



UROS 2019 PROJECT SHOWCASE

 UNIVERSITY OF
LINCOLN
Lincoln Academy of
Learning and Teaching

 Undergraduate
Research
Opportunities
Scheme

FOREWORD



The Undergraduate Research Opportunities Scheme (UROS) is a well established initiative at the University of Lincoln. Following the Student as Producer ethos, this scheme encourages students to be curious and active in creating new knowledge by developing their research projects under the supervision of members of academic staff.

This scheme has proved very effective in engaging students from across the University in hands on summer research activities. Previous participants have highlighted how it has given them new research experiences and skills. Project activities culminate in an annual exhibition showcase event in which participating students share their knowledge and demonstrate student voice in research to the wider academic community.

Having taken part in previous UROS showcase events, I am delighted with the range of applications for UROS bursaries from across our increasingly diverse learning community and I look forward to seeing what skills and new experiences students gain from working with staff and other participants through their project activities this year.

Jasper Shotts
Dean of LALT

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Applying for a UROS bursary

The Undergraduate Research Opportunities Scheme (UROS) is designed to encourage undergraduates to become actively involved in the research work of the University. UROS embodies the principle of ‘Student as Producer’, which underpins the Lincoln approach to teaching, learning and student engagement.

UROS offers a unique opportunity for students to work alongside academic researchers to engage and gain hands-on research experience on projects covering all disciplines across the University.

Successful projects are awarded a bursary of up to £1000 to support students with their research projects which would normally be completed during the summer break. Students taking part in the scheme are required to produce a blog report and poster to showcase their research at an exhibition event.

Applications are invited from both academic schools and professional services departments for stand-alone projects, or form a subsidiary part of larger scale research work, that could be completed by an undergraduate student working under the supervision of a member of academic staff. The completed application form must be submitted collaboratively by the staff and students participating in the project.

Eligibility

All first and second year undergraduate students are eligible to apply for the scheme. Final year students would not normally be eligible because they will have become graduates at the point when UROS project starts, however, exceptions may be made in special circumstances e.g. where the final year student intend to pursue a higher degree when they graduate.

What's involved

> Expectations of Staff

All projects require an academic member of staff in the role of research project supervisor, who must ensure that the student researcher is fully supported throughout the whole project, e.g. an induction, supervision and regular progress review meetings, training and assisting with the written reports and dissemination on research, and keep the LALT Engagement Team updated with project progress.

> Expectations of Students

Students are expected to understand the nature of the research required prior to accepting scholarship, work professionally with others, and develop and apply skills to deliver reliable project outcomes. Student researchers are expected to keep the LALT Engagement Team updated with project progress, and to produce a 500-word blog report and a poster display showing the results of the completed research project.

> Support Sessions

The Lincoln Academy of Learning and Teaching Engagement Team provides a range of workshops throughout the UROS programme, including Presentation Skills, Blog Writing and Photoshop workshops specifically designed to support students undertaking research projects.

> Sharing your research

The UROS showcase is held to give UROS participants the chance to share their research and learning journey with other students and staff at the University. Written reports will be published on the LALT blog, where they can be shared with the wider community.

We encourage all UROS participants to attend research events to share their research experience as widely as possible and many participants go on to attend external conferences and contribute to published papers.

> How to apply

The application window for UROS opens each year on the 1st September, and closes on the 31st January.

Applications are invited from both academic schools and professional services departments for stand-alone projects and be separate from curriculum work. Applications should be jointly completed by the supervising academic and collaborating research student.

As a competitive programme, all applications will be scored by reviewers against key criteria, and successful applicants will be notified in March.

Find out more:

✉ uros@lincoln.ac.uk

🌐 lincn.ac/UROS

Investigating Language Lateralisation and Motor Control during Development

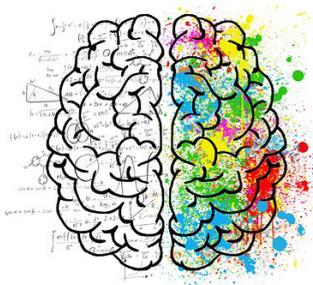
by Amber Scotting (BSc Psychology) // Supervised by Dr John Hudson & Dr Jessica Hogson



My project investigated the link between hand performance and preference to language laterality. It has long been thought that handedness and language are linked within the brain, so the current study aimed to use more in-depth tests of handedness, to investigate its complex nature. A dichotic listening task was also used to uncover childrens' ear advantage, an indication of which hemisphere their language centre is located.

Data collection was completed at the university's Summer Scientist, which allowed us to get a large sample of children aged from 3 to 10 years old. This research will not only help to understand handedness throughout childhood development but also understand the link between handedness and language in people with impairments to these functions, e.g. Developmental Coordination Disorder.

Due to the sample being made up of young children, we faced problems with explaining tests. This was especially a problem with younger children in the sample as it was often the case that these children had not yet started to write and as a result would know which hand they preferred.



It has led to me to consider research in more of a professional sense, taking into account publication and the views of professionals in this academic field; this view was reiterated by my supervisors. Whether I want to work in clinical or experimental neuropsychology is still a decision I need to make but UROS has given me an insight into what working in psychological research would be like, which is extremely helpful in deciding my career path.

“UROS has given me an insight into what working in psychological research would be like, which is extremely helpful in deciding my career path.”

Longitudinal Study on the Relationship between Students' Objective Smartphone and Social Media Use and Academic Performance

by Andreea A Moldovan (BSc Psychology) // Supervised by Dr Michael Osei Mireku



In these modern times, technology became an extension of our lives. Because it represents such a big part of our daily routine, it is only natural that we should be concerned about the effect it might have on us.

As a student, my academic record is important and based on the research done in the past, it was indicated that It can be affected negatively by the amount of time spent on different devices. Therefore, the study conducted by me and my supervisor,

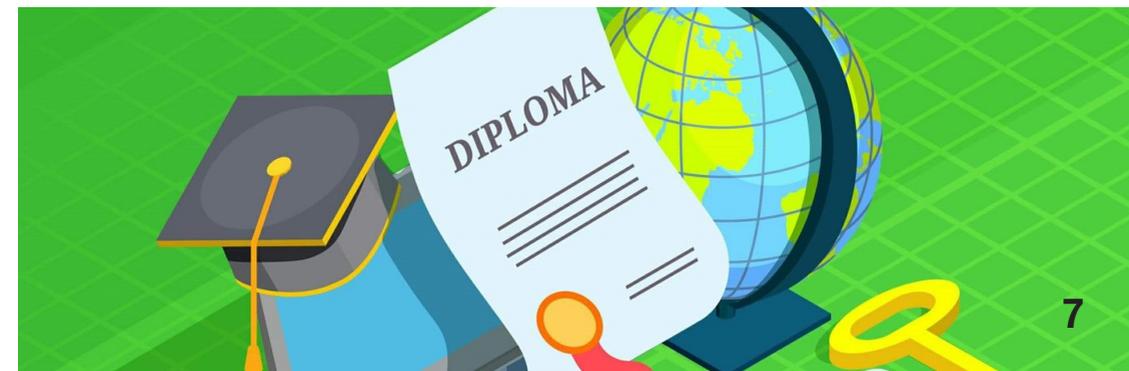
Dr Michael Mireku, was meant to investigate if there is any connection between the two, but taken from an objective point of view, instead of using just self-reported data.

During this project, I had the great (and not so fun, but yet really useful) opportunity to learn how to enter data into a program new for me: Epidata, and, at the same time, realise how much effort goes into just dealing with big amounts of data, something that can only be learnt through experiences like this. I have learnt a great deal on how SPSS works as well, using functions I had no idea existed.

We have not only found no correlation between objective or reported screen-time and average grades; but the results also indicate that participants were reporting spending more time on their devices overall than they actually were, based on the objective data collected.

I believe that this experience has shaped the way I look at research, now that I know how much work goes into creating and conducting studies. It was hard work, but with the help of my supervisor, I feel like I gained more than I was expecting out of this. I know the knowledge received will help me in the future and it will represent an important step in my career.

“I believe that this experience has shaped the way I look at research.”



Hybrid Electrical Energy Storage System (HEESS) for Battery Electric Vehicles

by Billy J Robinson (MEng Electrical Engineering) (Control Systems) // Supervised by Dr Tim Smith



LiPo and Li-ion batteries are currently considered the modern standard in Battery Electric Vehicles (BEVs). Both battery technologies have their pros and their cons, as all technologies do. However, they both share a common disadvantage and that is limited specific power despite having high specific energy.

Specific energy is the measure per kg of how much energy can be stored, whereas specific power is the measure per kg of how much power an Electrical Energy Store (EES) can supply. Supercapacitors

however have higher specific power but limited specific energy.

In this project, it has been proposed that a Hybrid Electrical Energy Storage System (HEESS), which relies on both batteries and supercapacitors, can be developed. A HEESS can be configured to exhibit characteristics similar to an ideal EES which has high specific power and energy. In utilising more than 1 EES the strengths of each can be exploited to provide greater performance metrics over using any 1 EES.

The aim of the project was to design and then simulate a typical HEESS suitable for integration into a BEV. This began by identifying the components of the system and how they would interact using a block diagram before expanding on each block by developing the necessary circuitry. This then enabled the full simulation of the system using Simulink.

Participating in UROS has been invaluable allowing me to develop key skills, both in terms of the engineering involved and in project management. Even from the early stage of preparing an application to completing my project, the entire experience has prepared me for continuing research into the HEESS moving forwards. It has provided me with a unique insight into conducting research and taught me key communication skills which were essential in facilitating the research, which will serve me well through the remainder of my studies and beyond.

“Participating in UROS has been invaluable allowing me to develop key skills, both in terms of the engineering involved and in project management.”



Synthetic Atomic Force Microscope Data

by Broderick Harvey (MMath Mathematics) // Supervised by Dr Matt Watkins



Atomic force microscopy has been a highly involved technique in analysing (crystalline) surfaces at nanoscale/atomic level. However, the calibration of atomic force microscope tips is a seemingly unsystematic process and often relatively random when used for atomic-scale engineering.

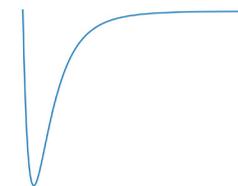
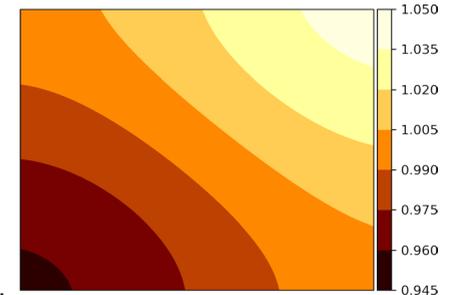
The aim of this research is to provide a framework for a consistent and coherent method of producing a frequency (contour) map and thus improve calibration technique.

The frequency map provides an accurate representation of the forces acting upon the tip, which allows one to deduce properties regarding the structure of some crystalline material at an atomic level.

Using blocks of code within Python, necessary solutions to differential equations – as well as integrals – have been computed in order to plot the data. Force vs. surface-tip separation graphs and frequency shift contours were plotted using the matplotlib library.

This algorithm is repeatable and generalised, which allows the generation of synthetic frequency maps and calibration of any cantilever tip, for any given crystalline surface.

This research be developed further, by utilising a neural network to machine-learn the calibration procedure, based upon the sample material and cantilever tip alone.



Throughout the project, I've faced a few challenges, most especially with the implementation of the differential equations and their solutions, and the plotting of these solutions (which became a nightmare as this progressed). However, this research has helped me to practise coding in Python, as well as hone my problem-solving skills.

I'd like to sincerely thank my supervisor, Dr Matt Watkins, for being so patient throughout, as well as helping me through the struggles along the way. On several occasions, he has helped me to become unstuck and has been there to provide consistent support.

“It has been a pleasure to work with an expert in this field and gain a first-hand insight into entry-level research.”

Solastalgia: An Empirical Exploration

by Daniel Ford (BA Criminology) // Supervised by Dr James Heydon



My project was a study on the topic of solastalgia -Glenn Albrecht's term for the feeling of nostalgic loss toward the environment (2006). More specifically, the study was an empirical exploration of the subject. What my supervisor and I wanted to examine was the existence of the feeling of solastalgia in contemporary Britain, as research on the topic so far had only covered the existence of the feeling in more indigenous societies whose culture is more focused around their environment anyway.

Thus, there was a gap in research when it came to solastalgia as a concept in contemporary western society; it was unclear the extent to which solastalgia would manifest under the conditions of this society. Clarifying this was the primary aim of the research.

The most challenging lesson I found in the project was the consideration of 'latent' themes. This meant that I had to examine deeper themes in the data, and to find evidence of solastalgia where it was not overtly written. This was both challenging and very rewarding when I had completely figured it out as it increased my data analysis skills exponentially, helping me immensely in preparing for my final year and dissertation.

A key part of the project was the collaboration with my supervisor, James Heydon, who assisted me at all stages of the project, from the initial introduction of the concept of solastalgia all through to the data collection and analysis stages. The guidance I received from James was invaluable to the project, and working together has given me valuable experience in working on research both individually and collaboratively.

Albrecht, G. (2006) Solastalgia: environmental damage has made it possible to be homesick without leaving home. *Alternatives Journal*, 32(4-5), p34-.



“Working with my supervisor has given me valuable experience in working on research both independently and collaboratively.”

Raising Educational Aspirations? Evaluating the Second Iteration of a Student-Mentoring Scheme

by Elena Gaschino (BA Criminology) // Supervised by Gary Saunders & Dr Anna Tarrant



Young people from working-class backgrounds are less likely to have access to the professional networks available to their middle-class counterparts.

Mentoring schemes that use undergraduate students enable young working-class people to widen their networks and understanding of higher education (Wilson et al., 2018) and, thus, have potential to develop their social and cultural capital.

It was in this context that the student-mentoring scheme was established and implemented with the key aim of promoting the educational success and aspirations of working-class boys. This project implemented and evaluated the second iteration of the student-mentoring scheme. Having carried out the first evaluation in the summer of 2018, I was well placed to continue evaluating this project.

Despite having experience in undergraduate research and support and guidance from my supervisors Mr Gary Saunders and Dr Anna Tarrant, this evaluation was not without its challenges. Nevertheless, it was clear from the interviews carried out with the student mentors, the teaching staff and the mentees themselves that the scheme had benefitted the boys taking part and had been well received by the teachers and school in general.



Taking part in this evaluation has been of great value to me. I was once again able to work closely with experienced researchers and benefit from their knowledge as well as gaining further understanding of societal issues and social barriers affecting working-class boys and their educational aspiration.

“Challenges are a part of research, and I am glad my research team and I were able to face and resolve them as it has helped me grow in confidence whilst preparing me for any future research opportunities”

Improving Unfamiliar Face Matching with Feedback

by Ellen Wheeler & Bethany Raven (BA Psychology) // Supervised by Dr Robin Kramer



Our UROS project provided us with the chance to investigate whether working in pairs can lead to improvements in unfamiliar face matching, which previous studies have shown to be difficult.

This issue causes real-world problems, as person identification is important for security services around the world, for example at passport control. We were particularly interested to see if the initially worse participant in each pair improved when working with the initially better participant. As part of our study, we filmed the pairs to investigate how working in pairs led to improvements for the worse person.

Another challenge we had to face was having to conduct the research separately. Both of us and our supervisor were together when collecting the data. However, we went home for the summer period, which meant we had to complete the rest of the research from home. We overcame this challenge by having a 'shared drive' which we could all share documents on. This meant that our supervisor could oversee and provide guidance through every step. Also, we were able to meet up and work together sometimes.

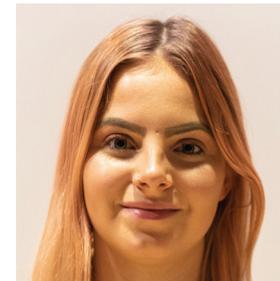
We have learned to work well in a team, by splitting the workload evenly and supporting each other. We have learned how to run an experiment in MATLAB, which neither of us had used before, showing us both that we are able to adapt and learn new skills. Our supervisor Robin was amazing, as he gave us guidance every step of the way. We both learned from Robin, he introduced us to new techniques and ways of thinking which will be beneficial to the rest of our studies.

UROS has been particularly useful in preparing us for future academic endeavours such as our dissertation. It has given us an insight into how research is conducted and allowed us to develop the professionalism expected in this field of research.

We will carry these lessons throughout our studies and onto postgraduate studies, which thanks to UROS will be something we would both like to pursue.

Islamophobia, 'Brownface' and Social Media Controversies: An Analysis of Twitter Responses to Channel 4's 'My Week as a Muslim'

by Gabrielle Weyer (BA Criminology) // Supervised by Dr Lisa White



The documentary 'My Week as a Muslim' aired on Channel 4 in October 2017. This programme followed a white Christian woman, who spent a week in Islamic dress, brown make-up and prosthetics in order to 'experience life as a Muslim' in Manchester in the aftermath of the Manchester Arena Bombing.

The aim of my project was to look at how the newspaper media responded to the programme. I wished to find out whether the show was received positively or negatively and how claims of 'brownface' were or were not

represented in the newspaper media.

During the project, I was able to work through a few obstacles. Due to time constraints and problems in accessing other forms of media data, a decision was made to use content analysis. When I read the articles, I made clear guidelines for myself about whether a response was 'positive' or 'negative' based on the phrases that were used, yet these positions are largely subjective. I also made a third category for articles that were neither 'positive' or 'negative' in their response to allow these articles to be represented. Another problem was when the data set was downloaded, some newspapers were duplicated meaning the initial data set was much larger than the data used. Despite this, a large data pool was still analysed, and the results were representative of the newspapers responses to the programme. Had there been more time, I would have liked to take the research further and analyse the kinds of newspapers involved, the nature of the articles (e.g. TV review, opinion piece) and the presence of social media data.

The aspect of working with a supervisor has been a positive experience for me. Lisa aided me where need be and provided me with resources I would otherwise struggle to obtain.

The experience of my UROS project has prepared me for my future as I intend to get a career within social research after I graduate. The project has given me experience in completing an ethics form, working to a time schedule, working collaboratively and also provided me with an opportunity to conduct primary research for myself. I hope that the experience will also prepare me for my dissertation as it has given me a first-hand insight into producing a piece of research.



How Content do Victims of Youth Crime Feel with the Joint Diversionary Panel Process?

by Hollie Skipp (BA Criminology) // Supervised by Dr Sue Bond-Taylor



I was keen to undertake the opportunity to be a part of the Undergraduate Research Opportunities Scheme (UROS), of which I will be evaluating victim satisfaction with the Joint Diversionary Panel (JDP). The UROS scheme has given me a valuable set of transferable skills to put on my Curriculum Vitae.

The research project for UROS endorses a student as producer ethos, therefore it aims to emphasise the role of students as collaborators in the production of knowledge.

Therefore, in order to adopt a student as producer outlook, I have been proactive in my research to find interesting conclusions about victim satisfaction with the JDP. There is a gap in the research, as the JDP differs in each county and it was introduced in 2017, thus since then there has been limited independent evaluations.

I currently work full time in hospitality, however my career aspirations are in line with the Criminal Justice sector, thus I applied for the UROS scheme with a view to broaden my knowledge of sentencing terminology, the detailed process of JDP and the victim's perspective of JDP as a process of diversion. My research journey has been insightful, I have: liaised with multi-agency stakeholders i.e. Lincolnshire Youth Offending Team and the Victim Liaison Officers, prepared appropriate and significant interview questions and analysed 53 victim surveys and 1 victim interview.

In relation to our efforts, it was crucial we planned and prioritised training for me to carry out the analysis using Excel and N-Vivo. Training for the software packages commenced, meaning I was able to work independently on the above to create pivot tables, cross tabs, percentage stacked charts, pie charts and nodes. This aided my development of the following: ability to use my initiative, ability to be self-motivated and ability to be self-determined.

“The UROS Scheme has given me a valuable set of transferable skills to put on my Curriculum Vitae”



The Replication Crisis in Psychology; Current Attitudes from Students and Academics

by Jacqueline Jones (BSc Psychology) & Alice Gains (BSc Psychology with Clinical Psychology) // Supervised by Dr Kirsty Miller



Our UROS project was a fascinating journey that allowed us to explore the ‘replication crisis’. This topic has limited investigation and is argued to be an ever-growing concern within psychology.

We wanted to take the time to investigate attitudes towards the apparent ‘crisis’ from students and staff at the University of Lincoln, within the School of Psychology. To do this, we created an online Qualtrics questionnaire exploring topics including ‘definitions’ and ‘solutions to the crisis’. Therefore, the research allowed participants to consider possible solutions to protect public and academic trust in Psychology.

Our findings show a moderate amount of awareness about the replication crisis here at the University of Lincoln, but personal definitions and rating of published definitions vary greatly. A spotlight was put on the need to teach the replication crisis earlier at university and the need for openness and transparency when approaching research.

In reflection, taking part in UROS has been an extremely positive experience. As this was a joint project, we have improved our team working skills and ability to efficiently organise workloads. Moreover, we hope to further study this topic and publish our findings externally.



Although, the project was faced with various challenges. For example, a difficulty to recruit participants over the summer period as we initially planned to collect student data while they were still timetabled on campus. To overcome this, we frequently advertised our study on social media.

To anyone considering being involved with UROS in the future, we would recommend submitting ethics as soon as possible to kick start data collection!

Finally, we thank the UROS team for their help. Also a big thank you to our supervisor, Dr Kirsty Miller, for her continuous support and guidance on this project.

“In reflection, taking part in UROS has been an extremely positive experience.”

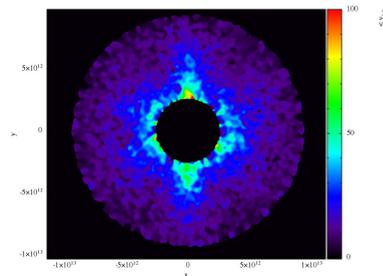
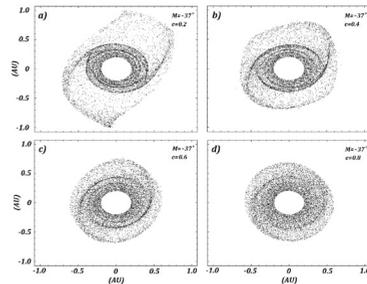
Investigating Gravitational Instabilities within Planetary Rings during Planet-Planet Scattering Events

by Jake Muff (BSc Physics) // Supervised by Dr Phil Sutton

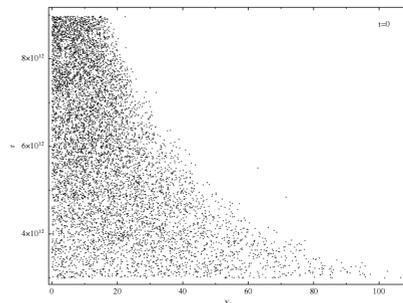


For this project we looked at the J1407 star system which is approximately 434 light years from Earth. The system consists of the Star which is about 90% of the mass of the Sun and the exoplanet, which is approximated to have between 13 and 26 Jupitar masses with an extensive ring system (640 times the extent of Saturn's rings!). The most unique thing about this system though is its eccentricity. With an eccentric orbit estimated to be around 0.6 which is a highly eccentric orbit when compared to the Earth's 0.0167!

J1407b is the first exoplanet to be discovered with a ring system by transit method, therefore allowing us the unique opportunity to help everyday research with this project. The aim of this project was to understand how eccentric orbits can affect a planets ring system and to understand if this allows for moons to form in the planetary ring.



This project was tough; however, I learnt an immense amount from it. It was hard in the sense that it was a level of independence I had not yet experienced at university as I had to read up on something I've never heard about before, plan out the project myself and learn a new computer language then use it for my programs.



"This project taught me a lot about myself and how I can best complete a task that I have set for myself as well as how to overcome problems and issues independently without asking for help."

Determination of the 3D structure of the TE1-TE2 thioesterase enzyme

by Jamie Burford-Evans (BSc Biochemistry) // Supervised by Dr Edward Taylor



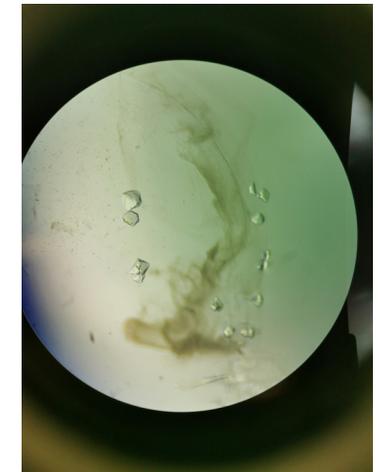
Antibiotic resistance is a global concern and if not challenged, could see human populations without the availability of effective antibiotics. This is why constant research surrounding antimicrobial compounds is required to ensure a sustainable supply of effective antibiotics, ensuring life expectancy and quality of life can be safeguarded for generations to come.

This UROS project focuses on one of the many necessary steps in current antimicrobial research that can take an up and coming antibiotic, Teixobactin, from the laboratory

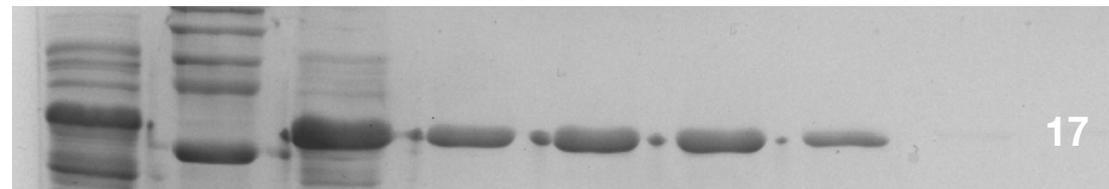
into a clinical setting. TE1-TE2 is one of the enzymes responsible for Teixobactin's biosynthesis and is at the centre of this project. Greater understanding of this enzyme's 3D structure could provide the indirect information about Teixobactin's biochemistry crucial to maximising the exploitation of Teixobactin as an antibacterial treatment.

The comprehensive research conducted included a wide range of laboratory techniques: culturing and genetic transformation of E. coli, induced expression of the TE1-TE2 gene, purification of the expressed TE1-TE2 protein via Ni²⁺ affinity chromatography and crystallisation of the purified protein in preparation for third party structural analysis of TE1-TE2 by x-ray diffraction.

This project has allowed me to work alongside experienced scientists in a research focused environment. Providing an insightful example of the research-based application of a variety of laboratory techniques, the meaningful analysis of the data collected and the importance of the communication of research findings to both the scientific community and wider community. Hence, I would not hesitate to recommend UROS to my peers.



"This project has allowed me to work alongside experienced scientists in a research focused environment."



A Human-Robot Interaction Interface Library

by Laurence Elliott (BSc Computer Science) // Supervised by Prof Marc Hanheide & Francesco Del Duchetto



The problem of developing GUIs (Graphical User Interfaces) for robots is one that typically requires knowledge of robotics programming and web or desktop GUI development to communicate the user's inputs to a robot, and to communicate a robot's state and outputs to the user.

This project introduces a FOSS (Free and Open-Source Software) JS (JavaScript) library: 'RWC' (ROS Web Components), which utilises the also FOSS 'ROS' (Robot Operating System). RWC simplifies the development of web-

based GUIs for HRI (Human-Robot Interaction), by exposing common robot behaviours and data through one-line JS function calls, and defining custom HTML (Hypertext Markup Language) elements which can call these functions to display data or send user input to a robot. RWC requires only beginner level knowledge of HTML or JS, and ROS, to enable rapid and easy development of web-based UIs for HRI. RWC is configurable, with more experienced users able to define their own ROS topics and action servers for the library to interface.



Working on this project required me to expand my knowledge of JavaScript, ROS, and the design and development of robot GUIs. Especially difficult was understanding the concepts and syntax of JavaScript's asynchronous functions, web components, and shadow root. It was a rewarding challenge to develop my project to provide all the necessary features for two use cases.

The first: RWC as a backend for a web-based visual robot programming tool by Onis Brown, for public engagement with robot programming. The second: Redeveloping the touchscreen web UI of tour-guide robot Lindsey at Lincoln's The Collection museum. This, coupled with continuous feedback from my supervisors, Marc Hanheide, and Francesco Del Duchetto, taught me to listen carefully to the requirements of my project's end-users, and to consider their needs at every stage of design and development. Collaborating with experienced researchers, and the joy of seeing the project gradually come together has given me increased confidence and passion in robotics research, which I aim to utilise in continuing my studies in robotics with a master's at Lincoln, with the eventual goal of making a career of robotics and AI research.



'Into the Groove' - Developing Methodology for Wet Cleaning Vinyl Grooved Audio Media

by Liam Robinson (BA Conservation of Cultural Heritage) // Supervised by Dr Lynda Skipper



Using environmentally friendly products to clean the surface of vinyl audio records. The aim of this study was to identify a safe and effective cleaning method to remove surface dirt from vinyl audio records using environmentally friendly products. Two cleaning products were compared against water only. These were; Orvus WA (an animal shampoo also used for textile cleaning) and Synperonic A7 (a detergent widely used by conservators).

In order to evaluate the two products, an LP record was cut into squares. Twenty-four squares were prepared with a greasy thumb print to simulate poor handling. Another twenty-four squares were soaked in water with card from the record sleeve and compressed while drying. This simulated water damage and poor storage. Six samples were left unprepared, as a control group.

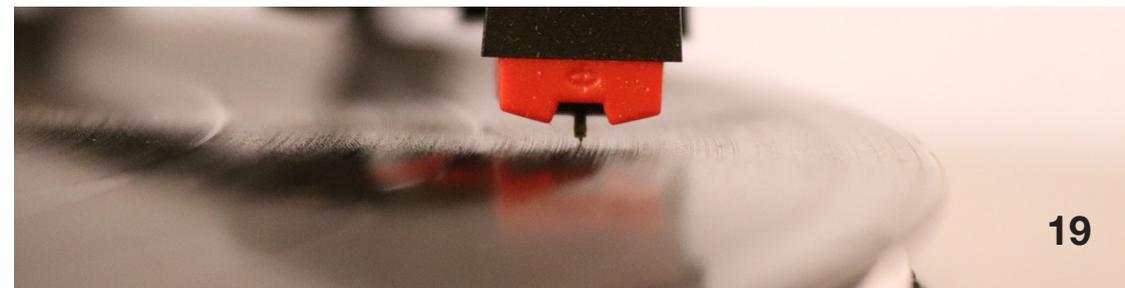
The samples were cleaned with different strengths of the products in solution with distilled water. A cotton swab was used to apply the solution to the surface. Distilled water was then used to remove any traces of the product.



The cleaning was evaluated using the naked eye, a microscope at x20 magnification and a Dino-lite digital microscope at x240 magnification. The best performing samples were then tested against a control sample, using FTIR (Fourier Transform Infrared Spectroscopy) analysis to check that cleaning had not caused damage to their carbon structure.

The results showed that a solution of 10% Orvus WA paste in distilled water was the most effective. The FTIR analysis confirmed that this product and cleaning method does not alter the carbon structure of the plastic.

The findings of this study have identified an environmentally friendly and effective cleaning product for use on vinyl records. This could be further developed by examining cleaning techniques, testing on a larger sample group and assessing the effect on playback sound quality.



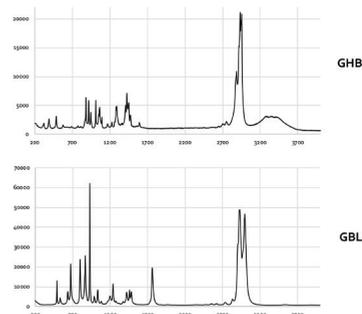
Using Raman Spectroscopy for the Quantification of 'Liquid X' in Vaping Misuse

by Nancy Whittaker (BSc Forensic Science) // Supervised by Dr Mathieu Elie



Over the past few years, there has been a huge growth in vaping, i.e. the use of electronic cigarettes for the consumption of both nicotine-containing and nicotine-free liquids ("e-liquids") that are vapourised to be inhaled. Public Health England has deemed it as a healthier alternative to tobacco smoking based on the lack of tar containing substances, however, news reports reveal that vaping has become a vehicle for nuanced uses such as shampoo and fruit juices. The rise of vaping misuse also sees the introduction of illegal drugs into e-liquids, such as cannabis and synthetic cannabinoids.

My research project investigated vaping of e-liquids laced with the controlled substances gamma-hydroxybutyrate (GHB, "liquid X") and its precursor gamma-butyrolactone (GBL, "Insom-X") using both Raman and Infrared spectroscopy (IR) for analysis. Analyses of samples were carried out both pre and post vaping to investigate the effect of the vaping mechanics on the chemical profile of the studied e-liquids. Furthermore, prolonged vaping use was a focus of my work by repeatedly vaping e-liquids such as a user might do.



During the experimental stages of the project, I encountered a few challenges relating to the vaping set-up and data collection. However, after talking with my peers as well as consulting my supervisors and literature, the laboratory set up was optimised for safe vaping simulation – involving both the laboratory equipment and the settings on the e-cigarette itself.

Aside from learning new analytical instrumentation to a much deeper level than my undergraduate degree, I learned advanced ways to process the data I had obtained from the analytical instruments I used for this project. This not only deepened my understanding for this project but will further my ability for analytical chemistry research, and I envisage it will support me immensely during my postgraduate studies, and hopefully after that.

"Aside from learning new analytical instrumentation to a much deeper level than my undergraduate degree, I learned advanced ways to process the data"

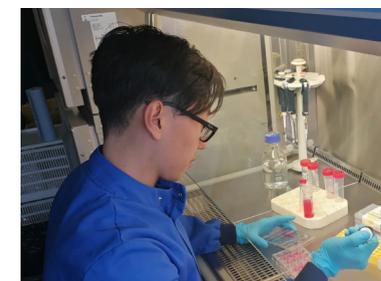
Investigating Cancer-Derived Exosomal MUC12 Induced Target Cell Proliferation, Migration and Integrin Expression

by Jin Ke Pan (BSc Zoology) // Supervised by Dr Timea Palmai-Pallag



Throughout the duration of my UROS project I have worked in collaboration with my supervisor Dr Palmai-Pallag on the effect of mucins in cancer metastasis. We employed routine laboratory techniques, but also much more advanced procedures and I was lucky enough to be included in meetings where the work of other young researchers was presented to me.

I have always been interested in actively contributing to new knowledge and loved to be able to come up with a question and test them experimentally. However, as with many things in my life reality might not be the same as I expected them to be. This project has been an amazing experience for me to try something that I am really passionate about and do it on an almost professional level.



Of course not everything went smoothly, experiments didn't always work out and it was sometimes quite frustrating, but even surprising to myself, I didn't look at those moments of failure as reasons to quit. Instead the difficulties I have faced during my research have helped me familiarise with a dominating aspect of research and prepared me for what to expect in future work in this field. This is

why I think this UROS project really has helped define my interests and shaped my future career path and I will treasure these experiences and use them to pursue my academic career.

In hindsight I can certainly say that this experience has been extremely informative, enjoyable and worthwhile.

"UROS project really has helped define my interests and shaped my future career path and I will treasure these experiences and use them to pursue my academic career."

Synthesis of Bicyclic Lactams from Simple Caprolactams via Dieckmann Cyclisation to Contribute to Targeting Antibiotic Resistance

by Saffah H. Danial (MPharm Pharmacy) // Supervised by Dr Tobias Gruber



Antibiotics are essential in treating many bacterial infections in both humans and animals. They can also be used to prevent infection in the case of operations or may be recommended for those vulnerable to the harmful effects of infection, for example, people with weakened immune systems due to chemotherapy or HIV (National Health Services, 2019a).

Antibiotic resistance is an epidemic challenge, requiring extensive research for providing treatments for concerning bacterial conditions, such as antibiotic-resistant gonorrhoea (a sexually transmitted infection), clostridium difficile (a bowel infecting bacteria), methicillin-resistant Staphylococcus aureus (MRSA) and multi-drug-resistant tuberculosis. My project focused on synthesising molecules to contribute to research in targeting antibiotic resistance. My work was carried out in a laboratory setting at the University of Lincoln, under the direct supervision of Dr Tobias Gruber. I learnt a range of research skills, including planning and executing the synthesis of organic compounds, interpreting NMR spectra, working with solvents and syringes and running a chromatography column containing silicon dioxide.

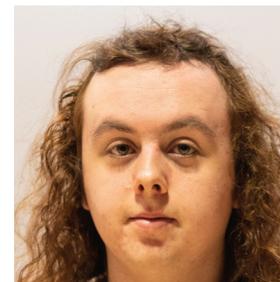
I produced some interesting compounds in the lab, and I am proud to have been the first ever person to synthesise a particular compound. Conversely, I also faced some challenges during my project, such as having to work with new equipment, e.g. a rotatory evaporator, which took a while to learn. Separately, one of the compounds formed still contained starting material, which resulted in me having to repeat a procedure, for which just the initial step took over 24 hours. Overall, I learnt that when carrying out lab work, there is always the possibility of unexpected setbacks and human error. However, it is important to stay positive and work around the barriers and learn from every situation.

My UROS project enabled me to work collaboratively with my supervisor, which was a terrific opportunity, allowing me to discuss theory and procedures throughout the seven weeks. The experience was invaluable in preparing me for my future, as I gained several important skills, including academic writing, self-organisation and safe-working in the lab environment. These qualities are helpful for me as a current Pharmacy student and also for my future profession, as it is the responsibility of a Pharmacist to manage medicines safely and effectively.

I would like to thank Dr Gruber for giving me this extraordinary opportunity and also to Christian Weck for his help and support with this project.

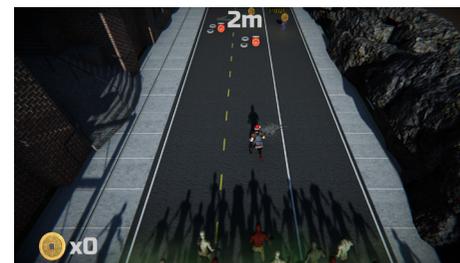
Avatars for Mobility Impaired Players in Virtual Reality

by Samuel Stubbings (BSc Games Computing) // Supervised by Dr Patrick Dickinson, Kieran Hicks & Kathrin Gerling



Existing research has studied the design of movement-based games to support mobility impaired players (wheelchair users). This has focussed on particular design elements, such as interface. Thus far, little work has considered the effects of player representation (avatar) on their experience, nor player's preferences on how they are represented in-game. This is particularly relevant to VR games, which can convey a strong sense of player embodiment.

The aim is to design and develop a suitable research game which can be used to explore user's response and preferences to different player avatar types. We are planning to use this game in a series of user studies over the next year.



The aim of these studies is to investigate the effects of the different avatars on both able-bodied players and wheelchair users. This will include difference in player experience, perceptions of player's abilities, and user preferences.



Understanding the extent of microplastic pollution in the River Witham, Lincolnshire, UK

by Sophie Leggot (BS Geography) // Supervised by Dr Daniel Magnone, Gertruda Zientute & Prof. Mark Macklin



How would you feel if your home became a dumping ground for plastic waste?

With plastic pollution of Oceans on the rise, the impacts on the marine environment are becoming more severe. So where does all the plastic come from? Plastics of any size are entering the Oceans either as identifiable objects or as microplastics (pieces of plastic which have a length of less than 5mm), which make their way into the foodchain for our consumption. With this in mind, my project focused in on the Microplastic contamination

within the River Witham that follows its course to the Wash, which extends into the North Sea where no previous research has occurred.

I took a representative 13 samples from within the 26 collected from the source of the Witham in South Witham to the Wash. I also looked at shell counts, XRF data (to show different contaminations such as lead), and conductivity. By looking at the shell counts we potentially could identify a way that the microplastics are entering into the foodchain and thus being consumed by ourselves unknowingly.



Within the conclusions of this research I found there to be very high levels of microplastics within the Haven (5960 per Kilo of sediment). I also found there to be a strong correlation between the amount of shells and the amount of microplastics, as when inspecting under the microscope small pieces of shiny material fell out of them; thus showing a way that the microplastics are entering our foodchain.

This project has enabled me to consider further research as this research could be used within the realms of tackling the plastic pollution and to better

understand where the majority of plastic is coming from. This project has also enabled me to develop in several ways as I have gained a greater understanding of academic research and fieldwork which are vital for future research that I may undertake.

“I have gained a greater understanding of academic research and fieldwork which are vital for future research that I may undertake.”

Scenography and Nation: How does theatre and performance design reflect and engage with diverse national cultures?

by Thomas Cansdale & Joseph C T Carter (BA Drama) // Supervised by Dr Siobhán O’Gorman



Our project sought to explore the question set out by our tutor: ‘What is the relationship between scenography and nation?’

The main focus of the research was to document, analyse and engage with the

variety of work showcased recently at the Prague Quadrennial of Performance Design and Space in 2019.

The Prague Quadrennial (PQ) is the world’s largest festival of theatre design, occurring once every four years. It embodies the contemporary scenographic scene and offers its visitors a chance to engage with prominent work from over 79 countries. The festival has been taking place since 1967 and has consistently been a pilgrimage for those interested in the latest trends in performance design. The value we saw in the festival was in the opportunity to have access to a unique environment with such diversity in one site: the Art Nouveau Industrial Palace Prague.

Due to the international nature of our research, and the wealth of art available both at the PQ and the city of Prague itself, the difficulty came in narrowing our focus to coincide with the project’s ends. Rather than pursue our individual, academic interests, we engaged with the investigation through a retrospective and critical lens with a series of pod-cast style discussions. Each of these were supported by images and videos documenting each relevant piece featured at the festival. With this portfolio we were then able to collate our findings once back in Lincoln. Our conclusions tracked a growing concern over the mediatization of scenography, a practice that traditionally focuses on physical interactions with the world. This led us to investigate how conceptions of nation can manifest on the virtual plane, and consequently how this impacts on scenographic engagements with nation.

This has given us the experience needed to confidently enter the University of Lincoln’s MA Theatre programme with a strong sense of what comprises an independent, self-led piece of research based on international fieldwork.

As one of the first School Fine and Performing arts projects to have been granted funding by UROS we would like to think that our research may lead to further applications in the future from upcoming undergraduates. We would also like to personally thank Dr Siobhán O’Gorman for all of her support in our research and her passionate engagement with the work of her students. Projects such as this show the incredible support from the University and its staff in recognising the value of the arts in our contemporary world.

Synthesis and characterisation of p-type and n-type CuInS₂ nanocrystals

by Tobias Whinney (BSc Physics) // Supervised by Dr Matthew Booth



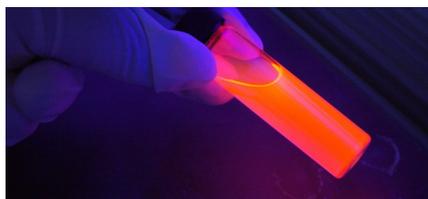
In a world where efficiency in energy usage has never been more paramount, nor as well scrutinised on how it impacts our precious planet, new technologies are being discovered at an unprecedented rate.

It is essential for developing technology not only to be increasingly energy efficient with exponential capabilities but be safe to use and reduce its environmental impact compared to its predecessors. Nanocrystals (NC's) with a diverse application range offer such a solution.

The aim of this project was to test the validity of a method of synthesising CuInS₂ NC's by surfactant driven self-assembly in a nucleation reaction reaching a maximum temperature of approximately 210°C. p- and n-type crystals were grown with various amounts of copper and indium to determine the optimal Cu:In ratio.

They were characterised using X-ray diffraction, ultraviolet-visible light spectroscopy and photoluminescence spectroscopy.

The project was concluded as a success as crystals of a nanoscale were produced, averaging 101.4nm, which can be easily changed by adjusting the time allowed for the crystals to grow at the maximum temperature. The characterisation methods generated expected results in accordance with the change in ratios.

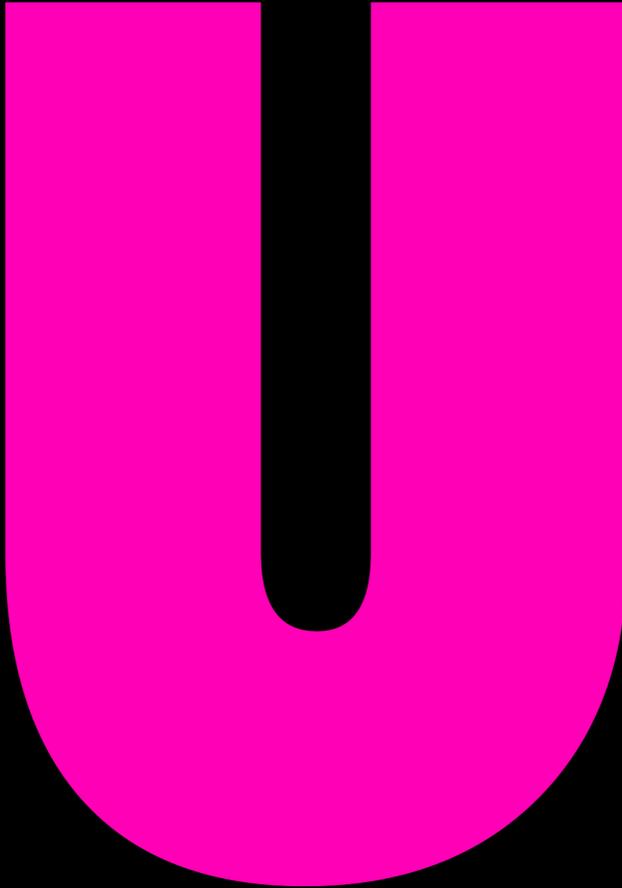


The main challenges the project presented included the operation of spectroscopy machines to ensure that reliable results for the spectra were produced and to achieve a consistent increase in temperature in the synthesis of the NC's to avoid losing the chemical ratio.

Invaluable techniques for how to use very precise laboratory equipment were developed as all NC's are treated as potentially hazardous and were time-consuming to refine.

“Collaborating with my supervisor and working in a professional laboratory over this project has been a great pleasure. With further study and employment in the not too distant future, this will prove to be an indispensable experience.”

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