aspects of the study.

The secondary aim is to allow talented undergraduate students to experience the excitement of large flagship projects such as CANDO to help them determine whether or not to pursue research as further study.

Funding source: Newcastle University  
Supervisor: Dr Patrick Degenaar

Siobhan Ingram  
BSc (Hons) Biology  
How you can get food poisoning from oysters without eating one – Modelling the epidemiology of Norovirus.

Norovirus is a highly contagious disease, spread via person-to-person contact and through contaminated surfaces, food and water. It is responsible for numerous intestinal disease cases in the UK. The aim of this project was to help develop a microsimulation model of norovirus disease, to better understand key sources of infection. The epidemiology (transmission) of the disease was therefore deconstructed into its contributing factors, such as oyster consumption, an individual’s immune response, their proximity with people, the weather and the time of year, which can all affect the distribution of the virus. Shellfish (filter feeders) can concentrate the virus from contaminated waters in their tissues and oysters in particular have been sources of norovirus outbreaks. Due to the complexity of Norovirus it can be difficult to predict its transmission and causes of outbreaks.

Funding source: Newcastle University  
Supervisor: Professor Steve Rushton

Wasim Iqbal  
BSc (Hons) Food & Human Nutrition  
A new approach for authenticating whole grain products

Whole grain foods are well known for their beneficial health effects. Over the past few years organisations have responded by producing products using the term “whole grain” or “wholemeal”. However, with no clear definition of WG, this has left room for WG fraud -potentially misleading consumers into thinking they are eating 100% WG products when it may in fact contain much less. This study aims to authenticate WG products by identifying the different anatomical features of the grain (germ, endosperm and bran) based on the presence of complex plant polysaccharides which are natural markers of different parts of the grain. Various wheat and barley whole grain samples were subjected to moisture removal and carbohydrate extraction. The extracted polysaccharides were then printed and combined with antibodies using microarray technology. It was found that the distribution of polysaccharides differed between the different layers of the grain. This information will help provide industry with a more accurate means of assessing whole grain products.

Funding source: Newcastle University  
Supervisors: Professor William Willatts and Professor Chris Seal

Jenita Jona James  
BSc (Hons) Biomedical Sciences  
Analysis of the effect of upper limb functional taping on hand function in children with hemiplegia

Cerebral palsies are a group of neurological disorders causing movement impairments, due to damage to the developing brain. Hemiplegic cerebral palsy (HCP) predominantly involves one side of the body, often affecting hand function. Daily tasks using both hands are more difficult, so requires early intervention to improve hand function. We researched the efficacy of applying elastic sports tape to the affected limb of children with HCP to determine whether it increases awareness and usage of the affected hand. Affected hand function was recorded during spontaneous play using the Assisting Hand Assessment. We also annotated the videos to compare duration of desired movement behaviour with and without the tape, and analysed using Matlab software. The results show increased time looking at the affected hand, reduced time of thumb in palm but no change in duration touching toys. Further investigation will assess whether hand use improves after sustained use of elastic taping.

Funding source: Newcastle University  
Supervisor: Dr Anna Basu, Dr Jill Cadwgan
Kundan Jeswani  
BEng (Hons) Chemical Engineering  
Mechanical Characterisation of Hydrogels for Medical Applications

Soft matter, such as hydrogels, can be used in several medical applications including drug delivery, contact lenses and tissue engineering. Due to their structure, hydrogels have different physical properties with different swelling ratios (percentage of water). For instance, the gels used for soft contact lenses are relatively stiff and strong but can crack during handling depending on the extent of drying.

This project focused on determining the stiffness, strains and ultimate tensile strength (UTS) of nine different hydrogels, each of which density. The engineering stress and strain results were processed in a Digital Image Correlation (DIC) software. It was found that the stiffness of the hydrogels can be increased by increasing the crosslinker concentration. The results also show that the UTS of the hydrogels is not dependent on the density of the material. These findings will contribute to work directed at modifying existing commercial hydrogels to improve their functionality.

Funding source: Newcastle University  
Supervisor: Prof S Bull

Christian Johnson-Richards  
BSc (Hons) Physics  
Manipulation Of Fibre Optic Cables for use in the Telecoms Industry

A new photonics device will be developed that will be able to split light from one optical fibre into many optical fibres. The current technology relies on a form of light splitting that is very sensitive to external factors, such as, temperature and humidity. Our device uses completely different physics to split the light and is impervious to such factors. The ultra-high stability and compactness of our device means that it is particularly suited to quantum communications networks, where every single photon is important. However, we envisage that the outcomes of this project will also be a disruptive technology for standard telecommunications networks.

Funding source: Newcastle University  
Supervisor: Dr Noel Healy

Francesca Jones  
MSci Biomedical Genetics  
Does depletion of condensin complexes contribute to loss of oocyte chromosome architecture during female ageing?

Sexual reproduction depends on the formation of male and female sex cells, containing exactly one copy of each chromosome. This requires a specialised cell division called meiosis. Female meiosis is error-prone, increasing as women age resulting in infertility, birth defects and miscarriage. The overall aim in the Herbert lab is to understand how chromosome architecture is maintained, enabling accurate segregation in the two meiotic divisions. Specifically, in this project we are interested in the complex cohesin. In mitosis (cellular division of non-sex cells), cohesin mediates cohesion between replicated sister chromatids and its removal is regulated by the enzyme PLK1 in the prophase pathway. The aim of my project was to determine whether the enzyme PLK1 is involved in removal of oocyte cohesin. My findings indicate that cohesin is removed by a PLK1-mediated mechanism, analogous to the prophase pathway in mitotic cells. This may compromise the chromosomal architecture in female meiosis.

Funding source: Newcastle University  
Supervisor: Prof Mary Herbert

Ksenia Kharlamova  
BSc (Hons) Biomedical Genetics  
Role of autophagy in DNA damage response during senescence

Cellular senescence is the state of cell cycle arrest, believed to be an important mechanism acting as a guard against the onset of cancer. Autophagy is the intracellular pathway involved in degradation of damaged and dysfunctional proteins. A failure in autophagy results in cellular toxicity, neurodegeneration and disease due to the accumulation of proteins and lipids in lysosomes. Niemann-Pick disease (NPC), a neurodegenerative autosomal lipid storage disorder, caused by a mutation to the NPC1 gene, and characteristically the condition is associated with mitochondrial dysfunction and delayed autophagy.

Using knockout NPC1-/- MEF mouse models, the correlation between NPC1 protein and cellular death was investigated. In this project various cell lines of differing NPC1 gene mutation states were compared to one another when placed in glucose and galactose medium. It was established that in galactose medium NPC1-/- MEF cells were not rescued as they were forced to use mitochondrial respiration, resulting in the accumulation of p62 and LC3. However, glucose media had no effect on any of the cell lines.

Funding source: Newcastle University  
Supervisor: Dr Viktor Korolchuk
Thomas Kidder  
**BSc (Hons) Biochemistry**  
Investigating the mechanism of mucin degradation by the gut microbiota.

The thick layer of mucus that protects the colonic epithelia provides a significant nutrient source for some members of the normal gut bacterial community (the gut microbiota). While in a healthy gut this process is carefully controlled, in certain disease states, such as inflammatory bowel disease, mucosal bacteria can contribute to the destruction of this protective barrier, thus exacerbating the disease. Despite the importance of this process to human health, very little is known about how the mucosal layer is broken down by the microbiota. In this project I will use molecular biology and biochemical techniques to further my understanding of mucosal break down by key members of the gut microbiota.

**Funding source:** Newcastle University  
**Supervisor:** Dr David Bolam

Nathan Shaun Kindred  
**BSc (Hons) Biomedical Sciences**  
High throughput screening of yeast telomere mutants

The ends of human chromosomes, known as telomeres, are complex structures that protect the chromosome from damage. Despite the protective role of these structures human chromosome ends shorten over time. This is of particular relevance to cancer cell progression in which cells divide uncontrollably, lose their telomeres and should become inviable due to resultant chromosome instability. However, cancer cells find alternative ways to protect their telomeres and remain viable. The DNA binding protein cdc13 is known to be involved in telomere protection. A mutant form of this protein (cdc13-1) fails to protect telomeres at high temperatures, resulting in telomere damage which then stops cell division. This study used budding yeast, both with and without the cdc13-1 mutation, as a model organism to investigate the effects of telomere damage on cells. This was done in order to explore potential mechanisms cancer may use to progress while keeping rapidly dividing cells viable.

**Funding source:** Newcastle University  
**Supervisor:** Dr Peter Banks

Sylvia Wei Wei Kong  
**MBBS**  
Perceived barriers faced by trainers in delivering Essential Newborn Care (ENC) Training to the health workers in Nepal

In Nepal, the risk of a newborn death is the highest in the early neonatal period during the first 7 days of life, following similar global trend. Newborn deaths could be prevented if skilled health workers perform effective health measures at birth and during the first week of life. The effective training programme for health workers on the aspects of Essential Newborn Care (ENC) is particularly vital to ensure the survival of newborn and their well-being. However, the voices of staff who offer the ENC training to these health workers often have less recognition in the literature. This study sought to elicit the views of ENC trainers in Kathmandu Valley on perceived barriers faced in delivering ENC training to the health workers in Nepal. Interviews were conducted with 16 trainers using a semi-structured questionnaires with both open- and close-ended questionnaires developed in English. This study may help to facilitate the ENC training provision in Nepal in the future for any shortfalls that were highlighted.

**Funding source:** University Expeditions Committee  
**Supervisors:** Dr Michaela Goodson, Dr Alice Kurien

Katy Lamb  
**BA Combined Honours**  
“Cradle of the Confederacy, Birthplace of the Civil Rights Movement”: Race, Social Memory, and Landscapes of Commemoration in Montgomery, Alabama.

Museums and memorials offer powerful vantage points from which to examine the complexities of contemporary social relations, via the lens of the remembered past. In Montgomery, Alabama, the Equal Justice Initiative (EJI) is developing two extraordinary projects opening in 2018: The Memorial to Peace and Justice, the first monument to the history of racial terror lynching in America; and a museum, From Enslavement to Mass Incarceration, which maps the ongoing legacies of slavery.

Drawing on interviews, and analysis of Montgomery’s monuments and museum exhibits, this research explores how memories are built, renewed and interpreted via public sites of commemoration. Standing in contrast to ambivalent representations of this history elsewhere in the city, the emergence of the EJI’s work from grassroots, anti-racist activism is an important element to be considered. Another key consideration is how place can be used and invoked to both uphold, or create a challenge to normative histories.

**Funding source:** Newcastle University  
**Supervisor:** Dr Catherine Degnen
Isabella Lawrence  
BSc (Hons) Biomedical Sciences  
Biochemical characterisation of a candidate yeast endoribonuclease linked to mRNA quality control and genome stability

Messenger RNAs (mRNAs) are the blueprints for protein production. mRNA quality control or surveillance pathways are in place to ensure proper gene expression thereby maintaining the health and fitness of all organisms. This is achieved by marking particular mRNAs as targets for enzymes called nucleases, which can remove harmful or unwanted molecules. Exonucleases degrade RNA from the ends, while endonucleases cut RNAs in the middle. For example, the nonsense-mediated decay (NMD) pathway removes faulty RNA molecules, which could otherwise produce toxic proteins. RNA surveillance also maintains adequate histone mRNA levels which are critical for genome stability as histones are proteins which package DNA. The aim of this project was to explore the function of NMD4 within the NMD pathway in budding yeast. The overall finding was that NMD4 acts as an endonuclease through a site called the PIN domain, with this activity increasing in the presence of the metal, manganese.

Funding source: BBSRC  
Supervisor: Dr Claudia Schneider

Irma Lepeseva  
BSc (Hons) Biomedical Genetics  
The Effects of Specific Mitochondrial Inhibitors on Respiration and ROS production

Mitochondrial Reactive Oxygen Species (ROS) have been recurrently involved in ageing and age-related diseases. While they can cause oxidative damage, ROS are also essential for maintaining cellular homeostasis. Sanz's laboratory has recently demonstrated that the site at which ROS are generated is homeostasis is central in determining their physiological effects. Increasing ROS levels by inducing reverse electron transport (RET) through respiratory complex I (CI) extends lifespan and protects mitochondrial function. During my research project, I successfully studied the mechanisms by which RET is generated in the brain of Drosophila melanogaster (fruit fly). Firstly, I used specific mitochondrial inhibitors (chemical drugs) of respiratory complex III (myxothiazol) and IV (cyanide) to prevent electron flow and record any difference in mitochondrial respiration compared to the control. Secondly, I confirmed the results of using the same inhibitors to measure ROS with confocal microscopy. In conclusion, blocking CIll and IV results in reduced respiration which explains increased ROS levels.

Funding source: Newcastle University  
Supervisor: Dr Alberto Sanz Montero

Sheng Zheng Lim  
MBBS (NUMed Malaysia)  
The role of synaptonemal complex proteins in cancer

Cancer remains the second leading cause of death with 8.4 million deaths worldwide in 2012 despite the major progress made in cancer diagnosis and treatment. Therefore, understanding the molecular mechanisms of cancer development and progression is vital. Meiosis is a type of cell division that reduces the number of genetic materials in the parent cell by half and produces four sperm cells or one egg. I am interested in a protein complex that forms during meiosis. For my summer project, I aimed to show that changes in these meiotic complex forming proteins observed in cancer patients are surprisingly common. I analysed publicly available data collected from cancer patients all over the world. Survival analysis in cancer patients with genetic in these proteins was performed. Analysis of publicly available datasets indicates that meiotic protein might be expressed and play a role in cancer development and biology.

Funding source: Newcastle University  
Supervisor: Dr Owen Davies

Mo Liu  
MChem (Hons) Chemistry  
Synthesis of Bis (borane diisopropylphosphino) Methyl Calcium, a Phosphine-stablised Novelty Carbanion System

During this time of summer research, with kind assistance from Yasmin Vajeth, a new carbanion system stabilized by sterically congested phosphine borane, namely bis (borane diisopropylphosphino) methyl calcium, was synthesized from a seven-step procedure. The synthesis, being an unprecedented combination of alkylation, metatization and metathesis, caused significant difficulties in terms of purification. Disopropylmethylphoshoine, for example, a crucial intermediate generated from methylation of pure disoproplychlorophosphine, insisted in coexisting with unknown phosphine impurities. It was after five attempts of synthesis and distillation did I finally isolate disopropylmethylphosphine from impurities, though further research will be required to unravel the true cause of such obstruction. Nonetheless, the success of the synthesis route, albeit a complex procedure with modest yield (overall 10.41%), provides a great opportunity for chemists to look into the unique properties of carbanions as ligands in organometallic and pharmaceutical researches.

Funding source: Newcastle University  
Supervisor: Dr Keith Izod
Research Scholarships and Expeditions 2017

Carissa Lloyd
BSc (Hons) Chemistry
Synthesis of Fluorescent Phosphonium Salts as Imaging Agents of Mitochondrial Dysfunction

Our research group is interested in the design and synthesis of molecules which have not one, but multiple functionalities, which represents a leap forward in the molecular design of new therapeutics. Bodipy phosphonium salts would be expected to exhibit fluorescent properties because of the boron-dipyrromethene backbone – in addition, the positive charge resulting from the phosphonium cation will also attract them to the negative membranes of mitochondria. Dysfunctional mitochondria are associated with diseases such as Parkinson’s, Alzheimer’s and cancer, and which results in a change in the mitochondrial membrane potential. Therefore, whether these highly fluorescent probes accumulate in the mitochondria or not can indicate mitochondrial function, and may allow a determination of whether a patient’s drug treatment is effective or not. In this study, new synthetic routes to these valuable probes will be presented.

Funding source: Royal Society of Chemistry
Project Supervisor: Dr Lee Higham

Zhiyu Loh
MBBS (NUMed Malaysia)
Individual Differences in Chromatic Discrimination Ability

Colour vision is important for many behavioural tasks, including searching for and recognising objects, and detection of biological signals. People normally possess three types of cone photopigments – maximally sensitive to short (S), middle (M) or long (L) wavelengths of light. These photopigments allow humans to perceive different colours. ‘Colour-blindness’ results from genetic alterations in these photopigments. Previous research has also shown colour vision deficits in neurodevelopmental disorders. Yet even in normal colour vision, people differ in how well they discriminate colours. We aim to explore individual variations in colour discrimination due to age and sex, and how these change in typical development. We will test the hypothesis that the visual pathways built on the S-cones develop slower than those for the L- and M-cones by assessing colour discrimination and behavioural uses of colour in typically-developing children and adults.

Funding source: Newcastle University
Supervisor: Professor Anya Hurlbert

Naveen Eugene Louis
A/L Richard Louis
BSc Biomedical Sciences (2+1 NUMed)
Screening & Identification of Oxalate Degrading Bacteria From Environmental samples

Accumulation of oxalates in the body and paper pulp industries can lead to the formation of kidney stones and cause pollution respectively. Currently three oxalate degrading enzymes have found to work at a lower pH. The aim of this project is to develop a screening protocol that can identify different oxalate degrading bacterial strains with different properties such as pH range and substrate specificity that can have tremendous probiotic and industrial application. Environmental samples such as soil and root nodules of legumes which are rich in oxalate were processed and cultured on Yeast Extract Mannitol agar plates. In order to test for oxalate degrading capacity, all the samples were subjected to an environment with and without oxalate on YEM plates. All bacterial strains showed significant increase in growth rates and colony size. Agar well diffusion tests were performed to obtain a ‘halo’ which could demonstrate the utilization of oxalate.

Funded by: NUMed Malaysia
Project Supervisor: Dr Roshan Mascarenhas

Catalin Luncanu
BSc (Hons) Biochemistry
The role of protein kinases in the regulation of Rif1 during DNA damage and spindle damage in eukaryotic cells

Rif1 (Rap1-Interacting Factor 1) protein is a well-conserved DNA-damage-response factor, required for cell survival after DNA damage and for proper execution of DNA replication. Little is known about how Rif1 achieves these functions or how it is regulated. This project will investigate potential roles in phosphorylating Rif1 as response to histone damage. Histone regulatory and maintaining machinery proteins genes are deleted and the level of histone gene expression is to be measured in the presence and absence of Rif1. Furthermore, Rif1 post translational modifications are to be investigated (e.g. phosphorylation) as a form of signalling. This would occur as result of the histone housekeeping genes: HIR1, RTT109, CAC1 being knocked-out. No attempt gene deletions have been successful using a kanamycin resistance marker using special design primers. Despite colonies forming on kanamycin selective media plates, suggesting that kan cassette has been introduced elsewhere in the genome of haploid Saccharomyces cerevisiae cells.

Funding source: Wellcome Trust
Supervisor: Dr Laura Maringele
Women's Shakespeare Clubs in the United States were a widespread phenomenon in the nineteenth and early twentieth century. They not only provided educational opportunities for their members, but also the opportunity for women to be active in their local community as well as national movements like women's suffrage. This project aims to do a detailed case study of one such club, the West Side Shakespeare Club of the mining town in Butte-Silver Bow Public Archives. By studying how these women saw Shakespeare and literature in general as a way (in the words of the club's motto) 'to be prepared for life', we can gain a deeper understanding of the lives of middle- and working-class women during this time period, and of the contribution reading and sociability can jointly make to fostering community in a rapidly-changing world.

**Funding source:** Newcastle University  
**Supervisor:** Professor Kate Chedgzoy

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The brushless dc motor (BDCM) as its name indicates is a motor which is not comprised with brushes in its structure. In a DC motor brushes are normally used to energize the rotor through mechanical commutators to make it work. However, with development in power electronics, the BDCM became a reality, replacing the basic DC motor in many applications. The basic idea behind BDCM is that the coils in the stator of the motor are energized by an electronic controller which provides some DC power, and a sensor is used to determine the position of the rotor.

The sustainability of the motor applications is increased by improving the performance of the power converter. So, it will be built a low power BDCM drive using a PIC microcontroller for motor control, and will be examined a software-based control which reduces power convertor and motor losses to maximize efficiency.

**Funding source:** Newcastle University  
**Supervisor:** Dr David Atkinson

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Medicines which harm a developing baby in the womb are known as teratogens. In the 1960s, the pregnancy anti-sickness drug, thalidomide, caused birth defects in thousands of babies. The UK Teratology Information Service (UKTIS) was established over 30 years ago to advise on medicine use in pregnancy and, over this time, has collected information on how these pregnancies ended. I analyzed information collected by UKTIS on a class of antidepressants known as serotonin and noradrenaline reuptake inhibitors (SNRIs) to assess whether SNRIs are linked to a higher chance of birth defects in the baby upon exposure during the first 13 weeks of pregnancy. The results of the study were considered alongside similar research in order to determine the overall risk to the baby, in the hope of allowing expectant mothers to make more informed decisions in the future.

**Funding source:** Newcastle University  
**Supervisor:** Dr Laura Yates

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Aphasia is a language disorder that often occurs after stroke. Aphasia is also accompanied by short-term memory difficulties, which affect a person's ability to repeat spoken words and sentences. Some people who appear to have recovered fully from aphasia after stroke, continue to have subtle difficulties with language and short-term memory. This research investigated whether novel speech-timing measures (e.g. preparation time, duration of spoken words and silent pauses) can identify subtle differences between people who have made a full recovery from aphasia. Speech-timing measures taken from a short-term memory task (word repetition) were compared between people with aphasia, and people who made a full recovery from aphasia. Results showed that fully recovered people had longer speech-timing measures, compared to those in the aphasia group. Speech-timing measures can therefore identify subtle differences in people who have made a full recovery from aphasia after stroke.

**Funding source:** Newcastle University  
**Supervisor:** Christos Salis
Research Scholarships and Expeditions 2017

Romany McLure  
BSc (Hons) Biology  
Bacterial degradation of complex carbohydrates by the human gut microbiota

The human gut is home to a vast array of microbes which are important in both health and disease. The microbiota aids in metabolism, digestion and immune function of its host and imbalances regularly result in disease. The gut microbiota has the capacity to breakdown the fibre in our diet that humans cannot, this fibre is largely made up of complex carbohydrates. The bacteria in the gut use these complex carbohydrates by producing various enzymes to breakdown and utilise the carbohydrates. This project studied the action of these enzymes, allowing a higher understanding the process of carbohydrate utilisation and the how the enzymes are involved, and therefore how we can influence the microbiota. This will lead to the development of novel pro- and pre-biotic strategies to encourage a healthy diverse microbiota rather than an unhealthy microbiota that we often observe in disease states.  

Funding source: Newcastle University  
Supervisor: Dr Fiona Cuskin

Toby Middlebrook  
BSc (Hons) Physics  
Biophotonics – Exploring photonic devices for use in optogenetic stimulation of neural tissue.

Epilepsy is a neurological disorder which can be characterized by unpredictable seizures. Whilst anti-seizure medication can help people suffering from epilepsy, for many people diagnosed with epilepsy, anti-seizure medication does not work. The aim of the research project was to help explore the viability of optogenetic devices that stimulate the neural systems as an alternative to anti-seizure medication. An optogenetic device is a device that uses light to stimulate or inhibit neural circuits. Within this research project, my aim was to develop computer models that can be used to simulate the properties of this device and to run an experiment using a degradation test rig that was used to test the conditions required for the device to no longer function.  

Funding source: Newcastle University  
Supervisor: Dr Patrick Degenaar

Kokila D/O Morgandass  
BSc (Hons) Food & Human Nutrition (NUIS)  
Body image dissatisfaction and eating attitudes among men of various ethnic background living in Singapore.

Men from different races will differ in body shape and this may force to conform to a certain muscular ideal via excessive exercise and/or disordered eating behaviour. The aim of this project was to gather data about eating behaviour and body image satisfaction of men from three main ethnicities in Singapore (Chinese, Malay and Indian) through a survey. In average and significantly, Indians (n=92) were the heaviest whilst Malays (n=87) the most dissatisfied with weight. Generally, all three ethnicities desired to be more muscular, particularly Chinese (n=84) who reported the highest shape discrepancy. From average results on the Eating Attitudes Test (EAT-26), this sample was at a low-risk of developing eating disorders. However, Indian and Malay scored significantly higher than Chinese on both EAT-26 and subscale Dieting. In this multi-ethnic sample, being heavier or dissatisfied with weight had a higher impact than muscular shape as shown by results on EAT-26.  

Funding source: Newcastle University  
Supervisor: Dr Lourdes Santos-Merx

Nagarathanam Shobha  
MBBS (NUMed Malaysia)  
Does α-synuclein increase cell damage and inflammation in neurons and microglia?

Parkinson’s disease (PD) is a neurodegenerative disease which causes slow onset of movement, resting tremors and rigidity in patients. In PD, nerve cells, or neurons, in certain parts of the brain contain abnormal α-synuclein proteins. Neurons are not independent, but instead interact with neighbouring support cells such as microglia. Researchers believe that microglia produce inflammation signals triggered by accumulated α-synuclein in neurons. Thus, my project aims to model the interaction of neuron and microglia-like cells in a co-culture system. This mimics the conditions inside the brain of a PD patient. I stained treated cells and calculated the amount of cell damage present in the neuron and microglia-like cells. I also measured the expression of inflammation markers in co-cultured neuron and microglia-like cells. I hope that results from my project can help specialists and the public to understand the role of inflammation on the disease progression of PD.  

Funding source: Newcastle University  
Supervisor: Dr Gabriele Saretzki
Hydroponic farming is a relatively new farming practice in Singapore and research on the ideal packaging material is limited. The ideal packaging material should protect the produce from physical damage and maintain the appropriate moisture content to ensure edibility. This project aimed to explore the influence of different packaging materials on the shelf-life of hydroponic Chinese chard. The materials tested were Clingwrap, Ziploc bags with vents, muslin cloth, paper towels and the original plastic packaging. Leaves were repackaged into the above-mentioned materials and monitored for perishability over 2 weeks. The moisture content of leaf samples was measured biweekly. Results obtained indicate that plastic-based materials were better at maintaining the moisture content as compared with muslin cloth and paper towel. This could be attributed to plastic’s permeability characteristics that allow favourable transmission rates of oxygen and carbon dioxide. For future studies, plastic packaging material with different permeability levels can be tested.

**Funding source: Newcastle University**
**Supervisor: Dr Saloni Kaur Dang**

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**Nimisha Narayan**  
*BSc (Hons) Food & Human Nutrition (NUIS)*  
Influence of Packaging material on the shelf life of hydroponically produced Chinese chard

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**Amy Neild**  
*BSc (Hons) Physics*  
Degradation in new photovoltaic technologies: how do devices fail?

Sunlight, or solar energy, is a clean, renewable source of energy that is extremely important at this moment in time, as climate change is occurring, demand for energy is rising and non-renewable energy resources are running out. However, it can be expensive to manufacture high efficiency solar panels that can tackle this problem. A new type of material called a perovskite can be used to make very high efficiency solar cells. They are extremely simple and inexpensive to produce, however a big challenge for perovskite solar cells is their stability and understanding how they fail. Over the course of 8 weeks I will set up and program an instrument to control the degradation conditions and monitor the solar cell parameters in real-time. I will then investigate what can cause the device to degrade, which will help in creating a sustainable perovskite solar cell.

**Funding source: Newcastle University**  
**Supervisor: Dr Pablo Docampo**

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**Salem Nizami**  
*BSc (Hons) Biochemistry*  
Investigating the phosphorylation of Rif1 in DNA Damage Responses to defective telomeres in Saccharomyces Cerevisiae.

The regulation of DNA Damage Response (DDR) pathways is critical for the survival of all higher organisms in response to environmental stresses or ageing. This regulation often involves modifications of the proteins which carry out the necessary functions in the pathways; such as on Rif1 in Saccharomyces Cerevisiae (budding yeast). In this project I will investigate two proteins that may potentially modify Rif1 by phosphorylation. This involves creating gene knockouts; transformed cells lacking the genes coding for these proteins and thus, not expressing them. Rif1 is phosphorylated in response to both DNA and spindle damage (Maringele, unpublished). If these transformed cells contained phosphorylated or unphosphorylated Rif1 under stress conditions, it would show whether or not those proteins are needed for Rif1’s phosphorylation. This will be demonstrated by inducing DNA damage at telomeres of these cells by increasing the temperature and then analysing Rif1 phosphorylation levels (by a technique called Western Blotting).

**Funding source: Newcastle University**  
**Supervisor: Dr Laura Maringele**
Himalayan glaciers are highly sensitive to climate change and feed major river systems, which supply water to ~800 million people in their densely populated, downstream catchments. Over the past two decades, they have shrunk rapidly and this is forecast to continue throughout the 21st century. Due to the mountainous, active landscape of the Himalayas, rock debris on the ice surface is a key control on the melt rates: a thin layer of debris can accelerate melt, due to its darker colour, whereas thick debris suppresses melting. As such, understanding the influence of debris on glacial behaviour is essential for predicting ice loss from the Himalaya.

Due to their remote, high-altitude locations, our knowledge of Himalayan glaciers is limited and ice losses appear to vary substantially across the mountain range. In particular, the Annapurna-Manaslu region has received very little glaciological study to date, meaning that our work here will produce highly novel datasets and results. Glacial meltwater in this region is very important for local communities, and the tourist industry on which the local economy depends. Thus, improving knowledge of glacial behaviour in the Annapurna-Manaslu region is essential for assessing future glacial hazards and water resources.

Funding Sources: QRA – New Research Workers Award, RGS – Small Research Grant, RGS – Geographical Research Grant, Mount Everest Memorial Fund, Mount Everes Foundation – Alison Chadwick Memorial Grant and the Gilchrist Educational Fund

Supervisor: Dr. Rachel Carr

Jack Oxtoby, James Linighan & Arminel Lovell
MPhil Geography as a Science
Annapurna South Glacier Scientific Expedition

NF-κB is a protein complex which is crucial in the regulation of inflammation and cell proliferation. This means that what dysregulated this can cause severe inflammatory or over-proliferative effects on cells (cancer). My project involves the study of the RelA subunit of NF-κB, in particular two amino acids Serine 42 and Serine 45. I am comparing normal cells from a human cancer cell line to cells where these serine residues have been mutated to alanine. This allowed me to partially discover the role of these residues and how they are implicated in inflammation and cancer. To do this my cells were treated with DNA damaging agents and I viewed the expression of certain genes that are targets of RelA to see how the mutation was affecting them, thus how it would affect cell growth and inflammation.

Funded by: Wellcome Trust
Supervisor: Professor Neil Perkins

Kathryn Patterson
BSc (Hons) Biochemistry
IKBKE- A Potential Therapeutic Target in Prostate Cancer?

The androgen receptor (AR) stimulates PCa cell growth when activated by the binding of the hormone testosterone. Current therapies avoid AR activation by preventing testosterone binding to the AR. This slows the growth of the PCa tumour. Unfortunately, the AR often develops resistance to such therapies. Changes in the AR structure as a result of gene mutation allow the AR to become activated in the absence of testosterone resulting in tumour growth that cannot be controlled through current therapies.

In addition to testosterone, studies suggest that an alternative cellular component- novel kinase IKBKE- may also play a role in AR regulation. This project aimed to understand the effect of IKBKE inhibition and siRNA knockdown on PCa cell growth to determine if IKBKE has the potential to be a therapeutic target in PCa treatment.

Funding source: Wellcome Trust
Supervisor: Dr Kelly Coffey
Matthew Pindar  
**BSc (Hons) Biology**  
Can the Age and Success of a Woodland be Attributed to its Soil?

The predominant habitat in the UK pre industrial revolution was deciduous woodland. However, large demands for wood by industry and war has left the habitat type largely destroyed. The project aimed to determine if the concentrations of particular vital minerals and soil characteristics could be distinctly attributed to the three woodland type in the UK: Ancient (over 400 years old), secondary mature (over 150 years old) or woodland creation (within last 150 years). The variation of these chemical properties present in the woodland types will be used to select sites in a further study. Genetic methods will be used to determine species differences in an attempt to establish if the soil communities and properties have a significant effect on the chance of a forest being continuously present for 400+ years.

**Funding source:** Newcastle University  
**Supervisor:** Dr Darren Evans

Glenna Yu Ya Poh  
**BSc (Hons) Food & Human Nutrition**  
Potential benefit of seaweeds in management of Type II diabetes mellitus

Type II diabetes mellitus is a chronic medical condition resulting from abnormally high blood glucose level after meal consumption. It is caused by resistance of body cells to the effect of hormone (i.e. insulin) in absorption of glucose released from the digestion of carbohydrate, and abnormal glucose release in the liver to the body despite raised blood glucose level. This study investigated the inhibitory effect on carbohydrate digestion by digesting encapsulated brown seaweed in two types of beads made from brown seaweed fibre (i.e. alginate) in laboratory model of gut system. It was found that carbohydrate digestion was affected by encapsulated seaweed in DMB alginate beads but not the GHIB alginate beads; which was related to their organic compounds (i.e. polyphenols) released during the small intestinal digestion phase. This inhibitory effect of encapsulated seaweed in DMB alginate beads could possibly provide a potential alternative solution in managing blood glucose level.

**Funding source:** Newcastle University  
**Supervisors:** Prof Jeff Pearson and Dr Matthew Wilcox

Sarah Poyntz  
**BSc (Hons) Physiological Sciences**  
Feeling Sound

We know our world through our senses which analyse stimuli such as sound, light or touch. Because they rely on distinct brain pathways, these senses are often studied in isolation, but natural events usually activate multiple senses. Previous studies in our lab have demonstrated interactions between hearing and vision that are important for perceiving speech. Here our aim is to determine whether our sense of touch can also help us perceive sounds. A device will deliver fluctuating patterns of vibration to the finger-tip of human volunteers while they listen to sounds that fluctuate with the same or different pattern of loudness. In this way the student will test whether our ability to recognise patterns in sounds are influenced by touch stimuli. If such interactions occur they might be used to develop a device that helps the elderly and others with hearing problems to hear better over the telephone.

**Funding source:** Wellcome Trust  
**Supervisors:** Prof Adrian Rees and Doctor Quoc Vuong

Vicente Puyat  
**BSc (Hons) Psychology**  
ASTEROID (Accurate STEReotest On a mobile Device): The Effects of Motion in Depth on Stereoacuity

Stereotests are special eye tests used to see how well the eyes work together to perceive depth and to monitor common binocular vision disorders, such as Strabismus (manifest squint) and Amblyopia (lazy eye). However, the reliability of common clinical stereotests has been debated (Vancleef et al., 2017; Ohlsson et al., 2001) and have not changed greatly over decades. Dr. Read’s lab is working on ASTEROID, a fun computer game for children that can collect critical information to assist in making better clinical decisions (http://research.ncl.ac.uk/asteroid/). The task involves selecting a 3D square that seems to “stand out” from a choice of 4 squares. This square remains at constant depth but recent research suggests that if the square jumped back and forth between two different depth planes, the task might be easier (Tidbury et al., 2016). To address this, subjects’ stereoacuities were measured using constant depths and alternating depths. Interestingly, this study found that alternating depth worsened 3D perception.

**Funding source:** Newcastle University  
**Supervisor:** Prof Jenny Read
Research Scholarships and Expeditions 2017

William Redfearn  
BSc (Hons) Biology  
The taste response to common pesticides in honey bees

Pesticides have been linked to colony collapse disorder, which plays a role in the declining number of bees worldwide. Exposure to pesticides occurs when foragers collect pollen from treated plants. I hypothesised that bees could not taste these pesticides.

A proboscis extension reflex (PER) response was elicited using 1M sucrose. The test substance was introduced to mouthparts and individuals were scored depending on their behaviour. 1 was awarded to bees that consumed the solution and 0 if they did not consume, but did not retract their proboscis. A ‘#' meant the proboscis was retracted (behavioural response to bitter substances).

From the range of pesticide concentrations tested (100nM, 10nM and 1mM in 1M sucrose), data suggests either the bees could not taste, or that they liked the taste of, all the test solutions. Varying sucrose concentrations of the solutions could determine which.

Funding source: The Physiological Society  
Supervisor: Dr Nicola Kay Simcock

Francesca Ridley  
BSc (Hons) Zoology  
Analysis of the conservation status of species subject to international trade controls.

Species listed on the Convention of International Trade in Endangered Wildlife (CITES) Appendix II will be categorised by extinction risk according to the IUCN Red List of endangered species, looking for differences and similarities between the two listings. The CITES trade database will be used to rate the appendix II species by level of trade and subsequently, a relationship between exploitation and threat of extinction determined. Particular attention will be paid to species that experience a high level of exploitation and have high extinction risk, and Least Concern species with a low trade demand. Other criteria for moving species between categories will be studied to assess the scientific and political factors which impact the level of protection species receive, and provide a view of how representative CITES appendices are of the current state of biodiversity loss.

Funding source: Newcastle University  
Supervisor: Dr Philip McGowan

Edwin Lionel Anarcaya Roca  
MEng Automation and Control  
Controlling a ball’s position on a plate

Balancing systems are one of the most challenging problems for machines. Understanding the physical response and being able to translate it into a mathematical model is a significant area for theoretical and practical research in terms of applying appropriate control systems. By understanding the physical response, we can implement and validate control theories and demonstrate their applications before applying them to real-life situations that exhibit similar dynamics.

The objective of this project was to balance a ball in a fixed position and to make it track a desired pathway on a flat plate. This was successfully achieved by implementing a control program that uses a camera to determine the actual position of the ball on the plate and control algorithms which command the two servo motors to tilt the plate relative to the horizontal plane and adjust the ball position to the desired point.

Funding source: Newcastle University  
Supervisor: Dr Matthew Armstrong

Armando De Sousa Santos  
BEng (Hons) Electrical Engineering  
Runtime Adaptation of Energy-efficient and Reliable Many-Core Systems with Concurrent Applications

This research seeks for better ways to introduce reliability along with energy efficiency to meet certain degrees of performance for modern embedded system applications. These two variables are very demanding trade-offs in hardware and software designs that engineers are devising sophisticated platforms to solve them. At the core of the research, such problems will be approached by means of Machine Learning principles and other principles that are available to tackle the same potential issues.

Funding source: Newcastle University  
Supervisor: Dr Rishad Shafik
Joseph Scott  
BEng (Hons) Electronics & Computer Engineering  
Pangraph – a software library for manipulating graphs in standard file formats

The microSystems research group is closely working with e-Therapeutics, a British drug discovery company, on hardware accelerators for computationally hard problems in biological graphs (networks), with the recent prototype achieving a 1000x factor improvement in industrial benchmarks.

A key component of the prototype is the Pangraph library, which I developed on a placement with the group last summer. Pangraph provides a set of tools used for efficiently parsing the file formats of graphs into an abstract data type for further algorithmic processing. Although the Pangraph library has been instrumental for the above-mentioned project, it has a few limitations I will endeavour to work on in my summer research placement. In particular I will work on improving the scalability of the library for handling graphs comprising millions of nodes and providing a wider range of parsers and serializers for other graph formats, such as those produced by the Workcraft modelling framework.

Funding source: Newcastle University  
Supervisor: Dr Andrey Mokhov

Kwang Li Sin  
BSc (Hons) Food & Human Nutrition (NUIS)  
Development of novel food product prototypes using okara / moromi waste by-product from the Singapore soy sauce industry

Okara (or moromi) is a by-product from the production of soy-based products such as soymilk and soya sauce. In Singapore alone, an estimated 30 tonnes of okara are effectively discarded daily. Studies indicate that okara is rich in insoluble dietary fibre and isoflavones (which have been linked to several health benefits). This study was focused on adding value to moromi (a type of okara). After initial kitchen-based trials, a ‘Hawaiian’ pizza containing moromi in its base was developed. After fine tuning of formulations through informal sensory testing, a consumer trial (n=50) was conducted comparing pizzas with bases containing 10% and 12.5% of moromi. Hedonic ratings indicated an absence of significant difference between the formulations in terms of liking of texture and flavour/taste, while panellists indicated equal willingness to purchase the three formulations. This indicates that pizza containing up to 12.5% moromi by-product in its base may be commercially acceptable.

Funding source: Newcastle University  
Supervisor: Dr Gerard O'Brien

Emma Karoliina Smith  
BSc (Hons) Psychology  
Is stress related to attentional biases towards threat?

When studying the physiological stress response, the goal is to induce stress in an efficient and controllable manner. We used a modified version of the Sing-a-Song stress test (SSST) to induce stress in our participants. The stress response activates the sympathetic nervous system, which increases heart rate and skin conductance, which we measured using a wearable wrist-sensor. Exaggerated stress and emotional responses are related to anxiety, which in turn is related to attentional biases towards threatening stimuli. Attentional bias towards threat is measured by measuring participants’ reaction times while they respond to threatening stimuli. We were interested in whether the stress response is related to faster threat reaction times. We did produce a physiological stress response in participants by using the SSST, however we did not find physiological stress to be related to participants’ threat-related attentional biases. This may however be due to lack of power, i.e. a small sample size.

Funding source: Newcastle University  
Supervisor: Dr Quoc Vuong

Georgia Smith  
MChem (Hons) Chemistry  
Synthesis of Fluorescent Phosphonium Salts as Imaging Agents of Mitochondrial Dysfunction

The LJH research group has developed new fluorescent compounds which are highly selective for mitochondria, on account of their positive charge which attracts them across the organelle’s outer, negatively charged membrane. Importantly, if the charge on the membrane is altered, due to mitochondrial damage, the probes ability to cross the membrane is perturbed and this can be evaluated by flow cytometry - thus the accumulation of the probes in the mitochondria could be used to assess whether there is evidence of dysfunction or not. As mitochondrial damage has been implicated in a wide variety of diseases, including Parkinson’s and Alzheimer’s disease, the potential to detect problems early on without invasive surgery is very attractive. Currently we have only synthesised two such probes and in this project the student will prepare four new compounds of differing structures, which will help us delineate which properties give the best imaging performance. Following their synthesis these probes will then be assessed at the end of the project by our collaborators at Newcastle University’s world-renowned Wellcome Trust Centre for Mitochondrial Research http://www.newcastle-mitochondria.com/

Funding source: Newcastle University  
Supervisor: Dr Lee Higham
Research Scholarships and Expeditions 2017

Holly Stewart
BSc Hons Pharmacology
Assessment of the pathological hallmarks of neurodegenerative age-related diseases, comparison of quantification methodologies

I will be focussing on age related neurodegenerative diseases which are prevalent in our ageing population. It can be hard to diagnose these diseases and distinguish between those which are very similar. I will be researching the different markers which help you diagnose somebody with that specific disease in a quantitative and semi quantitative manner. These diseases are degenerative and therefore people with the same disease don’t always have the same markers and don’t show the same symptoms. I will be researching the different stages on the disease and how the markers of the disease change throughout the disease.

Funding source: Newcastle University (project undertaken summer 2016)
Supervisor: Professor Johannes Attems

Oliver Stewart
BSc (Hons) Biochemistry
Therapeutic targeting of androgen receptor variants in prostate cancer

In healthy prostate tissue, Androgen Receptor (AR) signalling is highly regulated and controlled. AR is critical for prostate cancer development, due to the presence of Androgen Receptor Variants (AR-Vs). These AR-Vs are truncated versions of normal AR, whereby constitutive activation of the AR occurs, resulting in tumour growth and survival. Despite the development of anti-androgens such as Enzalutamide, as well as many tumours becoming castrate-resistant, novel targets must be identified for therapeutic intervention. My project focused on the usage of the 20S Proteasome as an example of one of these potential targets. The 20S Proteasome contains two components, entitled PSMA4 and PSMA6, which are critical in the initial assembly of the Proteasome. I knocked down the expression of these subunits in my CW22Rv1 cell line. Following this, I visualised the effect this has on AR signalling, via Western Blot analysis and Real-Time Polymerase Chain Reaction (PCR).

Funding Source: Newcastle University
Supervisor: Dr Luke Gaughan

Jennifer Szypillo
BA (Hons) Fine Art
How can methods of on-site printmaking be developed to provide new ways of visualising landscape in order to capture its sensory and atmospheric qualities

My recent creative practice has been concerned with responding to landscape using forms of hand-made printmaking.

Building on this broad interest I wish to focus this practice-based research project on developing innovative methods of on-site mono-printing in direct response to the experience of being ‘in’ the ever-changing landscape environment of Stora Sjofallet National Park, Sweden. This location will provide the ideal terrain, weather and logistical conditions to enable the development of new approaches to the visualisation of immersive landscape experience.

*a mono-print is a one-off image made typically by transferring ink from a smooth surface onto a sheet of paper.

Funding source: Newcastle University (project undertaken summer 2016)
Supervisor: Prof Christopher Jones

Helen Timmins
BSc (Hons) Biomedical Sciences
Synthesizing novel protein Speedy and investigating its role in controlling cell division; building a foundation for future cancer research:

Cyclin dependent Kinases (CDK’s) are proteins that help regulate Mitosis (cell division). CDK’s act at each stage of mitosis, controlling the cells ability to progress through cell division. CDK’s themselves are controlled by another set of proteins- Cyclins- that bind to CDK’s and activate them. Some CDK’s can also be activated by a cyclin alike protein named Speedy. A recent a paper published the structure of Speedy, showing it to be very similar to Cyclins. Building on this paper, the aim of this project was to determine which materials and methods were best to create a Speedy protein in the lab. This recombinant protein could then be used in future research. As Speedy has been reported to be found at high levels in certain cancers our work may have important implications for future cancer research.

Funding source: Newcastle University
Supervisor: Prof Jane Endicott
Homogeneous catalysts are dissolved alongside the reactants in a chemical reaction, and have advantages in terms of their ability to control the outcome of a chemical reaction. Heterogeneous catalysts are typically insoluble solids, instead interacting with the reaction mixture via their exposed surface. Such a catalytic surface is highly chemically active, making heterogeneous catalysts an effective tool in improving the rates and yields of chemical reactions. Furthermore, heterogeneous catalysts are more easily recovered and reused once a reaction is complete, due to their solid nature.

This work explored the possibility of a combined approach, building a heterogeneous catalyst by binding a homogeneous catalyst to a silicon surface using a DNA linker. The chemistry of this functionalisation was already known, making the study of the functionalised surface’s properties the experimental focus.

**Funding source:** Newcastle University  
**Supervisor:** Dr Andrew Pike

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**Yasmin Vajeth**  
*MChem (Hons) Chemistry*  
**Transparent p-type semiconductors for efficient solar energy capture, conversion and storage**

In conventional silicon solar cells, photons with high energy lose their energy via thermalization and so developing new materials, such as dye-sensitized solar cells (DSCs), that capture high energy photons have shown promising efficiencies with a significant reduction in cost. Combining negative (n)-type and positive (p)-type DSCs onto a single p/n device should give rise to a substantial increase in photocurrent and therefore be of use in more efficient DSCs. The research is focusing on improving the efficiency of p-type semiconductors, first by investigating the preparation method for the NiO films, which can cause major changes to the device performance and by tuning the heating rate, the crystallinity can be studied using X-ray powder diffraction. The next phase of the project is to investigate new p-type semiconductors based on copper-doped NiO that have high conductivity properties due to their larger band gaps and so are potential candidates to be incorporated into DSCs.

**Funding source:** Newcastle University  
**Supervisor:** Dr Elizabeth Gibson

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**Uma Veerappan**  
*MBBS (NUMed Malaysia)*  
**Assessment in disease progression in muscle using quantitative magnetic resonance imaging and spectroscopy in a natural history study of dysferlinopathy**

Dysferlinopathy is a rare hereditary condition that affects the body’s conducting system and muscles. This disorder is caused by a decrease in the dysferlin protein that is required for normal muscle functioning. As a result, patients manifest a group of rare muscle wasting disorders. They typically present with the condition in early adulthood and symptoms associated with this disorder are highly variable (for reasons which are not yet understood), ranging from no symptoms to severe functional disability. As the disease progresses over time, healthy muscles are gradually replaced by fat. This project aims to assess the disease progression in 27 subjects from baseline to year 1 using quantitative magnetic resonance techniques. By measuring disease progression, accurate details regarding full clinical spectrum of different forms of dysferlinopathy can be collected. This can then aid in assessing efficacy of potential therapies as there is no cure for this disorder yet.

**Funding source:** Newcastle University  
**Supervisor:** Dr Fiona Elizabeth Smith

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**Dotty Walker**  
*BA (Hons) History*  
**Violent crime in York, 1832 to 1862**

The number of crimes carrying the death penalty in England and Wales dropped from sixty to four in the quarter of a century from 1832. Many people feared this would lead to a sharp increase in offences, and the period is often still seen as one of widespread criminality. To test this perception, I examined violent crime in York during a thirty-year period using a variety of official records and reports. These showed the number of trials for assault did not increase, whilst those for robbery with violence and homicide rose slightly in relation to population size. The overall picture is of crime levels resulting more from growing social pressures than changes in sentencing. Another factor was the development of a new police force, although it was difficult to determine its effectiveness in terms of detection and prevention. What is clear is that the feared upsurge in violent crime did not happen.

**Funding source:** Newcastle University  
**Supervisor:** Professor Jeremy Boulton
Laura Walker  
*Msci Biochemistry*  
A study of the interactions between proteins involved in chromosome segregation in *Bacillus subtilis* using the yeast-two-hybrid system.

The project involved testing protein-protein interactions from the bacterium *Bacillus subtilis*. The proteins to be tested (Spo0J, MinD, comN, racA, divIVA and minJ) are involved in chromosome segregation in this organism, specifically during spore development. The chromosome segregation process is vital in all organisms, but is not well understood in bacteria. Using a yeast-two-hybrid system it was hoped I would be able to robustly test these protein-protein interactions, furthering our understanding of chromosome segregation process. Plasmid constructs containing the protein genes were designed/created for the project and various tests were used to measure levels of protein-protein interaction within the yeast cells. This showed preliminary positive protein-protein interactions; including interactions between proteins divIVA-divIVA and proteins soj-divIVA. It is hoped these plasmid constructs can be used in the future to further test protein interactions with soj using the yeast-two-hybrid technique, with the aim to decipher the action of soj.  

**Funding source:** Wellcome Trust  
**Supervisor:** Professor Jeff Errington

Frederick Webb  
*BA (Hons) Ancient History & Archaeology*  
*Mithraism in Roman Britain*

Mithraism is a Graeco-Roman cult, which appeared in Roman Britain between the 1st and 4th centuries AD. The cult worshipped the Eastern God Mithras. Cults arose across the Empire based on the members perception of Mithras as a protection against evil. Worship took place in underground temples called Mithraeum. The major example of a Mithraeum is the London Mithraeum at Walbrook. Excavations took place in 1954 and revealed dedications to multiple deities. Notable examples include the head of Serapis and marble dedications to Minerva and Mithras. The Great North Museum will have these dedications on public display from July to September. The Museum also holds exhibits to other Mithraic sites in Roman Britain. The aim of the research project is to enhance our understanding of the impact of Mithraism on society and everyday life in Roman Britain.  

**Funding source:** Newcastle University  
**Supervisor:** Federico Santangelo

Anna Kang Chee Wong  
*BSc Biomedical Sciences (2+1 NUMed)*  

Enterobacteriaceae are rod-shaped bacteria that are commonly found in the human gut. Extended Spectrum Beta-Lactamases (ESBL)-producing Enterobacteriaceae can produce enzymes that are capable of destroying antibiotic. Carbapenem (antibiotic) is used to kill the ESBL-producing Enterobacteriaceae. However, Carbapenem-resistant Enterobacteriaceae (CRE) had been discovered. In 2017, the World Health Organization (WHO) declared that antibiotic resistant Enterobacteriaceae as one of the group of critical resistant bacterial group. The objectives of this study are to determine Enterobacteriaceae populations, the presence of the ESBL-producing and CRE in the inflow of a local wastewater system in Malaysia. Growth medium with chromogenic substances (different coloration in different bacteria colonies) was used for ESBL-producing Enterobacteriaceae screening. Potential Enterobacter cloacae or Citrobacter freundii were the most abundant residents in the wastewater. Escherichia coli and potential Salmonella enteriditis or Shigella flexneri were most common ESBL-producing Enterobacteriaceae. This study discovered that ESBL-producing and potential CRE exist in the wastewater and capable to pose threat to human health.  

**Funding source:** NUMed Malaysia  
**Supervisor:** Dr Roshan Mascarenhas
Singapore is facing a surge in inclining elderly population and has resulted in an increased rate of nutrition-related health issues such as metabolic diseases - Heart diseases, Diabetes Type 2 and High Blood Pressure. In order to understand the contributing factors of such diseases, it is important to identify the food intake and eating habits of the elderly population. Food Frequency Questionnaires (FFQ) will be focused towards collecting dietary data and dietary habits. The results from this study will be beneficial for researchers, private and government bodies to produce targeted strategies to reach out further to the elderly populations’ nutritional needs.

**Funding source:** Newcastle University

**Supervisor:** Dr Iain Brownlee

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Type 2 diabetes (T2D) patients have decreased skeletal muscle function when compared with age-matched subjects without diabetes. p38MAPK is a protein involved in cell differentiation and a previous study found increased p38MAPK activation in cultured skeletal muscle cells from insulin resistant T2D patients with a strong diabetes family history. This study investigated p38MAPK activation in cultured muscle cells from an unselected group of T2D patients. Activated and total p38MAPK was determined by western blotting in protein samples from undifferentiated myoblasts and day 7 differentiated myotubes from T2D patients and age-matched non-diabetic subjects (n=11 and 12, respectively). Overall, there was no significant difference in the degree of p38MAPK activation between diabetic and non-diabetic myoblasts and myotubes. This suggests that increased p38MAPK activation is restricted to a subgroup of T2D patients, which might be related to family history, diabetes durations or treatment types that might affect p38MAPK activation.

**Funding source:** Newcastle University

**Supervisor:** Prof. Mark Walker

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According to the WHO and SEVA (tinyurl.com/ohzsls9), there are more than 800,000 individuals who suffer from blindness in Egypt. The effect on their families, society and economy is large. Modern ophthalmic drugs and retinal prosthetics are very expensive. Most will therefore continue with substituting the sense of touch – using braille and the stick. The British council have therefore funded a £200k project to explore the use of next generation of tablets with 2D “tactile” force feedback. We have teamed up with Tanvas, a key start up in this field which is providing devices and are exploring, through clinical trials, how they could be used.

This research will involve developing concept user interfaces for blind people to use haptic tablets. This will involve developing Java programming skills as well as user interface architectures. I will have to liaise with the clinical teams involved in the UK and Egypt.

**Funding source:** Newcastle University

**Supervisor:** Dr Patrick Degenaar
University Expeditions and Research Scholarships 2018

The University will once again support Expeditions and student Research Scholarships in 2018. The application form for the 2018 scheme is already available and can be found at: www.ncl.ac.uk/students/wellbeing/finance/funding/ukstudents/vacation/. Applicants will continue to be encouraged to seek external funding wherever possible. The web links below provide details about eligibility and applications procedures. Research Scholarships are available for six to eight weeks’ work and carry a grant of £200 per week. Schools or Research Institutes are expected to provide modest grants for essential materials, travel etc., in support of the awards.

A panel consisting of the Pro-Vice-Chancellor (Learning & Teaching) and Faculty Undergraduate Deans will again judge applications primarily on academic merit and potential for providing research training. Students awarded funding by the University Expeditions Committee will not be considered for Research Scholarship awards in any one year.

Specific details about the Presentations and Reception evening in previous years can be found at: www.research.ncl.ac.uk/vacationscholarships/

Details about the 2017 presentations will be available on this website from the end of January 2018.

University Expeditions 2018

Information about submitting applications for University Expeditions Committee funding is available on the Student Financial Support section of the Student Wellbeing web pages at: www.ncl.ac.uk/students/wellbeing/finance/funding/ukstudents/expeditions/

The deadline for receipt of applications is Friday 26th January 2018

University Research Scholarships 2018

Information about submitting applications for University Research Scholarships Committee funding is available on the Student Financial Support section of the Student Wellbeing web pages at: www.ncl.ac.uk/students/wellbeing/finance/funding/ukstudents/vacation/

The deadline for receipt of applications is Friday 9th March 2018
Comments from Research Scholarship and Expeditions holders 2013-2016

Below are comments from a selection of research scholarship holders in previous years:

“The support and encouragement given by the University and Supervisor has increased my confidence and shown me that I am capable of taking on and completing research projects in areas of personal interest.”

“I am sure now that I want to pursue research as a career.”

“It provides undergraduates with the opportunity to experience research while being confident to make and learn from mistakes. It also allows you to get to know how you like to work, and what makes you work effectively - an important skill for any piece of work.”

“It has made me consider research as a career and lab work too. Before I didn’t have the confidence but after doing the research project I feel I could do this. I had a really enjoyable time and learned a lot.”

“I am contemplating a Masters as a result. I think the important part of the Research Scholarship is providing an experience of what post graduate education is like, to make an informed decision of whether it is something you would like to pursue or not. Whether you pursue it or not, it is a highly valuable experience.”

“I have made really good contacts for future research and have realised it is a viable option. Also it has given me much more confidence in my academic abilities. My supervisor has given me lots of options about future research such as Masters and PhD programmes within the University. I have also spoken about my experiences to other members of my course which does not traditionally move many students on to research immediately post-graduation.”
Feedback from 2017
Research Scholarships scheme

It is hoped that if you were an undergraduate who undertook a funded research project during the summer of 2017 that it was a rewarding experience for you. The Research Scholarships Committee and the Student Financial Support Team strive to improve the scheme each year and would greatly appreciate feedback regarding your experiences and thoughts on this year’s presentation and reception.

A short survey is now available online here:

[www.surveymonkey.co.uk/r/6XDH6LJ](http://www.surveymonkey.co.uk/r/6XDH6LJ)

Alternatively if you have any additional feedback not covered by the above please do not hesitate to contact us at:

[Vacation-scholarships@ncl.ac.uk](mailto:Vacation-scholarships@ncl.ac.uk)