Celebrating Research Scholarships and Expeditions 2019

Wednesday 4th December
Introduction to Research Scholarships and Expeditions 2019

**Professor Suzanne Cholerton**
Pro-Vice-Chancellor (Education)

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 at first hand and to develop key skills through a wide range of activities, such as researching new archival material in Newcastle or further afield, working on archaeological material, collecting, analysing and interpreting social data, working on a laboratory project alongside members of a research team, travelling to another part of the world to undertake a research project in an unfamiliar and challenging environment.

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

As well as encouraging students to explore their interest in pursuing further research the University has a strong ethos of supporting interdisciplinary work which allows students to work collaboratively on joint research projects. For the first time this year collaborative interdisciplinary research projects undertaken by small groups from different faculties or subject areas have been funded from the Research Scholarships Scheme.

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

I hope that all of the students who were successful in gaining funding to support their research projects 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.

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**Dr Emma Pearson**
Chair of the University Expeditions Committee

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 seventy one years have been organised and conducted by students from a wide range of disciplines from each of the three University faculties to more than seventy different countries. Recent expeditions over the past five years have taken place in more than fifteen diverse destinations including Brazil, Costa Rica, Ethiopia, Fiji, Greenland, Nepal, and Tanzania. Research has been carried out on a wide range of topics including biodiversity, ethnography, territoriality and identity, nursing and medical care, and melting glaciers.

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.
Research Scholarships and Expeditions 2019

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 with 148 projects being 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, 22 received external funding from other organisations, including the Biochemical Society, the Royal Society of Chemistry and the Wellcome Trust. Successful scholarships were also undertaken by Newcastle University students based at the University’s branch campus in Malaysia.

In 2019 three Expeditions were undertaken by students from the Faculty of Humanities and Social Sciences and the Faculty of Science, Agriculture and Engineering. 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 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 2019 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 4th December 2019. From 4.30pm in the Main Exhibition Space, Great North Museum, 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 six 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 students for 2019 will be announced by Professor Suzanne Cholerton (Pro-Vice-Chancellor (Education)) and winners will be presented with their certificates.

<table>
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<tr>
<th>Time</th>
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<tr>
<td>4.30-5.15pm</td>
<td>Posters available for public viewing in the Main Exhibition Space. Great North Museum</td>
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<tr>
<td>5.30-5.40pm</td>
<td>Welcome and introductions by Professor Suzanne Cholerton and Dr Emma Pearson (University Expeditions Committee Chair).</td>
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| 5.40-7.15pm| Presentation 1- Agatha Chu  
Presentation 2- Anna Kalish & Team  
Presentation 3- Meilin Song  
Presentation 4- Jennifer McFarlane & Team  
Presentation 5- Jacob Marvin and Philipp Rethwisch  
Presentation 6- James English & Team |
| 7.10-7.20pm| Closing comments by Professor Suzanne Cholerton, announcement of prize winners and presentation of certificates. |
| 7.30pm     | Informal supper reception in the Main Exhibition Space, Great North Museum |
| 9.00pm     | Event closes                                                                 |
Our expedition to Kangerlussuaq in West Greenland was a collected data for our dissertations whilst experiencing the field first hand. One team, based on the ice, collected data on the surface melt rates as well as surface ice properties. Another team was based along the ice margin, studying moraines, basal ice debris and the ice-dammed lake. Despite encountering some challenges in terms of our research and expedition logistics, we were able to overcome these which strengthened us as a team and also as individuals. Whilst in Greenland, we had the pleasure of assisting researchers from Nottingham and Loughborough universities in collecting data for paleolimnology and biological oceanography projects. This was a fantastic learning experience and gave us true feel of what more advanced scientific research entailed. Additionally, this year was one of the highest Greenlandic melt rates on record, demonstrating the importance of this research in the context of global climate change. This was featured on Channel 5 news, who interviewed us about our views on the increase in melt and climate change. We are very grateful for the generosity and support of the Newcastle University Expeditions Committee, without which our expedition would not have been possible.

Funding sources: Newcastle University Expeditions Committee, Royal Geographical Society, Sheffield Church Burgesses Trust, Sheffield Grammar School Exhibition Foundation and Go Fund Me

Project supervisors: Dr Rachel Carr, Dr Neil Ross and Professor Andy Russell

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Hearing loss in middle-age is one of the biggest risk factors for dementia but the reasons for this are unclear. One potential mechanism is via reduced ‘speech-in-noise’ discrimination, which allows us to have conversations in noisy environments and better captures ‘real-life’ hearing. This is dependent on working memory, which has been shown by our research group to involve the hippocampus, a brain structure involved early in dementia.

We used a novel auditory task for working memory precision to show stronger correlations with speech-in-noise ability, as compared to conventional clinical measures, in a group of 36 participants with clinically ‘normal’ listening. This, with measures of sub-clinical hearing, also better predicted individual speech-in-noise discrimination ability.

Our study provides a link from central auditory ability to real-life hearing. Our task could potentially be used in the future to predict cognitive decline.

Funding source: Newcastle Biomedical Research Centre

Project supervisor: Dr Meher Lad

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The threat that air pollution poses to human populations is a significant global issue. There are few methods available for the large-scale removal of pollutants from the atmosphere, however, it has recently been demonstrated, in city-scale studies, that trees represent one of the few effective options. In particular, growth of roadside trees appears to be one of the most promising ways to reduce urban particulate matters (PM) concentrations, and two recent empirical studies found >50% reduction in PM10 level inside houses screened by a line of trees. The goal of this project is to work with chemical engineers and biologists to learn the underlying/hidden filtration mechanism from trees and grasses. The knowledge gained from this study will help us to design a robust, and high efficiency capture system to aid in solving a major global pollution problem. In particular, we attempt to answer the long-standing research question ‘is there a correlation between air quality and leaf detachment in the Winter time?’

Funding source: Newcastle University

Project supervisor: Dr Steven Wang and Dr Stevin Pramana
Aim: To deepen knowledge of key ecological processes and interactions to aid conservation challenges at Cocha Cashu biological station.

**Projects:**

**Jaguars:** 20 camera traps were set up across the trail system to identify individual jaguars. Habitat attributes such as canopy density were measured to investigate factors affecting jaguar and prey species habitat use. Three jaguars, a mother and two cubs, were identified.

**Strangler Fig Trees:** The distribution of strangler figs were recorded across the trail systems. Factors such as diameter of the tree, canopy cover and height of host tree were recorded. The distribution of over 200 trees was plotted.

**Insect Herbivory:** 600 leaves were collected from ten plots in five different habitats. Types of insect herbivory damage, e.g., leaf miner, hole feeding, window feeding, were categorised from each leaf collected, along with the leaf area index and the percentage of herbivory damage.

**Palm Trees:** The distribution of individuals from the family Arecaceae and forest trees above 10cm diameter (DBH) were mapped in 100m by 10m quadrats. The quadrats were randomly generated in three areas of different successional stages in the forest. Over 500 individuals were recorded.

**Funding sources:** University Expeditions Fund, Harry Collinson Travel Scholarship, Royal Geographic Society-Geographical Fieldwork Grant, Gilchrist Educational Trust and SNES Travel Award

**Project supervisor:** Dr Darren Evans, Dr Marion Pfeifer and Dr Ankush Prashar

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Jennifer McFarlane, Lauren Barnes, Lydia Crabtree and Alex Lowe
*BSc & MSci Biology (Ecology and Conservation) / BSc Applied Plant Science*
*Newcastle University Peru Expedition 2019: Investigating the Flora and Fauna of Manu National Park.*

This project aimed to digitise archaeological data from the Swahili coast while also highlighting the need for further digitisation and conservation efforts in the area. Tana Tradition pottery from Kenya was analysed and digitalised by Philipp in cooperation with the National Museum of Kenya whilst Jacob used photogrammetry techniques to create 3D models of architectural remains on Zanzibar. Artefacts like pottery are always at danger of being lost due to limited funding or poor preservation conditions. The structural archaeology is also in danger due to environmental change. Rising sea levels and coastal erosion are a growing problem for archaeologists on the Swahili coast and other coastal areas. Should this evidence be lost or damaged, digitalised records of them might be our only trace of them.

Additionally digitalised records can make the evidence more accessible to researchers even with limited resources with digitised resources being available via the internet.

**Funding source:** Newcastle University

**Project supervisor:** Dr Ashley Coutu

**Jacob Marvin and Philipp Rethwisch**
*BA (Hons) Archaeology*

Stones and pots along the East African coast: Digital recording and conservation of East African Archaeology.
The purpose of the expedition was to travel to a remote field site in the Sayan Mountains, Russia, to extract cores for environmental reconstruction using chironomids (non-biting midges), diatoms (single celled algae) and spheroidal carbonaceous particles (SCPs). Chironomids will be used for palaeotemperature reconstruction, diatoms will be used to quantify ecological change in the study lake and SCPs to assess the extent of anthropogenic pollution.

Travel to the field site took three days and included the use of a minibus, off-road Ural Car and a hike accompanied by Russian counterparts from the Vinogradov Institute of Geochemistry and local guides and horses to assist in equipment transport. Once at the field site, the team wild camped, hiking to and from the study lakes each day. Two inflatable rubber boats were used to access the lakes and long and short cores were extracted from two lakes – Kascadnoe-1 and Khikushka. A Wimbledon corer was used to extract short cores and a handheld percussion corer was used to extract long cores. Once the cores were returned to Irkutsk, the Kascadnoe-1 core was selected for subsampling in the Institute of Geochemistry laboratories and the team began the preparation of the subsamples necessary to produce microscope slides.

Funding sources: DIMA Project, Newcastle University Expeditions Committee, Sonia Stonehouse Expedition Fund, Royal Geographical Society, Gilchrist Educational Trust and Mount Everest Foundation

Project supervisor: Dr Maarten van Hardenbroek

James English, David Warnes, Megan Picken and Harry Williams
BSc (Hons) Geography / BSc (Hons) Physical Geography
Newcastle University Russia Expedition 2019: Reconstructing environmental conditions in the Sayan Mountains, Siberia, Russia.
Acute Lymphoblastic Leukaemia (ALL) is the most common cancer in children. IAMP21 is a high-risk subgroup of B-cell ALL, where patients are three times more at risk of a tumour relapse. Subsequently, reliable detection of this subgroup can enable the intensification of chemotherapy and future targeted treatments.

This project utilised machine learning, a form of artificial intelligence, capable of detecting subtle patterns to classify patients with IAMP21 from non-IAMP21 B-cell ALL patients. We used machine learning on gene expression-based data from 59 bone marrow patient samples to separate our IAMP21 patients. Through gene expression visualisation, gene selection and cross-validation, we identified a seven gene Chromosome 21 group that could detect IAMP21 patients with a perfect level of accuracy and specificity. This supports the role of machine learning and gene-expression based markers as a supportive diagnostic tool in clinical decision-making processes.

**Funding source:** Newcastle University
**Project supervisor:** Dr James Harriman-Smith

Love Letters between a late nobleman and the famous Mr Willem van de Velde (1723). As a starting point, this project demonstrates that, far from being the product of Queer print culture, pornography is far from being the product of Queer print culture, it was likely the result of a smear campaign against deceased government ministers. Love Letters is a text so shrouded in subterfuge that it will never be fully understood.

**Funding source:** Newcastle University
**Project supervisor:** Dr James Harriman-Smith

Kryptos, a sculpture commissioned by the CIA, contains 1736 characters of a seemingly incoherent nature. Since the installation of the sculpture in 1990, there have been many attempts by professional and amateur code-breakers, alongside enthusiasts, to decipher the hidden information within the sculpture. It has been confirmed by Jim Sanborn, the artist behind the sculpture, that only the final 97 characters remain unsolved. With 867 of the 176 characters acting as a key, Advancements in technology since 2000, namely computing power, has meant that computers could be vital to making a breakthrough with the currently unsolved characters of the sculpture. This project aims to use modern computing and mathematics to automate aspects of already accepted paper solutions to parts of the sculpture. Furthermore, there will be unique attempts to solve the final 97 characters with careful consideration being given to clues Sanborn has released over time.

**Funding source:** Newcastle University
**Project supervisor:** Dr Stuart Hall

The Bacterium Staphylococcus aureus, more commonly known as MRSA, colonises mammals and is frequently associated with skin infections. To colonise a host and cause disease, S. aureus must compete with the residing microbes. This may be achieved via the secretion of toxins which target other microorganisms. S. aureus contains a Type VII Secretion System (T7SS), which has been shown to secrete 2 toxic substrate proteins to achieve such goals, however, further T7SS-dependent proteins mediating pathogenicity must exist. The genes EsxB, EsxC, and EsxD each encode a protein secreted by the T7SS, however, their functions are currently unknown. This project aims to determine whether EsxB, EsxC, or EsxD are toxic to E. coli when produced in 2 different compartments of the cell.

**Funding source:** Society for Applied Microbiology
**Project supervisor:** Professor Tracy Palmer

My project explores the relationship between orientalism and femininity in 18th and 19th century Britain using Chinese wallpapers as a medium to illustrate this link. As a starting point I am using a catalogue of wallpapers displayed in National Trust properties throughout England to determine how Chinese wallpaper designs were adapted to the expectations of Western consumers. The assumption of the Orient as a feminised place is suggested through the design motifs and placement of the papers in ‘domestic’ private spaces. London-based wallpaper sellers also marketed the wallpaper specifically to women via business trade cards, therefore, contributing to the overall association of women and the Orient. The central aim of the project is to ask how far the Orient was ‘feminised’ for, and by, the elite female consumer.

**Funding source:** Newcastle University
**Project supervisor:** Dr Jane Webster
The aim of this project was to investigate methods to synthesise and characterise nanomaterials using AgI/AgI/CuI salts with Thio-Nucleobases, Thio-Nucleosides, Nucleobase, Nucleosides and Nucleotides. The most effective method of characterisation for coordinated Metallo complexes is X-ray crystallography, providing detailed information on the interactions involved in the bonding of the complex. Hydrothermally and Solvothermally reactions were investigated to attempt to crystallise insoluble complexes such as 6-thioguanine coordination compounds, under extreme pressure caused by the expanding solvent above its boiling temperature in a confined Teflon container by the autoclave. Many attempts resulted in failure to obtained crystalline material, a reaction of Tetraakis[2-chloro-1,3,5-triazine](tripletriphosphor) tetrafluoroborate in acetonitrile at solvothermal conditions resulted in red and yellow diamonds (small crystalline material). The use of Atomic Force Microscopy showed usual 2D plates. The use of a confined Teflon container by the autoclave. Many attempts resulted in failure to obtained crystalline material, a reaction of Tetraakis[2-chloro-1,3,5-triazine](tripletriphosphor) tetrafluoroborate in acetonitrile at solvothermal conditions resulted in red and yellow diamonds (small crystalline material). The use of Atomic Force Microscopy showed usual 2D plates.

Netanya Aarabi Canagarajah
MBBS
Does mitochondrial dysfunction in skeletal muscle stem cells drive sarcopenia in people ageing with HIV?

If we can better understand what makes us age, we may be able to slow the onset of much ill health. Muscle is very important for healthy ageing. Healthy muscle requires tiny ‘batteries’ in our cells called ‘mitochondria’. We already know that these mitochondria are damaged in some people living with HIV. However, we also know that those people with HIV are fatter than expected. Muscle also needs ‘stem cells’ to repair itself, and these stem cells also need healthy mitochondria.

In this project I will find out whether muscle from people with HIV has damaged mitochondria in the stem cells. I will then ask whether this is related to reduced muscle mass.

I expect this work will help us to understand why some people with HIV are frail. In the future this may lead to new treatments to improve the long-term health of these patients.

Funding source: Newcastle University
Project supervisor: Dr Martin Dade-Robertson

Ian Rye-Carriegas
BSc (Hons) Physics
Investigating the effects of solar intensity on ionic conductivity in lead iodide perovskite thin films.

Sunlight, or solar energy, is a clean, renewable source of energy that is extremely important at this moment in time. As climate change is accelerating, demand for energy is rising and non-renewable energy resources are running out. However, it can be expensive to manufacture high efficiency solar panels that can tackle this problem. A new type of material called a perovskite can be used to make highly efficient solar panels very easily and at a fraction of the cost. In perovskite solar cells, unlike standard silicon solar cells, perovskites contain ions which hinder the performance of the solar panel and leads to JV hysteresis. Over the course of 8 weeks I will set-up and programme instruments to measure how the ions affect the efficiency and conductivity across low currents with varying solar intensity.

Funding source: Newcastle University
Project supervisor: Dr Pablo Docampo

Stephen Chan
BSc (Hons) Biomedical
Comparison of matrix deposition and biomechanical responses in tissue engineered cartilage model of musculoskeletal ageing

Pseudoachondroplasia (PSACH) is characterised by short stature, joint instability and early onset osteoarthritis, and results from mutations in cartilage oligomeric matrix protein (COMP). PSACH cell and animal lines are often used to model premature musculoskeletal ageing.

2% agar constructs seeded with ATDC5 chondrogenic cells transfected with wild type and T5BM mutant COMP-GFP were cultured in chondrogenic medium supplemented with ITS, ascorbic acid, BMP7 and TGF, and compressed for 2 weeks at 30mm/day at 10kPa 0.33Hz to mimic physiological compression of cartilage.

Gene expression of chondrogenic markers (Col2, Col10, Acan and Ihh) increased in ATDC5 cells upon compression, whilst Col1 (dedifferentiation) and Sox9 (stem cell marker) expression decreased. Interestingly, levels of Col1, Col2, Acan and Ihh expression increased upon compression of wild type COMP-GFP ATDC5 whilst Col1 and Sox9 expression decreased. Compared with wild type, expression of all markers was decreased in T5BM COMP-GFP constructs upon compression, indicating cell stress.

Funding source: Newcastle University
Project supervisor: Dr Katarzyna Piog

Jeremy Jie En Cheong
MBBS
Evaluation of an anatomy education MOOC

This research will be performed to evaluate use of an ‘ORDER Touch’ MOOC, an online platform for learning anatomy using 3D diagrams and drawings. The aim of the MOOC is to teach students how to draw the 3-dimensional anatomical and biological structures of the human body on paper. Through this method, students will be able to use their multisensory observational skills such as sight, touch and manipulation to help them understand, remember and visualise anatomical structures. This research will involve the design of an approach to evaluate the effectiveness of the MOOC as a supplement to the current anatomy teaching in Newcastle University and beyond.

Funding source: Newcastle University
Project supervisor: Dr Iain Kennan

If you can better understand what makes us age, we may be able to slow the onset of much ill health. Muscle is very important for healthy ageing. Healthy muscle requires tiny ‘batteries’ in our cells called ‘mitochondria’. We already know that these mitochondria are damaged in some people living with HIV. However, we also know that those people with HIV are fatter than expected. Muscle also needs ‘stem cells’ to repair itself, and these stem cells also need healthy mitochondria.

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Funding source: Newcastle University
Project supervisor: Dr James Knight
I am exploring the gentrification that occurs in major student cities. With 1 in every 15 homes in Newcastle being a student property and Durham University seeing an increase of 7,500 students in 15 years, I want to focus on the way cities with a large student population are being changed as a result of an increased influx of students. I will gather data on how the composition of buildings and local shops have changed and look at what problems this brings, also using interviews. I also want to shed light on the impact new housing accommodation has on city centre areas, especially those previously occupied by lower income residents living in council estates. I will link these phenomena to other ways gentrification affects areas to draw a conclusion on how cities are being transformed and made more or less attractive for families, elderly, young professionals and other types of residents.

**Funding source:** Newcastle University

**Project supervisor:** Dr Sara Maioli
Sarah Ludlow, BSc (Hons) Physiological Sciences
Collection, analysis and presentation of ‘real life’ physiological data for use in teaching, engagement and outreach activities to promote Newcastle University and enhance our student’s learning.

Members of the Biomedical Faculty are trekking to Everest Base Camp over the summer and myself and the team will be investigating the physiological effects of altitude including heart rate, blood pressure, O2 saturation, haematocrit, VO2 max, blood lactate and other cognitive functions. We are already in the process of taking baseline data and will analyse the data produced from the trip and use this to produce materials for outreach and student engagement.

This will include relevant literature review and individual research, to aid interpretation of the data we will collect whilst using relevant available technology.

Funding source: Newcastle University
Project supervisors: Dr Beth Lawry, Dr Alison Howard and Dr Michele Sweeney

Charlotte Cummings, MChem with Hons in Chemistry
Developing new OLED technology: An investigation into Excitation-Plasmon coupling

The aim of this project is to investigate the enhanced light emission of a host-guest material, which consists of an iridium based dye and a Gold nanoparticle embedded into a porous silica host. During this project I will first synthesise the host-guest material and then investigate how their excited states interact resulting in enhanced light emission. This research is of importance in the technology industry as it has applications in light emitting devices used in everyday life such as OLED televisions/monitors and general lighting. The use of an iridium based dye rather than small organic molecules or polymers which are currently used in OLED devices will massively improve the quantum efficiency of the light emission. The ability of the Iridium dye and Gold nanoparticle to produce enhanced and more efficient light emission is of importance and could be used to improve OLED devices in the future.

Funding source: Royal Society of Chemistry
Project supervisor: Dr Fabio Cucinotta

Brigid Davidson, BSc (Hons) Biomedical Sciences
Memorising chromatin structure in mitosis

For cells to divide correctly, DNA in the form of chromosomes must separate equally into the two daughter cells so that they are both identical to the mother cell. If this occurs incorrectly, then cells will either die or they may behave abnormally (e.g. causing cancer development or Down Syndrome). Haspin is an enzyme which modifies chromosome behaviour during cell division to ensure correct separation of chromosomes. Here, we hypothesised that a chromosome protein (Cohesin, SCC1) brings Haspin to the right place on chromosomes. Therefore, our aim was to see how Haspin was affected when SCC1 is no longer present in cells. To do this we used specific cells which were engineered to destroy SCC1 when exposed to a plant hormone. The results showed that Haspin activity was affected when SCC1 was no longer present. These findings help us understand what might go wrong during cell division.

Funding source: Newcastle University
Project supervisor: Professor Jonathan Higgins

Isabella Davies, MBBS
Improving Health Promotion for Childhood Cancer Survivors in Long-Term Follow-Up Care

My project is focused on lifestyle advice given to childhood cancer survivors (CCSs) at their yearly long-term-follow-up appointments, which impacts on their quality of life. Due to the aggressive nature of cancer treatment, their risk of developing health problems, such as diabetes and heart disease, in the near future is greatly increased despite their young age. It is therefore recommended that survivors receive good quality lifestyle advice. However, it is not clear what survivors think about receiving lifestyle advice at the clinic and whether they feel they even need it. The project aims to interview CCSs, discussing their views and experiences of receiving advice, as well as exploring their need for it. The project has allowed insight into their preferences on how this advice can be given effectively. Ultimately, this should begin to give us a better understanding of how healthcare professionals should approach health education of this patient group.

Funding source: Newcastle University
Project supervisors: Dr Morven Brown, Professor Roderick Skinner and Professor Linda Sharp

Jake Elliot, BSc (Hons) Physiological Sciences
Building a library of engagement and teaching material based on ‘real life’ physiological data to promote Newcastle University and enhance our student’s learning

To encourage enthusiasm and engagement in our students, we need to involve them in the process of collaborative learning and build a library of teaching resources that are ‘student friendly’. We recently began involving stage three physiological sciences students in outreach activities to the public and we aim to build on this by developing a library of engagement material (including infographics, videos, worksheets, activities etc.) designed and produced by a placement student. We will use these resources for public outreach, raising the profile of Newcastle University, and in-house for teaching across stages 1 and 2 of our degrees.

The focus of the material will be ‘real life’ data, showing the impact of environmental changes specifically altitude, on physiological function. Our team is currently working with first year students to collect physiological data from a group of volunteers who are trekking to Everest Base Camp in April 2019.

Funding source: Newcastle University
Project supervisors: Dr Alison Howard, Dr Beth Lawry and Dr Michele Sweeney

Rowan English, BA (Hons) Archaeology
Buried antiques: examining the reuse of objects and landscape features in Anglo-Saxon period burials.

My project has explored the presence and significance of ‘antique’ objects found in Anglo-Saxon period burial contexts in Northumbria. The project has focused on burials dated to the period of conversion to Christianity and aimed to establish a link between the presence of reused objects and the location of Anglo-Saxon burials near Roman and prehistoric landscape features. The project also aimed to record any patterns or common themes in the practice of the reuse of material culture. In terms of the style and material of objects, and chronology of the reused material. The project has also attempted to highlight the role women played in religious conversion.

Funding source: Newcastle University
Project supervisor: Dr Ashley Coutu

James Davidson, BSc (Hons) Earth Science
The Daily Grind: Glaciers and ice sheets as pressurized mechanochemical reactors

When a Flint is struck against a Flint, a spark is formed. This is produced by broken bonds (free radicals) on the fractured flint surface reacting with the atmosphere. Under glaciers, similar ‘mechanochemical’ reactions take place when rocks embedded in the glacier beds grind over bedrock and sediment, reacting with liquid water to split water to produce hydrogen gas and oxidents. Experiments were carried out adding oxygen free water to freshly crushed quartzite (a common rock of West Antarctica). Significant concentrations of hydrogen peroxide (40 nmol/g quartzite) were generated within the first hour of reaction, and concentrations polyvalent stable for at least 200 hours. This contrasts with previous experiments with oxygenated water, where hydrogen peroxide was quickly lost from solution. These results indicate that rock crushing under oxygen free conditions can facilitate the production of hydrogen peroxide, which can provide a source of oxidents to potentially help support subglacial life.

Funding source: Newcastle University
Project supervisor: Dr Jon Telling

Zoe Dunnett, BSc (Hons) Biology (Ecology) Conservation
Determining and comparing levels of herbivory across planted, ecologically restored and pristine mangrove forests in Northern Sulawesi, Indonesia

Mangrove forests are unique coastal wetlands that sustain millions of people globally. They contribute to the survival and welfare of those people through protection against coastal erosion, provision of food and materials, and through filtering of waterborne pollutants. Despite this, mangrove suffer significant destruction, with more than 20% of their global cover lost between 1980 and 2000. In particular, Indonesia has lost 40% of mangrove cover in the last three decades. Recently, considerable effort has aimed to restore mangroves, but the success of these schemes are limited. This project aims to determine and compare the level of herbivory across planted, ecologically restored and pristine mangroves in Northern Sulawesi. Leaf damage of 288 leaves was assessed using the LeafByte app. In conjunction with counts of scrapes and chews. The results have the potential to advise future schemes on the best practice for restoration.

Funding source: Newcastle University
Project supervisor: Dr Darren Evans
Heart defects are one of the most common birth defects. The genetic cause of these has been established in some cases but there are still many unanswered questions. In order for cells to maintain their normal function, they often have to recycle or destroy abnormal components within them, this is known as autophagy. We believe that this process is essential for the heart to develop correctly during embryogenesis and altering the levels of autophagy, can affect how those cells behave, consequently leading to abnormalities in the heart as it develops. By using mouse models to knock-out the function of one of the genes in the autophagy pathway, we hypothesise that the embryos will develop heart defects and we can start to pinpoint in which of the cell types required for the development of the heart this process is paramount. This work will provide future candidate genes for congenital heart defects.

Funding source: Newcastle University
Project supervisor: Dr Helen Phillips

Sarah Goode
BA (Hons) Modern Languages, Translating and Interpreting
Mapping the Global Translations of Simone de Beauvoir’s Le Deuxième Sexe (1949)

Simone de Beauvoir’s Le Deuxième Sexe (1949) is a fundamental source of philosophical feminist knowledge, providing concrete evidence of women’s societal oppression and delineating the constructed nature of gender. Its translation into more than forty languages to date has contributed to shaping knowledge in discourses on gender and sexuality, and the centrality of Beauvoir’s text is testament to its continued relevancy for feminist thought and activism in a multitude of global contexts. To date, important scholarship on the translation of this cornerstone text into specific locales exists, yet, in isolated pockets.

The aim of this study will be to map the transnational and transgenerational dissemination of Beauvoir’s Le Deuxième Sexe by locating details of all existing translations. Collating details such as translation dates, translator profiles, publishers, front cover images and whether a full or partial translation exists, this project will seek to map how Beauvoir’s text has travelled globally.

Funding source: Newcastle University
Project supervisor: Dr Pauline Henry-Tierney

Cellular metabolism is the set of chemical reactions that occur in living organisms in order to maintain life. Accurate transcription of our genes is essential for cell viability. Alterations to the transcriptional program is feasible and well accepted by participants.

Funding source: Newcastle University
Project supervisor: Dr Mario Siervo

Jack Griffiths
MPhys Physics
Metastability in a prototype atomtronic circuit

Quantum technology is an area of intense interest for companies and governments as they aim to invest in our future communications, computing and sensing technology. The proposed technology is far more advanced than we currently use today.

Atomtronics — an emerging area of ultra-cold, atomic physics — exploits the charge neutrality of atoms to create circuits analogous to those found in electronic systems. Some atomtronic devices exploit the Bose-Einstein condensate state of matter of ultra-cold, atomic gases — as their basis. The area is of theoretical and experimental interest; the BEC was the subject of the 1997 and 2001 Nobel Prize in physics.

In this work, a theoretical model of an experimentally realised state-of-the-art quantum sensor by Los Alamos National Laboratory was simulated. The theoretical model successfully produced results which corroborated with the experiment. This model, fundamentally, provides a proof of principle atomtronic sensing device — the “atomic SQUID”.

Funding source: Newcastle University
Project supervisor: Professor Nick Proukakis and Dr Tom Bland

Sophie Graham
MBBS
Optimisation of viral transfection in rodent cortical cells

Epilepsy is a neurological disorder causing recurrent seizures, due to abnormalities in sudden bursts of electrical activity in specific areas of the brain. Optogenetics is a recently developed technique that has potential to be applied as a therapy. Small devices, called optodrives, deliver pulses of light to affected cells and simultaneously record their activity. To do this, a virus is injected into the cells containing genes to make them responsive to specific wavelengths of light at the right time could alter cell activity and suppress seizures.

Viral infection of target cells has previously been demonstrated. This project investigated the extent of gene expression in cells infected with three different types of virus, at varying concentrations, to identify any particularly efficient vector. Rodent cortical cells were cultured, infected, and visualised using fluorescent microscopy. Subsequent quantification highlighted the success of infection and any resultant damage, with a view to optimise the technique.

Funding source: Newcastle University
Project supervisor: Dr Gavin Clowey

Leo Nekli Gopfert
Combined Honours (English Literature and Japanese)
Refugees in Tokyo

Research into the lives and stories of refugee applicants in Tokyo. Understanding, by conducting video interviews, the complex legal and personal situation of asylum seekers in Japan, a country with by far the lowest refugee acceptance rate of any OECD country. Allowing refugees to narrate their own experience on film provides an opportunity to understand the areas of focus which they themselves deem significant.

Funding source: Newcastle University
Project supervisor: Tina Ghavari

Chloe Frost
MSci Biomedical Sciences
Investigating how the dysregulation of autophagy, leads to abnormalities in heart development and disease

Heart defects are one of the most common birth defects. The genetic cause of these has been established in some cases but there are still many unanswered questions. In order for cells to maintain their normal function, they often have to recycle or destroy abnormal components within them, this is known as autophagy. We believe that this process is essential for the heart to develop correctly during embryogenesis and altering the levels of autophagy, can affect how those cells behave, consequently leading to abnormalities in the heart as it develops. By using mouse models to knock-out the function of one of the genes in the autophagy pathway, we hypothesise that the embryos will develop heart defects and we can start to pinpoint in which of the cell types required for the development of the heart this process is paramount. This work will provide future candidate genes for congenital heart defects.

Funding source: Newcastle University
Project supervisor: Dr Helen Phillips

Thomas Foy
BSc (Hons) Biomedical Sciences
Investigating the role of INO80 chromatin remodeler in metabolism in S.cerevisiae

INO80 is a chromatin remodeler that has been shown to play a role in the regulation of metabolism. This project will investigate the potential roles of the INO80 chromatin remodeler enzyme in regulation of the transcriptional response to metabolic changes.

Funding source: Newcastle University
Project supervisor: Dr Manolis Papamichos-Chrkonakis
DNA replication initiation is essential for genome duplication. During replication initiation all cells must load helicases at origins to facilitate DNA unwinding for DNA synthesis. Despite the universal importance of helicase loading, crucial aspects of the process in bacteria are poorly understood. In particular the physiological relevance of a recently proposed interaction between the helicase loader protein and single-strand DNA, based on cryo-EM structures in vitro, is unclear. The goal of this proposal is to address this question in vivo using the genetically tractable model system of Bacillus subtilis. The approach employs new tools developed in the Murray lab that allow the construction and characterization of mutations within the essential helicase loader protein. This research project will extend our fundamental understanding of the bacterial DNA replication initiation mechanism and it will determine whether the proposed loader ssDNA interface is a feasible target for drug development.

Funding source: Newcastle University
Project supervisor: Professor Michael J. Waring

My literature project this year is about researching Antibody drug-conjugates and their use in cancer treatment, this has sparked my interest in this field, and so I have been reading further into the chemistry behind different cancer treatments. From this, my supervisor and I sat down to discuss which project would allow me to look further into the chemistry within an 8 week project. We discussed a project about protein labelling, inspired by my antibody drug conjugate work, which led to the project on using covalent version of fragilies to map protein interactions.

Fragilies are a set of minimal molecules expressing common molecular features that are necessary for molecular recognition of a ligand by a biological macromolecule e.g. proteins. I will design and synthesise covalent fragilies containing functional groups with “drug-like reactivity” displayed on halogenated fragments, then the approach will then been applied to novel proteins of relevance to cancer.

Funding source: Newcastle University
Project supervisor: Dr Jinju Chen

Mitochondrial damage has been implicated in a wide variety of diseases, including Parkinson’s and Alzheimer’s.

Mitochondria is the part of a cell that produces its energy, in doing so it gives the outer membrane a negative charge. If this charge is altered - due to mitochondrial damage - some compounds are less able to cross the membrane. This can be seen using medical imaging techniques. Therefore, there is potential to detect problems early, without invasive surgery.

In this project, I carried out a multiple-step synthesis of a new, fluorescent compound. This compound contained phosphorus with a positive charge. The positive charge is highly selective towards the negative charge of mitochondrial membranes.

The results of my project have aided the research group by narrowing the search to find which properties give the best performance in mitochondrial imaging.

Funding source: Newcastle University
Project supervisor: Dr Lee Higham

Facial Recognition Corporate innovation is the process of an identity implementing new innovation opportunities into their business model. As time passes, identities adapt their strategy to the future of work such as the evolution of technologies.

This research will focus on how the country, China, uses facial recognition technology in 4 perspective, education, purchases, border controls and surveillance. With data on the faculty recognition camera usage, the prediction usage in the future.

Question is how China uses the facial recognition, how the future of work, may reshape the way surveillance and different department operates.

This project will work on finding out the direction of how facial recognition technology improves China in four perspective: surveillance, border controls, purchases and education perspective and also discuss the effectiveness, limitations and challenges with the facial recognition technology evolution.

Funding source: Newcastle University
Project supervisor: Dr Yang Zhao

Optical Coherence Tomography offers several opportunities for a vast number of applications, including the use of imaging to deduce mechanical properties of tissues. Since the introduction of Optical Coherence elastography in 1998, the field has witnessed a great acceleration in research and development in the recent years. However, a vast area of applications is yet to be explored. This project entails the software development for a prototype AirJet Indenter for use in Optical Coherence Elastography of Soft Matter. The Air Jet Indenter allows for noncontact, pressure-controlled indentation of soft matter. The system employs an Arduino microcontroller for control of the system and data collection, interfaced with MATLAB software for data processing and plotting. The Tested system collects and plots data at a frequency of 60Hz. The system promises broad applications in noncontact tissue assessment and characterisation.

Funding source: Newcastle University
Project supervisor: Dr Jinju Chen

The Li4H research group has developed new fluorescent compounds which are highly selective for imaging mitochondria, on account of their positive charge, which attracts them across the organelle’s negatively charged membrane. Importantly, if the charge on the membrane is altered, due to mitochondrial damage, the probes ability to cross the membrane is perturbed and this can be evaluated by flow cytometry – thus the accumulation of the probes in the mitochondria could be used to assess whether there is evidence of dysfunction or not. As mitochondrial damage has been implicated in a wide variety of diseases, including Parkinson’s and Alzheimer’s disease, the potential to detect problems early on without invasive surgery is very attractive.

Over the 8 weeks I worked with many bodily complexes including phosphonium salts, gained lab experience and improved upon basic lab techniques.

Funding by: Newcastle University
Project Supervisor: Dr Lee Higham
The most common childhood cancer in the UK is leukemia and the main subtypes are acute lymphoid leukemia and acute myeloid leukemia. The aim of the project was to investigate how incidence rates differed over time with age (up to age 25 years), sex and socioeconomic status (SES). The project reviewed relevant published literature in national and international regions and analysed patient data from the Northern Region Young Persons' Malignant Disease Registry. The registry data findings revealed AML incidence rates decreased from 1971-2012 in the Northern region. ALL and AML had higher incidence rates for males in UK, including Northern region, and specific international regions. ALL incidence rates decreased with lower SES. The Greaves hypothesis potentially explains why a lower SES can be advantageous, as it proposes that more affluent children are less likely to have a primed immune system due to better hygiene, thus fewer exposure to infectious agents.

**Funding Source:** Newcastle University

**Project supervisor:** Dr Richard McNally

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The Mediterranean dietary pattern has attracted considerable attention in recent years, due to potential beneficial effects on cardiovascular, metabolic and in the context of the prevention of Dementia, cognitive health. Prior to the start of the research, there has been a multi-domain intervention to increase the intake of Mediterranean Diet, characterised by the Mediterranean Diet Score (MEDAS), over a 24-week period in UK adults at above average risk of dementia.

The objectives of this research are to, firstly, assess the feasibility and acceptability of the aforementioned intervention, and secondly, to assess the effects of the intervention on cognitive performance, brain function, vascular function, biochemical parameters, in order to inform their use in the main trial.

**Funding source:** Newcastle University

**Project supervisor:** Professor John Mathers

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Urinary tract infection (UTI) in which bacteria infect the bladder and cause pain is a common infection with more than 150 million cases reported annually. Treatment involves taking antibiotics, but the over-use of antibiotics has caused antibiotic resistance making some UTIs very difficult to treat.

Clinical data suggests that some patients suffering UTIs carry bacteria in their urine called Proteus mirabilis and that carriage is associated with reduced numbers of infections. The project aim was to investigate these bacteria.

The bacteria were isolated from patient urines and engineered so they fluoresced and could be easily studied. Data in the laboratory showed they did not attach to or invade bladder cells, indicating why they did not cause infections. However, they were able to outcompete and kill other known uropathogens. These data suggest that establishing a stable therapeutic urobiome may be alternative treatment to antibiotics in managing patients suffering rUTIs.

**Funding source:** Wellcome Trust

**Project supervisor:** Dr Judith Hall

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**Project supervisor:** Dr Judith Hall

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**CRISPR/Cas9** is a powerful technique allowing scientists to change the sequence of the DNA in genes in cells. Using this approach, the Perkins lab have engineered cancer cell lines to mutate a specific amino acid of the NF-kB2 (p100/p52) gene, an effector of the ‘non-canonical’ NF-kB pathway. This amino acid, serine 222, is modified in cells by phosphorylation and can regulate DNA binding by the active, p52 form of this protein. It has been shown that the ‘non-canonical’ NF-kB pathway, can become aberrantly active in many types of cancer, where it can function as an important regulator of cell proliferation. I will investigate the effects of mutating the serine 222 (S222) phosphorylation on gene expression and cancer cell proliferation regulated by p52. My experiments will establish the importance of this phosphorylation site as a regulator of NF-kB activity, providing insights into how p52 activity is regulated in cancer cells.

**Funding source:** Biochemical Society

**Project supervisor:** Professor Neil Perkins

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**Project supervisor:** Dr Judith Hall

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**Order of NF-κB p52 Ser222 phosphorylation**

When the motor pathways in the brain and spinal cord are injured, movement can become impossible or very restricted. The focus of our research is how we can strengthen the remaining connections to aid recovery. A loud startling sound preferentially activates the Reticulospinal Tract (RST), one of the motor pathways controlling our muscles. The RST can also be activated using non-invasive brain stimulation methods, such as transcranial magnetic stimulation (TMS). By pairing these two inputs to the RST with the right timing, we aim to modulate RST function. Our results indicate that repeated pairing of a startling sound with TMS induces a long-lasting facilitation effect in motor responses in the biceps muscle. Importantly, this facilitation lasts for at least 30 minutes after the intervention and is absent in distal hand muscles. We therefore conclude that this may reflect enduring changes in the excitability of the RST specifically.

**Funding sources:** Newcastle University and International Spinal Research Trust

**Project supervisor:** Professor Stuart Baker

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**Funding source:** Wellcome Trust

**Project supervisor:** Dr Judith Hall

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**Isabelle Kenningham**

**BA (Hons) Fine Art**

**Drawing as Activation and Recovering the Family Photograph**

My work this summer has revolved around how drawing can be used as a tool to explore images in archives, with a specific focus on photographs of families. Using the archives at the Philip Robinson Library, Keighley Local Studies Library, and the Tyne and Wear Archives I created a series of drawings from family photographs that have been archived and engaged in analysis and reading around why these images might have been archived as opposed to others. My research culminated in an examination of an album of images of tenant families on the country estate of Wollington Hall, Northumberland in 1928 and how their lives were shaped by the politics of their landlord, Sir Charles Philips Trelving, a Liberal and Labour MP. This drawings and writing made around the tenants are to be exhibited within the Fine Art department this semester.

**Funding Source:** Newcastle University

**Project Supervisor:** Professor Christopher Jones

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**Developing a new tool for allowing the quantification of fluxes of woody debris and macro-plastics on the surface of river channels in the UK and in Chile.**

Datasets have been collected at 15-minute intervals over the past 12 months. Through analysing these datasets, it was possible to determine the river channels with the highest quantity of macro-plastics and woody debris. For this tool to be developed, objects from videos were manually identified and labelled on a computer as plastic, wood or leaves and used to create an algorithm that recognises these items in other videos. The most common macro-plastic items identified were traffic cones and footballs. This technique could be utilised in the future as part of flood management. Further labelling will have to be carried out in order to make the algorithm more accurate. Obtaining knowledge on transportation of macro-plastics in rivers could inform future studies on this topic.

**Funding source:** Newcastle University

**Project supervisor:** Dr Matthew Perks
My project involved designing and investigating the population dynamics and migration patterns of humpback whales at their breeding grounds in Mozambique. The combination of sighting data and vocalisations allows analysis of their population dynamics, such as breeding pairs and sex ratios and comparison of the data collected to previous years to determine if these have changed over time. Song characteristics are important when considering migration patterns in humpback whales, as the song similarity between other sub-stocks (e.g. C2, Madagascar) can give an indication of interaction e.g. immigration and the pathways they take during their long migrations. The scientific framework surrounding this species in Mozambique is currently under supported, so the data collected will allow me to contribute significantly to ongoing research. Furthermore, with this information, Gunjata Bay has the potential to become a Marine Protected Area, meaning one of the most important humpback breeding grounds in the world will be protected for future generations.

**Funding source:** Newcastle University

**Project supervisor:** Dr Sara Marsham

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This research project aims to present an accessible approach to concepts in post-tonal music thus helping local audiences gain a deeper understanding of musical experiences. Utilising individual case studies in the works of Schoenberg and Webern, it would be possible to distill post-tonal concepts down and utilise those messages to enrich our consideration of musical communication. The research would be synthesised as an interactive talk and concert event, allowing collaboration with local concert venues. During the event the audience would be encouraged to reconsider western musical conditionings and view music itself in a new light. Success would be measured through means of a psychological questionnaire, designed by myself under the guidance of my project supervisor. This would provide data to determine the success of my analytic method and become part of a reflective examination of the power of post-tonal music when condensed into an academic poster.

**Funding source:** Newcastle University

**Project Supervisor:** Dr Paul Fleet

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Cervical cancer is characterised by abnormal cell growth in the lining of the cervix. These cancerous cells have the potential to spread to other parts of the body, thus making it a life threatening cancer. Cervical cancer is caused by infection from human papilloma virus (HPV), making it particularly suitable for immunotherapy. Immunotherapy utilises body’s own immune system to control and eliminate infections. However, in order to fight cancer, a large number of immune cells is needed. One way to achieve that is through genetic engineering to give a type of immune cells, called CD8+ T cells, the specific T cell receptor (TCR) which will recognise and kill abnormal cells. In this study, the technique of transferring the TCR into target cells was developed. The target cells used were the mouse BW DBA/2J2 cell line that normally TCR negative. Results show that donor TCR can be successfully transferred to mouse T cells and the next step would be to implement this technique on human cells.

**Funding source:** Newcastle University

**Project supervisor:** Dr Lei Huang
**Philippa Louise Greenhalgh-Mayell**
**MSc Biomedical Sciences**
Validating a Quantitative Readout of ER-stress Suitable for High-Throughput Drug Screening

Genetic Skeletal Diseases (GSDs) affect the development and homeostasis of the skeleton and result primarily from pathologically endoplasmic reticulum (ER) stress caused by the retention of mutant proteins within the ER. Currently there are few therapeutic interventions available. Studies have shown that the anti-epileptic drug Carbamazepine (CBZ) recovers cellular homeostasis and bone growth in Multiple Chondrodysplasia Type Schmid (MCD) that results from mutations in Collagen X. Despite this, Carbamazepine cannot be used in other GSDs that result from mutations in other extracellular matrix proteins. We have successfully validated an assay to monitor ER stress in vitro using Luciferase technology. For proof of concept, we showed that using the reporter plasmid ER stress can be monitored in cells expressing mutant Collagen X and this stress is reduced with CBZ. Future experiments will therefore use this successful reporter assay to perform high throughput drug screening to identify treatments for other GSDs caused by pathogenic ER stress.

**Funding Source:** Newcastle University

**Project supervisor:** Professor Nicola Curtin

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**Ethan McGuigan**
**MEng (Hons) Chemical Engineering**
Gas Marble Production

The production of liquid marbles, a droplet encapsulated in hydrophobic powder, has been well researched since their discovery in 2001. Recently, a similar phenomena was observed by Timounay when a volume of gas was encased in microparticles using a method analogous to blowing a bubble. This new technology can have significant implications for the future of gas storage, particularly because the strength of gas marbles is observed as tenfold that of their liquid counterpart. Their low permeability suggests potential in hydrogen storage for energy fuel cells and carbon capture methods. During my project, I succeeded in producing gas marbles with PMMA particles and a surfactant solution. I concluded that the hydrophobicity of the particles is critical to gas marble stability. Too low and the raft cannot be formed, too high and the particles slide off the bubble. In the future, further development in potential for gas storage should be examined.

**Funding Source:** Newcastle University

**Project supervisor:** Dr Steven Wang and Dr Vladimir Zivkovic

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**Abigail Rebecca Middlemass**
**BA (Hons) English Language**
An ethnographic study covering teaching of literature to adults learning English as a second language.

A key aim of the study was to use participant observation to look at how a group of Blurmers whose first language was Farsi, engaged with the Magic Mondays literature collection. The collection was put together by Professor Martha Young-Scholten and is designed to be used by adults learning English as a second language with low literacy levels in their second language. The study took place for two hours each week for ten weeks. A Common European Framework of Reference was used to estimate the learners’ literacy levels, to see if literacy levels influenced individuals’ choice of literature or method of engagement.

Additional participant data was collected to gain an overall picture of interactions between group members. The study was useful in gauging which factors encouraged the learners to take part in pleasure reading and how their interactions regarding the literature may impact literacy skills, reading comprehension, and pronunciation.

**Funding source:** Newcastle University

**Project supervisor:** Professor Martha Young-Scholten

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**Bethany Milburn**
**BA (Hons) Archaeology**
Bound to the staff. An investigation of seiðr and Viking "witches" in the archaeological record of early medieval Scandinavia.

The concept of seiðr refers to a form of shamanic ritual practice that was found in the Old Norse cultures across Scandinavia, performed predominantly by a wise, or seeress. This practice often involved the use of a divination or seiðr staff and has been regarded as a form of "textile" or "domestic" magic. The aim of this project is to examine the archaeological evidence for seiðr, in an attempt to understand the methods of practice, and the concept of the practitioners as early "witches," including how they may have influenced the more popular image of witches we have had since the late medieval period. The investigation also involved desk-based research of the Old Norse sagas and texts.

**Funding Source:** Newcastle University

**Project supervisor:** Dr Ashley Coutou

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**Abbi Mullins**
**MChem (Hons) Chemistry**
Zinc-ing to the future: Investigating OLED materials from Zinc PMO’s

OLEDs – Organic light emitting diodes – are fast becoming the screen displays of choice in modern technology, and new emitting layer material is required to drive innovation.

By utilising classic/modern synthetic chemistry routes a modified "host-guest" material building block was synthesised as a potential OLED emitting layer. Through reacting a polymerizable silica support structure with a Zinc (ii) complex. The expected transferred property given to the silica-Zinc polymer was hoped to be used as an energy vector to a guest molecule that can be included to sit in the silica-Zinc polymer’s pores.

The product was characterised via TEM, NMR, And UV-Vis/Fluorescence spectroscopy.

**Funding source:** Newcastle University

**Project supervisor:** Dr Fabio Cucinotta

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**Mhairi McBride**
**BSc (Hons) Biochemistry**
Determination of TIAF as an indicator of replication stress for potential ATR inhibitor-induced cytotoxicity in cancer therapy

Cancer cells experience replication stress when their DNA damages these experiences defects. Replication stress is events that take place usually during DNA replication that prevent normal function and stability. To prevent the cells from continuing to divide when the DNA is damaged (as this could lead to mutations or/and apoptosis (programmed cell death)) a pathway of enzymes, the ATR-Chk1-Wee1 pathway is activated to halt the cell-cycle (creation of new cells) before mitosis (cell division/separation) occurs for DNA repair to take place. Therefore, by inhibiting this pathway, the cycle isn’t halted, the DNA isn’t repaired, and apoptosis will occur after division.

This pathway inhibition can be exploited for cancer therapy which is potentially a much safer method as only the cancer cells (those experiencing replication stress) will be targeted so a marker is needed to distinguish these cells from normal cells which is what we are focusing on finding.

**Funding source:** Newcastle University

**Project supervisor:** Professor Michael Briggs

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**George Harvey Morritt**
**MPhys Physics with Honours**
Investigating hole transport in organic semiconductor layers of perovskite solar cells

Cheap and efficient solar cells are vital to reaching the UKs target of net zero emissions by 2050. In this area perovskite solar cells are a promising emerging technology. Perovskite solar cells are made of a sandwich of different materials, each layer with their own role. A key contributor to the efficiency of the cell is how fast one of these layers, made of an organic semiconductor, is able to move a type of charge called holes. The speed the holes move at is characterised by a property of the material called mobility, the higher the mobility the faster the holes move and the more efficient the solar cell is. This project aims to develop equipment that is able to measure the mobility of holes in organic semiconductors, contributing to the development of better solar cells.

**Funding source:** Newcastle University

**Project supervisor:** Dr Fabio Cucinotta

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**Raab Mujarrab**
**BSc (Hons) Biomedical Sciences**
Role of p31Comet Phosphorylation in Regulating the Mitotic Checkpoint Silencing in Human Cancer Cells.

Accurate chromosome segregation is very vital for genome integrity in Diploid organisms. There is a regulatory mechanism in place called the spindle assembly checkpoint (SAC) that monitors this process. This regulation prevents the premature segregation of the duplicated chromosomes when the cell is dividing and will end up in cell arrest at metaphase when the right conditions are not met. A protein called p31Comet plays critical roles in this checkpoint mechanism by dissociating the Mitotic Checkpoint Complex (MCC), which then activates the anaphase promoting complex. However only a trivial amount is known about this protein. In this research, we would like to test a hypothesis which states p31Comet is regulated by protein phosphatases and kinases – master regulators of the cell cycle. Based on the preliminary data produced in the lab. The research will also consist of the analysis of the p31Comet behaviors in different human cancer cell lines.

**Funding source:** Newcastle University

**Project supervisor:** Dr Jun-Yong Huang
Aphasia is an acquired language disorder, which commonly follows stroke. Individuals with aphasia often report difficulties with spoken production, for example, finding words, producing sentences, holding a conversation. This project investigated what individuals view as most important about their spoken production, helping to inform assessment and treatment by speech and language therapists. A thematic analysis of five spoken interviews was conducted. Themes identified included ‘ability’, ‘support’, ‘social functions of speaking’ and ‘factors relating to what is important’. Within the interview, clients also completed a ranking task, rating activities along a scale from ‘important’ to ‘not important’. The relative importance of activities varied according to the severity of the client’s aphasia. The fundamental use of speech to ‘get things I need’ was important for those with severe aphasia, whereas those with mild aphasia considered ‘speaking about complex ideas’ important. This highlights the individual variability present in aphasia.

Funding Source: Newcastle University

**Elle McWilliam**
BSc (Hons) Speech & Language Sciences

Spoken production in people with aphasia: what do individuals view as important?

Mitochondria are responsible for producing the majority of the energy a cell requires to function correctly. In some diseases, mitochondria no longer function properly, which stops cells working as they should and in some cases causes them to die. One way in which we think we can stop this happening is by treating the cells with drugs that force them to make more mitochondria. If the cell has more mitochondria, even if they are not working as well as they should be, it is possible that the cell has just enough energy to function normally. The aim of this project was to determine the PM20D1 gene methylation status in DNA samples obtained from the Newcastle BS5 study. PM20D1 is potentially the first example of an inherited “epitype” and individuals inherit either zero, one or two methylated alleles of this gene. It has been shown that an individual’s PM20D1 methylation status can have important implications on their health, as high PM20D1 methylation has been linked to, for example, increased likelihood of getting Alzheimer’s disease and cancer. This study was conducted to determine whether there are any significant changes in PM20D1 methylation in the very old individuals compared to the general population. Additionally, patient data was compared against the methylation status to find any links between a specific methylation status and a disease such as cardiovascular disease and diabetes.

Funding source: Genetics Society

**Pihla Numminen**
BSc (Hons) Biomedical Sciences

The Role of PM20D1 in Longevity

**Thuvu Aruku Naidi**
MBBS (NUMed Malaysia)

Exploring the effect of compounds on mitochondrial biogenesis

**Gayathri Rajesh Nair**
BSc (Hons) Biomedical Genetics

The Role and Regulation of IncRNA NEAT1 in Vascular Inflammation

**Elliot Noble**
MBBS

Exploring the activity of deiodinase 2 in the human prostate cell niche & the implications for prostate carcinogenesis

**Gayathri Rajesh Nair**
BSc (Hons) Biomedical Genetics

The Role and Regulation of IncRNA NEAT1 in Vascular Inflammation

Endothelial cells line the inner surface of blood vessels. Inflammation causes disruption to endothelial cell function leading to disease, i.e. atherosclerosis. Factors involved in the inflammatory response of endothelial cells were studied in this project. The project focuses on the long noncoding RNA NEAT1, a biological molecule until recently considered “junk” as its function was vastly unknown, and its potential role in the inflammatory response of endothelial cells. Levels of inflammatory mediators were measured after reducing NEAT1 in endothelial cells in conditions mimicking inflammation. Results showed that levels of inflammatory mediators decreased after reducing NEAT1, suggesting that NEAT1 plays a role in driving inflammation. Our findings suggest NEAT1 has a potential role in the inflammatory response in endothelial cells. These findings allow the possibility of future work using NEAT1 as a therapeutic target to lower inflammation in human disease such as atherosclerosis.

Funding source: Newcastle University

**Elliot Noble**
MBBS

Exploring the activity of deiodinase 2 in the human prostate cell niche & the implications for prostate carcinogenesis

**Pihla Numminen**
BSc (Hons) Biomedical Sciences

The Role of PM20D1 in Longevity

The overproduction of certain peptidoglycan hydrolases, required for the correct insertion of new peptidoglycan, increases the resistance to the beta-lactam mecllamin. This resistance is mediated by the stimulus of antimicrobials, the beta-lactams and glycopeptides, but the dramatic spread of multidrug resistant bacteria makes it essential to discover new antimicrobial drugs and to better the understanding of the bacterial drug-resistance mechanisms. The overproduction of certain peptidoglycan hydrolases, required for the correct insertion of new peptidoglycan, increases the resistance to the beta-lactam mecllamin. This resistance is mediated by the stimulus of antimicrobials, the beta-lactams and glycopeptides, but the dramatic spread of multidrug resistant bacteria makes it essential to discover new antimicrobial drugs and to better the understanding of the bacterial drug-resistance mechanisms. The overproduction of certain peptidoglycan hydrolases, required for the correct insertion of new peptidoglycan, increases the resistance to the beta-lactam mecllamin. This resistance is mediated by the stimulus of antimicrobials, the beta-lactams and glycopeptides, but the dramatic spread of multidrug resistant bacteria makes it essential to discover new antimicrobial drugs and to better the understanding of the bacterial drug-resistance mechanisms. The overproduction of certain peptidoglycan hydrolases, required for the correct insertion of new peptidoglycan, increases the resistance to the beta-lactam mecllamin. This resistance is mediated by the stimulus of antimicrobials, the beta-lactams and glycopeptides, but the dramatic spread of multidrug resistant bacteria makes it essential to discover new antimicrobial drugs and to better the understanding of the bacterial drug-resistance mechanisms.

**Bacteria** have a highly complex cell envelope containing the essential peptidoglycan sacculus, a mesh-like layer that protects the cell from rupture due to its turgor and that maintains cell shape. Pseudoglycan biosynthesis is the target of our most successful antimicrobials, the beta-lactams and glycopeptides, but the dramatic spread of multidrug resistant bacteria makes it essential to discover new antimicrobial drugs and to better the understanding of the bacterial drug-resistance mechanisms. The overproduction of certain peptidoglycan hydrolases, required for the correct insertion of new peptidoglycan, increases the resistance to the beta-lactam mecllamin. This resistance is mediated by the stimulus of antimicrobials, the beta-lactams and glycopeptides, but the dramatic spread of multidrug resistant bacteria makes it essential to discover new antimicrobial drugs and to better the understanding of the bacterial drug-resistance mechanisms.

**Shalman Jesse Ngozi Ojukwu**
MEng (Hons) Electronics and Computer Engineering with Industrial Project

Designing Pervasive AI Hardware using Tsetlin Machines

In future, ubiquitous applications will need Machine Learning everywhere for artificial and augmented intelligence – from sensed data at the micro-edge to the decision processes in the cloud. Two major challenges of these applications are energy efficiency and unreliability (i.e. high variability) of power supply from batteryless harvester. The current generation of AI hardware in the form of Deep Neural Networks are highly energy consuming and not suitable for implementation under power supplies that vary significantly over time. How will AI hardware look like for these applications? How can we design hardware systems that can autonomously adapt to the natural power variations coming from harvesting sources? These questions will critically shape the way we design new-generation hardware circuits and systems for pervasive applications. Tsetlin Machine has recently emerged with improvement over traditional Machine Learning in terms of faster convergence and minimum training time. Dr Shafik’s group has recently been investigating ways to incorporate energy autonomy and efficiency features for this new Machine Learning hardware by using its natural capability to alter complexities under extreme power situations with minimal loss of accuracy. The group has a number of collaboration initiatives with national and international academic and industrial research groups.

**Shalman Jesse Ngozi Ojukwu**
MEng (Hons) Electronics and Computer Engineering with Industrial Project

Designing Pervasive AI Hardware using Tsetlin Machines

**Funding source: Newcastle University**

**Project supervisor: Dr Rishad Shafik**

**MSc Biomedical Sciences**

Kelly-Rose O’Reilly

MSc Biomedical Sciences

Mcellamin resistance mediated by overproduction of peptidoglycan endopeptidases

**Pihla Numminen**
BSc (Hons) Biomedical Sciences

The Role of PM20D1 in Longevity

**Elliot Noble**
MBBS

Exploring the activity of deiodinase 2 in the human prostate cell niche & the implications for prostate carcinogenesis

**Shalman Jesse Ngozi Ojukwu**
MEng (Hons) Electronics and Computer Engineering with Industrial Project

Designing Pervasive AI Hardware using Tsetlin Machines

**Funding source: Newcastle University**

**Project supervisor: Dr Rishad Shafik**

**MSc Biomedical Sciences**

Kelly-Rose O’Reilly

MSc Biomedical Sciences

Mcellamin resistance mediated by overproduction of peptidoglycan endopeptidases
Psychiatric wards in Northumberland, Tyne and Wear (NTW) NHS Trust had identified several areas in which sleep management could be adapted to decrease inpatient stays and improve outcomes. Recommended changes included the adoption of a more flexible approach to night-time observations, improvements in identification and management of sleep disorders, modifications to the local environment and increased access to therapy. To facilitate these changes, the ‘SleepWell’ project was developed as a six-month intervention across seven wards, in which these factors were adopted and outcomes measured. My role was to assimilate and analyse emerging data, to determine which have been reported to improve alertness. However, its effect on brain activity is unknown.

This research aims to determine the changes in brain activity after tDCS, which is non-invasive and involves placing rubber electrodes on top of the head and forehead. A group of healthy young and older adults participated in the experiment and were randomly allocated to receive active or sham (non-active) stimulation. Functional Near-Infrared Spectroscopy (fNIRS) device records their brain activity as they carry out the simple and choice reaction test. Results show that reaction time declined less in older adults and there is increased brain activity in certain areas after receiving active tDCS, suggesting that tDCS may be an effective method of improving alertness.

**Funding source:** Newcastle Biomedical Research Centre

**Project Supervisor:** Professor John Mathers

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Colorectal cancer (CRC) is the second largest cancer killer in the UK. CRC development has been linked to abnormal signalling of the WNT pathway, a cellular reaction which facilitates cell proliferation. WNT inhibitor genes act to reduce WNT signalling and cancer progression. CRC has been strongly linked to dietary factors, for example vitamin D deficiency. The potential mechanisms behind vitamin D’s protective role is not fully understood, but it is possible that vitamin D may enhance WNT inhibitor genes through a process called demethylation. Demethylation removes barriers from the DNA, effectively activating genes.

This study investigated the effect of vitamin D on the methylation of three WNT inhibitor genes, WIF-1, SFRP4 and Dkk1, in rectal biopsies. Data and samples from the Biomarkers Of Risk of Colorectal Cancer (BORC RiC) Follow-Up (BFRU) Study (2017-2018) were used. No significant relationship between vitamin D and methylation of the three WNT inhibitors could be established.

**Funding source:** Newcastle University

**Project Supervisor:** Professor John Mathers

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Childhood Cancer Survivors (CCSs) have an increased risk of developing serious cardiovascular problems. Physical activity (PA) is important for CCSs cardiovascular health however studies have shown that CCSs engage in less PA than young people without a history of cancer. It is not well understood why CCSs have lower levels of PA and what may help them to be more active. The aim of this research project therefore was to identify and evaluate previous studies which have tried to uncover the factors that influence CCSs’ PA levels and also to identify any gaps in the current literature. This information can then be used by researchers at the Institute of Health & Society who are currently interviewing CCSs and their parents with an end goal of creating a behavioural intervention to help facilitate PA in CCSs.

**Funding source:** Newcastle University

**Project supervisor:** Dr Morven Brown, Professor Linda Sharp and Dr Vera Araujo-Soares
Prostate cancer (PC) is the most commonly diagnosed cancer in men. The prostate is androgen dependent and relies on the androgen receptor (AR) for maintenance and growth. The AR is also a critical molecule involved in PC development and progression and is the main therapeutic target in the treatment of this disease. However, the majority of patients relapse and develop castration-resistant disease, for example by the generation of AR splice variants. As this stage is incurable, there is a clinical need to develop new treatment strategies. Basescope procedures were optimised successfully, using HeLa cell pellets to test for positive and negative controls first, to detect both red and green signals. Specificity of RNA probes was then confirmed in different prostate cancer cell lines via the Basescope technique, allowing visualisation of varying levels of AR/AR-V7 in cell pellet samples, for use in imaging mass cytometry in future research.

**Funding source:** Newcastle University

**Project supervisor:** Dr Kelly Coffey

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Hypertrophic cardiomyopathy (HCM) is a disease associated with increased thickness of the wall of the heart, which increases the risk of death. People diagnosed with HCM commonly present with reduced exercise tolerance and quality of life. Factors that affect exercise intolerance (VO2) are either central/cardiac (cardiac output or peripheral/skeletal arteriovenous oxygen difference). The aim of my project was to determine which factor is implicated in HCM patients; propose pathophysiology and suggest treatment techniques. Throughout my project, I obtained a large range of results but I specifically looked at the baseline results for VO2 and cardiac output. This allowed me to quantify the arteriovenous oxygen difference and therefore compare the results for controls against HCM patients. Findings showed that cardiac output was the main diminished factor for HCM patients at peak exercise and therefore treatment should be targeted in order to increase this factor.

**Funding source:** Newcastle University

**Project supervisor:** Dr Djordje Jakovljevic

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The corridor illusion induces a sense of depth and makes the brain perceive equally sized objects as larger when placed in the background of a corridor and smaller in the foreground. Previous experiments used corridor illusion to demonstrate that illusion strength depends on reading/writing habits. In my experiment, I will be investigating if the direction of visual scanning monitored with eye tracking will affect illusion strength. Secondly, I will investigate the corridor illusion in bilinguals. The research is essential in understanding the role of cultural factors like reading/writing habit in visual perception. More importantly, a study concluded that visual illusions are a useful tool at exploring brain mechanism in DD. If the result of the project shows a clear link between corridor illusions and reading abilities, this could lead to further researches into corridor illusions in DD subjects, as there are no researches on DD susceptibility to corridor illusion.

**Funding source:** Newcastle University

**Project supervisor:** Dr Sammy Rima

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In recent years, traffic control is becoming a world-wide problem. Many old-fashioned solutions include building smarter roads and bigger parking spaces, but in recent years, the growing field of autonomous vehicles presents many new opportunities for improving traffic. This paper focuses on methods to control traffic and decrease the average journey times by implementing collaborative diffusion.

Collaborative diffusion is a method in which agents, autonomous vehicles, communicate between each other their next goal destinations and make decisions so as to minimise their average journey time for reaching their end locations.

The technique is implemented and explored in a simulated environment which is based on the densely populated traffic network of the Newcastle upon Tyne city network. The tests are compared to other implementations of algorithms for traffic control and the results are shown to be substantially more efficient.

**Funding source:** Newcastle University

**Project supervisor:** Dr Gary Ushaw

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Megan Rigby

**BSc (Hons) Biomedical Sciences**

Optimisation of Basescope probes for the detection of androgen receptor and its AR-V7 splice variant in prostate cancer tissue

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Sophie Russell

**MSci Biomedical Sciences**

Pathophysiology of Exercise Intolerance in Hypertrophic Cardiomyopathy

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Deyan Samardzhiev

**BSc (Hons) Computer Science**

(Dr Software Engineering)**

Autonomous Vehicle Navigation with Collaborative Diffusion for City Congestion Control

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Mary-Chelsea Chong-San

**MSci Biomedical Sciences**

Developing novel fluorescent CRISPR approaches for understanding androgen receptor biology in prostate cancer

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Gunkavee Saengkrajang

**BSc (Hons) Biomedical Sciences**

Assessing the link between reading/writing direction and perception of the corridor illusion

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Antony Rose

**BSc (Hons) Biomedical Sciences**

Investigation into the role of ADAMTS9 in primary cilia structure/function

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Project supervisor: Dr Kelly Coffey

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**Project supervisor:** Dr Sammy Rima

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Project supervisor: Dr Djordje Jakovljevic

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Funding source: Newcastle University
Epilepsy is a neurological disorder consisting of seizures. One-third of epilepsy patients are inadequately treated by medication, meaning brain surgery may be chosen to help prevent seizures. Up to half of patients can still experience seizures post-surgery. Better understanding of which brain connections to remove may improve these surgical outcomes. Structure-function coupling is the link between neural structural and functional connectivity. This concept can be quantified through a correlation. We predict that the most epileptogenic connections will be the most strongly correlated (also correlated), but this will only apply to those without seizures as the epileptogenic connections have been removed. We computationally analyse diffusion-weighted magnetic resonance imaging (DW-MRI) and magnetoencephalography (MEG) data from 23 patients. Our results suggest the coupling between neural connections insulated (gFA) and neural frequency wave (Alpha) may be a marker for epileptogenic connections. Eventually clinicians may use this to inform brain surgery and ensure post-surgical seizure freedom.

**Funding source:** Newcastle University

**Project supervisor:** Dr Peter Taylor

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Lewy Body dementia (LBD) consists of dementia with Lewy bodies (DLB) and Parkinson’s disease dementia (PDD). DLB is categorised by the aggregation of α-synuclein in intracellular accumulations termed Lewy Bodies, which are thought to damage the brain and cause symptoms experienced by patients. However, we hypothesise that interneurons, which regulate the activity of groups of pyramidal neurons, are damaged in LBD, despite not developing Lewy bodies.

We used post-mortem brain tissue from the prefrontal cortex of LBD patients and determined numbers of pyramidal and interneurons with stereology. We found a significant reduction in interneurons in LBD when compared to the unaffected control samples, but no significant loss of pyramidal neurons.

These findings suggest that interneurons, despite not developing Lewy bodies, are subject to neurodegeneration in LBD. These findings suggest interneurons as a novel therapeutic target in LBD and raise questions about the importance of Lewy bodies in neurodegeneration.

**Funding Source:** Newcastle University

**Project supervisor:** Dr Daniel Erskine

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The idea of this project came from an interest in social history and a desire to record marginalised voices of alcoholics. Through being in recovery myself, I gained access to interviewees with long term sobriety. I interviewed everyone over two sessions, to get beyond pre-rehearsed narratives of recovery. I visited four men and four women in the North East and each interviewee was a member of Alcoholics Anonymous.

Using themes of stigma, religion, addiction and treatment services I looked at the personal experiences of recovery. One key outcome was that I noticed a common language amongst the interviewees. However I found this did not create a uniform belief system. For example, AA is a spiritual program with Judeo-Christian influences. Yet it is also a broad church with atheists, agnostics and believers. In summary, I learnt that oral history is less about facts and more about the value of personal experience.

**Funding source:** Newcastle University

**Project supervisor:** Dr Noel Healy

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My summer research project was based around ALL (a rare form of childhood leukaemia). High hyperdiploidy occurs in many childhood leukaemia cases. This is where the patient has over 50 chromosomes (they should only have 46). I have looked at individual bone marrow cells using cytogenetics (when the chromosomes are in their mitotic stage of the cell cycle) under the microscope, via cytogenetic analysis. I dyed them with a red/green fluorescent protein tag via the FISH (fluorescent in situ hybridisation) technique and identified specific chromosomal patterns. For example, I would look for 2 dots (representing 2 copies of the specific chromosome of interest) – this would occur in a normal situation 3 copies or 4 copies. I was looking for 3 different scenarios: LH clone, (31 chromosomes), doubled up clone (62) or both. We will be trying to prove that both clones being present contributes to ALL.

**Funding source:** Newcastle University

**Project supervisor:** Professor Graham Smith

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The project is aiming to use statistical methodology to identify risk loci. The study will include genomewide association studies (GWAS) and post-GWAS association analysis to identify risk loci, (i.e., a fixed point on chromosomes contributed to Primary biliary cirrhosis (PBC), a rare autoimmune liver disease, which would potentially lead to development of new treatments. There were 27 risk loci discovered in previous research. This project will analyse a larger set of data from 3 groups of subjects, including 6971 UK people, 13848 Canadian people and 1512 Italian people. The goal is to identify new risk loci. The project identified of multiple risk loci across the genome including the HLA locus, which encodes molecules that play a key role in the immune system. Further investigations are needed in order to understand the functional effects of these risk loci and to improve knowledge of PBC pathogenesis.

**Funding source:** Newcastle University

**Project supervisor:** Professor Heather Cordell
Peer-support groups have the potential to empower and give hope to marginalised individuals and those suffering from mental health issues. This qualitative research project explored various topics with a peer-support group for adults based in a café. It aimed to research any characteristics/factors of significance within the unique community group and explore the participants’ ideas for developing it. Two one-hour discussion sessions using various qualitative thinking skills tools revealed, after qualitative analysis, that ‘Friendship’, ‘Shared Experience/Learning’, and ‘Judgement-free Support’ were all significant characteristics/factors that helped the group function effectively as a support group. ‘Table Cards’ were also regarded as a significant and ingenious tool to ease communication between group members who may be struggling with anxiety. Discussion emerged around communication between group members who may effectively serve as a support group. Part one - fact finding about ankle injury prevention. I will travel to Turin, Italy to complete two weeks work experience at their Proprioception Centre. I will learn from Dr Dario Riva and his team at the International Society of Proprioception and Posture, who over six years reduced ankle injuries in the Cant Basketball Team by 81%. Part two - I will return to the UK and using what I have learnt in Turin, refine the approach I will use. I will work with coaching and medical teams at the Newcastle Eagles to create an effective screening process that will inform player-specific proprioception training programs to reduce ankle injuries. Part three - I will begin the screening process, guided by the coaching and medical teams. All players will complete the same tests to identify potential risk factors for ankle injury. 

Funding source: Newcastle University
Project supervisor: Dr Jill Clark

Katie Stienlet
BSc (Hons) Sport and Exercise Science

The effectiveness of developing player specific proprioception training programs in an attempt to prevent ankle injuries in high level basketball.

Part one - fact finding about ankle injury prevention. I will travel to Turin, Italy to complete two weeks work experience at their Proprioception Centre. I will learn from Dr Dario Riva and his team at the International Society of Proprioception and Posture, who over six years reduced ankle injuries in the Cant Basketball Team by 81%. Part two - I will return to the UK and using what I have learnt in Turin, refine the approach I will use. I will work with coaching and medical teams at the Newcastle Eagles to create an effective screening process that will inform player-specific proprioception training programs to reduce ankle injuries. Part three - I will begin the screening process, guided by the coaching and medical teams. All players will complete the same tests to identify potential risk factors for ankle injury.

Funding source: Newcastle University
Project supervisor: Dr Brook Galna

Funding source: Newcastle University
Project supervisor: Dr Aditya Sharma

Iona Tatham
MBBS
Process and Outcomes Evaluation of Smartphone Applications for Bipolar Disorder: A Scoping Review

Bipolar disorder is a serious mental illness that is characterised by episodes of depression and elation. Smartphone applications have been shown to be a useful and appropriate tool in predicting early warning signs for relapse in people with bipolar disorder. They allow users to track intrinsic and extrinsic factors in order to identify triggers and patterns. Also, they enable practitioners and those close to the patient to stay informed about how the patient is doing. However, there is not yet a robust, widely utilised framework for evaluating these applications. An evaluation framework would allow researchers to quickly and accurately assess the usability and efficacy of these tools. During my research, I reviewed the available scientific literature on how smartphone applications designed for people with bipolar disorder had been evaluated, in order to inform future developments into app evaluation.

Funding source: Newcastle University
Project supervisor: Dr Aditya Sharma

Funding source: Newcastle University
Project supervisor: Dr Peter Banks

Arda Deniz Tugrul
BSc (Hons) Biomedical Genetics
Investigating the effects of cdc28 on cell cycle regulation in Saccharomyces Cerevisiae

I have investigated the effects of cdc28 protein on cell cycle regulation in Saccharomyces Cerevisiae. First, I have cultured the yeast cdc28 query strain on a YPD rich media. I have also arrayed the yeast alpha library and cultured them. After culturing both my query cdc28 strain as well as the alpha-library strain, I have crossed both strains for mating on a new plate with robot pinning technology at high-throughput screening facility. After mating event, I have selectively picked the colonies and cultured them again on a diploid selection plates, then after diploid selection I have finally selected the spores through the use of eukaryotic selective marker (G418) on new sporation plates to ensure that I was analysing the spores that had the library deletion as well as my query cdc28 deletion. After collecting my raw data, I have analysed my final data through SGA Tools software, looking at colony size of each strain to observe the fitness.

Funding source: Newcastle University
Project supervisor: Dr Peter Banks

Yu Heng Brian Tan
MBBS (iNUMed Malaysia)
Changes in spinal connections by descending pathways with ageing

Instructions to move are sent from the brain to the spinal cord over several neural pathways. The most important such link, the corticospinal tract, has been shown to lose 25% of its axons by the age of 50, yet at this age it seems, to have few consequences for movements. We do not know how the spinal terminations from this and other tracts change to compensate for the axonal loss. Do surviving connections strengthen uniformly, or does the balance between pathways change? We need to fill this gap in our understanding, as it could prove critical to understanding some of the difficulties with movements which appear later in ageing, such as frailty, sarcopenia and increased risk of falls. In this project, we will analyse spinal terminals of descending pathways using anatomical methods in aged and young macaque monkeys, which have a very similar motor system to humans.

Funding source: Newcastle University
Project supervisor: Professor Stuart Baker

Funding source: Newcastle University
Project supervisor: Dr Maxim Kapralov and Professor Anne Borland

Harriet Todd
BSc (Hons) Biology
Nocturnal photosynthesis and how to find it

Crassulacean acid metabolism (CAM) is a nocturnal photosynthesis that evolved to save water. Given the rising population and climate change there is a demand to make crops more water efficient. Hence, engineering CAM into crops could provide a solution for global food security. It is unknown how widespread CAM is across the plant kingdom. This study was to develop a high throughput method of screening plants for CAM. To test this method, we used the National Collection of Sedum found in Bedlington which contains succulents from across the world and it is the largest of its kind in the UK. The current methods for screening CAM, whilst accurate, are time consuming and low throughput. Here we have developed a promising high throughput method for screening species for CAM identification.

Funding source: Newcastle University
Project supervisor: Dr Maxim Kapralov and Professor Anne Borland

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Bipolar Disorder: A Scoping Review

of Smartphone Applications for

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Project supervisor: Professor Stuart Baker

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Bipolar Disorder: A Scoping Review

of Smartphone Applications for Bipolar Disorder

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Funding source: Newcastle University
Project supervisor: Professor Stuart Baker

Funding source: Newcastle University
Project supervisor: Dr Maxim Kapralov and Professor Anne Borland
### Project 1
**Drug is blocking complement in patients.**

Help refine the testing process for how effectively this free complement that is not blocked by the drug. I will develop and test new methods that can detect the complement system can prove fatal due to excessive times of disease. In some diseases, overactivation of the complement system, which is mostly responsible for preventing infection but also causes inflammation at cell walls. This project will focus on understanding the role of the complement system in disease development.

**Funding source:** Newcastle University  
**Project supervisor:** Professor Claire Harris

### Project 2
**Pectin is a structural polysaccharide found in plant cell walls.**

This project aims to assess the potential for pectins recovered from potato peels to act as bioactive modulators of digestive enzyme activity. Identifying high value application for waste streams from food production is a key goal for industry as it promotes sustainability, reduces waste and provides alternative revenue sources. Previous research in the Pearson lab has shown certain dietary fibres can modulate pancreatic lipase activity, and have applications as weight management technology. This project looked to assess the use of recovered Pectin as a modulator of Lipase activity.

**Funding source:** Newcastle University  
**Project supervisor:** Professor Jeffrey Pearson

### Project 3
**Chronic lymphocytic leukaemia is the most common type of leukaemia in the UK.**

Although the disease generally progresses slowly, treating it is difficult. Most patients will initially respond well to the treatment, but the disease will come back and eventually be untreatable, leading to patient death. The causes of this failure of the treatment are largely not known. In this project we will investigate a possible reason why treatment fails for CLL patients. This is based on a type of change that can occur in human DNA called DNA methylation. Our initial results suggest that by studying the specific changes in this DNA methylation in CLL patients, we can predict in advance which patients will respond well to therapy and which patients will not. This project will aim to confirm our initial observations in the hope that this can subsequently be used to improve choice of treatment for CLL patients.

**Funding source:** Newcastle University  
**Project supervisor:** Dr Gordon Stratdhee

### Project 4
**Knossos, also known as Europe's oldest city, is the largest Bronze Age archaeological site on Crete.**

It has long been believed that, like other Minoan settlements, Knossos significantly declined at the end of the Bronze Age. However, recent research has revealed that the settlement continued to thrive into and throughout the Iron Age, revolutionising our understanding of Knossos and settlement patterns in the region more generally. In light of these new discoveries, a reconsideration of the Iron Age Knossos North Cemetery, conducted through a re-evaluation of the excavation reports, is necessary. Our knowledge of Iron Age Greek society is heavily dependent on a clear understanding of burials. Therefore, this research is key in allowing us to readjust our interpretations of contemporary social systems and structures, including specifically the emergence of the city state, in the light of new evidence from the settlement.

**Funding source:** Newcastle University  
**Project supervisor:** Professor Claire Harris

### Project 5
**ALS is a common form of MND with localised symptoms which progress to become systemic, involving death of neurones from the brain to the spinal cord (LMN) and from the spinal cord to the muscles (UMN).**

Often only diagnosed once symptomatic, the therapeutic window is missed, hence the life expectancy after diagnosis is on average 2-3 years. Poor understanding of its early pathology means there are three hypotheses: that neurones die primarily due to TP53-A3 aggression in the neocortex causing secondary death in the spinal cord (dying forward); that weakening in the junction between muscle and neurone spreads upwards (dying backward); or that the disease spreads from the corticospinal tract’s (specific UMN) end synapse (dying outward). By comparing the literature, I hope to evaluate each hypothesis, showing the most likely mechanism for MND. This could help identify early markers of the disease, and aid treatment by entering the therapeutic window.

**Funding source:** Newcastle University  
**Project supervisor:** Dr Mark Baker and Dr Hugo Oliveira

### Project 6
**The Northern Institute for Cancer Research (NICR) is currently developing a method of simultaneously quantifying multiple anticancer drugs from one blood sample using one universal method. If implemented, this could save a large amount of time and expense for the NHS and streamline therapeutic drug monitoring (TDM) for cancer patients.**

The method relies on High-Performance Liquid Chromatography (HPLC) to separate the components in a sample, in tandem with Mass Spectrometry (MS) which uses molecular weight to quantify each individual fraction.

For my project, I selected five Tyrosine Kinase inhibitors: Bosutinib, Dasatinib, Imatinib, Nilotinib and Ponatinib. The full method would be capable of analysing up to 40 drugs, but all need testing to assess how they behave when in combination. My work focused on five of these, with the results forming part of the overall combination method.

**Funding source:** Newcastle University  
**Project supervisor:** Professor Gareth Veal

### Project 7
**Poor understanding of its early pathology means there are three hypotheses: that neurones die primarily due to TP53-A3 aggression in the neocortex causing secondary death in the spinal cord (dying forward); that weakening in the junction between muscle and neurone spreads upwards (dying backward); or that the disease spreads from the corticospinal tract’s (specific UMN) end synapse (dying outward).**

By comparing the literature, I hope to evaluate each hypothesis, showing the most likely mechanism for MND. This could help identify early markers of the disease, and aid treatment by entering the therapeutic window.

**Funding source:** Newcastle University  
**Project supervisor:** Dr Mark Baker and Dr Hugo Oliveira

### Project 8
**Death is now an event of later life, and an increasing number of older people are dying with frailty. A good understanding of their end-of-life care needs is crucial, to provide appropriate services and support.**

This project brought together existing research on the care needs of frail older people at the end-of-life. 13 studies were included. All used interviews and focus groups to understand the end-of-life experiences of people with frailty, their families and healthcare workers.

We found that people with frailty did not have a shared understanding of their frailty, or how close they were to the end-of-life. Many people had physical symptoms, such as pain, but these were less important to them, than their emotional needs. A focus on the present, and support to ‘live in the moment’ was wanted. This study will help end-of-life services develop better care for older people with frailty.

**Funding source:** Newcastle University  
**Project supervisor:** Professor Barbara Hanratty
The supervisor is developing a new stereoacuity test presented on a tablet computer (known as "ASTEROID" for "Accurate Stereo"). This measures how well the two eyes work together to see depth. For any test, it's important to know how a person with "normal vision" performs, in order to know when a patient has a deficit. Previous work showed that scores on ASTEROID were around twice as high as on other stereo tests. We think this is because the ASTEROID test uses quite large, chunky dots. We have modified ASTEROID to use smaller dots. We now need to compare the two versions to see if scores are smaller on the new version. This is what I will carry out over the summer.

**Funding source:** Newcastle University

**Project supervisor:** Professor Jenny Read

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**Zhen Xin Wong**

**MBBS (NUMed)** Malaysia

**Identification of Prostate Stem Cell Niche and its role in carcinogenesis**

The prostate gland is an important male reproductive organ which is responsible for the production of semen. A stem cell niche is a microenvironment surrounding stem cells which regulates their activity to maintain the normal cell cycle. Hence, dysregulation of the stem cell niche can lead to uncontrolled division which contributes to the formation of cancer. This project aims to identify the location of prostate stem cell niche and to determine the factor that can regulate this microenvironment so that process leading to cancer can be controlled. This project will be carried out by mainly staining prostate gland tissue by different markers to find the possible location of stem cell niche. The stem cell niche area will then be tested by different marker to control the stem cell progression.

**Funding source:** Newcastle University

**Project supervisor:** Dr Shalabh Srivastava

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**Wei Kang Yap**

**MBBS (NUMed)** Malaysia

**Assessment of ciliary length in Human urine derived Renal Tubular Epithelium in Autosomal Dominant Polycystic Kidney Disease**

Autosomal Dominant Polycystic Kidney Disease (ADPKD) is an inherited kidney disorder characterized by abnormal growth of numerous cysts in the kidneys. Most of the patients with ADPKD have worse prognoses and are likely to progress to end stage kidney failure. The only treatment proven is to slow down the progression of the kidney dysfunction, however with many unacceptable side effects. Hence, identification of patients who should be given the treatment is necessary.

Human kidneys comprise of epithelial cells lined by protrusions called cilia. It has been reported that abnormal cilia structure was found in patients with cystic kidney disease. This research mainly works on analysis of cilia length from kidney epithelial cells of patients with ADPKD, in which epithelial cells are derived from the urine samples and cilia length is examined carefully. Laboratory results are matched with the set of genes and clinical data of patients to check the correlation.

**Funding source:** Newcastle University

**Project supervisor:** Dr Shalabh Srivastava

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**Xinye Yek**

**MBBS (NUMed)** Malaysia

**Normative scores for new digital visual acuity test**

How good is your eyesight now? When is your last eyesight (visual acuity) test? Do you feel troublesome for making a trip to any healthcare setting just for testing your eyesight? An electronic app, ASTEROID, is innovated for testing your eyesight on a tablet device comfortably at your home. However, you may have doubts about its accuracy and reliability, and is the Grating acuity (an eye test by identifying stripes, orientation and direction) introduced in this app better than the Letter acuity we use frequently? Therefore, an experiment is conducted to test the validity and reliability of Grating acuity compared to other visual tests. In conclusion, the Grating acuity test (ASTEROID) has low validity and reliability, because its measured visual acuity is significantly different from the eye chart used clinically, and it fails to obtain consistent results in the repeated test. More improvement needed before introducing it to the population.

**Funding source:** Newcastle University

**Project supervisor:** Professor Jenny Read

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**Yee Ying Yong**

**MBBS**

**Prevalence and symptoms of delirium associated with inpatient Parkinson’s disease**

Patients with Parkinson’s disease (PD) may be at increased risk of developing delirium. Delirium is the acute onset and fluctuating course of disturbance in attention, awareness and consciousness. Delirium in PD inpatients (DiPD) may be underdiagnosed due to overlapping symptoms, including hallucinations, sleep wake disturbance and fluctuating attention. This study aimed to describe the prevalence and symptoms of DiPD. Consented PD inpatients completed a single delirium assessment. 63 inpatient admissions with 18 delirium cases (34%) were identified. Repeating numbers and months of year backwards, three stage command, delayed recall and orientation scores were impaired in cases with delirium (p<0.05 for all). Confusion (83.3% vs. 34.3%, p<0.05), delusions (50.0% vs. 14.3%, p<0.05) and hallucinations (61.1% vs. 28.6%, p<0.05) were significantly prevalent symptoms in DiPD. The symptoms and tests identified in this study as significantly different in patients with delirium may enable clinicians to manage DiPD cases earlier and minimise adverse outcome.

**Funding source:** Newcastle University

**Project supervisor:** Dr Rachael Lawson

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**Julian De Zordi**

**MSci Biomedical Sciences**

**Information processing in recurrent gene regulatory networks**

My project involved working with bacteria and analysing how protein levels are controlled within them. The genes which encode for these proteins are controlled by transcription factors which, depending on the environment the cell is in, will result in up or downregulation. This in turn will affect the level of protein made. We used Escherichia coli to perform this experiment. To measure gene expression, fluorescence and population density methods were used. Furthermore, we used a technique called time-lapse microscopy which allowed us to observe changes in real-time and helped us understand the role of transcription factors in controlling gene expression, especially when the cells were placed in a stressful environment. By using bioinformatic tools and applying specific conditions, we are able to further our comprehension of how a population of cells responds to stress, with implications for understanding gene regulation in more complex organisms.

**Funding source:** Newcastle University

**Project Supervisor:** Dr Jordi Garcia-Ojalvo
University Research Scholarships and Expeditions 2020

The University will once again support student expeditions and research scholarships in 2020. 2020 applicants are, however, encouraged to seek external funding wherever possible. Further information about the schemes, including details about eligibility criteria and applications procedures can be found using the web links below.

Information about posters, presentations and the celebratory event from previous years can be found at: [http://research.ncl.ac.uk/vacationscholarships/](http://research.ncl.ac.uk/vacationscholarships/) 2019 posters, presentations and prize winners will be available on this website from the end of January 2020.

University Expeditions 2020

Information about submitting applications for University Expeditions Committee funding is available from the Student Financial Support web pages at: [www.ncl.ac.uk/student-financial-support/research-funding/#expeditions](http://www.ncl.ac.uk/student-financial-support/research-funding/#expeditions)

The deadline for receipt of 2020 applications is 31st January 2020

University Research Scholarships 2020

Information about submitting applications for University Research Scholarships Committee funding is available from the Student Financial Support web pages at: [www.ncl.ac.uk/student-financial-support/research-funding/#scholarships](http://www.ncl.ac.uk/student-financial-support/research-funding/#scholarships)

The deadline for receipt of 2020 applications is 6th March 2020

Students cannot hold both University Expeditions Committee funding and a research scholarship in any one year.

Feedback from previous participants

Below are a selection of comments from previous research scholarship recipients:

“I am contemplating a Masters as a result. I think the important part of the Research Scholarship is providing an experience of what postgraduate 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 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.”

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

“I've always found it easy to talk to people but have really struggled when talking with academics about anything even slightly intellectual in case I get something wrong. This project has really helped me to find value in my own academic ability and viewpoints”

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

“I 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.”

“I am sure now that I want to pursue research as a career.”
2019 Research Scholarships Scheme Feedback

It is hoped that if you were an undergraduate who undertook a funded research project during the summer of 2019 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 scheme.

A short survey, which should take only a few minutes to complete, is available at: https://forms.ncl.ac.uk/view.php?id=5322820

Alternatively if you have any additional feedback not covered in the survey please do not hesitate to contact us at: vacation-scholarships@ncl.ac.uk