Institute of Liberal Arts and Sciences / Keele Doctoral Academy

Keele Postgraduate Conference 2022

Keele University
13th June 2022

The Keele Difference

Keele Postgraduate Conference 2022

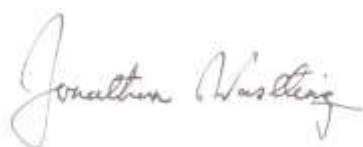## Monday 13 June 2022 – Keele Hall

Conference Programme	
9.15am	Conference opens with welcome drinks
9.30am	Conference welcome Hosted by Professor Eran Edirisinghe, *Pro Vice-Chancellor for Research and Innovation*
9.45am	Poster viewing and networking
11.00am	Refreshment break
11.15am	Advertise your research competition Hosted by Professor Alex Lamont, *KDA Director*
12.00pm	Keynote speaker Dr Michelle Phillips, *Senior Lecturer and Head of Undergraduate Programmes - Royal Northern College of Music*
1.00pm	Lunch (break) and final competition viewing/voting
2.00pm	Interdisciplinary research activity Hosted by Professor Alex Lamont, *KDA Director* and Dr Ben Coleman, *Researcher Developer*
3.00pm	Presentation of prizes Hosted by Professor Alex Lamont, *KDA Director*
3.30pm	Conference closes

Institute of Liberal Arts and Sciences / Keele Doctoral Academy
Postgraduate Conference 2022

Welcome

I am delighted to welcome you to the 2022 ILAS/KDA postgraduate conference, being held for the first time after the pandemic in person (with some online engagement). This is a great opportunity to connect with colleagues from across the university and to appreciate the diversity of the postgraduate research community and their work. As well as strengthening your skills and confidence in sharing your research, talking to others with alternative perspectives will spark fresh ideas and will get you thinking differently about your own work.

Thank you to our presenters and visitors and also all of the staff who support the work of the Institute and who have helped to make today possible. I hope that it will be an enjoyable and energising conference for all.

Professor Jonathan Wastling
Director, Institute of Liberal Arts and Sciences

We are excited to welcome you to our third event in collaboration with ILAS. The KDA is now firmly established as the strategic body for all things to do with PGR and we have worked closely with many of you over the past 18 months – it will be a wonderful opportunity for us to meet many of you in person, but we also welcome those of you engaging at a distance.

The conference is the culmination of the events that take place at Keele that give you valuable opportunities to engage with others and to communicate your research to a wide audience. We are joined by our keynote Dr Michelle Phillips sharing her passion for her own research, public engagement and knowledge exchange – it will be an exciting presentation which we hope will inspire you, and the rest of the day is full of stimulating events designed to get you talking.

We hope you enjoy engaging with each other and with postgraduate research during the event which celebrates the importance of the Keele postgraduate community at the heart of the university.

Professor Alexandra Lamont
Director, Keele Doctoral Academy

Allied Health Professions

Anusha Carolin

Exploration of hand dysfunction in patients following transradial access for percutaneous coronary procedures: a systematic scoping review

Chemical and Physical Sciences

Menna Morgan

Natural Rubber based solid polymer electrolyte for electrochemical double-layer capacitors

Erjona Mulaj

Evaluation of sensors for monitoring environmentally important species using custom-made Raspberry Pi-based digital colorimeter

Arjeta Selmani

Coumarin synthesis with biocatalysis

Vullnet Veseli

Development of Raspberry-Pi based digital colourimeter for high throughput analysis of plant nutrients in water and soil

George Weaver

Using Bayesian Machine Learning Models To Estimate The Ages Of Stars

Geography, Geology and the Environment

Pratheesh Bellan

Clean coal technology - Biocoal/Bioenergy with carbon capture technology

Matthew Harris

Where did it come from, where did it go? Modelling airmass transport to the Ellsworth Mountains, West Antarctica

Humanities

Rachana Dhaka

The Consequences of De-Notification of (Criminal) Tribes in India: The Case of Bawariya Community

Abiodun Oluwasola Fakemi

Ian McEwan Solar and Helon Habila's Oil on Water: An Ecocritical Study

Life Sciences

Maryam Behjat

Investigation the role of protein phosphatase 4 regulatory subunit (PP4R1) on the survival of leukemic human T cells

Wahaj Mahmood

Restoration of Seagrass Meadows via Tissue Culture

Jude Martin

Developing a method to investigate viral genomic structure and variation

Rebecca Molena

Drug screening of naturally derived compounds against Trypanosoma evansi: Rationale and design

Anthea Mutepfa

Marine collagen scaffolds are a sustainable biomaterial for fabricating neural stem cell implants for spinal cord injury

Alessia Ostini

Investigation into the role of the long non-coding RNA MIAT in leukaemia

Emma Widlake

Altering Viral Diversity: How This Impacts Viral Infection

Medicine

Bushra Kabiri

Evaluating the feasibility of transporting complex neural cell models to remote sites using specialised chemical media

Amardeep Legha

Longitudinal trajectories of work absence: bridging the gap between health and work

Sarah Logan

Starting Methotrexate….what do people with Rheumatoid Arthritis really want to know?

Anais Makos

Immune cell profile in patient with Psoriatic Arthritis

Sandeep Rai

Sikh State of Mind: Exploring the experiences of the Sikh community involved in the 1984 anti-Sikh riots and the long-term impacts on mental health

Jennifer Watson

Assessing Empathy in Medical Student Consultations: Could Machine Learning provide a viable tool for assessment?

Nursing and Midwifery

Sahar Abdalla

Lived experiences and needs of university students who have supported or are continuing to support a person following a suicide attempt or experiencing suicidal ideation#

Pharmacy and Bioengineering

Lewis Dowling

FTIR Spectroscopy for Lung Cancer Diagnosis: Classification of lung cancer cells from non-cancer cells on a glass substrate using machine learning

Gehad Mohamed

Inhibition of BCKDK to increase the sensitivity of breast cancer cells to paclitaxel

Trisha Vikranth

Decellularised pleural membranes in pulmonary regenerative medicine

Xuyiling Wang

Cellular level magnetic hyperthermia for cancer therapy

Geography, Geology and the Environment

Emma Randall

Bittertweet Melancholy: Falconry, behind the glove

Humanities

Rachana Dhaka

Life of a Born Criminal (a poetry with a picture of people the poem talks about)

Medicine

Sarah Logan

Finding out about what people with Rheumatoid Arthritis want to know about Methotrexate - a poem 'Methotrexate'

Jennifer Watson

Assessing Empathy in Medical Student Consultations: Could Machine Learning provide a viable tool for assessment?

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Sahar Abdalla

School of Nursing and Midwifery

Lived experiences and needs of university students who have supported or are continuing to support a person following a suicide attempt or experiencing suicidal ideation

Offering better support to suicidal individuals is constantly focused on by healthcare researchers and professionals but their informal carers need support too, especially those students who are looking for good education. Research Question: What are the experiences and needs of university students who were supporting or are continuing to support a person following a suicide attempt or experiencing suicidal ideation? Aim: To present the systematic literature search and review the relevant literature. Objective: To discuss the available literature about the experiences and needs of university students who support suicidal individuals. Methodology: A comprehensive systematic literature search on five databases as well as grey literature. Findings: Two main themes were identified from the literature: caregiver burden, needs and support. These include four sub-themes: physical and mental health, quality of life, needs of support and supportive services. Outcome: No literature was identified regarding either university students' experiences of supporting a suicidal person or an assessment of their needs; thus, exploring those students' experiences as well as their support needs as carers is important in enhancing the support services offered to students by universities and healthcare systems.

Maryam Behjat
School of Life Sciences

Investigation the role of protein phosphatase 4 regulatory subunit (PP4R1) on the survival of leukemic human T cells

Protein phosphatase 4 (PP4) is an essential enzyme for cell growth, division and survival. PP4 consists of catalytic subunit (PP4c) interacting with four different regulatory subunits (PP4R1, PP4R2, PP4R3 and PP4R4). Our previous studies showed that PP4c has an important tumour suppressor function and plays an important role in the control of cell death and survival of myeloid leukemic cells. The present work investigates the role of PP4R1 in the regulation of leukemic cell survival. Jurkat T cells were transfected with PP4R1 specific siRNAs to silence PP4R1 or a plasmid encoding PP4R1 to overexpress PP4R1. Decreased expression of PP4R1 reduction was associated with a decrease in viable cells. Overexpression of PP4R1 caused a significant increase in viable cell number and decrease in basal apoptosis. knockdown of PP4R1 expression caused Jurkat T cells to arrest at G0/G1 phase in the cell cycle. Overall, the results show that PP4R1 regulates cell survival and growth of Jurkat leukemic T cells, and it could play an important role in maintaining the balance between cancer cell survival. The results suggest that dysfunction of PP4R1 as well as PP4c may be important in the development and progression of leukaemia.

Pratheesh Bellan
School of Geography, Geology and the Environment

Clean coal technology - Biocoal/Bioenergy with carbon capture technology

The UK has reduced its reliance on coal for power generation and expects to eliminate it by 2025. Coal was used to create most of the power in the UK for almost a century, but it is now mostly utilised as a backup. Renewable energy is booming. But, to meet the current power generation demand with net-zero carbon emissions, bioenergy is introduced as a form of energy produced from biological sources such as biomass which replaces coal combustion with bio-coal or biochar. The obstacles to attaining 2 or 1.5 °C targets are so enormous that many believe negative emissions technologies (NETs) are essential. NETs are a diverse range of techniques proposed to remove CO_2 from the atmosphere to mitigate climate change. Among NETs, Bioenergy with carbon capture and storage (BECCS) has gotten the most attention. Large-scale CO_2 removal poses socio-political, technological, and environmental concerns. BECCS's technical potential is greatly dependent on local biomass and geological storage sites. Uncertainty in policy and economics has slowed BECCS growth. This study examines environmental, economic, social, policy, and political variables to determine the economic and technological viability of widespread BECCS deployment. The future recommendation for technological implementation and emission reduction has been explored.

Anusha Carolin

School of Allied Health Professions

Exploration of hand dysfunction in patients following transradial access for percutaneous coronary procedures: a systematic scoping review

Transradial (radial artery) access has become increasingly popular for coronary interventions, with inherent advantages over femoral access. However, studies investigating adverse outcomes have raised concern that patients may experience hand dysfunction. This review aimed to identify the incidence and prevalence of hand dysfunction following the procedure. Based on Arksey and O'Malley's framework (2005), a systematic scoping review was undertaken using keywords (percutaneous coronary intervention, hand dysfunction, and transradial approach) and five databases (Medline, Web of Science, Cochrane Library, Cinahl, AMED). Studies assessing hand function post-procedure were included. Consensus meetings (with a second reviewer) informed study selection and data collection. Results were narratively synthesized. Of 338 articles identified, 12 (prospective study (9), systematic review (3)) were included in the review, reporting on 15,270 patients. A pooled estimate of hand dysfunction rate was calculated as 486 (0.62%). Most studies relied upon subjective measures to identify hand complaints (pain, swelling, numbness, weakness, tingling); only five incorporated objective assessment. Objective methods are lacking in evaluating hand dysfunction, and sensory and motor function are not measured together objectively. Minor or asymptomatic conditions that could affect daily activities in the future are not recognised. Further research is needed to investigate this.

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Rachana Dhaka (Poster and Advertise Your Research)
School of Humanities

Poster

The Consequences of De-Notification of (Criminal) Tribes in India: The Case of Bawariya Community

My research focuses on the Criminal Tribes Act, 1871 enacted for registration, control and surveillance of certain tribes, in India. The CTA has been repealed and tribes listed were de-notified after independence, but the discriminatory treatment continued, with little change in their legal status under the Habitual Offenders Act, 1952. The project looks at Bawariya Community who were compelled by the British Officials in 1870s, to leave hunting, and shifting cultivation, i.e. their traditional way of livelihood and were either left with things such as to steal, smuggle, or put into settlement jails to work as free labor, otherwise tortured physically and mentally. They are Indigenous people with a rich culture of preservation of natural resources who are bound to live under constant fear and injustice due to the stigma of being 'born criminals'. This project endeavors to find the ways the community wants to lead its life in future.

Advertise Your Research

Life of a Born Criminal

The Indian Criminal Justice System still follows the dark laws from British era. Certain laws such as the Criminal Tribes Act, have been repealed and tribes listed were de-notified after independence, but the discriminatory treatment continued. Because the new law- the Habitual Offenders Act, 1952, treated them the same. They are indigenous people with rich cultural of preserving natural resources and leading a life with least harm to environment. But they are bound to live under constant fear and injustice. They were compelled by the British Officials to loot, kill, steal, or smuggle, since they were aware of the travel routes passing through forests, otherwise tortured physically and mentally. therefore, they don't know any other way to earn their livelihoods and society is not accepting them due to the stigma of 'born criminals'. This is time to help them revive their habitats and skills to live a free life.

Lewis Dowling

School of Pharmacy and Bioengineering

FTIR Spectroscopy for Lung Cancer Diagnosis: Classification of lung cancer cells from non-cancer cells on a glass substrate using machine learning

Cancer incidence rates have been continually rising since the early 1990s. This is putting further pressure on pathology departments which can delay diagnosis and worsen patient outcomes. This has only been worsened by backlogs from COVID-19. An automated system using Fourier transform infrared (FTIR) spectroscopy could help to improve diagnosis times for cancer while providing an objective method of diagnosis. A major hurdle to the translation of FTIR spectroscopy to a clinical setting is the cost of substrates which can cost £50-60 per slide. Glass is not regularly used as a substrate because the fingerprint region of the spectra is obscured. However, we have shown that enough information is available in the spectra to classify lung cancer cells from non-malignant lung cells placed on a glass substrate using machine learning. This is the first time lung cells have been classified from lung cancer cells on a glass substrate with FTIR spectroscopy.

Abiodun Oluwasola Fakemi

School of Humanties

Ian McEwan Solar and Helon Habila's Oil on Water: An Ecocritical Study

This study juxtaposes Ian McEwan's Solar and Helon Habila's Oil on Water to illustrate their areas of convergence and divergence concerning their portrayal of ecological discourse. Attention is paid, to how McEwan and Habila deploy characterisation (particularly of the main characters and female characters) to bring to the fore the overwhelming influence of socio-political and economic issues on ecological or environmental crises in the societies portrayed in the two narratives.

The aesthetic and socio-political dimensions of ecocriticism are deployed in this study. In the same vein, the interplay of the socio-political and ethical dimensions has been investigated as well. Habila depicts women as victims of circumstances and females as representatives of problems in the postcolonial context while McEwan portrays them as bad influences who inadvertently prevent men from saving the planet. Ironically, the same women are projected as objects to be used and discarded (in the same manner the natural world is exploited).

In addition, Solar illustrates climate change issues and their effects on the planet though with an undertone of sociocentrism while Oil concentrates on the environmental vis-à-vis economic and social crises in the Niger Delta. It is also ascertained that what makes both texts invaluable for this study is the political and economic ties between the two major countries they are set in, as one is the former coloniser of the other. Significantly, both narratives are not apocalyptic.

Matthew Harris

School of Geography, Geology and the Environment

Where did it come from, where did it go? Modelling airmass transport to the Ellsworth Mountains, West Antarctica

The chemistry of ancient layers of ice from Antarctica can give glimpses into how the Earth system reacted to past climate change. Such insights are vital as we hurtle towards an uncertain climate future. The presence of these chemical fractions in ice cores is dependent on a wide array of factors including precipitation (i.e. snowfall) dynamics, recycling through the atmosphere, and migration within the ice itself. Using NOAA's HYSPLIT atmospheric trajectory model coupled with gridded spatial data analysis, we demonstrate the complex seasonal dynamics controlling the delivery of precipitating and aerosol-laden airmasses to the Ellsworth Mountains in the West Antarctic over the last four decades. Such insights on the physical origin of the precipitation and chemistry preserved in contemporary Antarctic snow provides crucial context for the interpretation of longer records and our understanding of global climate.

Bushra Kabiri

School of Medicine

Evaluating the feasibility of transporting complex neural cell models to remote sites using specialised chemical media

Penetrating traumatic brain injury (pTBI) carries a high socioeconomic burden with therapeutic advances depending critically on effective cross-disciplinary collaboration between biomedical scientists and engineering/material sciences. Significant logistical challenges due to the localisation of equipment and expertise causes a research bottleneck in developmental testing. We have developed complex, pathomimetic, and technically facile in vitro models of pTBI, which are highly suitable for testing novel technologies (e.g. functionalised nanoparticles, biomaterials). However, transport of such complex models from specialised to non-specialised sites has not been previously attempted. Postnatal mice cortices were dissociated and seeded to culture as a cell monolayer. After 10-14 days in standard culturing conditions (37°C/5% CO2), cultures were stored in HibernateTM medium for 4 hours at room temperature (RT) before being returned to standard conditions. They were fixed and immunocytochemistry/dye staining performed to assess cell viability and detect neural cell specific markers. Relative cell proportions and morphologies were thus evaluated. Our data show that all the major brain cell types [neurons, astrocytes, oligodendrocytes, microglia] can be recovered after storage in HibernateTM medium at RT. Our data support the concept that delivery of complex multicellular neural models to remote sites without the use of cold chain transport is feasible.

Amardeep Legha

School of Medicine

Longitudinal trajectories of work absence: bridging the gap between health and work

Aches and pains, as well as mental health conditions, are one of the biggest causes of work absence in the UK. Most people return-to-work reasonably quickly after a work absence, but approximately 10% go on to have longer-term absences of >12 months. Lengthy work absences can be harmful to individuals, their employers, and wider society. However, early, and targeted intervention from General Practitioners (GPs) can encourage a quicker and more sustained return-to-work. The issue is that it is difficult for GPs to tell who is at risk of longer-term absence at initial consultation. It is hypothesized that having access to data of the patterns of work absence over time (trajectories), can help GPs better identify who is at risk of longer-term absence. This project therefore aims to derive the different possible trajectories of work absence, as measured by receipt of fit notes, for an English population absent from work due to pain or a mental health condition. A secondary aim is to explore whether different characteristics of a person affect their chances of following a particular work absence trajectory. For example, are people living in more disadvantaged neighbourhoods more likely to have a longer-term work absence?

Sarah Logan (Poster and Advertise Your Research)
School of Medicine

Poster

Starting Methotrexate….what do people with Rheumatoid Arthritis really want to know?

Methotrexate is an effective drug treatment for Rheumatoid Arthritis (RA) that requires safety monitoring to reduce the risk of harm from adverse effects. Guidelines recommend people with RA receive information before starting Methotrexate (MTX) however there is national variation in the information that is provided. We know that concerns about taking MTX and possible side effects can result in people with RA not taking Methotrexate. This can lead to poorly controlled disease and disability. Little is known about the information people with RA want to receive when starting MTX. We aim to find out what information people with RA require when starting MTX, how they would like to receive this information and whether current service provision meets their needs and expectations. We are recruiting adults of different ages, gender, and ethnicity from two rheumatology units to obtain a broad range of perspectives. Participants take part in a qualitative interview before and after receiving information about MTX. Results generated from thematic analysis will be reviewed by a patient and public involvement group. Stakeholder groups comprising researchers, people with RA, and rheumatology service providers will use the results to develop practical recommendations for providing person-centred information to support people to take MTX.

Advertise Your Research

Finding out about what people with Rheumatoid Arthritis want to know about Methotrexate - a poem 'Methotrexate'

Wahaj Mahmood

School of Life Sciences

Restoration of Seagrass Meadows via Tissue Culture

30% of seagrass meadows have been lost worldwide and 92% within UK alone. Seagrass locks up 5x more carbon dioxide in 1m2 than rainforests, and they do it 35x faster. Traditional methods of replanting seagrass meadows at a large scale (such as taking cuttings) have been unsuccessful.

'Project Seagrass' at the Torode Lab in the University of Keele is using innovate techniques to solve this issue with tried and tested techniques used to grow land plants commercially, known as 'Tissue Culture', where small pieces of a plant are used to make several new ones. The aim of the project is to use single cells of Zostera marina (eelgrass) to make whole new plants and 'artificial seeds' in the laboratory.

I have sterilised different parts of eelgrass collected from Plymouth Sound and cultured them in different conditions with plant growth hormones, nutrients, light cycles and temperature. Within 6 months, I have successfully created fast growing single cell cultures of eelgrass and identified the ideal conditions for their growth. The next step is to 'regenerate' these cultures into healthy plants that are ready to be acclimatised to conditions in the wild and replanted in three meadows in the South West of England.

Anais Makos

School of Medicine

Immune cell profile in patient with Psoriatic Arthritis

Psoriatic Arthritis (PsA) is chronic immune-mediated disease in which immune cells play an important role. Studying the immune cell profile in blood of patients may help to predict their response to specific biologic treatment.

The immune cell profiles of healthy individuals and patients with PsA are compared using a Hematology analyzer (ABX Micros ES 60) and clinical data from patients' clinical records. The white blood cells profile is analysed using flow cytometry (BD FACSCantoTM II).

The level of white blood cells that has granules (granulocytes) does not significantly differ in PsA patients and healthy donors. However, the level of monocytes is significantly higher in PsA patients (0.52×10^9/L) than in healthy donors (0.17×10^9/L), with a p-value = 0.027. Regarding the level of each lymphocyte subset studied (T cells, T helper cells, activated T helper cells and regulatory T cells), there is no significant difference between PsA patients and healthy donors. The high level of monocytes in patients with PsA may lead to joint inflammation via secretion of pro-inflammatory molecules such as TNF and diverse interleukins. The T cell profile do not show significant differences between both groups but differs from one patient to another and may be responsible for difference in response to treatment.

Jude Martin

School of Life Sciences

Developing a method to investigate viral genomic structure and variation

Viruses contain all the information needed to make copies of themselves in a sequence of genetic material, their genome. The virus can also use the shape of this genome to interact with viral and host elements as an extra layer of information. Viral replication does not always produce a perfect copy of this information however and there is considerable diversity within viral populations during infection. Mutant virus copies can develop which provide beneficial effects to the population as a whole. These factors combined ensure the viral population contains a wealth of varied information that aids in transmission and infection. Genomic sequencing can used to study the viral genome; however, it has generally produced reads made up of short sections and this can hamper the analysis of the genome structure as a whole and of the varied virus population. Here we outline a novel method we are developing utilizing new sequencing methods to provide a means of determining structure and sequence across full length viral genomes and which will be better able to characterize the entire viral population.

Gehad Mohamed

School of Pharmacy and Bioengineering

Inhibition of BCKDK to increase the sensitivity of breast cancer cells to paclitaxel

Background: Breast cancer is the most diagnosed cancer among women worldwide. Drug resistance is the major challenge in breast cancer management. Paclitaxel, a first-line chemotherapeutic drug for certain types of breast cancer, often develops resistance with time. Our group has identified the genes that contribute to paclitaxel resistance. One of these genes was BCKDK. Inhibition of BCKDK with siRNA or drugs increases the sensitivity of breast cancers cell lines to paclitaxel. The development of BCKDK inhibitors for clinical use may help to overcome the drug resistance and lead to improved patient survival rates.

Methods: EBSS was supplemented with BCAA to obtain a media equivalent to DMEM with a range of BCAA concentration. The effect of growing the cells in different media and measuring the level of IC50 of paclitaxel were tested.

Results: showed that the effectiveness of our method in manipulation of intracellular BCAA and emerged the difference of breast cancer cell growth corresponds to the cell culture BCAA level. Also, the lower level of BCAA in the cells growing media is causing the cells to be more sensitive to paclitaxel.

Rebecca Molena

School of Life Sciences

Drug screening of naturally derived compounds against Trypanosoma evansi: Rationale and design

Non-tsetse transmitted animal trypanosomiasis is a group of veterinary diseases caused by infection with protozoan parasites, Trypanosoma evansi, T. equiperdum and T. vivax. The resulting diseases have a widespread distribution in tropical regions and affect a range of domestic livestock including cattle, camels and horses. T. evansi has a wide host range and is spread mechanically by biting insects. Infection with this parasite species causes the wasting disease surra, which is a major cause of loss in camel productivity in North Africa. While surra results in major economic losses across the globe, current treatments for the disease have limited efficacy and can cause severe toxicity. In addition, emergence of the drug resistance to all available treatments highlight the need to identify new drugs. The aims of this project are to identify new hit compounds for the treatment of surra.

Menna Morgan

School of Chemical and Physical Sciences

Natural Rubber based solid polymer electrolyte for electrochemical double-layer capacitors

Depleting fossil fuels and ever-increasing energy demands, and costs, has created a demand for more sustainable electrochemical energy conversion and storage devices [1]. This has led to an increased interest in supercapacitors as an energy storage device, with electrochemical double-layer capacitors (EDLCs) the most common [2]. EDLCs have gained prevalence in recent years, particularly those using solid polymer electrolytes (SPEs).

Here we demonstrate the fabrication and characterisation of an EDLC based on natural rubber (NR) based SPE. The electrolyte was prepared via the solvent casting method, using NR and sodium trifluromethanesulfonate ($NaCF_3SO_3$ -NaTf) in the composition of NR : NaTF = 1 : 0.6 (weight basis). EDLC was fabricated using the NR-NaTF based SPE sandwiched between a pair of natural graphite-based composite electrodes. For this electrolyte composition, a room temperature conductivity of 1.22×10^{-4} Scm^{-1} was found. Characterisation of the EDLC was then conducted using electrochemical impendence spectroscopy (EIS) and cyclic voltammetry (CV). For our EDLC, the single electrode specific capacitance (Csc) was found to be 1.21 Fg^{-1} using EIS. CV measurements showed Csc = 4.57 Fg^{-1}. The differences in the Csc values can be attributed to the differences in characterisation techniques such as frequency range and scan rate [3].

Erjona Mulaj

School of Chemical and Physical Sciences

Evaluation of sensors for monitoring environmentally important species using custom-made Raspberry Pi-based digital colorimeter

In the contemporary world where the population is still growing rapidly, an increase in food production is also essential. To meet this demand, intensive farming is applied which requires the extensive use of fertilizers and pesticides to raise the quantity of food production. Overuse of fertilizers leads to soil, water and air pollution. Thus, their monitoring in the soil is important. The need for a simple, inexpensive and portable sensor that allows better spatio-temporal measurements is essential. In our work, a custom-made Raspberry Pi-based colourimeter (PiSENS) is utilised for sensing chemical species relevant for sustainable agriculture, such as NO_3^-, K^+, Na^+, Mg^{2+}.[1]. Polymer membrane-based films sensitive to target species are integrated with so-called optodes. The latter change their colour relative to the concentration of analyte species in the sample solution using a low-cost computer capable of analysing colour intensity, signal processing and data transmission. Plasticized PVC membranes incorporating conventional potassium-selective neutral ionophores and a neutral H^+- selective chromoionophore have been used as reversible sensing devices for an optical determination of K^+ activities in pH-buffered solutions.

Anthea Mutepfa

School of Life Sciences

Marine collagen scaffolds are a sustainable biomaterial for fabricating neural stem cell implants for spinal cord injury

Spinal cord injury (SCI) is a serious condition caused by damage to the spinal cord through trauma or disease, often with permanent debilitating effects but no cure as yet. One promising strategy is the application of implants at the site of injury to encourage tissue re-growth through delivery of cells and/or neurotrophic factors. However, a major issue in the area is the reliance on bovine or porcine collagens to fabricate such implants. In our current study we investigate Jellagen®, a marine collagen biomaterial, as an encapsulating device for an implantable cell therapy. Marine collagen appears to be a sustainable alternative to porcine/bovine collagen. Other patient benefits are the removal of religious barriers to treatment with mammalian collagen medical grade biomaterials. The purpose of the study was to determine whether neural stem cells could retain key regenerative features on Jellagen®. Neural stem cells were shown to survive, proliferate and produce daughter cells required for successful neural tissue regeneration. We further demonstrate an initial protocol to fabricate non-cytotoxic conductive collagen scaffolds and data which indicates biocompatibility of the scaffolds. Our findings support the ongoing development of marine collagen to deliver cells and enhance the regenerative potential of stem cells in implantable devices.

Alessia Ostini

School of Life Sciences

Investigation into the role of the long non-coding RNA MIAT in leukaemia

Myocardial Infarction Associated Transcript (MIAT) is a long non-coding RNAs (LncRNA) that do not possess protein-coding capacity. MIAT is located within the nucleus, and it is found on chromosome 22q12.1. Various findings associated the role of this lncRNA to carcinogenesis and determination of cell fate, mainly acting as an oncogene. MIAT was found to play critical roles in various cancer types, acting as ceRNA and regulating cellular growth, invasion, and metastasis. Thus, unveiling its potential to be used not only as a reliable biomarker but also to be employed for prognostic, predictive and, potentially, therapeutic purposes for cancers. This study aimed to investigate the role of MIAT in the regulation of leukemic cell survival. Two leukemic cell lines Jurkat and CEM-C7 were transfected with MIAT-specific siRNAs to silence MIAT before assessing short- and long-term survival. Decreased expression of MIAT was associated with decrease cell viability and the cell ability to form colonies. MIAT knockdown was associated with an increased number of basal apoptosis and led to the change in the cell cycle profile of these leukemic cells. Conclusively, the results confirm a role for MIAT in leukaemia and in the control of leukemic cell survival.

Sandeep Rai

School of Medicine

Sikh State of Mind: Exploring the experiences of the Sikh community involved in the 1984 anti-Sikh riots and the long-term impacts on mental health

1984 saw what many describe as a genocide, with the anti-Sikh riots in India. As this targeted attack was government prompted, it was distorted by the media at the time and Sikh voices have not been widely documented. This research project aims to explore the experiences of Sikh people who survived these attacks as well as the long-term impacts this has had on their mental health. I aim to develop a richer cultural understanding of this community in order to improve counselling and psychotherapy services and ease accessibility for the Sikh community to seek support. It is intended for this research project to honour the culture of the participants and centre their voices. With this in mind, data will be analyzed as a narrative inquiry and may be presented in a poetic form, which is a nod to the Sikh practices of bani and kirtan.

Emma Randall (Advertise Your Research)

School of Geography, Geology and the Environment

Bittertweet Melancholy: Falconry, behind the glove

My love of birds of prey is unusually complex; I share a close bond with them, one of resilience. It feels natural then, for my PhD, that I am exploring people's encounters with birds of prey and the potential for personal well-being. I was fortunate enough to experience falconry for the first time last year; during the visit, what surprised me was my lack of fear. In the moment, I realised how individuals can be fascinated with falconry centres, handling wild animals is an obvious way to create everlasting connection with them. But my immediate joy and exhilaration was replaced by concern matched by an unsettling feeling, the reality of the situation gave way for the birds held in captivity. I find viewing birds from a distance isn't necessarily as exciting, but more life-affirming because they are free to go about their business in the wild without human interference. #flyingfree

Arjeta Selmani

School of Chemical and Physical Sciences

Coumarin synthesis with biocatalysis

The use of enzymes for organic synthesis vastly improves the sustainability of how chemists can perform chemical reactions.

They operate under ambient conditions (room temperature, aqueous media) and proceed with perfect levels of selectivity (chemo-, regio-, stereo-).

This project has developed a novel biocatalytic synthesis of 3-nitrocoumarins, an important class of molecule that has implications in multiple biological contexts (e.g. biological probes, therapeutic compounds). Many approaches to molecules such as these employ unsustainable methods, such as precious-metal catalysis, toxic reagents and high temperatures.

With this new method which is developed from my researches we will enable the transition to a more sustainable society and give access to important biologically active molecules in the process.

In this project we have use a class of enzymes called lipases, which break down triglycerides in nature to fatty acids and glycerol. We used simple precursors that are commonly available (salicylaldehydes derived from aspirin, and alpha-nitroesters) we have develop new, sustainable enzymatic processes and we produce a range of compounds which will be used for biological testing.

In our work we synthesis 3 Nitrocoumarin,3 sulfocoumarin and R-3Nitrocoumarins.

Vullnet Veseli

School of Chemical and Physical Sciences

Development of Raspberry-Pi based digital colourimeter for high throughput analysis of plant nutrients in water and soil

The quantitative measurement of plant nutrient species in water and soil is of great importance for a variety of human activities, ranging from agriculture and food science to environmental studies. Laboratory-based analytical methods have been developed that provide high sensitivity and specificity, but the bulkiness of the instruments hinders their use in resource-limited settings. We present an inexpensive, portable, and easy-to-use digital colourimeter for the detection of plant nutrients in water and soil. The analysis is based on the utilization of polymer membrane-based optodes as colourimetric sensors and a low-cost Raspberry Pi computer for capturing and analysing optode images. Optode's colour change is analysed using a code written in the free programming language Python. Polymer membrane-based optodes consist of a "cocktail" containing ionophore, chromoionophore, ion-exchanger, polymer and a plasticizer. Advances in wireless communication services offer the possibility to use these devices, facilitating real-time decision-making. To demonstrate the potential of the device, we characterized its analytical performance by detecting K + ions in commercially available bottled water and compared the results to those obtained from a standard UV-VIS instrument. Thanks to its price, portability, commercially available components, and open-source-based system, we believe it represents a valid approach to bring high-precision laboratory-based analysis at the point of care.

Trisha Vikranth

School of Pharmacy and Bioengineering

Decellularised pleural membranes in pulmonary regenerative medicine

Prolonged air leaks as post-surgical complications of lung resections and biopsies are a significant cause of patient morbidity. Extended duration of chest tube drainage and revision surgeries are the standard approaches for its management. Transplantable decellularised pleural grafts as adjuncts to intraoperative closure techniques could reinforce the mechanical barrier, reducing incidence and severity of sustained air leaks. As a treatment modality, it can provide the physiological cues that stimulate endogenous tissue regeneration. We optimised a decellularisation protocol for porcine pleural membranes with minimal disruption to the native tissue architecture, biochemical and mechanical integrity. Our scaffolds were derived using a combinative physical and chemical method. Characterisation involved histology, quantitative bioassays, biomechanical testing, and scaffold biocompatibility studies. Histology revealed the absence of stained nuclei and minimal disruption to core structural extracellular matrix proteins, collagen, and sulphated glycosaminoglycans. Residual DNA quantification showed a 94.6% reduction in native nuclear dsDNA ($p < 0.001$). Mechanical testing showed increased thickness ($p < 0.05$) with comparable young's modulus (12782.7 kPa ± 3874) against native tissue (9259.5 kPa ± 2079). Our pilot study represents a step forward in developing proof of concept for the application of relatively unexplored decellularised pleura in extracellular matrix scaffold-based therapeutics.

Xuyiling Wang

School of Pharmacy and Bioengineering

Cellular level magnetic hyperthermia for cancer therapy

Nanoparticles that could respond to an external AC magnetic field is termed magnetic nanoparticles (MNPs), usually with the size <100nm. They could generate heat because of irreversible magnetization process under AC field condition. On the other hand, cancer cells are more sensitive to elevated temperature, due to higher metabolic rates, than healthy cells. Enough elevated temperature (>42℃) for enough time (~30min) could induce apoptosis in cancer cells while healthy cells remain. This leads to the idea of using MNPs to generate such localized heat to kill cancer cells, termed magnetic hyperthermia (MH). It has become a promising alternative/assistive cancer therapy since last decades. However, once associated with cells, AC magnetic response, as well as heating effect, of MNPs changes dramatically compared with MNP suspensions due to complex biological environment. Therefore, investigating the cellular level magnetic response of MNPs mimicking the in vivo environment, although not seen much progress due to technical limitations, is a necessity. Moreover, cellular level MH where MNPs are either inside or on the membrane of cells could potentially increase the efficacy and thus reduce the dosage and side effects compared to the direct tumour-injection methods seen in most clinical trials.

Jennifer Watson (Poster and Advertise your Research)
School of Medicine

Poster

Assessing Empathy in Medical Student Consultations: Could Machine Learning provide a viable tool for assessment?

The importance of empathic communication within healthcare is well established with research demonstrating that it has a positive association with relationship formation, outcomes, engagement and care overall.

As the emphasis on empathy grows, it is vital to ensure that medical students' capacity to act empathically is assessed and nurtured both accurately and usefully. At present, clinical assessment tends to rely on OSCE examinations. Although these are gold-standard there are suggestions that there may be areas where these could be improved, particularly when assessing 'softer' skills.

The aim of this PhD is to begin the exploration of alternate assessment tools. In particular the focus will be on a computer technology called Machine Learning. By using algorithms, this technology allows computers to identify trends / patterns in existing data (a training dataset) to make predictions about new data. For this PhD the aim is to begin work on the production of a user-influenced training dataset which identifies empathic behaviours. Study 1 will use video-simulated-interviews to look at the ways in which empathy is displayed within medical consultations. The results of this study will be used to guide subsequent work using wider audiences with a more specific focus on certain empathic behaviours.

Advertise your Research

Assessing Empathy in Medical Student Consultations: Could Machine Learning provide a viable tool for assessment?

The importance of empathic communication within healthcare is well established. As the emphasis on this grows, it is vital to ensure that medical students' capacity to act empathically is assessed and nurtured both accurately and usefully. Currently, OSCEs are the mainstay of clinical assessment. Although these are gold-standard there are potential areas for improvement; one of which may be the assessment of empathic communication. This PhD aims to begin the exploration of whether Machine Learning could be used to support this assessment. Machine Learning (a branch of Artificial Intelligence) uses algorithms to identify patterns / predict trends in data. The algorithm is generated using a labelled training dataset. For this PhD (and beyond) the proposed training dataset would consist of labelled examples of empathic behaviour. This will be created using multiple studies; the first will use video-simulated-interviews to identify how students and tutors label empathy when viewing a medical consultation.

George Weaver

School of Chemical and Physical Sciences

Using Bayesian Machine Learning Models To Estimate The Ages Of Stars

As stars progress through the earliest 100 million years of their lives, they begin with visible Lithium lines in their light spectra. Over time, as the star's interior becomes convective, Lithium is taken away from the surface and mixed through the stellar interior. The observable Lithium in their spectra depletes, with different rates of depletion across different temperatures of stars. The change in this depletion with temperature and time can be studied to produce models which give estimates of the star's age. This work utilises a machine learning model in order to model the relationship between Lithium abundance, surface temperature) and age. This model, trained on several clusters of stars and their previously estimated ages from literature, can then be used to generate a most likely estimated age, and associated errors, for input data of Lithium and surface temperature from a given star. The use of machine learning, particularly producing estimates in the form of probability distribution functions, with associated errors and most likely age estimates, provides a distinct versatility. The model can theoretically be trained with any set of data to identify functional relationships, including those that may not yet be known through theory, analytical modelling or simulation.

Emma Widlake

School of Life Sciences

Altering Viral Diversity: How This Impacts Viral Infection

In viral infection, making a genetically diverse population of the virus is important for its survival and transmission. Mosquito-borne viruses face barriers to infection, known as bottlenecks, as they infect each new tissue within the insect host. Beneficial variants in the viral population may overcome these bottlenecks by enhanced receptor binding or evasion of the host immune response, as examples. We infected mosquito cells with two viruses, a vaccine strain of Venezuelan equine encephalitis virus and a mutant version of this. The mutated version creates more diversity than the vaccine strain. We sequenced the cellular RNA and analysed a key host immune response to the viruses. We found that this immune response, which targets viral RNA, was active against the vaccine strain but not against the mutated strain. This shows that altering the rate of diversity impacts key interactions with the host mosquito.

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