Celebrating Research Scholarships and Expeditions 2016
Wednesday 23rd November
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.

A Research Scholarship can cover 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 or working on a laboratory project alongside members of a research team.

Conducting independent research alongside 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 on research projects, Research Scholarships enable students to understand the research activities of their teachers, and to have a window on the research environment. Conducting research work in the field gives students opportunity to plan, organise and execute research projects in challenging and unfamiliar environments.

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.

For some students the experience of working on a ‘live’ research project will stimulate or confirm an interest in postgraduate research, for others it will be a way of integrating knowledge, enhancing the learning experience and developing valuable professional skills.

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.
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-eight 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, as last year, around 120 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 15 students received external funding from other organisations, including the British Society for Plant Pathology, the Genetics 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 2016 four Expeditions were undertaken by students from the Faculty of Humanities and Social Sciences 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 2016 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 23rd November 2016. From 4:30pm 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 2016 will be announced by the HASS Undergraduate Dean and winners will be presented with certificates and prizes.

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<td>5:30-5:40pm</td>
<td>Welcome and introductions by Mr Simon Pallett and Dr Emma Pearson</td>
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<td>5:40-7:05pm</td>
<td>Presentation 1 - Holly-Ann Carl</td>
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<td>7:05-7:15pm</td>
<td>Announcement of poster winners by Mr Simon Pallett (HASS Undergraduate Dean) and presentation of awards to students</td>
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<td>7.30pm</td>
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Holly-Ann Carl  

**BA (Hons) Archaeology**  

**Perceptions of a Castle: Hylton Castle Sunderland**

Hylton Castle is a fortified manor house in Sunderland now in an urban setting and surrounded by a 1940s housing estate. The Castle was built by Sir William Hylton as his principal residence in 1400. Like many medieval high status houses, Hylton Castle has undergone many changes which are visible in the building's fabric, most noticeably in the construction and demolition of the north and west wings. More interestingly the landscape setting of the castle is poorly understood and has not been fully investigated. I have compared historic images as well as archaeological evidence in order to examine how perceptions of the castle have changed through time. I have also considered how factors such as ownership, wealth and taste are reflected in the surviving fabric. The castle, which currently lies in ruins, is about to undergo major restoration and renovation as it is transformed into an education centre.  

**Funding source: Newcastle University**  

**Supervisor: Dr Caron Newman**

Natasha Fothergill Misbah and Jim Stacey  

**MSc Public Health & Health Service Resources**  

**Perceptions about Parkinson’s disease (PD) and its treatment in a rural area of Tanzania**

Parkinson’s disease (PD) is a neurological disorder that results in a reduced quality of life for people with Parkinson’s disease (PWP) and their carers. Diseases associated with later life were thought to be rare in sub-Saharan Africa (SSA), however, ageing populations have led to a higher prevalence of non-communicable diseases. SSIs were conducted with 3 PWP and 6 carers in Hai, Tanzania in order to explore their perceptions of PD and its treatment. Interviews were conducted in Swahili with a translator and took place in participants’ own homes.  

There were misconceptions about the cause of disease, ranging from cold weather to evil spirits. PWP and carers displayed various treatment seeking behaviours, including biomedical services, traditional healing and faith healing. A lack of health services and social support was identified as well as a limited understanding of PD among healthcare workers. PD knowledge is minimal in Tanzania; PWP and carers have their own coping mechanisms with regards to their illness, including religion, prayers and family support networks. Cultural beliefs play a big part in the health and illness beliefs of this population and it is crucial that biomedical treatment practices are incorporated into traditional aspects of life.  

**Funding source: University Development Trust & the Henderson Fund**  

**Project Supervisors: Dr Katie Brittain, Prof Richard Walker, Dr Claire Dickinson, Dr Richard Lee**

Ruby Scott  

**Bsc (Hons) Biology**  

**Honeybee population decline as a consequence of intensive agriculture**

The worldwide decline in honeybee populations has caused much concern due to the central role they play as an ecosystem service. One of the major contributors to the decline in populations is believed to be poor nutrition as a consequence of intensive agriculture. As a result, beekeepers are increasingly using artificial pollen substitutes to feed and maintain their colonies. Unfortunately, these are poorly constructed, have little scientific credibility and contain indigestible protein leading to considerable wastage. This study explored the problem with a goal of providing workable solutions to overcome this issue. Artificial solutions were fed to honeybees for 14 days and consumption was measured. It was found that different proteins affected how much honeybees consumed in relation to carbohydrates and also that the addition of tryptophan reduced dietary protein intake. These findings will contribute to work directed at developing an improved pollen substitute that can be used to provide bees with optimal nutrition.  

**Funding source: Newcastle University**  

**Supervisors: Prof Jerry Barnes, Prof Jerri Wright & Dan Stabler**
Alexandra Mckee, Rebecca Leitch and Diana Luke  
*Bsc (Hons) Geography*  
Study of fluvial and environmental processes affected by the 2015 Calbuco volcano eruption, Chile.

Combined, our overall aim is to study the fluvial and ecological effects of the Calbuco eruption, however individually this involved investigating fluvial geomorphology, lahar characterisation and ecological disturbance. Choosing two sites along the Rio Blanco Este that were highly affected by volcanic processes and materials, we collected primary data to compare with secondary information to create a full picture of what happened in April 2015 and what is still happening today.

Preliminary findings of the river geomorphology indicate that the upper site was impacted immediately after the eruption, however the lower site responded several months ensuing. This is most likely due to the transportation of loose, unconsolidated material, which took a longer period of time to reach the second site than the first.

Initial logging of the stratigraphic columns revealed at least 4 or more units at the upper site and at least 5 or more units at the lower site. The majority of the stratigraphy columns exhibited poor sorting, with a range of clast sizes from boulders (>4096 mm) to granules (<4mm). The samples of finer grained matrix collected from each column encompassed clast sizes ranging from very fine sand (>0.06mm) to pebbles (<20mm).

Whilst the lower site features trees nearer to the river edge, at the upper site the first signs of living vegetation are located 100m away from the current river position. Overall, the impact of the volcanic disturbance on vegetation related mainly to the lahar and ash fall, which impacted areas more extensively than the lahar flow. The ash permitted some vegetation to exist, whereas the areas in direct contact with the lahar flow show no vegetation.

**Funding sources:** Newcastle Expeditions Committee, University Development Trust, the Henderson Fund, Royal Geographical Society (with IBG), Gilchrist Educational Trust and the Jeremy Wilson Charitable Trust.

**Project Supervisors:** Prof Andy Russell & Dr Stuart Dunning

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**Jia Yee Ho**  
*BSc Biomedical Sciences 2+1 NUMed and Newcastle UK*  
Presence of Multidrug-Resistant and Extended-Spectrum Beta-Lactamases (ESBLs) – Producing E. coli – A pilot study of a Johorian River, South Malaysia

The emergence of antibiotic resistance is a global concern. Antibiotic resistance renders treatment against common infectious diseases ineffective. Escherichia coli (E. coli) can produce enzymes including extended-spectrum beta lactamases (ESBLs). These enzymes break down structure of beta-lactam antibiotics, such as penicillins and cephalosporins. Drug-resistant E. coli present in faeces could cause a widespread transmission via river. This preliminary study aims to detect presence of resistant E. coli in Ulu Pulai River, Johor, Malaysia. Results obtained showed presence of various bacteria in the river water sample. These bacteria grew on nutrient agar and HiCrome coliform agar. Disc diffusion (antibiotics- containing paper discs on a plate of bacteria) method tested the susceptibility of isolated E. coli against five antibiotics. These antibiotics have different mechanisms of action. Isolated E. coli were resistant to ciprofloxacin, ampicillin-sulbactam and sulfamethoxazole-trimethoprim. Susceptibility was evident towards ceftazid.

**Funding source:** NUMed Malaysia  
**Supervisor:** Dr Mukhrizah Othman

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Research Scholarships and Expeditions 2016

Ayusha Abbas
BEng (Hons) Electrical & Electronic Engineering
Communication using acoustic waves inside the human body

This project analyses the effectiveness of using ultrasonic waves in order to communicate through human tissue. Firstly, the results were obtained by simulating the body environment in Matlab and some theoretical results were produced depending upon the distance between the receiver and transmitter, frequency etc. Results showed that attenuation of signal is linearly related to the distance while transmission, intensity and output power of signal shows an exponential decay as distance increases. Secondly, by assuming that human body has on average 60% water, practical experiment was performed in water and similar results were obtained as the theoretical ones. When distance was varied from 0 to 12 cm it was observed that the power coming out of transducer was reduced by only 24.5 dB which is good for acoustic transmission. Finally, experiment was performed on human body and results showed that good communication and power transfer is possible using this technique.

Funding source: Newcastle University
Supervisor: Mr Jeff Neasham

Esther Akpan
BSc (Hons) Biomedical Sciences
The Effect of Age on Exercise Tolerance in Women

Exercise tolerance is the most physical exertion that is achievable by a person before exhaustion. It is a key assessor of heart and blood vessels function in health and disease, and is measured by the peak oxygen consumption during exercise. The aim of my project was to define the effect of age on mechanisms of exercise tolerance. Forty healthy women (20 young and 20 old) underwent gas exchange and blood measurements at rest and during an exercise test. Statistical analysis of the results showed peak oxygen consumption was lower in the older group and it was due to a decreased heart function. As aerobic exercise is a vital component of everyday lives, further studies are needed to identify interventions that will help maintain and improve cardiac function in the older population.

Funding source: Newcastle University
Supervisor: Dr Djordje Jakovljevic

John Anderson
Mchem (Hons) Chemistry (Industrial Training)
Fast But Not Furious - Molecular Dynamics simulations and molecular docking calculations of protein complexes on a CPU/GPU system

Computational chemistry encompasses a variety of hardware and software that allows the modern chemist to find many qualities of a molecule quite reliably without ever entering a lab. Many of the tools developed thus far are still being developed and optimised to run on ever evolving hardware. Examples include Gromax which predicts molecular dynamics (motion of atoms within the molecule) for a molecule and DOCK6 which allows for prediction of the favourability of a molecule to bind to a site of another. Both of these, until recently, have not employed a large part of the modern computer, the GPU (Graphics Processing Unit). Gromax now supports the use of a GPU whereas DOCK6 still does not. It would therefore be valuable to examine how effective the use of various GPUs are and to find and test alternative programs to DOCK6 which do make use of the GPU.

Funding source: Newcastle University
Supervisor: Dr. Agnieszka K. Bronowska

Hannah Anthony
BSc (Hons) Speech and Language Sciences
Promoting interaction between mothers and their young children with neurodisability – a phase I study

Children with motor disorders often have difficulties producing intelligible speech and gestures. Parents can find their attempts to communicate difficult to interpret. Speech and language therapists train parents to recognise their child’s communication attempts and to create new opportunities for communication development. Researchers at Newcastle University have developed a mobile phone therapy app for therapists to coach parents between therapy sessions. They are testing the app with eight families and are measuring changes in children’s communication and parents responses during and after the therapy. My study has shown that parents created more opportunities for their children to communicate and were more responsive to their children’s attempts to interact during therapy.

Funding source: Newcastle University
Supervisor: Dr Lindsay Pennington
Type 2 diabetes is a condition that is linked to prolonged high blood glucose concentration. When left untreated, type 2 diabetes might result in the loss of kidney function and even premature death. Studies have shown that certain species of tropical seaweed hinder the activity of the enzyme α-amylase; resulting in a lower blood glucose concentration. However, most commercially available seaweed products undergo food processing. Upon undergoing food processing, seaweed samples may lose the ability to hinder α-amylase activity. In this study, the effect of commercial seaweed products on α-amylase activity was evaluated. A total of 14 seaweed products found in Singapore supermarkets were analysed. Based on the results, 6 seaweed products inhibited α-amylase activity up to 8% while 8 seaweed products activated α-amylase activity up to 31.9%. The contrasting effects of seaweed products on α-amylase activity may be attributed to the different origins and processing of the seaweed products.

**Funding source:** Newcastle University

**Supervisor:** Dr Iain Brownlee

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Sarah Atkinson

*BSc (Hons) Speech and Language Sciences*

Using the Behaviour Change Technique Taxonomy to describe and classify an expert speech and language therapist’s intervention techniques when delivering therapy to a child with comorbid language, literacy and behaviour difficulties.

The Behaviour Change Technique Taxonomy (BCTT) comprises 93 labels and descriptions of techniques used in healthcare interventions to change behaviour e.g. smoking cessation and healthy eating. The BCTT can form a basis for the collective classification of techniques used by many healthcare professionals. This will enhance both healthcare interventions and students’ clinical education. To date the BCTT has not been applied to speech and language therapy (SLT) interventions with children. This study uses the BCTT to describe and classify SLT techniques in intervention for a child with language, literacy and behavioural difficulties. It involved analysing videos of the intervention, matching the techniques to BCTT labels and creating definitions for new techniques. The observed techniques were compared to techniques identified in the treatment manual. This testing of treatment fidelity, is required in devising and evaluating all new interventions. It was found that the use of the BCTT aided this procedure significantly.

**Funding source:** Newcastle University

**Supervisor:** Dr Helen Stringer

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Sorena Azaripour

*BEng (Hons) Electrical Power Engineering*

The Effect of space weather on devices we use

This investigation looks into the effect of space weather on devices on Earth which use satellites signals. Time varying irregularities are generated as a consequence of solar storms in space which can cause a decrease in the percentage accuracy of results which mainly affect the phase and amplitude of satellite signals which pass through this solar storm. Many devices using global positioning system (GPS) signals require very precise results in order to function correctly therefore the space weather activity is measured and observed using data collected from EUREF (European network station). The raw data is then passed through different steps so that the final result is presented and analysed in the simplest format. The final hurdle in this study is to potentially minimise the phase and amplitude fluctuations which degrade the GNSS performance.

**Funding source:** Newcastle University

**Supervisors:** Dr Rajesh Tiwari and Dr Martin Johnston
Katie Barker  
Bsc (Hons) Pharmacology  
Examining the potential treatment of hepatocellular carcinoma by investigating the non-canonical NF-κB signalling pathway and its role in tumorigenesis.  
The most common type of liver cancer, hepatocellular carcinoma (HCC) is the second-highest cause of cancer mortality worldwide, having a 5-year survival rate of only 5%. Given this, new options for the treatment of HCC are urgently required. This project will examine a cellular signalling pathway (non-canonical NF-κB), which has been implicated in driving other types of tumour but not studied in liver cancers. We will use 7 types of human liver tumour cells and stimulate or inhibit the signalling pathway to determine whether its targeting could represent a potential new way to treat this devastating disease.  
Funding source: Newcastle University  
Supervisor: Prof Steve Wedge

Hannah Barnes  
Bsc (Hons) Psychology  
Mindfulness Meditation Groups for Huntington’s disease Patients  
Huntington’s disease (HD) is a progressive genetic disorder affecting cognition, emotion and movement often manifesting between 30-50 years old. Investigating ways to provide HD patients with support and coping mechanisms is imperative as no cure exists. This study is the first to explore the use of a Mindfulness based-intervention (MBI) as a potential therapy in a HD population. Mindfulness is a meditation focusing on awareness of the present moment, non-judgmentally. It has been found in Alzheimer and Parkinson’s populations to reduce stress, anxiety and depressive symptoms. More recently MBIs have been shown to improve functions such as attention, memory and emotional control. HD patients could benefit from these improvements and so there is reason to assess the use of a MBI. The aims are to develop a HD adapted MBI protocol, investigate potential benefits by using a range of pre and post intervention measures and assess feasibility of the programme.  
Funding source: Newcastle University (undertaken at Monash University, Australia)  
Supervisor: Dr Joel C Wallenberg

Rachel Barry  
BA Hons English Language  
Language Change and Continuous Gender: investigating Tyneside phonological changes in people of nonbinary gender identities  
This project analyses the effectiveness of using ultrasonic waves in order to communicate through human tissue. Firstly, the results were obtained by simulating the body environment in Matlab and some theoretical results were produced depending upon the distance between the receiver and transmitter, frequency etc. Results showed that attenuation of signal is linearly related to the distance while transmission, intensity and output power of signal shows an exponential decay as distance increases. Secondly, by assuming that human body has on average 60% water, practical experiment was performed in water and similar results were obtained as the theoretical ones. When distance was varied from 0 to 12 cm it was observed that the power coming out of transducer was reduced by only 24.5 dB which is good for acoustic transmission. Finally, experiment was performed on human body and results showed that good communication and power transfer is possible using this technique.  
Funding source: Newcastle University  
Supervisor: Prof Julie Stout

Param Bharaj  
BSc (Hons) Biomedical Genetics  
Investigating the origins for the host for the mitochondrial endosymbiont  
Early research in phylogenetics (study of the evolutionary relationships between organisms) suggested there are 3 primary domains of life: Eukaryotes, Bacteria and Archaea. Eukaryotes are unique as they have membrane-bound organelles, but their origin is unresolved. However it’s widely accepted that Eukaryotic cells were created when a bacterial cell and an unknown host combined (endosymbiosis). This resulted in Eukaryotic cells containing mitochondria, the bacterial remnant. Some think the host for the endosymbiosis was the common ancestor of Eukaryotes and Archaea (3 domains hypothesis), whilst others think Eukaryotes originate from an Archaeal host (2 domains hypothesis). This project studies the host’s nature by investigating the phylogeny of Iron-Sulphur containing proteins, which are strongly conserved across all domains. By comparing the sequences of these proteins, trees are created showing how closely related different species are. Hopefully these trees will shine light on whether the 2 or 3 domains hypothesis is more accurate.  
Funding source: Newcastle University  
Supervisor: Professor Martin Embley
In the past Actinobacteria have been used to produce many antibiotic compounds, but in the modern environment with the threat of MRSA and the rise of bacterial resistance to traditional antibiotics, these can prove ineffective. Using Actinobacteria sourced from extreme environments that are taxonomically different to more prevalent species in order to produce novel antibiotic compounds may be the solution to this problem.

To test this hypothesis techniques developed at Newcastle University will be used to isolate and extract Actinobacteria from soil samples taken from the Atacama Desert in northern Chile. These isolates can be tested to see how effective their products are as antibiotics, and curated if they prove useful.

Funding source: Newcastle University
Supervisor: Prof Michael Goodfellow

Modification of proteins by the small protein ubiquitin regulates fundamental cell processes from simple yeast to humans. Importantly, deregulation of ubiquitin is linked with common diseases such as cancer and therefore, to develop effective clinical treatments, it is essential to understand normal functions of ubiquitin. Ubiquitin forms chains on target proteins and one such chain involves lysine at position 63 in ubiquitin (K63). Interestingly, although K63 ubiquitin chains are linked to signalling functions remarkably little is known about this type of cell regulation. Hence we aim to utilise state-of-the-art robotics, together with large collections of yeast gene mutations, to investigate K63 linkages in all cell functions. To achieve this aim the current project successfully constructed yeast strains containing deletions of normal ubiquitin expressing genes and obtained DNA vectors, which express genes required for the robotics screen. These reagents are essential for future studies of the functions of K63 ubiquitin chains.

Funding source: Newcastle University
Supervisor: Prof Brian A. Morgan

Multiple epiphyseal dysplasia (MED) is a rare genetic skeletal dwarfism characterised by short stature due to defective processes affecting the growth plate where cartilage transforms to bone. This disease is linked to inherited DNA mutations in proteins important in cartilage and bone development. Insufficient degradation of altered proteins induces cellular stress resulting in increased levels of a protein regulator called Creld2. To understand its role in this process I am investigating its actions within mice models, both wild type with the gene for Creld2 (knockout) and in increased levels of a protein regulator called Creld2. We found that mice lacking Creld2 exhibited abnormal cartilage and bone formation in comparison to those with the gene, and displayed features of MED. This data suggests that Creld2 is important in this process, and is a potential target in the treatment of skeletal dwarfs.

Funding source: Newcastle University
Supervisor: Prof Michael Briggs
Research Scholarships and Expeditions 2016

Steven Brown
MBBS
Poly-electromyography (Poly-EMG) in the Investigation of Movement Disorders.

Myoclonus is a disabling movement disorder that is a common complaint in neurology patients and has a wide range of causes. It is characterised by brief bursts of muscle contraction, called jerks. It can be organic, where there is an identifiable biological defect, or functional if there is not. Making the correct diagnosis is important as it will impact on a patient’s treatment and outlook, and measuring the electrical activity of muscles (electromyography, [EMG]) can help distinguish between myoclonic disorders which appear superficially similar. Here we aim to develop more specific diagnostic criteria by establishing the normal range of electrophysiological measurements in healthy people. We asked 20 healthy volunteers, with no history of neurological diagnoses, to mimic jerks as briefly as possible for a range of muscles. We found significant differences between muscle groups, and produced a reference table for clinicians who might be faced with a complex clinical picture.

Funding source: INSPIRE
Supervisor: Dr Mark Baker

Lawrence Bruce
MChem with Hons in Chemistry
Characterising Red Cabbage Anthocyanin Droplets Using Raman, Infrared and UV-Vis Spectroscopy

The aim of the project was to investigate the feasibility of using naturally occurring dyes to help characterise microscopic aerosol droplets with its primary use being a pH sensor. Red cabbage was used as an anthocyanin dye source; bulk solutions were made to vary from pH 2-11 using stock NaOH and HCl. Bulk solutions were characterised using UV-visible, IR and Raman spectroscopy and spectral peak changes with pH was investigated. The degradation of red cabbage anthocyanins was also monitored to observe its effect on the validity of characterisation. Unmodified red cabbage solution was aerosolised and stabilised in optical tweezers and characterised in terms of size and refractive index through observation of the whispering gallery modes.

Funding source: Royal Society of Chemistry
Project Supervisor: Dr Toni Carruthers

Mary Burke
BSc (Hons) Biomedical Sciences
Sequences of development in brain tissues and the ability to ‘self-repair’

The generation of new neurons in the adult brain has been a prevalent research topic for over 50 years. One element of this neurological research is investigating the birth and creation of new neurons in the brain after a stroke (caused by lack of oxygen reaching the tissue). This project aims to identify the origin and activity of new neurons that appear in the brain at a site of stroke. My research project involved labelling the new neurons generated in the stroke-injured brain in order for them to be quantified and these were then compared to a non-injured control. These experiments gave insight into what happens in the brain after suffering a stroke and also into the brain’s regenerative potential. Following successful labelling results showed significantly different neuron cell numbers between the injured and non-injured brain, supporting the hypothesis that the brain is capable of generating new neurons in response to stroke injury.

Funding source: Newcastle University.
Undertaken at Monash University, Australia
Supervisor: Prof James Bourne

Ekaterina Buzun
BSc (Hons) Biomedical Sciences
Investigating the mechanism of mucin degradation by the gut microbiota

The thick layer of mucus that protects the intestinal epithelia provides a significant nutrient source for certain gut microbiota. In a healthy gut this process is carefully controlled, whereas in states such as irritable bowel disease (IBD), the mucosal bacteria can damage this protective barrier, thus exacerbating the disease. Little is known about mucus degradation by the gut microbiota, or their nutritional strategies. We investigated enzyme BM03340; from Bacteroides massiliensis, a gut microbe thought to use only mucosal glycans. BM03340 is a family 92 glycoside hydrolase (GH92) targeting α-mannosidic linkages. Data revealed enzyme specificity for α1-3-mannose containing glycans and unlike other characterized GH92s could target substrates where the +1 sugar was substituted, characteristic of plant-derived N-glycans. The study also suggests that the enzyme acts in conjunction with BM03341, a peptidyl N-glycosidase produced by the species. The data could aid our understanding of the intestinal mucus layer as a microbial niche.

Funding source: Newcastle University
Supervisor: Dr David Cousins
Ly Khanh Can  
**BSc (Hons) Biomedical Sciences**  
The effect of reactive oxygen species on innate defence mechanisms of normal and cystic fibrosis airway epithelial cells.

Cystic Fibrosis (CF) is a genetic disease due to a defect in the gene called CFTR and is very common in Northern Europe (about 1 in 25 people carry the defect). People with CF have shortened lives mainly due to deterioration of their lungs due to repeated bacterial infections. In response to infections, reactive oxygen species (ROS) are often excessively produced by inflammation. ROS are suspected to be one of the contributors to the loss of lung function, and also to the reduced effectiveness of the airways natural protection against bacteria. This project aims to test whether ROS alter the defence mechanisms of the lung cells, and whether they damage the epithelial cells lining the surface of the lungs. Although a lot of studies have focused on the potential of CFTR-dependent treatments, positive results from this non-CFTR dependent approach may lead to better treatments and so reduce CF lung disease.  
**Funding source:** BBSRC  
**Supervisor:** Dr Vinciane Saint-Criq

Matthew Canning  
**BSc (Hons) Biomedical Sciences**  
Effects of High intensity interval training (HIIT) and fluoride consumption on F metabolism in fluorosis-susceptible (A/J) mice

Dental cavities affect 60-90% of children. A way of preventing this is by using fluoridated water, however, excessive fluoride uptake can cause enamel fluorosis or enamel cell death. Fluoride uptake is influenced by many factors but relatively little is known about if or how, exercise affects this. To analyze how exercise affects fluoride uptake, three groups of mice were used: group 1: control, group 2: fluoride only and group 3: exercise and fluoride. Muscle tissue from the mice was tested for the expression levels BAX (causes cell death) and BCL-2 (prevents cell death) and quantified visually via Western Blotting. The results had shown that there was no BAX present in group 1 with a significant increase in group 2, and a bigger increase in group 3. The same trends were present for BCL-2 expression between each group. The results show that exercise does have an effect on fluoride uptake.  
**Funding source:** Wellcome Trust  
**Supervisor:** Dr Ruth Valentine

Douglas Carr  
**BA (Hons) Archaeology**  
Roman Piggy Banks? Investigating the social life of containers for coin hoards

Roman coin hoards are some of the most famous finds from the past and have attracted academic interest for many years. Hoards represent a major undertaking by those creating the hoard and are key in understanding changes in the Roman world. The primary focus of study of these hoards has usually been through numismatics (the study of coins) with the contents taking centre stage and the containers used in hoarding often overlooked. My research has focused on these containers (which can be metal, organic or pottery). My project has examined patterns in the nature of these containers through a sample of one hundred hoards drawn from across the Roman period in Britain (AD 43 – 410). My research has shed some new light on the relationship between the contents of these hoards and their containers and the interesting patterns of similarity and change emerging in that relationship throughout the Roman period.  
**Funding source:** Newcastle University  
**Supervisor:** Dr James Gerrard

Yew Yuan Glenn Cheng  
**Bsc (Honours) Food & Human Nutrition**  
Snapshot Survey of Cyanogen levels in Cassava for Retail Sale in a South-east Asian Region Context. A Singapore Study

Cassava (Manihot esculenta), an edible starchy root, are purchasable from Singapore farmer markets. Fresh roots (n= 25) were purchased from two outlets in North-East of Singapore. A KCN standard curve (represented as HCN), helped determine the relationship between colourimetric absorbance with HCN quantity. Enzyme activity on a partially purified, concentrated Linamarase provided by CIAT (Cali, Colombia) was tested with its substrate Linamarin (a glucoside), to ensure an enzymatic unit (EU) of ≥ 3 EU/ml (Cooke, 1979) for proper function of the cyanogenic potential (CNp) assay on cassava roots. CNp of the cassava roots were determined by colourimetric analysis after chopping and peeling and the average was 36.9mg/kg (as HCN) on a fresh weight basis. This complied with the CODEX Alimentarius standards for ‘Sweet cassava’. However, 9 roots had CNp ranged 50.8–75.9mg/kg. Hence, a re-evaluation is necessary as not all cassava roots sold in Singapore have CNp within safe limits.  
**Funding source:** Newcastle University  
**Supervisor:** Dr Gerard M O’Brien
Kwa Yee Chu
BSc (Hons) Biomedical Sciences
A Pilot Study on the Identification of Resistant E.coli in a Southern Malaysia River

Escherichia coli (E. coli) is a common Gram-negative bacteria found in river water. E. coli can cause intra-abdominal infections and various other diseases. Resistant bacteria including E. coli produce enzymes that degrade certain antibiotics. This causes the loss of functions of those antibiotics. Rivers and streams could carry antibiotic resistant bacteria providing ease of transmission to humans. One of the aims of this research was to detect the presence of bacteria in the river water samples. Another aim was to determine isolated E. coli antibiotic susceptibility via disk diffusion method. E. coli were present in the river water samples along with other coliforms. The river water samples contained more Gram-negative bacteria than Gram-positive bacteria. E. coli isolated from the river were not Extended Spectrum Beta Lactamases producers. They were also not multidrug-resistant. Molecular tests could confirm the species of other bacteria in the river water samples.

Funding source: NUMed Malaysia
Supervisor: Dr Mukhrizah Othman

Charlotte Clodfelter
BA Combined Honours
An Exploratory Study of Pagan Self-Representation Online.

The Pagan community has an (imagined) ancient history, often demonised, and associated with a need for secrecy. However, pagans, in all their diverse forms, are starting to reveal themselves to the world via virtual online platforms. This project explores how and why the Pagan community use the internet. This data collected is qualitative and comprises of an in-depth (ethnographic) interview with a moderator of an online Pagan forum and three critical discourse analyses of websites in North East England. This analysis suggests an internet presence serves the purpose of making connections with other individuals who identify as Pagan, and acts as a bridge for access to other services within the Pagan community. Moreover, varying degrees of privacy and transparency enable groups and individuals to negotiate their position and authenticity within the Pagan community, whilst the position of the Pagan community in wider society is mediated through the Media.

Funding source: Newcastle University
Supervisor: Dr Emma Clavering

Jack Collier
BSc (Hons) Biomedical Genetics
CRISPR/Cas9-based Modelling of Mitochondrial Disorders.

Mitochondria are complex cellular organelles which provide an energy source for the body. Mitochondrial dysfunction results in mitochondrial diseases, which are associated with a wide range of symptoms, severities, and age of onset. To investigate the molecular basis of a newly identified mitochondrial disease gene, RTN4IP1, a DNA editing technique called CRISPR/Cas9 was used to generate a human cell model that mimics the RTN4IP1 pathogenic mutation. This technique targets ‘molecular scissors’ to a specific locus within the genome, which cut the DNA and can introduce mutations. In order to engineer this cell model, CRISPR/Cas9 constructs were generated by molecular cloning and introduced into a human cell line. Thus generated cells harbouring specific mutations in the RTN4IP1 gene will be used to further characterise the role of RTN4IP1 in mitochondrial disease.

Funded by The Biochemical Society
Supervisors: Dr. Monika Oláhová, Prof Robert N. Lightowlers, Prof. Zofia M. A. Chrzanowska-Lightowlers and Prof. Robert W. Taylor

Emily Collins
BSc (Hons) Pharmacology
Proteins in whole blood as biomarkers for dementia

The number of people suffering with dementia is steadily rising. There are approximately 7.7 million new cases each year, the majority due to Alzheimer’s disease. Symptoms show great variability and can include cognitive impairment, behavioural and mood changes. Symptom variability and the lack of reliable tests makes diagnosis and treatment challenging. Molecules known as bio markers could allow for specific and sensitive diagnosis. They could also monitor disease progression and the effects of treatment. My project investigated the use of whole blood proteins as dementia bio markers. Initial screening highlighted three dementia related proteins. Data collected has shown that these proteins can discriminate between normal ageing and dementia. They can also differentiate between distinct dementia sub types and therefore are promising bio markers.

Funding source: Newcastle University
Supervisor: Prof Elizabeta B. Mukaetova-Ladinska
Jordan Connolly  
BSc (Hons) Pharmacology  
The role of skin metabolism, UV irradiation and exposure to parabens in generation of reactive oxygen species

The experiments were an investigation into the rate of absorption and the potential skin enzyme metabolism of paraben compounds. Parabens are used in a large quantity of skincare products or as product preservatives. Parabens could possibly cause toxic compounds and reactive oxygen species to form. UV radiation experiments can be used to discern whether parabens potentiate cancer. Experiments used ex vivo porcine skin (application on pig skin) as a model of human skin. Parabens were radio-labelled and applied to skin. Then vials were produced for scintillation and solid phase extraction whereby the radioactivity can be measured. The results for absorption and metabolism showed different rates for different skin donors. Parabens were highly absorptive and were also metabolised by skin enzymes. No chemical or dose concentration effect was seen with data collected to show increase of reactive oxygen species or potentiation of cancer.  
Funding source: Newcastle University  
Supervisor: Dr Simon Wilkinson

Aimee-Jade Corner  
Bsc (Hons) Psychology  
The ontogeny of episodic memory recollection: characterising the experience of recollecting early memories in children and adults.

Previous research in children and young adults suggests the richness of recalling personal episodic memories declines with an increase in time from the present moment. In contrast recently experienced memories are more vividly recalled. We propose the rate of decline is caused by the time elapsed (TE) since the original event was experienced. This project intended to support previous findings by comparing the coherence of the earliest memories of a former children and young adult sample with a larger cohort of 7-10 year olds and an older young adult age range (29-32 year olds). Our experimental design repeated that of previous research, with participants describing and drawing memories ranging from their most recent to earliest. The current data was then compared against previous data sets. Our results demonstrate the further back in time a memory is sampled, the greater rate of decline in the memories coherence in both age groups.  
Funding source: Newcastle University  
Supervisor: Dr Sinead Mullally

Kern Cowell  
MEng Mechanical Engineering with Biomedical Engineering  
Analysis of explanted silicone finger implants

Rheumatoid arthritis of the hands affects 280,000 people in the UK with this number continuously rising. In serious cases the general treatment of this area is to replace the joints with a prosthesis, the most common of which are silicone prosthetics. The lifespan of these replacements joints is shorter than common hip and knee replacements, therefore research into how these joints wear and fracture is vital. This project involved developing a new method of measuring the amount of wear on a prosthesis using white light profilometry to record the change in surface of a prosthesis and therefore how much material has been lost while implanted. Also completed were the rebuilding of a finger joint simulator for use in testing mechanisms of prosthesis wear, various chemical analysis of the prostheses and studies into alternative materials for use in finger joint replacement.  
Funding source: Newcastle University  
Supervisor: Prof Tom Joyce

Grace Dobbs  
BSc (Hons) Biomedical Sciences  
Immune system interactions in response to stem cell treatments

Mesenchymal stem cells (MSCs) are a type of multipotent stromal (connective) cell found in the bone marrow. These cells can differentiate into many different cell types, and can produce various soluble factors which mediate tissue repair. They are also capable of regulating the inflammatory response, and for the purposes of this project we looked at use of these cells in asthma treatment. My project aimed to compare the fate of human MSCs and mouse MSCs when injected into an asthma mouse model. To track the MSCs inside the mouse we prepared DNA which would make the MSCs fluoresce. The results showed that the human MSCs localised to the lungs and suppressed airway inflammation. Then within 48 hours they were cleared. The research from these project experiments with mouse MSCs will be continued to see if they have a greater effect at reducing the hallmarks of asthma.  
Funding source: Newcastle University. Research undertaken at Monash University, Australia  
Supervisor: Dr Tracey S.P. Heng
**Ryan Doran**  
*Mmath (Hons) Mathematics*  
*Solitons of Ultracold Matter*

Conventional waves, like ripples in a pond, spread out over time. Solitons, however, are remarkable waves which maintain their shape and height over large distances. Solitons were first reported in a Scottish canal in 1834. These waves have since been observed in systems as diverse as optical fibres, blood circulation and traffic flow. Most recently, solitons have been formed in ultracold quantum gases. These gases are millions of times more dilute than the gas in a room and are only a few thousandths of a degree above absolute zero. The solitons formed in this gas are roughly the size of the width of a human hair. In this project we consider a quantum gas with dipolar atoms (so each particle in the gas behaves like a tiny bar magnet). By mathematically minimizing the energy of this ultracold gas, we can theoretically predict the conditions in which solitons are formed.  

**Funding source:** Newcastle University  
**Supervisor:** Dr Nicholas Parker

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**Jessica Downing**  
*BSc (Hons) Biomedical Genetics*  
*Identification of genes involved in Joubert syndrome*

Joubert syndrome (JS) is a rare childhood condition leading to kidney failure, blindness and brain malformation. Mutations in the Cep290 gene are the most common cause of the disease but there are many genes yet to be discovered. It is not known how mutations cause disease and current treatments merely alleviate symptoms. Understanding JS is further complicated by the fact that individual patients, even siblings, can show very different symptoms. This project studied a mouse model of JS (mutated Cep290 gene) to understand the genetic complexity of the disease. By interbreeding mouse strains (black and beige mice), disease symptoms range from mild to severe depending on the black/beige genes inherited, i.e., a model of natural human genetic differences. The results have validated the datasets by identifying coat colour genes and have revealed that multiple genetic variables influence disease severity but that these will be identifiable with statistical analyses.  

**Funding source:** Newcastle University  
**Supervisor:** Dr Colin Miles

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**William Drabble**  
*BSc (Hons) Biology (Ecology & Environmental Ecology)*  
*How Threatening is the Edge Effect? Analysing the Threat to Herpetofaunal Communities in Tropical Environments from Habitat Fragmentation.*

Deforestation in tropical regions has led to patchy forests. This has caused transitional habitats called edges to form between forest and farmland, resulting in unpredictable effects to the abundance of species present. To study the effects of fragmentation on amphibians and reptiles I used two sets of data, collected in Mexico and Brazil. I examined the effect of distance to nearest edge and edge influence on the number of threatened species. I then explored the effect that closeness to roads and buildings had on diversity of wildlife in Mexico. The results help to form a more complete picture of how fragmentation effects communities, and in particular threatened species. Patterns were seen in relation to edge influence and distance to edge against diversity. However, more information is needed on species abundance and threat status in order to find patterns and create conservation tactics.  

**Funding source:** Newcastle University  
**Supervisor:** Dr Marion Pfeifer

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**Gina Elsayed Abdelaal**  
*BSc (Hons) Biomedical Genetics*  
*Potential conditional lethal genes in T-cell Leukaemia*

Abnormal patterns of gene expression are a feature of cancer cells. Genes that are normally switched off in normal cells may be switched on to allow cancer cell survival. These genes are referred to as conditional lethal genes. In cancer cells, abnormal gene expression may be due to loss of control of DNA methylation. Cancer therapies are advancing from chemotherapy to more targeted treatments. It is now possible to identify cancer cells by looking at the methylation levels of certain genes, thanks to advances in technology. Since potential lethal genes are only expressed in cancer cells they make the perfect candidate for a targeted cancer therapy. T cell leukaemia and B cell leukaemia share some conditional lethal genes, so a treatment for one may target both.  

**Funding source:** Newcastle University  
**Supervisor:** Dr Gordan Strathdee
Catalysis is key to the sustainable use of scarce resources. Using comparatively small amounts of catalyst, we can exponentially increase the efficiency of many industrial processes. In doing so, we reduce the pressure placed upon dwindling stockpiles of fossil fuels and other precious raw materials. Catalysts come in two forms; heterogeneous and homogenous. Most heterogeneous catalysts are solids that act on reagents in a liquid or a gas, and hence are in a different phase. Homogeneous catalysts on the other hand are in the same phase as the reactants and are said to be molecular; they have an inherent tunability, and thus greater selectivity in terms of the reactions which they catalyse. In this project potential homogenous catalysts were immobilised on silicon chips in order to yield a catalytic material which shares the properties and hence the advantages of both homogeneous and heterogeneous catalysts. In addition, the semiconductor nature of the solid silicon chips allows for the electrochemical monitoring of the catalytic process. 

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

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**James Fortune**  
**BSc (Hons) Biology**  
**Improving Food Security using Compounds produced from Fungal spores.**

It is projected that food productivity must increase by 70% to feed an additional 2.3 billion people by 2050. Plant diseases are responsible for a large proportion of global crop losses, therefore reducing global food security. Spot Blotch is a fungal plant disease, caused by Bipolaris sorokiniana, responsible for losses of up to 15-20% of wheat production in South Asia annually. Compounds produced by cultivated or formulated Trichoderma harzianum T22 spores were extracted, and a very small volume of the extracted compound suspension was pipetted onto B.sorokiniana samples. Cultivated spores were more effective than formulated spores, 51% and 43.4% respectively after 48 hours. This research provides evidence that a potential solution for reducing the severity of Spot Blotch disease may lie within the use of compounds produced by Trichoderma harzianum spores.  

**Funding source:** BSPP  
**Supervisor:** Dr Ethan Hack

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**Lucy Gee**  
**Msci Biomedical Sciences**  
**Mechanisms of seizure generation in a mouse model of tumour-associated epilepsy**

Glioma is the most common form of cancerous brain tumour in adults, representing 81% of all malignant brain tumours. It often causes seizures, affecting between 29-75% of patients depending on the grade of the tumour. Although tumour-associated epilepsy (TAE) significantly affects the quality of life of these patients, the factors that lead to the onset of seizures are poorly understood. There are many theories including differences in tumour size or changes to the cell populations around the tumour. In this project a mouse model of TAE has been used to investigate cell population changes by fluorescent staining techniques the results of which were analysed by both cell counting software and manually. Despite some variation, of the cell populations studied none showed statistically significant differences between seizure and non-seizure groups. These results will inform the debate on the mechanisms underlying TAE, helping to develop future treatment for patients.  

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

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**Phillipa Goode**  
**Bsc (Hons) Physiology**  
**The PHANTOM Project**

The PHANTOM project involved collecting information about patients with serious physical injury brought to the RVI Major Trauma Centre between 8 AM and 10 PM in 2014 by either the Great North Air Ambulance service (GNAAS) or North East Ambulance Service. These cases were chosen using criteria which looked at how severe the patient’s injuries were using a verified trauma database. I calculated how many patients received critical care interventions (e.g. sedation and ventilation) pre-hospital, which can only be provided by GNAAS, and how many patients received this care once they reached the Emergency Department. It also made it possible for me to calculate the sensitivity (the percentage of positives correctly identified) and specificity (the percentage of negatives correctly identified) for GNAAS tasking (case allocation). This is being taken forward by the service to improve tasking to maximise the potential for better patient outcomes.  

**Funding source:** Newcastle University  
**Supervisor:** Dr John Wright
Michael Goodfellow
MBBS
Does sleep play an important role in the consolidation of learned motor skills?

Very little is known about what the brain does during sleep. It is thought that sleep allows us to replay and learn memories and skills acquired throughout the day; however it is not known how this happens. Most research into how the brain works during sleep uses electrodes placed on the scalp of the subject to record overall brain signals. However, this does not allow us to observe what individual brain cells are doing during sleep. We have used implanted electrodes and wearable data loggers to record the brain activity from multiple brain cells. These electrodes have been placed into the area of the brain responsible for movement in monkeys 24 hours a day during natural behaviour and sleep. This project uses this existing data to investigate the activity of individual brain cells related to brain waves of different frequencies.

Funding source: Wellcome Trust
Supervisor: Dr Andrew Jackson

Samantha Goodrick
BSc (Hons) Speech and Language Sciences
Validating illustrations in a new writing therapy resource for use with adults with aphasia

There are 1.2 million stroke survivors living in the UK, 33% of whom have subsequent aphasia (a speech, language and/or communication difficulty). Newcastle University Speech and Language Sciences are developing new picture-based worksheets to support people with aphasia to write everyday words as this is a useful communication strategy for many. The pictures being used are new so it was not known how people would interpret them. This project investigated: what words people think of when they see the pictures (naming agreement), and how well people thought the pictures represented the words they are supposed to. Overall, all the images were rated very highly for how well they represent the word, and most also had high naming agreement. The pictures with more varied naming responses were collated into a list so that clinicians can be better informed when using these more ambiguous images with clients.

Funding source: Newcastle University
Supervisors: Dr Julie Morris and Dr Janet Webster

Caitlin Halfacre
BA Hons Linguistics
Investigating social class perceptions of regional accents

This project is an empirical investigation into perceptions of accents and social class. I have made an observation since studying in Newcastle that many people from the northern parts of England describe all southern accents as sounding “posh”. The hypothesis is that Northern speakers of English are more likely to incorrectly classify a speaker as upper class if the accent is Southern. The North/South border was drawn based on accent features according to Upton & Widdowson (2006). The primary data collection method was an online survey which plays speech recordings and asks for a judgement of social class. The survey was taken by both southerners and northerners to allow for comparative analysis. The recordings are of 13 female speakers under 30 years old and include words which have regional variation. (e.g. foot-strut, gas-glass which rhyme for Northerners but not for Southerners). This hypothesis was tested using quantitative methods including statistical analysis to reliably identify relationships in the data.

Funding source: Newcastle University
Supervisors: Dr Danielle Turton

Dominic Hall
BSc (Hons) Biomedical Sciences

It has been shown that stress can cause irreparable damage to the protective structures at the ends of our DNA: telomeres. We know that exposure of cells to cigarette smoke causes damage to telomeres and that lung diseases linked to cigarette smoking show increased telomeric damage. However it is unknown whether this damage is permanent or reparable. The first part of this research involved measuring telomeric damage in cells and mouse lung tissue following cigarette smoke exposure and short and long periods of recovery time. Telomere damage was measured by fluorescence microscopy. We found that telomere damage was decreased when tissue was allowed longer to recover. However the cell data was inconclusive. Adulthood asthma is a relatively under researched area. Therefore the second part of this research involved measuring telomere damage in lung tissue from patients who developed asthma as adults. We found that damage was increased in asthmatic patients.

Funding source: Newcastle University
Supervisors: Dr Jodie Birch & Dr Joao Passos
While diamidotetrylenes \((R_2N)E\) (E = Si, Ge, Sn, Pb) have a long history, the P-substituted diphosphatetrylenes \((R_2P)E\) have yet to be as well-established, but use of phosphide ligands have yielded metal centres stabilised by pπ-pπ interactions with a planar phosphorus centre. By linking two molecules of primary phosphine \([\text{Dipp}]\text{PH}_2\) \((\text{Dipp}=2,6\text{-diisopropylphenyl})\) with a short alkyl chain, a new type of bridged diposphine ligand \([\text{Dipp}]\text{PCH}_3\text{P}[\text{Dipp}]\) was synthesised. Lithiation of the phosphine gave the equivalent bridged diposphide which was characterised by X-ray crystallography and multinuclear NMR spectroscopy. Using this ligand system, it was possible to synthesise an entirely new and stable stannylene, \([\text{Dipp}]\text{PCH}_3\text{P}[\text{Dipp}]\text{Sn}\). The stannylene was observed to be dimeric in the solid and solution state, as characterised by X-ray crystallography and multinuclear NMR spectroscopy respectively.

**Funding source:** Newcastle University  
**Supervisor:** Dr Keith Izod

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**Danwen Huang**  
**BSc (Hons) Computing Science**  
**(Game Engineering)**  
**Analysis tool for detecting strategic thinking in recovering stroke victims**

The project is around creating a web-based analysis tool for analysing common permutations (sequence of moves made by players) within user data (coordinates) collected from a 3×3 pegboard game. Players have to move 9 pegs from one board to another. The analysis takes in spreadsheet (CSV) data files and counts the common permutations, sorts them, display their distribution (times they appear in each player file) and outputs a visual chart representation of move sequences.

This data is used to detect certain player strategies such as if they’re reorganising the pegs onto the new board in a column by column fashion. We can use this as a marker for measuring if patients are showing more signs of using common strategies as they recover. There are currently little research on cognitive and strategic thinking recovery in stroke victims and the tool hopes to provide a gateway into that research.

**Funding source:** Newcastle University  
**Supervisor:** Dr Gary Ushaw

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**Michelle Tan Ching Huey**  
**BSc (Honours) Food & Human Nutrition (NUIS)**  
**Improvement of an online dietary analysis database for use in large-scale dietary surveys**

Food Frequency Questionnaires are used extensively in diet and health studies because they are easy to complete and can be administered on-line. Converting the “frequency” of food consumption to daily nutrient intakes requires good estimates of portion size for each food type in the questionnaire. Our aim was to improve an existing 20-year-old database by updating portion size data using the 2008-2012 National Diet and Nutrition Survey Rolling Programme which reports the types and quantities of foods consumed in the UK. These data were used to update an on-line dietary database to generate a new weighted estimate of portion sizes and nutrient composition. The new database was tested for reliability and compared with the old database. The results showed that portion sizes were significantly bigger in the new dataset. This suggests that people are eating more compared with 20 years ago which might be contributing to the rise in obesity.

**Funding source:** Newcastle University  
**Supervisor:** Prof Chris Seal

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**Hong Ting Hui**  
**BEng (Hons) Electrical & Electronic Engineering**  
**Development of real-time control system for multi-core DSP for power converter control**

Many power electronic applications such as wind turbine generation systems and electric motor control systems can benefit enormously from high-speed digital control. There are some very impressive advances in modern digital signal controller hardware which can be used for this application area. This project will explore the programming of a new dual-core digital signal processor for real-time power converter control.

**Funding source:** Newcastle University  
**Supervisor:** Dr David Atkinson
Marine Protected Areas (MPA) are continuously studied and assessed however, little attention is directed to financing of MPA networks. At the Small Islands Developing States (SIDS) Conference in 2014, Fiji reaffirmed its commitment to make 30% of its inshore and offshore marine area MPAs by 2020. This study aims to explore benefits derived from selected community-based MPAs and recipient stakeholders within Fiji, to better understand and identify sustainable financing mechanisms for maintaining a MPA network. Using Willingness to Pay and Willingness to Contribute Time, top-down and bottom-up approaches of MPAs are combined in a common framework to elucidate possible financing mechanisms. This approach endorses both customary management, and more contemporary science-based styles of MPA design and implementation. Income from fishing, food security and proximity to a fishing market were found to be significant variables influencing stakeholder’s Willingness to Pay and Willingness to Contribute Time to manage an MPA. Tourists WTP was also an important factor in financing ‘hotspot’ MPAs. However, offshore MPA findings expose significant gaps between the concept and practice of creating practical sustainable financing models. These findings are recommendations to the Government of Fiji to consider innovative and long-term sustainable financing mechanisms for an MPA network with goals of biodiversity conservation and sustainable resource management.

Funding source: University Expeditions Committee & Harry Collinson Scholarship
Supervisor: Prof Selina Stead

Microfluidics devices play an important role in testing biological samples. They are microscopic systems which allow for processing and manipulation of very small (10-9 to 10-18 litres) amounts of fluids. This is done inside channels which have dimensions ranging from tens to hundreds of micrometres. These channels are moulded inside a polymer called Polydimethylsiloxane or PDMS. For more complicated applications multiple PDMS layers have to be connected together. The production of these devices requires very fine scale movement and alignment of components, something impossible to achieve by eye. The aim of this project is to produce a mechanical system that can be used to align the parts of a microfluidics device with accuracy. At the end of the project fully functioning mechanical controllers have been designed and tested. Further tests need to be performed to optimise the design of the optical system and to make sure it is working correctly.

Funding source: Newcastle University
Supervisor: Dr Jinju Chen

Parkinson’s Disease (PD) is a debilitating condition affecting the brain. The predominant features of PD are slowness of movement, rigidity and tremor. However, novel studies reveal a reduction of intellectual function in some patients as well, although the mechanism for this remains unclear. For my project, I aimed to investigate this further from a DNA perspective. DNA is the framework from which the body produces proteins. These proteins are essential for the body to function normally. A fault in the DNA subsequently leads to abnormal protein production and a disruption in normal bodily function. I hypothesised acquisition of faults in the DNA of PD patients leads to a gradual decline of intellectual function. I proceeded to identify specific faults, which may be associated with the intellectual decline.

Funding source: Newcastle University
Supervisor: Prof David Burn
Iria Jimenez
BSc (Hons) Biomedical Sciences
Charactrisation of the beneficial effect of increasing telomerase levels in a mouse model of Parkinson’s disease

Telomerase is an enzyme that protects the ends of chromosomes (telomeres). Recently other functions of the protein part, Telomerase reverse transcriptase (TERT), were discovered that are independent of telomeres. Nerve cells in adult human brain still contain TERT protein, which may be protective against diseases such as Parkinson’s disease (PD). This project analysed the effect of the telomerase activator GRN510 on a mouse model of PD overexpressing a human protein involved in the development of the disease (alpha-synuclein). Our group demonstrated previously that telomerase activators can boost TERT levels and improve brain function in old mice. Here we found a significant improvement in motor performance between treated and control male PD mice. There was also a trend of higher amounts of DNA damage in brains in the PD-model compared to wild-type mice. This suggests that increasing telomerase protein might exert beneficial effects in a mouse model of PD.

Funding source: Newcastle University
Supervisor: Dr. Gabriele Saretzki

Adam Jones
BA Combined Honours

The Congress of Racial Equality has a long, varied history. Founded in 1942 by an interracial group of Chicago students, C.O.R.E would go on to be, variously: pioneers of civil disobedience and direct action in the late 1940s and early 1950s, largely inactive for in the mid- to late-1950s, a key player in the mainstream Civil Rights Movement in the early 1960s, and a part of the more extreme black power movement of the late-1960s. This project sought to understand the institutional culture of C.O.R.E, and thereby how the conditions were created which allowed the organisation’s structure, aims, and position within the Civil Rights Movement to fluctuate so wildly. Thus, local chapters of C.O.R.E across the United States throughout the 1940s,’50s, and ’60s were examined, as well as the National Executive, to gain an understanding of the organisation’s overarching issues. The key theme which emerged was the conflict between the organisation’s fundamentally democratic principles with largely autonomous local branches, and the more practical need to establish the organisation as a national movement pulling in one direction- The C.O.R.E Tug Of War.

Funding source: Newcastle University
Supervisor: Dr Benjamin Houston

Viktoriia Kartysh
BSc (Hons) Biomedical Sciences
Pyroglutamylated Aβ and alpha-synuclein phosphorylated at serine 129 in mixed Alzheimer’s and Lewy body disease

Alzheimer’s disease (AD) and Lewy body diseases (LBD) are among the most common neurodegenerative diseases associated with dementia. Cases that fulfill neuropathological criteria for both AD and LBD are classified as mixed dementia. Accumulations of toxic proteins are found in the affected brains: neurofibrillary tangles and amyloid β plaques in AD patients, whilst Lewy bodies composed of alpha-synuclein in LBD patients. Pyroglutamylated Aβ (pE(3)-Aβ) and alpha-synuclein phosphorylated at serine 129 (pS129α-syn) are sub-species of Aβ and alpha-synuclein respectively. Specialised stains were used to visualize and quantify pE(3)-Aβ and pS129α-syn in human post-mortem brain tissue. Data from project was statistically analysed revealing a synergistic relationship between protein aggregates. The study depicted a positive correlation between pS129α-syn and pE(3)-Aβ in the striatum and between HP-t and pE(3)-Aβ in the amygdala. Differences in pathological load in mixed AD/LBD cases were subsequently assessed across clinical diagnoses and statistically, no significant differences in proteinopathies were observed.

Funding source: Newcastle University
Supervisor: Prof Johannes Attems
Research Scholarships and Expeditions 2016

Alice Kennedy  
BSc (Hons) Speech and Language Sciences  
Investigating assessment of paragraph level understanding; paragraph and question properties

People with aphasia (acquired language difficulties post-stroke) often have problems reading and understanding text. This project investigated the properties of a test of paragraph comprehension that has been designed for people with aphasia. The test consists of 15 paragraphs followed by a set of questions which target specific types of information. The project considered text dependency (do people need to read the paragraphs to answer the questions) and the relationship between the paragraphs and their questions. The study found with the exception of 2 paragraphs and 15 questions, text dependency was at an acceptable level. There was more variability in the extent to which there was consensus about what were main ideas or details. These findings indicate the original assessment may need revision; questions with a low text dependency indicate they are not testing reading comprehension whilst others may not be testing what they intend to (main ideas and details).  
Funding source: Newcastle University  
Supervisors: Dr Janet Webster and Dr Julie Morris

Portia Kondoni  
Bsc (Hons) Physiology  
A role for Monocarboxylate Transporters as Metabolic Target’s to Improve Prostrate Cancer Therapeutics.

Prostate cancer is a common cancer diagnosed in men in the UK with approximately 40,000 new cases diagnosed every year. The symptoms are mostly apparent when your prostate is affecting the urethra (a tube that carries urine from the bladder to the penis). The causes of prostate cancer are largely unknown. However to treatment prostate cancer there are different survival pathways within prostate cancer cells that can be targeted by drugs to either reduce symptoms or cure prostate cancer. The aim of my project is to investigate the main survival pathway within prostate cancer called “metabolic symbiosis”. This is a process whereby the surrounding cells around prostate cancer cells (stroma cells) fuel the adjacent tumour cells in order for them to survive. We will be testing different concentrations of a drug that we hope that might potentially inhibit the interaction between this two cells, hence kill prostate cancer cells.  
Funding source: Newcastle University  
Supervisor: Dr Stuart McCracken

Raul Lali  
MBBS  
Mapping the prediagnostic journey for sarcoma patients

Sarcomas are rare tumours arising in bones and soft tissues. They can occur in a wide range of anatomical sites and can occur at any age, but show increased risk with ageing. As sarcomas are rare, diagnosis is often delayed and often goes unsuspected which inevitably leads to poorer health outcomes. Delays can be patient related or occur through General Practice referrals or Hospital appointments, often leading to a poor patient experience and can affect the relationship between patients and their primary care team. The primary aim of this study is to investigate the prediagnostic experience of patients with suspected or confirmed sarcoma who visit the North of England Bone and Soft Tissue Tumour Service. A secondary aim is to identify points in the pathway where an educational or other intervention could be developed to reduce the time to diagnosis.  
Funding source: Newcastle University  
Supervisor: Mr Craig Gerrand
Cyber-Physical Systems (CPSs) combine computing processes with physical processes, human and other elements to deliver a global behaviour. They exist all around us— from pacemakers to power grids! Designing CPSs is challenging because we need to make compromises between factors such as performance, energy consumption and/or security. Finding the best CPS designs involves exploring vast numbers of alternatives to find optimal trade-offs. This is called Design Space Exploration (DSE). This project implements genetic algorithms for DSE and investigates whether they can find better designs more efficiently than evaluating every possible design. Genetic algorithms are processes which try to find better designs by drawing inspiration from evolutionary processes in nature by “breeding” new generations of improved designs from the best of the previous generation. This could be significant because they could save the engineer time and effort in creating designs that reduce emissions, energy and/or raw material costs.

**Funding source:** Newcastle University  
**Supervisor:** Prof John S Fitzgerald

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**Tze Hao Leow**  
**MBBS (NUMed Malaysia)**  
**Exploring the Biomarker Potential of Circulating Tumour Cells in Patients with Hepatocellular Carcinoma**  

Hepatocellular carcinoma (HCC) is the 2nd commonest cause of cancer death and is rising in the UK. Most patients have liver disease which makes treating the cancer difficult. Standard therapies cause liver failure and to use novel ‘targeted therapies’, the target needs to be present. Dr Reeves’ group have recently developed a method for detecting circulating tumour cells (CTCs) in the blood of patients with HCC. The aim of this project will be to see if prognostic biomarkers or candidate ‘targets’ such FGFR4 and FGF19 can be detected on CTCs, using Imagestream fluorescent microscopy. This research will be based in the Northern Institute for Cancer research where I will be working on optimising the biomarkers FGFR4 and FGF19 and detecting the biomarker expression levels of liver cancer cell lines.

**Funding source:** Newcastle University  
**Supervisor:** Dr Helen Reeves

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**Benjamin Puitong Lam**  
**MComp (Hons) Computing Science (Study Abroad)**  
**Genetic DSE: Implementing and evaluating advanced algorithms for automated exploration of design spaces for cyber-physical systems**  

Genetic DSE: Implementing and evaluating advanced algorithms for automated exploration of design spaces for cyber-physical systems

**Funding source:** Newcastle University  
**Supervisor:** Prof John S Fitzgerald

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**Kim Hui Lim**  
**MBBS**  
**Assessment of JAK/STAT inhibition as a therapeutic target in Primary Biliary Cholangitis**  

Primary biliary cholangitis (PBC) is a chronic autoimmune disease that predominantly affects women. It is characterised by the destruction of bile ducts by the body’s own immune system. This leads to an accumulation of bile in the liver, causing inflammation and scarring. Consequently, patients face liver failure and require liver transplantation. Currently, ursodeoxycholic acid (UDCA) is the only drug licensed to treat PBC. However, this only delays progression and does not improve the mortality rate. Furthermore, UDCA is ineffective in a third of PBC patients, particularly the male and pre-menopausal female population. Hence, alternate treatment options are required. An imbalance in the T-helper 1/17 signalling pathway, responsible for regulating genes involved in immunity, has been associated with the development of PBC. This project aims to evaluate a model of PBC that could allow drugs that inhibit this pathway to be tested in laboratories and determine its therapeutic effect on PBC.

**Funding source:** INSPIRE  
**Supervisor:** Dr John Brain
James Linighan, Rebecca Burley, Hannah Davies, Kirstie Murphy, Emily Potter and James Oxtoby

Bsc (Hons) Geography

Examining the effects of climate change on glaciers in Svalbard.

This expedition provided the team with the opportunity to collect primary field data from a dynamic glaciated landscape which is clearly responding to climate change. Our research will help to build a clearer understanding of the response of our study glaciers to atmospheric and oceanic temperature changes. The guidance and logistical support provided by members of the University Centre in Svalbard was invaluable to our research and allowed us to conduct fieldwork safely and efficiently. Below is an overview of the research conducted at each glacier.

Three separate projects were carried out on Longyearbreen Glacier. Kirstie Murphy investigated how variations in the thickness of debris cover on the surface of the glacier influenced the rate of summer ablation. The results show clear disparities in melt relating to the amount of debris present on the surface. The effects of temperature and localized weather conditions on glacial ablation were studied by Rebecca Burley, with preliminary findings showing that temperature mainly varies with direction of wind and shading from topographical influences. Emily Potter examined the short term evolution of three supraglacial meltwater channels on the glacier, taking twice daily discharge measurements along the long profile of the streams.

Research at Tunabreen was conducted by James Linighan alongside Associate Professor Chris Borstad from the University centre in Svalbard. On three separate days we travelled 15 km by boat to reach Tunabreen, a marine terminating glacier flowing into Tempelfjorden. Research was undertaken into the location of moulins on the glacier surface to examine the glacial processes which lead to their creation.

At Scott Turnerbreen Glacier, Jack Oxtoby carried out his research into the change in the glaciers mass balance over the last 20 years. High accuracy dGPS points taken over two field days can be combined with a previous dataset to create a DEM of difference inferring mass balance change since 1996. Hannah Davies examined the weathering processes taking place on the moraines of both Rieperbreen and Longyearbreen glaciers. Overall there was a variation in weathering and erosion at both Longyearbreen and Rieperbreen, which indicates complex processes are taking place on these moraines.

Funding sources: Newcastle University Expeditions Committee, The Gino Watkins Memorial Fund, The Royal Geographical Society Fieldwork Grant and The Andrew Croft Memorial Fund

Project Supervisors: Dr Rachel Carr, Dr Andy Russell and Dr Neil Ross
Andrew Lister  
BSc (Hons) Pharmacology  
Bipolar Lithium Imaging and Spectroscopy Study

Bipolar disorder affects mood states, and is debilitating for those who suffer from it. Lithium can help to manage it, but is not effective for everyone. Currently there is no easy way to know if someone will respond to lithium or not, short of treating them with a long course of the drug. When it does work, it is thought to do so by affecting brain levels of NAA (N-acetylaspartate, a supposed marker of neuronal integrity) and myo-inositol (thought to be involved in mania). To determine if changes in these chemicals act as markers of Lithium response, we must be able to measure them in the brain. Thus, a standardised procedure was designed to allow consistent determination of the levels of these compounds from the output of a magnetic resonance spectroscopy scan. This fed into a larger project to improve understanding of the brain’s response to treatment with lithium.  
Funding source: Newcastle University  
Supervisor: Dr David Cousins

Philippa Malko  
MSci Biomedical Sciences  
Investigating a Role for GATA2 in the DNA Damage Response in Prostate Cancer

The primary target of prostate cancer (PC) therapy is the androgen receptor (AR) as it is established that this protein drives cancer progression. Previous work has identified a protein known as GATA2 that promotes activity of the AR and may be important for enabling the cell to counteract the cancer cell-killing effects of both radiation- and chemo-therapies. In this research project we reduced GATA2 levels in a PC cell line to suppress the activity of the DNA damage response, necessary for tumour survival. This alteration to cellular repair mechanisms resulted in an apparent decrease in the expression of several genes involved in DNA repair, as well as an increase in the persistence of DNA damage in response to ionising radiation. This work identified a role for GATA2 in the proliferation of cancerous prostate cells, providing potential for the development of effective treatments for castrate resistant PC using GATA2 inhibition.  
Funding Source: Newcastle University  
Supervisor: Dr Luke Gaughan

Leigh-Ann Marono  
Mchem (Hons) Medicinal Chemistry  
Cobalt salen complexes as hydrogen evolution catalysts

There is a high demand for sustainable, renewable energy generation and storage. One pathway, which is thought to be ideal for the storage of solar energy, is hydrogen production from the water splitting process. A catalyst, which is a substance needed to speed up reactions, is used in the production of hydrogen. Platinum is currently the most efficient but more abundant materials are preferred. Molecular catalysts could offer a selective alternative to noble metals. Cobalt salen complexes, which are well known catalysts for many organic synthesis reactions, are easy to prepare and modify, however they have been overlooked for water splitting. This project involved preparing various cobalt salen complexes and testing their ability to act as catalysts for hydrogen production. The complexes were tested against each other using cyclic voltammetry, this shows which will be the best catalyst from their currents of oxidation and reduction.  
Funding source: Newcastle University  
Supervisor: Dr Elizabeth Gibson

Rosalind Mather  
Mchem (Hons) Chemistry  
A Novel Light-Harvesting Complex for Energy Conversion

The use of solar energy as an alternative fuel is becoming increasingly important. Natural light-harvesting photosystems such as chlorophyll are highly efficient at absorbing light and converting it to electrical energy. This project aims to synthesise a new compound which will mimic such systems. It will contain an organic dye called dipyrrin which has excellent light absorption in the visible spectrum and has a similar structure to porphyrin, the basic building block of chlorophyll. The new compound will contain this dipyrrin and another species called quinolinolate, both bonded to a zinc (II) centre. Upon exposure to light, the compound is expected to undergo a charge transfer process in which electrical energy is transferred between the two species. The compound will be studied using spectrophotometric techniques to elucidate the mechanism of light absorption and emission, in view of potential applications as a photo-sensitiser for solar energy conversion into electricity and fuels.  
Funding source: Newcastle University  
Supervisor: Prof Fabio Cucinotta
Research Scholarships and Expeditions 2016

Jonathan McHugh
BSc (Hons) Physiological Sciences
STED MICROSCOPY

All life starts out as a single cell, which, by the time the average human is fully grown, will increase to over 32,000,000,000,000 cells. To do this, cells must divide; replicating their DNA and content. Results can be catastrophic if this process goes wrong, and can result in diseases such as cancer or birth defects. In order to understand the complexity of cell division we must observe it using microscopy techniques. Super Resolution Light Microscopy allows us to see down to 250nm; 400 times thinner than a human hair. STED (Simulated Emission Depletion), a new type of microscopy, allows us to see at a resolution of 60nm. Depending on the type of microscopy, different fluorescent tags need to be used to visualize the cell components. The aim of this project was to maximize the potential uses the STED microscope by finding the ideal fluorescent tags and identifying optimum preparation conditions.

Funding source: Wellcome Trust
Supervisor: Dr Alex Laude

Jack McIntyre
BSc (Hons) Physiological Sciences
The origins of interneurons in the human cerebral cortex

Connecting neurones (interneurons) play a vital role in all of our thought processes and failure in development can lead to conditions such as epilepsy, autism and schizophrenia. In mice it was discovered that they migrate into the outer area of the brain called the cortex from other areas of the brain called the ganglionic eminence (GE). However in humans we believe they are born in the cortex but it’s still up for debate. I isolated some stem cells from these areas in human fetal brains and allowed them to grow into neurones in the lab. I then tagged them with specific proteins with fluorescent markers to identify interneurons and if they came from the cortex or the GE. I then counted them using a fluorescent microscope and performed statistical analysis to check the significance of my results.

Funding source: Anatomical Society
Supervisor: Dr Gavin Clowry

Joseph Middleton
BSc (Hons) Pharmacology
Examination of kv3 channel modulators on the development and expression of sensitisation to locomotor stimulant effects of cocaine in rats

Investigations into the spatiotemporal features of nicotinic receptor subtypes in human foetal brain samples varying from 8 weeks to 12 weeks post-conception. Carried out using immunohistochemistry, antibodies specific to alpha 4 and alpha 7 receptors bind to the receptor proteins which are fixed on glass slides. Then further antibodies are used to stain areas of the slide in the presence of the receptor in different brain areas, this was then visualised using microscopy. Different concentrations of the antibody led to different levels of staining. The basis for the research was founded on the understanding that smoking during pregnancy can lead to increased proliferation of some nicotinic receptors in the developing foetal brain which could suggest some of the physiological implications. Quantification was used to complement the visual data which measured quantities of RNA of the various receptor subtypes in foetal brain samples.

Funding source: Newcastle University
Supervisor: Dr Gavin Clowry

Samaa Musa
MBBS
Investigating the association between blood pressure and lung measures in the Gateshead Millennium study

Many studies have found that as lung function decreases, blood pressure increases in adulthood. This is important, as impaired lung function has been found to increase the risk of developing a number of cardiovascular diseases including hypertension. Growth and development in childhood has an impact on health in later life, yet few studies have looked at this in association with cardiovascular disease development. Detecting an association in earlier life can help to identify individuals at most risk of developing cardiovascular diseases in the future and potentially prevent this. This research study will investigate whether there is an association between blood pressure and lung function in children aged 12 from the Gateshead Millennium Study. A statistical analysis was completed involving blood pressure and lung function measurements to assess any association that may be present. Factors such as gender, age, height, body mass index, smoking and social deprivation were taken into account.

Funding source: Newcastle University
Supervisor: Prof Mark Pearce
Ethan Nelson
Mchem (Hons) Chemistry
Can A Fluorescent Phosphine Switch Identify Hard-to-Detect Catalytic Intermediates?

The purpose of this project was to develop compounds that were relevant to catalysis and to investigate their photophysical properties (response to UV light). The compounds to be created were to be fluorescent, made up of phosphine-based systems that were often unstable. The production of these compounds has implications in medical research, i.e. in cancer treatment, potentially for use in diagnostic imaging and in-vivo drug delivery. The aim was to build a ‘switch’ to observe intermediates in reactions that are normally hard to detect – to better understand the chemical process. This was done by several step synthesises, however this meant that it was difficult to produce a high yield. The research project revealed that these phosphine compounds were unstable, even with optimisation – using aromatic rings – they would decompose over 1-2 weeks. However, this is better than most primary phosphine systems which are often explosive and highly toxic.

Funding source: Newcastle University
Supervisor: Dr Lee Higham

Belinda Neo
Bsc (Honours) Food & Human Nutrition
Quality analysis of the diet of 17 to 21 year-old students from 2 different educational institutions in Singapore

This study critically analyses the 24-hour food recall of students (n=119) aged 17 to 21-year-old from two different educational institutes in Singapore. The dietary recalls were graded using a dietary scoring system supported with Chi-square to analyse the significance of the acquired data. Polytechnic students (n=69) consisted of more negative scorers compared to the Institute of Technical Education (n=50). Significantly, negative scorers consumed more fried food and sweetened source of calcium in contrast with positive scorers. Positive scorers consumed more vegetables and rice but only a few preferred the wholegrain type. Regardless of their demographics, the most prominent findings are the absence or lack of fruits, vegetables and wholegrains consumption in majority of the students. The dietary habits of this sample of young people in Singapore are still far from optimal and require further interventions to optimise their daily nutrient requirements.

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

Samuel Newton
Bsc (Hons) Biology (Ecology & Environmental Ecology)
Investigating Moorland Cutting Regimes on Invertebrates at RSPB Geltsdale

Working in Cumbria with RSPB Geltsdale and the North Pennines AONB (Area of Outstanding Natural Beauty) Partnership, the project was aimed at establishing if heather cutting to help restore moorland, as an alternative to burning, was impacting invertebrate populations. These are a major food source of nesting birds, including upland waders and migratory songbirds. These in turn indirectly impact predatory species, such as nationally rare Hen Harriers.

Plots cut on different years and levels of regeneration were selected, and sampled using sweep netting (for invertebrates in vegetation or airborne) and pitfall traps (for ground-dwelling species). Invertebrates were identified, and plot comparisons allowed analysis of the effects of heather cutting.

Intermediate aged plots had highest abundance and species richness, opposed to the oldest and most recently cut. Clearly maintenance of a mosaic of cut areas of different ages will maximise invertebrate diversity.

Funding source: Newcastle University
Supervisor: Dr Roy Sanderson

Sarah Newton
BSc (Hons) Mathematics and Statistics
Stroke recovery using virtual reality and motion tracking hardware

Strokes can affect the way a victim's muscles work. The brain sends signals to the muscles through the nervous system so that they move. A stroke damages the brain, hence damages the muscles. After the stroke has occurred, the muscle problems can improve without rehabilitation. Exercise can help the patient regain muscle strength. This research involves investigating two sets of hardware, Oculus Rift and Kinect 2. These are virtual reality and motion tracking hardware. The aim is to create a prototype of a game that helps patients recovering from a stroke. The prototype helps rehabilitate the arm affected by the stroke. This provides a way for a patient to exercise with a fun element of scoring. Using the hardware provided, the patient can immerse themselves in the game world. As a result they can find a way to enjoy the rehabilitation process.

Funding source: Newcastle University
Supervisor: Dr Gary Ushaw
Ya Min Ng
BSc Biomedical Sciences 2+1
NUMed and Newcastle UK
Identification of Escherichia coli antibiotic resistance genes present in surface and domestic tap water at Johor, Malaysia

Antibiotic resistance is the situation whereby microorganisms can thrive despite presence of antibiotics. Antibiotic resistance is a growing public health concern worldwide affecting not only mankind but also animals and the environment. Water samples were collected from a downstream river and domestic tap water at a small village Southwest of Johor, Malaysia. Samples were then plated on selective agar to differentiate between Escherichia coli (E. coli) and other bacteria. Gram staining and light microscopy were also performed to identify the classification and morphology of bacterial cells present in the water samples. Antibiotic resistance of E. coli was detected through disc diffusion method on Müeller-Hinton (MH) agar. Diameter of zone of complete inhibition was measured and compared with Clinical and Laboratory Standards Institute guideline for antibiotic resistance which shown surprising results. DNA extraction was done to allow for future DNA sequencing to identify the type of antibiotic resistance genes (ARGs) present.

Funding source: NUMed Malaysia
Supervisor: Dr Mukhrizah Othman

Sophie Nicholls
BA History & Archaeology
Maroon and free black communities: ethnicity, heritage and public understanding

My research focused on maroon (escaped slave) and free black communities in the Americas. These communities emerged after c.1500 but their ‘history’ is a developing one: maroon descent communities and heritage sites exist in many areas. Many Europeans and Native Americans lived in these places alongside people of African descent. Through library research and a visit to Fort Mosé in Florida (home to the first free black community in the New World) I explored the extent to which Native American presence is reflected in contemporary heritage presentation at maroon sites today. While present at many of the sites, it is evident that Native American contribution and presence at maroon and free black communities is somewhat over looked in contemporary heritage presentation. The lack of representation at these sites for Native Americans, makes for the heritage presentation and public understanding to not be truly representative of past communities.

Funding source: Newcastle University
Supervisor: Dr Jane Webster

Elizaveta Olkhova
BSc (Hons) Pharmacology
Investigation of molecular mechanism of CRISPR spacer acquisition by using an in vivo experimental system

CRISPR/Cas system stands for clustered, regularly interspaced short palindromic repeats coupled with CRISPR-associated proteins form the immune system of many bacteria and archaea against invading bacteriophages (viruses infecting only bacteria, can only replicate inside bacterial cells) and foreign plasmids (small circular DNA, which bacteria are able to take up from the environment). CRISPR genes contain short repeats, separated by hypervariable spacer sequences that are specific and therefore will bind to foreign DNA. The mechanism by which bacteria defend themselves by introducing double-strand DNA breaks in phages and plasmids is extensively studied, whilst the mystery of how spacer acquisition takes place and only affects invading DNA and leaves chromosomal DNA intact remains unsolved. In this research, the aim is to study which mechanisms underlie integration of foreign DNA into CRISPR loci in vivo in bacteria and which proteins or complexes of proteins are responsible for this process.

Funding source: Newcastle University
Supervisor: Prof Nikolay Zenkin

Sophie Oldham
BA (Hons) Archaeology
Remembering the Enslaved at Home: Slave Burials in Britain from 1701 to 1868

Slave burials have been a major focus of historical and archaeological research in the Caribbean and North America, but comparatively little work has been undertaken on the graves of enslaved individuals who died in Britain. This project has three aims. First, to quantify the number of enslaved individuals whose graves survive in Britain today; second, to ask what the imagery and wording on these memorials reveal concerning contemporary attitudes to the slave trade, and third to examine the ‘afterlife’ of these memorials as sites of memory, from the abolition of the slave trade in 1807 to the present day. The outcome of this research has led to the creation of a database which lists all of the slave graves that have been identified, a map illustrating the distribution of these graves across Britain and an analysis of how these graves are remembered and engaged with in today’s society.

Funding source: Newcastle University
Supervisor: Dr Jane Webster
A cell completes one cell cycle to produce two daughter cells. Many cancers arise from dysregulation of the cell cycle, causing uncontrollable growth of cells, forming tumours. Cyclin-dependent kinases (CDKs) control processes in the cell cycle, by regulating the activities of other proteins, such as transcription factors that control gene expression. The project looked at the interaction between CDK6 and the transcription factor Runx1, dysregulation of which is associated with acute leukaemias. DNA constructs to express a fragment of Runx1 and a complex between Runx1 and CBFβ (another transcription factor) in recombinant E. coli cells were prepared. Runx1 was successfully produced and its purification was optimised. Preliminary experiments to characterise the CDK6-Runx1 interaction were carried out. The reagents have been generated to map the Runx1 binding site on CDK6. This site will be probed by making CDK6 and Runx1 mutants and characterising their activities using biophysical, structural and cell-based assays.

**Funding source:** Biochemical Society  
**Supervisor:** Prof Jane Endicott

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This project investigates community ecology of invertebrates (hoverflies and spiders). Communities consist of biotic factors, interactions between same and different species and environmental abiotic factors for example, weather conditions and vegetation. The study was in Northumberland on National Nature Reserve land in a rare and isolated, calcareous (containing calcium carbonate) habitat called Newham Fen. Fens are neutral or alkaline wetlands and mires, consisting of mineral-rich ground or surface water. They are mainly found in the southern UK. Hoverfly and spider communities were surveyed between June to August to determine if vegetation management impacted the community structure. The hypothesis was that vegetation types and site moisture will predict the species within each site. This may be due to the presence of optimal conditions to enhance an individual’s survival or competitive exclusion whereby dominant species outcompete others. Findings will aid reserve management (grazing and vegetation cutting) to help conserve current species.

**Funding source:** Newcastle University  
**Supervisor:** Prof Stephen Rushton

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The LINC complex consists of two proteins; SUN1 and KASH5. These proteins interact and span the double nuclear membrane during chromosome alignment of mammalian meiosis 1. This process is necessary for the faithful reduction in chromosome number in cells undergoing meiosis and thus the production of viable gametes. For this reason, any disruption to either of the proteins involved in the LINC complex can be a cause of infertility. The aim of my project was to purify SUN1 both with and without KASH5 allowing structural techniques, such as SEC MALS to be performed. The structure of the SUN1 protein, which is meiosis specific could then be compared with its mitotic homologue SUN2. In the future this information could give way to the possibility of microinjecting viable germline cells with the SUN1 protein in vivo to produce cells capable of meiosis and thus allowing fertilisation to occur.

**Funding source:** Wellcome Trust  
**Supervisor:** Dr Owen Davies

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My research project analyses how the former Spanish colonies presented themselves in Spain during the 20th century. This is especially important because many of the nations involved had only recently become independent from Spain, allowing me to see which Spanish influences had or have survived. The main avenue of research involved analysing the still-standing buildings of the Exposición Ibero-Americana 1929 in Seville, Spain. This was supplemented with primary source material from Seville’s municipal archive, which includes correspondence between the nations involved. The exposition focused on Latin-America, with 23 nations taking part in total. Each country built its own pavilion to display what Latin-Americans believed to exhibit their technology and culture. All of the pavilions were unique in their appearance and their contents, allowing me to understand the ways in which the former colonies recognised their Spanish heritage, while simultaneously underpinning the unique, indigenous characteristics of their national culture.

**Funding source:** Newcastle University  
**Supervisor:** Dr Keith Brewster
Phyllis Phua  
*Bsc (Honours) Food & Human Nutrition (NUIS)*

**A Comparison of Microbial Contamination Susceptibility in Organic and Conventional Lettuce**

Microbial contamination is a concern to food safety. This is especially in raw foods such as lettuce, a common ingredient in salads. Organic vegetables are gaining popularity as a healthier option compared to conventionally grown vegetables. Yet there is limited information known about their susceptibility to microbial spoilage. This study compared spoilage due to microbial growth between organic and conventional iceberg lettuce. Samples were swabbed and the resulting bacterial colonies were identified using different biochemical tests. All bacteria identified were non-pathogenic. The number of bacterial species grown were characterised, and no significant difference was observed in the number of different bacterial species grown on the lettuce from the different sources. The lettuce samples were stored in the fridge to monitor decay. Organic lettuce decayed about one week earlier than conventional lettuce. This could be due to the relatively chemical-free soil composition of organic vegetables.  

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

Angus Richman  
*BEng (Hons) Electrical & Electronic Engineering*

**Current sharing in superconducting power networks**

Power distribution networks are moving from conventional copper based wiring to superconductors in order to increase efficiency and power density. Whilst superconductors are capable of handling currents over 100 times that of an identically sized copper wire, the challenge of integrating them in to a network to distribute power has not yet been thoroughly investigated. In particular, conventional electrical engineering principles cannot identify where current flows at a junction between three conductors. Hence this project seeks to identify for the first time, the current flows at such a junction and match this to advanced quantum theory.  

**Funding source: Newcastle University**  
**Supervisor: Dr Alton Horsfall**

Charlotte Sanders  
*BSc (Hons) Pharmacology*

**New Genes and Molecular Mechanisms of Complex III Deficiency in Mitochondrial Disease: Functional Effects of a Candidate UQCRH Variant in Patient Fibroblasts**

Mitochondria are often called the ‘powerhouses of the cell’, producing the energy source ATP (adenosine triphosphate). Mitochondrial DNA (mtDNA) and nuclear DNA (nDNA) encode the machinery of ATP production and contain genetic defects in mitochondrial disease. Mitochondrial diseases are so debilitating that research has looked to controversial techniques such as the 3 parent baby to replace faulty mtDNA. Despite this, a spectrum of causative mutations remain undefined in terms of molecular genetics and their effects on assembly and function of mitochondrial ATP-producing protein complexes, known as respiratory chain or oxidative phosphorylation (OXPHOS) complexes. This project studies a candidate patient of first-cousin parentage who has inherited such a mutation and presents with mitochondrial disease. Next generation sequencing determined that the defect occurs in DNA encoding a subunit of complex III, an OXPHOS protein. The aim of the ongoing project is to establish the molecular aetiology of the patient’s complex III deficiency.  

**Funding source: British Inherited Metabolic Group**  
**Supervisor: Prof Robert Taylor**
Raphael Selby  
MArch Architecture  
International Brutalism – ‘Brazilian Concrete’ and Brutalist Architecture

The research is centred on the current discussions on cultural heritage and importance of brutalist architecture in Britain and around the world, with focus on the Brazilian context. These buildings, loved or hated, are of great architectural importance from 1950s-1980s. In my research I analysed specific brutalist buildings in Brazil (a country with a rich heritage in concrete architecture) and held interviews with academics and architects, to formulate an understanding of the importance of brutalism in the Brazilian context, and how it adds to the discourse of ‘International Brutalism’. From the field study it was clear that key characteristics of Brazilian Brutalism are its material and structural honesty (the way the building’s construction is visually expressed); an interplay between monumentality and the human scale; and an integration of public space which creates a blurring of public/private space and inside/outside space. Please visit my research blog www.brazilianconcrete.wordpress.com for further information.  
Funding source: Newcastle University  
Supervisor: Dr Stephen Parnell

Bien Isabel Senica  
BSc (Hons) Biomedical Sciences  
Development of a predictive in vitro nephrotoxicity testing platform in rat primary renal proximal tubule cell monolayers

The lack of useful kidney models is a problem in pre-clinical investigations of nephrotoxicity, which is toxicity of the kidney. Here, we evaluated the utility of rat kidney cells as an experimental model for toxicity tests. To do so, we treated rat kidney cells with known kidney toxins, and then measured the expression of nephrotoxicity markers. The results showed that expression of the key markers was much higher in kidney cells treated with toxins. Additionally, levels of these markers were dependent on concentrations of kidney toxins. These data suggest that the rat cells express relevant key markers of nephrotoxicity and demonstrated their potential as an experimental model in toxicity screening.  
Funding Source: Newcastle University  
Supervisor: Dr Colin D A Brown

Steven Tan Heng Sern  
MBBS (NUMed Malaysia)  
Acute Kidney Injury in Cardiac Surgery and Transplantation: Long Term Effects and Use of Novel Biomarkers

Acute Kidney Injury (AKI) has been a common side effect and an unsolved problem for both cardiac and lungs surgeries. AKI is normally due to drugs, anaesthetic and surgical injuries during pre-, peri- and post-operation. If patients with AKI achieved a specific threshold of blood creatinine, i.e. >200 µmol/L, they usually require the Continuous Veno-Venous Haemofiltration (CVVH) program. It is a short term treatment used in ICU patients with acute or chronic renal failure to lower and maintain the blood creatinine. However, even the linkage of AKI to chronic kidney injury (CKD) is proved on cardiac and lungs surgeries, it is not well studied for transplantation. Therefore, our study aims to find the linkage for AKI leading to CKD in patients after cardiac and lungs transplantations, in order to assist further studies for prognosis of transplanted patients.  
Funding source: Newcastle University  
Supervisor: Prof John Dark

Sangam Singh  
MEng Electrical and Electronic Engineering (Industry)  
Software Support for Analysis of Density of Interface Traps (Dit) in Semiconductor Devices

Density of interface traps play an important role in semiconductor devices found in all kind of electronic equipment. It directly affects the mobility of the electrons and the holes in the semiconductors, thereby reducing the speed of operation of the device. To interpret its effect one needs to analyse the correlation between different factors (roughness, temperature, etc) and Dit.

This project is aimed at designing a software support for the automated and easy analysis of the experimental data. The software will take in the raw data, process it and produce the Dit as the output. The software uses two popular methods of calculating the Dit, which also allows a comparison between the accuracies of the two methods. The output of the software is the calculated Dit along with graphs which will aid interpretation.  
This software should make the entire process of Dit calculation easier, faster, and more convenient.  
Funding source: Newcastle University  
Supervisor: Dr Sarah Olsen
Children with chronic conditions often move with difficulty from child to adult healthcare. “Transition” is a four-year study, aiming to provide evidence to the NHS of what could help young people with these conditions during their transition from child to adult healthcare. This study investigated service needs of 108 young people with Cerebral Palsy. Questionnaires given annually to young people (and parents) explored eleven health needs these young people may have, and whether they are being met. The analysis identified two areas of unmet health need relating to Daily Activities and Medical Interventions. It revealed how unmet health needs can be calculated as a robust outcome measure in health services research. In the “Transition” study, analysis aims to identify which clinical practices during transition reduce unmet health needs, and suggest how the NHS might improve the quality of life of young people with long term conditions.

**Funding source:** Newcastle University

**Supervisors:** Prof Allan Colver & Prof Helen McConachie

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**Taxonomy (BCTT) to Speech & Language Therapy interventions: Application**

**Kirsty Spalding**

**BSc Hons Speech & Language Sciences**

*Changing the way we look at Speech & Language Therapy interventions: Application of the Behaviour Change Technique Taxonomy (BCTT) to Speech & Language Therapy interventions with children.*

Behaviour change interventions such as Speech and Language Therapy (SLT) are complex, and lack of common terminology makes their accurate implementation and replication difficult. The Behaviour Change Technique Taxonomy (BCTT, Michie et al, 2013) comprises 93 BCTs, or components of interventions that aim to change behaviour in some way, such as providing demonstration or giving instructions. It has been applied in various research fields including public health, but never within paediatric SLT. This project examines the feasibility of using the BCTT within SLT by applying it to videos of student SLTs delivering Building Early Sentences Therapy (BEST) and Phonological Awareness Intervention. The BCTT was useful for describing interventions and checking that delivery adhered to manual instructions (treatment fidelity). Some modifications were required and 10 new BCTs were identified. Possible uses of the BCTT include specifying intervention techniques in therapy manuals, assessing treatment fidelity, and facilitating student training.

**Funding source:** School of ECLS

**Supervisor:** Dr Helen Stringer

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**Developing microsatellite primers for two Tilia species in order to assess ascertainment bias**

**William Stephenson**

**BSc (Hons) Biology (Ecology & Environmental Ecology)**

*In most countries, neither initial language teacher training programmes nor continued professional development prepare teachers to work with adult low-educated second language and literacy acquisition (LESLLA) learners. According to report on the (2013-15) EU-Speak project, these teacher training/development programmes do not impart sufficient knowledge and skills for prospective teachers to work with LESLLA learners. This research project contributed to the continued improvement of the quality of online LESLLA teacher education modules. A qualitative research methodology was employed to investigate which module activities did the teachers take up, and whether the teachers perceived their learning experience of participating in these practical activities to be useful. Results indicated that although there were some facilitative factors which promoted supportive learning environment in the discussion forums, factors e.g. lack of face-to-face interaction with mentors and other teachers, lack of feedback from experts, unrealistic module activities could affect teachers’ engagement with the module.*

**Funding source:** Genetics Society

**Supervisor:** Dr Kirsten Wolff

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**Developing microsatellite primers for two Tilia species in order to assess ascertainment bias**

**Wai Hin Kevin Tai**

**BA (Hons) English Language & Literature**

*Immigrant Adults: Materials and Teacher Training*
Lithium is used for bipolar disorder; however, not all patients respond to it. This project aims to improve the understanding on the effects of lithium to brain with respect to the morphology and composition, using magnetic resonance imaging technique and computer software packages. Two different groups are being recruited; 25 patients with bipolar disorder taking lithium, and 6 healthy comparator subjects. Subjects undergo comprehensive clinical assessment and imaging on a 3T Phillips Archeiva MR scanner. The structural MRI data are pre-processed and statistically analysed with computer software packages such as MATLAB, SPM 12, Computational Anatomical Toolbox (CAT), and SPSS. The results were normalised to the total intracranial volume (TIV) as the raw images of brain differs between individuals. Lastly, the statistical results suggested that lithium has no effect on the TIV; while it causes a small loss of grey matter in brain.

**Funding source:** Newcastle University

**Supervisor:** Dr David Cousins

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The WNT5A protein is an essential part of a number of processes which are responsible for the growth, elongation, and patterning of cells in a developing embryo. It is also involved in the regulation of cell maintenance in adults. Low levels of the protein in mice has been shown to cause bone growth deficiencies. This project focused on the developing gut, as it undergoes a significant amount of elongation before birth. Presence of the protein was measured in a 50 days-post-conception (Carnegie Stage 20) human embryo. Protein expression was observed in the probable epithelial layer of the gut tube – the oesophagus, the stomach, the intestines, and the anus. Protein expression was also noted throughout the horizontal plane of the embryo, and in other organs. This provides support for the theory that the WNT5A protein is present at large, and is extremely vital, in the developing embryo.

**Funding source:** Genetics Society

**Supervisor:** Prof Susan Lindsey

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Research was conducted into the manufacture of a boron dipyrromethene (BODIPY) type dye for use in solar cell technology. The manufacture of such dyes is difficult however, the reactions produce poor yields making determining successful reaction conditions an important step. The research involved testing different techniques and proportions of chemicals to improve the amount of dye produced and purified. This research on improving production would aid further testing on BODIPY dyes using chemical analysis devices such as UV/Vis spectroscopy. This analyses the light absorbing and emitting qualities of the dye using ultra-violet and visible light, giving an insight into the efficiency and performance of the dye as a light absorbing material for use in solar cells. The dye can also be incorporated into a solar cell system to test its performance in a real world environment.

**Funding source:** Newcastle University

**Supervisor:** Dr Fabio Cucinotta

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Consumers world-wide prefer to buy locally-grown and freshly harvested vegetables for their better taste and higher nutritional value. Hence, hydroponic farming is slowly becoming popular in small countries like Singapore. This project aims to explore the hydroponic farming technique and test the microbiological safety profile of commonly consumed green leafy vegetables grown in a local hydroponic farm. Spinach samples grown hydroponically were compared to those grown conventionally for susceptibility to microbial contamination and subsequent effect on shelf-life. Bacteria was isolated using the Swab technique and characterized using a combination of different growth conditions and biochemical tests. Results show that hydroponically grown vegetables harboured fewer bacterial species, but exhibited a shorter shelf life compared to conventionally grown spinach. This could possibly be attributed to the extensive amount of insecticides used in conventional farming practices. Further testing would be required to conclude if the bacterial species on the hydroponic spinach are pathogenic.

**Funding source:** Newcastle University

**Supervisor:** Dr Saloni Kaur Dang
Mucus is produced in many places in the body such as the eye, the respiratory tract and the gastrointestinal tract. It mainly functions to protect cells and prevent bacterial infection. Using mucus in research can be problematic, as it can be toxic to cell cultures. Commercial suppliers only partially purify their product so it does not mimic reality; hence a sterile purer sample would aid research. This project investigated the main constituents and properties of mucus in an attempt to further understand the mucus gel. This project attempted to formulate a recipe in which these constituents can be combined to form a mucus-like gel, exhibiting similar characteristics of mucus in the gut, to be used in research. More research is required into this idea.

**Funding source:** Newcastle University

**Supervisor:** Jeff Pearson

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Neuroblastoma is the second most common solid tumour in children, with a 50% relapse rate in high risk cases. Neuroblastoma affects around 100 children every year in the UK. Genetic abnormalities are important in cancer as they determine how a tumour responds to treatment. During chemotherapy cells may gain more abnormalities allowing them to survive chemotherapy, resulting in relapse. A SNP array was used to detect SNPs in DNA taken from neuroblastoma cells at diagnosis and relapse. A SNP is an alternative form of a single base of DNA. To test the sensitivity of the Illumina SNP array seven SNP arrays were ran with different percentages of tumour content. This showed that SNP arrays can detect abnormalities down to 10% tumour content. The SNP array detected more abnormalities in relapsed samples compared to in diagnostic samples. Results from the SNP arrays will identify treatment targets when a patient has relapsed.

**Funding source:** Newcastle University

**Supervisor:** Prof Deborah A Tweddle

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With an increasing global population, there is a greater need for improving wastewater treatment. Clean water is crucial both for health and demand from industry. Wastewater treatment is facilitated by the use of filter materials which efficiently remove contaminants from wastewater. Trickling filters treat wastewater by flowing it through a bed of filter media (rocks or plastic) which accumulate thin, slime-like colonies of microorganisms, known as biofilms. Bacterial-surface attachment depends on several surface properties. This research aimed to investigate some of these properties through a series of experiments to understand how the design of plastic surfaces can control biofilm formation. Nylon samples were modified to different surface roughnesses and characterised using a range of probing equipment and microscopes. They were then placed in a real trickling filter for 28 days after which biofilm growth was investigated. Developments in wastewater filter design could lead to improved efficiency, cost and health benefits.

**Funding source:** Newcastle University

**Supervisor:** Dr Jinju Chen

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Hooks into Books are a collection of books and activities curated by Seven Stories: The National Centre for Children’s Books, to encourage reading for pleasure within schools. Two local schools received packs and were observed delivering a session on a chosen book to Key Stage 1 children. Questionnaires evaluated the children’s views on reading: what they liked to read, how often, where and whom helped them to choose texts. Teachers were asked which texts children read in class and how often. The schools took different approaches to delivery, one focussing more around creative writing, following the curriculum, the other taking a wholly ‘reading for pleasure’ approach. Children suggested they enjoyed the story-time from Hooks into Books more than their regular story-times, offering an accessible way into reading for pleasure. One teacher commented ‘Hooks into books are good for hooking teachers in, inspiring the children and are modern and current literature’.

**Funding source:** Newcastle University

**Supervisor:** Prof James Law

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**Funding source:** Newcastle University

**Supervisor:** Prof James Law
Dyslexia is a general term for a life-long condition where an individual has difficulties with word recognition, short term memory and verbal processing, despite adequate educational opportunities and a normal level of intelligence. It is a common learning difficulty which mainly affects an individual's ability in accurate spelling and reading. The syntax is the set of grammatical rules which gives structure within any language and is composed of varied complexities. The ability to identify relationships between syntactic elements separated by other components is essential for language learning, (for example subject-noun/verb agreement). Artificial Grammar Learning (AGL) framework manipulates a set of rules to create sequences of varied difficulties. These sequences can be used to mimic natural language to assess human language learning abilities. This study used artificial grammar with auditory made-up words to investigate how individuals with and without dyslexia learn the associations between made-up words in sequences that follow specific rules.

**Funding source:** Newcastle University

**Supervisor:** Prof Chris Petkov

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**Rosalind Walsh**

**MChem (Hons) Chemistry**

**Heteroatom Donor Mesoporous Ionic Liquid Functionalised Silica: Supports for Nanoparticle Catalysis**

A catalyst is a substance that speeds up a chemical reaction without being consumed. For reactions with more than one possible product a catalyst improves the selectivity for one product. This project was to develop a new generation of porous silicas, decorated with donor groups, as supports for nanoparticle catalysts. The silica framework provides a robust architecture to protect the catalyst while additional donor groups interact with the surface of the nanoparticles to modify selectivity and reactivity and also prevent metal leaching. The catalyst will be able to reduce a C=O group in a molecule which also contains a C=C group, leaving the C=C intact – currently a difficult reaction due to the similar reactivities of the groups and the expensive loss of metal catalyst. This catalyst would allow multiple reaction cycles without metal leaching, a faster reaction rate and lower temperatures making it a much more sustainable process.

**Funding source:** Royal Society of Chemistry

**Supervisor:** Dr Simon Doherty

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**Andrew Warburton**

**MComp (Hons) Computing Science**

**(with Industrial Placement)**

**Game AI- done differently**

Video games can often run slowly when many agents (enemies for example) are present, or when an agent with complex AI is present. My research was to program and test a method to make AI processing less taxing on the rest of the game. Processing, consisting of things such as AI and physics, is normally done on the Central Processing Unit (CPU) - a device within the computer. There is another device which is usually completely dormant in PCs with graphics cards – the CPU’s Graphics Coprocessor. I successfully made the graphics coprocessor process all of the AI for a game, which freed up the CPU to do more without the game slowing. This essentially added extra processing power to the computer and can be done on nearly every desktop PC with a graphics card. This also has implications to improve AI performance with large numbers of agents.

**Funding source:** Newcastle University

**Supervisor:** Dr William Blewitt
Joseph Wilson  
MArch Architecture  
Brutalism: The American Dream or an American Nightmare?

My dissertation research concentrates on the current discussions surrounding the cultural significance of Brutalist architecture. International Brutalisms appeared in the post-war period and discussions regarding their qualities and status continue today. I have specifically focussed upon North America's affiliation with Brutalism during the post-war era. I conducted field research in several US and Canadian cities, analysing a series of brutalist buildings. I also interviewed academic researchers and practicing architects to gain a greater understanding of North American Brutalism and analyse how it contributes to the global conversation of International Brutalisms. During the course of my field research, I noticed that North American universities are in abundance with modern concrete architecture. I found that the demands created by the Second World War made an opening for theories that reconfigured universities' approaches to planning and architectural expression. This paved the way for architects to implement their modern ideologies onto campuses.

Funding source: Newcastle University  
Supervisor: Dr Stephen Parnell

YehXiang Yao (Encey)  
BSc (Honours) Food and Human Nutrition (NUIS)  
The Mucus Barrier: Understanding and Recreating a Suitable Analog for Absorption Studies

Intestinal mucus acts as a protective barrier from external infections and physical damage to intestinal walls. To better understand the role mucus plays in absorption, laboratory experiments could not use commercial mucus or freshly harvested mucus to use on gut surface cells; these mucus samples although are fairly easy to obtain, readily kill the cells that it is applied to, due to their contaminated nature. This study aims to understand properties of intestinal mucus and come up with a formulation to reproduce a substance from mucus constructs and mimics actual mucus in a normal gut. The bulk of mucus is made up with water, and the remaining constituents are mainly mucin, (a gelling molecule), and other cellular components like proteins, DNA, lipids etc. These ingredients are carefully separated from other contaminants in mucus, and remade into a mucus like consistency which hopefully could be a useful for future absorption studies.

Funding source: Newcastle University  
Supervisor: Dr Matthew Wilcox
University Expeditions and Research Scholarships 2017

The University will once again support Expeditions and student Research Scholarships in 2017. The application form for the 2017 scheme is already available and can be found at: http://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: http://research.ncl.ac.uk/vacationscholarships/

Details about the 2016 presentations will be available on this website from the end of January 2017.

University Expeditions 2017

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

The deadline for receipt of applications is Friday 27th January 2017

University Research Scholarships 2017

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: http://www.ncl.ac.uk/students/wellbeing/finance/funding/ukstudents/vacation/

The deadline for receipt of applications is Friday 10th March 2017
Comments from Research Scholarship and Expeditions holders 2013-2015

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

“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.”

“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.”

“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.”

“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.”

“I am sure now that I want to pursue research as a career.”
“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 2016
Research Scholarships scheme

It is hoped that if you were an undergraduate who undertook a funded research project during the summer of 2016 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:

https://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