University of Surrey PGR/ECR Conference 2025:
Bridging Disciplines

Wednesday 30 April and Thursday 1 May
Vet School, Manor Park Campus

For more information, scan the QR code to visit our SharePoint site.

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Abstract for Keynote presentation 2 Day 1 (30th April)

Understanding singing together: the need for interdisciplinary approaches

Professor Ian Cross, Faculty of Music, University of Cambridge

Abstract: This talk explores some aspects of interdisciplinarity by focusing on the simple question: "What happens when people sing together?" A simple answer could be that it either sounds good or bad, and that is the premise underpinning most scientific explorations of the question. We shall briefly review a representative study that explores listeners' perceptions of correctness of tuning, and a more complex study that investigates what singers do in order to stay in tune with each other when performing together. These studies are typical in assuming that there exist desirable and consensually-determined tuning norms, which significantly constrain the operational definitions of their experimental tasks and concomitantly, the generalisability of their results. We shall refer to another study which indicates that people without musical training are rather imprecise when they sing and note that singing appears to be a universal capacity that does not require formal training. Across cultures, singing together seems to be oriented towards social bonding rather than towards beauty of sound, and this notion will be discussed in the light of Turner's notion of communitas and Turino's distinction between presentational and participatory music-making. Recent work examining the neural and endocrinal correlates and consequences of singing together will be reviewed, concluding with a brief account of ongoing research that explores non-expert, spontaneous joint singing and its outcomes.

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Abstracts for PGR / ECR Oral Presentations Day 1 (30th April)

(OP1-1) **Poetry as Witness: Memory, Trauma, and the Korean Diaspora**

M H Han

How do we remember histories that were meant to be erased? This presentation explores how poets of the Korean diaspora bear witness to trauma, particularly through writing about "comfort women" and other stories of war, displacement, and colonial violence. Poetry becomes a space where historical silence is broken, where intergenerational pain is acknowledged, and where the past is not just recorded but deeply felt. By drawing on memory studies, trauma theory, and history, this study looks at how poets use their work to challenge official narratives, reclaim agency over historical wounds, and hold space for collective remembrance.

Beyond literary analysis, this research also asks how poetry can help us understand the lingering psychological effects of trauma — how it shapes identity and how creative expression offers a way to process grief and resilience. In bringing together poetry, history, and trauma studies, this presentation highlights the role of art in preserving cultural memory and shaping how we think about justice, healing, and belonging.

(OP1-2) **Historically informed recording: ERA's violin case-study**

I Stanovic

This talk introduces a research case-study, conducted as a part of the Early Recordings Association's mechanical recording workshops. Recordings of violin playing from the early twentieth century are well-researched sources, mostly explored in terms of studying performance practice. Various insights in the late nineteenth and early twentieth centuries, in terms of traditions, musical approaches and performance styles, have all been well documented (Brown 1999; Fabian 2003; Leech Wilkinson 2006; Katz 2006; Gebauer 2017; Milsom 2003, 2019, 2020). This case study explored the main stumbling block in all the studies done on the historical violin playing styles on record: what is registered on the disc? The question of the difference between what was played in the recording session, and what was registered on the disc, was asked by Stanovic's post-doctoral project '(Re)constructing Early Recordings: a guide for historically informed performance'. Through further development of historically informed recording method, this case-study expanded the research question of the relationship between the performer and technologies. The case-study was based on violinists recording 10-inch acoustic discs and two-minute wax cylinders in front of an audience of musicologists and performers. The violinists all played the same repertoire, and the audience contributed with their feedback in terms of what they heard being played, and what was produced on the recording. Findings from the study reveal the differences between what is played and what is registered, along with the audience's response to violin vibrato and portamento, and suggested methodologies in performance practice research.

(OP1-3) **Reconstructing the Digital Divide: A Four-Stage Model of the Digital Divide from the Tourism Perspective**

ZJ Yao, XL Wang, MA Ribeiro, XE Jiao

With the deep penetration of digital technologies throughout society, the digital divide, a phenomenon occurred due to the disparity in the use of digital technologies, is generating an increasingly pronounced impact on the tourism economy. Particularly in developing countries, among urbanised, semi-urbanised, and rural areas, differences in the digitalisation of tourism have led to an imbalance in tourism demand and an increase in consumption stratification, hindering the distribution of the 'digital dividend'. Developing countries, such as China, are promoting national development strategies for rural revitalisation and cultural and tourism integration. This study aims to explore the influencing mechanism of digital divide on the tourism economy from the whole chain of demand management, marketing channels, and consumption patterns in the tourism economy by systematically examining the causal relationship and mechanism among the various stages of the digital divide (i.e., motivation, access, skills, and outcome divide).

Therefore, this study nests the Cumulative Disadvantage Theory (CDT) within the four stages of the digital divide to reveal its dynamic evolution mechanism in the tourism economy. The next step is that threshold effects is led to

characterize nonlinear transitions in various stages under specific conditions (tourism policies). Then, this research constructs a mediation model to systematically analyse the impacts of each stage on the tourism economy. In addition, to enhance the scope of application, which adopts a multi-group analysis to compare and contrast urban, semi-urbanised transition zones and rural areas from the perspective of economic geography, and to explore the differences in three geospatial contexts. Ultimately, the team expects to integrate cross-disciplinary theories and secondary datasets from multi-source databases, and use econometric analyses to explore the complex causal relationship between the digital divide and the tourism economy.

(OP1-4) **Harnessing Generative AI for Strategic Foresight to Enhance Business Resilience**

S F Choirisa, I F Tussyadiah, E C Ling

The service sector has long been vulnerable to natural and human-induced disasters. To tackle these challenges, businesses must shift from a reactive approach to a proactive one that prioritises resilience. Resilience, often defined as ""building back better,"" requires a forward-looking strategy to navigate an unpredictable future. But do businesses truly possess the capacity for strategic foresight?

Generative Artificial Intelligence (Gen AI) offers opportunities to overcome human limitations in future thinking and bridge knowledge gaps by expanding the range of possible future scenarios. This study aims to explore how Gen AI can improve foresight capacities in organisations, ultimately improving business resilience. It seeks to answer two key research questions: 1. What capacities do businesses need to develop for strategic foresight? 2. How can Gen AI enhance foresight capacity, thus strengthening business resilience?

To address these questions, a sequential explanatory design will be employed to gather insights from business decision-makers. Subsequently, agent-based modelling techniques will be utilised to test various scenarios generated through the use of Gen AI. Using the Dynamic Complexity Theory, this approach will examine the multifaceted interactions that shape potential futures.

This study offers a pioneering contribution to the development of a framework for foresight capacity, advancing the literature on foresight at the intersection of disciplines of psychology, strategic management, and information systems. Moreover, this study provides practical guidance for business leaders and foresight practitioners on integrating Gen AI to optimise foresight capacity, enhance organisational resilience, and provide actionable strategies for navigating uncertainty.

(OP1-5) **Understanding inequality in breast screening among Black women in the UK: Perspectives from the literature and the way forward**

AE Aliu, RS Kerrison, A Marcu

Women of Black African and Black Caribbean descent in the UK have a higher chance of being diagnosed with advanced breast cancer than White women and are more likely to die from breast cancer due to late-stage diagnosis. However, they are less likely to participate in breast cancer screening than women of other ethnicity.

To understand the ethnic inequalities in the uptake of breast cancer screening, we undertook a systematic review to understand the factors found to act as barriers to breast cancer uptake and the interventions designed to improve participation among Black women.

Evidence from this review has shown that the barriers to breast cancer screening for Black women of eligible age are not defined in research. Barriers highlighted were from mix of women eligible and non-eligible for screening. The views of women below screening age could have been anticipated rather than experienced, hence could lack ecological validity and may be subject to hypothetical bias. Furthermore, our review found no specific interventions aiming to address the barriers faced by Black African and Black Caribbean women.

Conclusion: There is a clear need for population-focused research with Black women of eligible age to understand screening barriers and culturally appropriate interventions that is co-designed, to increase participation in breast cancer screening.

This study was recently published, and findings has been widely disseminated to fill the knowledge gaps, providing evidence for both researchers, healthcare professionals and policy makers. The significance of the study findings evoked media responses resulting in a press release and other publications.

Next Step: To bridge this inequality gaps, the lead author has begun a co-produced study with Black women in the UK to understand screening barriers experienced by these women. Study will culminate in a co-design of culturally sensitive interventions by Black women, user-friendly and adaptable.

(OP1-6) **Closing the Lithium Loop: Bioelectrochemical Approaches for Metal-BioRecovery**

M Ramirez-Moreno, S Gadkari, J Sadhukhan & C Avignone-Rossa

By 2030, 13 million tons of lithium batteries (LiB) from electric vehicles will reach the end of their life, highlighting the need for sustainable lithium management. The disposal of spent LiB involves mechanical grinding, creating a solid waste called 'black mass,' which contains lithium oxides and other metals like cobalt, nickel, and manganese. Current metal recovery methods from this complex matrix, such as pyro- or hydrometallurgical processes, are complex, costly, and environmentally harmful. Bioelectrochemical systems (BES) have successfully recovered various metals and metalloids (e.g., Cr, Cd, Fe, Cu, Ni, Zn, Ag, Co, and Pt) from wastewater and soils, offering an eco-friendly, energy-efficient alternative for lithium recovery. The BELIEVE (BioElectrochemical Lithium rEcoVEry) project aims to optimize BES for lithium bio-recovery from black mass and conduct a sustainability analysis to "close the lithium loop". The initial step of this approach involves leaching lithium from the solid black mass powder into a liquid medium (leachate) through sustainable methods. The resulting leachate is then fed into a BES for lithium bio-recovery. We present our findings and explore the potential of this BES strategy for industrial lithium recycling and reuse.

(OP1-7) **Market Dynamics of Charging Station Infrastructure: Evidence from the UK**

T Bahrdo, M Chitnis

This paper examines the expansion of electric vehicle (EV) charging station (CS) infrastructure across the UK and explores pricing strategies that strike a balance between investor profitability and user welfare. Using quarterly panel data from 371 UK districts between 2019 and 2023, the research investigates the key factors influencing CS growth and applies a microeconomic framework to assess optimal pricing approaches.

The first part employs panel data econometric techniques to identify the main drivers of CS development. The findings reveal that an increase in EV registrations significantly contributes to the growth of CS infrastructure. Conversely, government grants aimed at supporting private, non-public charging facilities, such as those for households, have a negative effect on public CS expansion. Additionally, higher operational costs act as a disincentive to investment in public CSs. The analysis also considers spatial variation, macroeconomic indicators such as GDP per capita, electricity prices, and substitute technologies like hybrid vehicles. Robustness checks, including the Hausman test, support the use of fixed-effects modelling, and instrumental variable methods are used to address potential endogeneity in the relationship between EV uptake and CS availability.

The second part develops a microeconomic optimisation model, grounded in supply and demand theory, to explore how pricing decisions affect market dynamics. The study introduces the idea of incorporating parking fees as a supplementary income source. Findings suggest that such fees can enhance profitability in high-demand regions, notably London, although they may slightly reduce EV users' utility. A social planner framework weighs the trade-offs between investor incentives and societal welfare, offering insights for tailored regional policy.

Overall, this study offers evidence-based recommendations for fostering sustainable CS infrastructure. It highlights the importance of aligning public and private interests to support EV adoption and contribute to the UK's commitment to achieving net-zero emissions by 2050.

(OP1-8) **Heterogeneous creditors and sovereign defaults**

O Chakraborty

Recent empirical evidence highlights a significant increase in capital outflows from China to low-income developing countries (LIDCs) across Africa, Asia, and South America. Unlike traditional sovereign debt, Chinese contracts often impose stringent confidentiality clauses that restrict borrowers from disclosing loan terms publicly. These Chinese loans are typically classified as official creditor debt due to their non-defaultable status and seniority in repayment hierarchies. The surge in Chinese lending has sparked interdisciplinary debates about its underlying motives and long-term implications for debtor nations.

This paper develops a sovereign default model to analyze debt sustainability and welfare effects in economies with heterogeneous creditors: Chinese official lenders and private-market creditors. The model incorporates Risk-neutral foreign lenders and one-period non-contingent bonds, Endogenous output and investment dynamics to study the business cycle fluctuations and default episodes specific to LIDCs.
By integrating these features, the study examines the interplay between productivity shocks, borrowing spreads, and investment in small open economies. The results from which will explain the optimal debt allocation between official (Chinese) and private creditors, incentive to default and their dependence on creditor composition, Pricing of private debt under the shadow of senior official loans.
A key contribution of this paper is assessing whether Chinese official lending crowds out or deters private-sector creditors, with implications for debt sustainability and financial stability. The findings aim to inform policy discussions on sovereign borrowing strategies and creditor coordination in emerging markets.

(OP1-9) **A multidisciplinary approach to understanding ultrasonic stress in foodborne pathogens**
I Soyler, J Gutierrez-Merino, M Bussemaker
Advancing sustainable and non-thermal food preservation requires integrated approaches that span multiple scientific disciplines. This study combines bioscience and chemical engineering to investigate the impact of ultrasonic treatment on foodborne pathogens, including Escherichia coli and Listeria. The research focuses on how ultrasound-induced stresses, such as oxidative and thermal effects, influence bacterial survival, adaptation, and interactions with natural antimicrobials like epigallocatechin gallate (EGCG).
Physicochemical analyses, including sonochemical dosimetry and calorimetric measurements, are applied to characterize acoustic energy transfer and its role in reactive species formation. These data are complemented by microbiological and imaging techniques such as flow cytometry, confocal microscopy, and kinetic modelling to evaluate bacterial membrane integrity and stress response pathways.
By integrating methodologies from both bioscience and chemical engineering, the study provides mechanistic insights into microbial inactivation and stress adaptation. The findings support the development of effective multi-hurdle strategies for food safety and offer a model for interdisciplinary collaboration in addressing complex challenges related to antimicrobial resistance and sustainable processing technologies.

(OP1-10) **Net Zero through Music and Microzoning**
D Hart-Davis
The world is in the midst of an intensifying climate crisis. One of the biggest contributions to greenhouse gas emissions in the UK (and northern Europe) is heating, including our homes. In the UK the predominant style of heating is radiators driven from a fossil gas boiler, commonly oversized and badly installed, and then inefficiently run by householders with a poor understand of the underlying physics. And maybe 20 million existing such UK homes will need to be retrofitted with heat pumps, which are almost of necessity more complex in order to achieve a much lower carbon footprint for the same warmth.
My research aims to improve the outcomes of this home heat decarbonisation, from re-evaluating existing misunderstood technology that installers fear ("microzoning"), to using music alongside other feedback to better convey to end users the likely and more subtle results of how they operate their new heat pump to give them more agency and comfort than they have now. This work must be a cross-discipline mixture of engineering and building physics and modeling and human factors and science communication. A transition of this magnitude cannot be dealt with a single-parameter technical tick-box task: "the heat pump turns on so the job's done" doesn't cut it.
I will present a summary of my research to date and why I think that keeping people warm while eliminating the carbon footprint is not simply an engineering problem. I may even play some data as music to illustrate how we might convey important data to householders who don't read graphs.

(OP1-11) **Bio-Electrochemical System for Product Recovery from Spent Substrate Coffee waste**
O B Olaoye, M Moreno-Ramirez, S Wagland, C Avignone-Rossa
World coffee consumption in 2022 exceeded 170 million bags, emphasizing the importance of this agricultural commodity. However, coffee consumption also produces large amounts of waste with approximately 650kg of

spent coffee grounds (SCG) produced per ton of coffee bean. Due to its complex composition and quantities produced, disposal of SCG has led to environmental concerns. This has prompted research into valorisation of SCG as a secondary raw material.
Bioelectrochemical systems have been utilized for the conversion of organic waste into valuable products. Soil microbial fuel cells have shown promise in treating various organic waste resulting in a reduction of COD. By optimizing the parameters of a MFC, the activity of the exoelectrogens can be directed into producing high value products when treating organic waste.
This project aims to use SMFCs to extract pre-determined chemicals of interest from SCG while reducing the COD simultaneously. Additionally, pre-treatment methods to improve degradability will be studied. Metabolic and metagenomic analyses of the microbial community involved in this process will be conducted using bioinformatic techniques.

(OP1-12) **Use of Ionising Radiation for the Development of an Inactivated Vaccine Against Respiratory Syncytial Virus**

T J B Moore, R Prado Rocha, O Milton, L Broadbent, G Schettino, C Rollier

Respiratory Syncytial Virus (RSV) is an enveloped RNA viruses with large burden of disease, presenting a high risk for children. RSV causes 3.6 million hospital admissions and 100,000-200,000 deaths per year in under 5-year-olds. To date, only three vaccines are licensed for administration to pregnant women, or to older adults.
Inactivated vaccines rely on chemicals which can damage protein-based antigens which are needed to induce protective immune responses. Ionising radiation can be used to damage viral RNA without destroying key protective antigens and is thus an interesting alternative inactivation method.
This project aims to investigate the ability of various modalities of ionising radiation to inactivate viruses such as RSV to develop safe and effective vaccines.
RSV was exposed to varying doses of gamma or electron radiation to determine the optimal conditions for inactivation. Effective radiation doses were ascertained by viral titration. The inactivated vaccine candidates were characterized by RT-qPCR, confocal microscopy, and ELISAs as an initial assessment of their suitability as vaccine candidates. Furthermore, RSV was irradiated in the presence of ROS scavengers to evaluate if this approach increased the amount of pre-fusion (F) protein present on the inactivated virus.
Our results indicate RSV is inactivated at a radiation dose of 16-20kGy. Preservation of protein expression and conformation was confirmed by ELISA for RSV F protein. Confocal microscopy demonstrated that inactivated RSV can attach to and enter HEp2 cells, suggesting that the natural conformation of the F protein was preserved, including the ability of the virus to bind to and enter host cells. ROS scavengers were shown to impact the radiation dose required to achieve inactivation and increase the conservation of pre-F.
RSV can be inactivated by gamma and electron radiation and these methods of inactivation show potential for vaccine formulation. Future in vivo experiments will determine immunogenicity and functionality.

Abstracts for PGR / ECR Oral Presentations Day 2 (1st May)

(OP2-1) **Bridging the gap: the role of specialist centres in autistic pupils' experience of mainstream school**
A Cook, A Boddy

Autistic pupils often face challenges in mainstream schools, impacting their attendance, achievement, and wellbeing (Connolly et al., 2023; Goodall, 2018; NAS, 2023). To address this, five specialist centres were established within mainstream schools, providing tailored support, a calm environment, and autism-trained staff. This three-year study examined their impact on academic, social, and psychological outcomes, hypothesising that autistic pupils in specialist centres would show greater academic, social, and emotional improvements than those without centre placements, and no significant differences in mental health outcomes between centre pupils and non-autistic peers. A qualitative strand explored how autistic pupils experience school and how placement type shapes wellbeing, relationships, and identity.

A multi-methods approach tracked 119 autistic and 119 non-autistic pupils (aged 11–15) across five centre schools and two mainstream schools without centres over four timepoints (2021–2024). Surveys measured academic, social, and mental health outcomes, while schools provided attendance, exclusion, and progress data. Mixed-ANOVAs compared outcomes across time and school placement, and regression analyses assessed predictors such as age, gender, perceived support, and school placement. Interviews with 12 autistic pupils (aged 14–15) explored learning experiences, support, relationships and identity, analysed using reflexive thematic analysis (Braun & Clarke, 2021). Ethical approval was granted by the University of Surrey Ethics Committee.

Findings showed that pupils in centre schools demonstrated greater academic progress, smaller attendance gaps, and lower exclusion rates. They reported a stronger sense of belonging, increased happiness, and better peer relationships. No significant differences were found in mental health outcomes between centre pupils and non-autistic peers. Interviews highlighted the value of specialist support and calm spaces. Non-centre pupils felt unsupported and that schools should improve autism awareness. Findings suggest that integrating specialist support and calm spaces within mainstream settings enhances educational and social outcomes, offering a model for wider implementation.

(OP2-2) **How ageing impacts the heart-controlling nerve: Exploring the Heart-Brain Axis through electrophysiological activity and genetic changes**
B Lee, S Ahmad, C E Edling, F LeBeau, K Jeevaratnam

How does ageing impact the heart? What happens if there is a miscommunication between the heart and the brain? While ageing is a natural process, it may bring changes to the brain, impacting our memory and cognition and increasing the risk of neurodegenerative diseases such as Alzheimer's and Parkinson's disease. Similarly, heart experiences change alongside neuronal ageing, and ageing thus increases cardiovascular risk. Stellate ganglia (SG) are the organ that controls the neuronal signals to the heart. If there is a neuronal damage in this organ, it may result in critical heart problems involving the aberrant heart rhythm, which may lead the patient sudden death. However, little is known about how ageing impacts this organ functionally and genetically. We aim to investigate how the electrical nature of the 'heart-controlling nerve' changes with ageing. To investigate this, we utilised a technique to record electric currents on living SG tissue, called loose patch clamping. We compared young (3 months-old) and aged (13 months-old) black-6 mice to explore the age-mediated changes in the electrical nature of the heart and SG ($n > 30$ sites, 8 mice each group). The currents from the SG tissue were reduced with ageing, while ageing did not affect the heart. Additionally, we found out that the gene involved in the electrical control in nerves was changed with ageing. In conclusion, our study revealed that ageing might alter the electrical properties of SG in mice, potentially contributing to geriatric conditions. We believe this knowledge will provide meaningful insights into the ageing-related increase in cardiac risks and their prevention.

(OP2-3) **Use of Artificial Intelligence for Breast Cancer Risk Assessment**

M Eaton, S Pani, E Lewis

Breast cancer, one of the most common cancers worldwide, has a significantly higher survival rate when caught in its early stages. Breast density, the proportion of glandular tissue within the breast compared to the fat (or adipose) content, is a known risk factor. In order to improve workflow, AI models have been developed as breast density estimation tools. Currently, these have not been deployed clinically in the UK due to a lack of consistency and disagreement between results from different AI tools and different brands of mammographic units.

This work combines AI analysis with the use of a novel detector with spectral imaging capability. In spectral imaging, the information about the energy (wavelength) of radiation is preserved, unlike in conventional imaging, making additional information about the properties of the material accessible. An imaging setup was simulated, with test objects made out of materials representing the X-ray absorption properties of breast tissue. The detector response for a range of breast densities and thicknesses was simulated and used as the input data for a custom made AI tool. The AI model trained on this data, learning what features within the detector output indicated the percentage density of each corresponding test object.

When tested on unseen data, the model was able to predict breast density with good accuracy, having a mean squared error of 0.013 ± 0.002 %.

In the future, the combination of this detector technology and AI model could allow fast and reliable estimation of breast density, with potentially significant improvement in patient outcomes.

(OP2-4) **The association between children's socioeconomic status, their spatial skills and later mathematics understanding**

S McCarthy, D Gooch, M S C Thomas, A Ronald, E K Farran

Poor mathematics attainment is associated with worse life outcomes such as lower income levels, lower physical health, and less engagement by individuals in their communities. Given only 59% of 11-year-olds receiving free school meals achieved the expected standard in mathematics compared to 79% of their peers, a key focus of educators and policy makers in England is how to close this widening SES attainment gap. Improving children's spatial ability has been shown to improve children's mathematics attainment. Initial research has shown that spatial training may be particularly beneficial for children from low SES backgrounds. However, the mechanisms which explain the relationship between spatial ability and SES are not yet well understood. This study aimed to explore the relationship between SES, spatial skills and mathematics, taking account of children's language skill, which we also know is critical for mathematics. Using cross sectional data of 2454 participants (1350 female, 1104 male) from the Twins Early Development Study we ran hierarchical regression models to determine if spatial skills predicated later mathematics performance, whilst controlling for gender, SES and language ability. Spatial skills at age 2, 4 and 9 contributed unique variance to children's mathematics ability age 10 over and above language skills. There was no evidence to suggest that the SES of the individual changes the relationship between spatial skills and mathematics understanding. Mediation analysis to examine whether spatial ability mediates the relationship between SES and mathematics was positive at Age 2 and Age 9. This research has implications for targeted spatial training. Spatial training at key points in Early Years and Primary schooling could improve the mathematics performance of children from low socioeconomic backgrounds. This strategy should be considered by policymakers seeking solutions to close attainment gaps for the most vulnerable children.

(OP2-5) **Optimising Na-loading in NiRuNa-DFM for CO_2 capture and methanation using Bayesian Optimisation**

S Bahrami Gharamaleki, S Carrasco Ruiz, T Ramirez Reina, M Short, M Duyar

Dual function materials (DFMs) consist of adsorbent and catalytic materials that can capture and convert CO2 within the same reactor. Integrated CO2 capture and conversion require optimised DFM design to achieve the highest efficiency in both adsorption and conversion steps to tackle the ever-increasing rate of CO2 in the atmosphere. Achieving this optimal design often involves extensive experimental parametric studies, testing different adsorbent and catalyst combinations and their respective loadings. In our research, we employed a Gaussian process (GP) model combined with Bayesian optimisation (BO) to determine the DFM composition that would maximise methanation activity. Specifically, we investigated the effect of varying Na (adsorbent) loading, ranging from 2.5% to 15% by weight, in a DFM. We performed experimental initial screenings and characterisation

tests to understand the materials' behvaiour deeply. Through Bayesian optimisation-recommended experiments, we identified an optimal Na loading of 7.9 wt%, which led to the highest methane production (398.6 μmol gDFM-1) during a reaction cycle at 400°C. This case study demonstrates how computational tools can streamline the process of designing new DFMs. While the focus of this model was on optimising adsorbent loading, it provides a valuable foundation for further exploration of DFM compositions.

(OP2-6) **Using Digital Twin Technology for Recreational Water Quality Management in the UK**

N Shishmanova, K Pond, D Hajializadeh

Water quality at designated bathing sites in the UK is assessed through a set of bacterial indicators. Due to the incubation period required for microbiological analysis, a significant time delay exists between sample collection and providing timely warnings to water users. A key challenge also lies in the multi-dimensional nature of water quality, where various contributing factors, including meteorological conditions, hydrodynamics, and pollution sources, are often not considered systematically or interdependently. A shift towards nowcasting and forecasting of bathing water quality can help address these shortcomings by considering these multi-faceted aspects systematically. To this end, one approach is digital twin technology, in this context referring to a dynamic, data-driven virtual representation of the coastal water system, integrating multiple data sources, incorporating models, and providing visual outputs to support a proactive approach for water quality management.

This research focuses on a set of designated bathing sites in the southeast coast of England which are experiencing deteriorating water quality. It explores the development and application of a bespoke digital twin suitable for bathing waters management, capable of identifying, quantifying and localising factors contributing to suboptimal water quality.

To build a digital twin of the southeast coast of England, this project will develop a system architecture to layer historical and real-time data, alongside numerical models to enable reliable nowcasting and forecasting of water quality. The research aims to identify potential sources of pollution and explore corresponding mitigation measures, with a particular focus on the value offered by nature-based solutions.

The research combines methods and data from two distinct disciplines: computer modelling and environmental science, with contribution to the broader topic of water quality across the UK. To the best of the authors' knowledge, this project will present the first digital twin in the UK utilised for the purposes of bathing water quality management.

(OP2-7) **AI for Adolescent Well-being: Safeguarding the Smartphone Environment**

J M Verner

Given the correlations between excessive screen time, social media use and the rise in levels of anxiety and depression in adolescents, this research investigates how artificial intelligence (AI) could potentially be used as a safeguarding tool within smartphones for adolescents aged 11 to 16. According to Ofcom, in the UK, 27% of children aged 3–4 own a smartphone—a figure that rises to 61% for ages 8–11 and 96% by age 12. There is also evidence to suggest that the patterns of problematic smartphone use among adolescents mirror that of behavioural addiction. Most smartphones depend on built-in parental controls and app-level filters to block harmful content. However, this research highlights several limitations of these controls, mainly when digitally literate adolescents bypass them while adults lack the technical know-how to enforce them effectively. While safeguarding is a shared responsibility among families, caregivers, schools, local councils, and the state, current guidance on how AI can support protecting children online remains limited.

This research will adopt a case study approach, with focus groups of secondary school students in the UK aged 11 to 16, to examine their well-being in the context of smartphones. A series of workshops will be undertaken to involve young people, exploring their experiences and incorporating co-design methods to collaboratively envision how AI technologies could support digital well-being and safeguarding.

This presentation will provide an overview of the research aims and the key findings from the ongoing literature review. A summary of the proposed methodology, including the case study approach, will be presented. It will also outline the ethical considerations in the anticipated role of AI in supporting digital safeguarding. Attendees will gain insight into the project's key research questions and the potential contributions this study could make to safeguarding policy, practice, and technology design.

(OP2-8) **Supramolecular templated phosphate-based glasses for tissue regeneration**

C A Berry, H Zhao, M Felipe-Sotelo, D Carta

Supramolecular templating combined with the sol-gel (SG) method has received increased interest for the synthesis of highly porous phosphate-based glasses (PBGs) for biomedical applications due to their increased bioactivities.1,2 PBGs in the system P2O5-CaO-Na2O-TiO2 prepared via the conventional melt quenching (MQ) method have shown excellent potential for bone regeneration applications.3 The addition of TiO2 imparts beneficial osteogenic properties onto PPGs, whilst the presence of porosity is expected to enhance the biomedical properties. In this study, porous PBGs in the system P2O5-CaO-Na2O-TiO2 (0-20 mol% TiO2) have been prepared using both the SG method and an alternative, sustainable and cost-effective technique of coacervation (COA).

Various complementary techniques have been employed for the characterisation of the PBGs (X-ray diffraction, Fourier-transform infrared spectroscopy, thermal analysis). In addition, N2 adsorption-desorption analysis at 77 K and scanning electron microscopy were used to investigate their porosity. PBGs prepared via SG present meso- (2 < d < 50 nm) and macroporosity (d < 50 nm) following the removal of the templating agent, Pluronic P123, via calcination at 300 °C. PBGs prepared via COA show macroporosity following the removal of the titanium isopropoxide precursor via calcination at 350 °C. Dissolution properties of PBGs were investigated in deionised water via microwave plasma at time intervals of 3, 24, 48 and 72 hours and these samples were subsequently utilised for the assessment of the PBG biocompatibility. Cytotoxicity studies on osteoblasts and fibroblasts exhibit good proliferation and viabilities, indicating that these materials have great potential for hard tissue regeneration.

1. F. Foroutan et al., ACS Biomater. Sci. Eng., 2020, 6, 1428.
2. F. Foroutan et al., Front. Chem., 2020, 8, 249.
3. E. A. Abou Neel et al., Mater. Sci. Eng. C, 2014, 35, 307.

(OP2-9) **Aural Diversity in Musicians: Rethinking Hearing in Audio Research**

N Winge, C Chousidis, R Mason

Everyone hears differently. However, within audio research listening is often assumed to be relatively uniform, overlooking the rich variety in auditory perception amongst individuals. This research explores ""aural diversity,"" challenging the idea that there is a standard way of hearing. Specifically, we investigate subtle auditory differences amongst musicians, whose practices heavily rely on precise listening abilities.

Traditional hearing assessments, like pure-tone audiometry, measure hearing thresholds broadly and subjectively, potentially missing nuanced auditory differences significant for musicians. Our study addresses this limitation by incorporating objective auditory measures called otoacoustic emissions (OAEs) - low sounds naturally emitted by healthy ears -that provide detailed insights into auditory function.

We collected data from musicians across different ages, gender identities, and musical training backgrounds. Combining audiometric results with OAEs, we found notable variability in hearing, potentially influenced by musical experiences and gender identity. These findings may suggest variations in musicians' auditory systems based on the type and extent of their musical engagement.

By bridging audiology, psychoacoustics, and gender studies, this research enriches our understanding of auditory perception. Amplifying previously underrepresented perspectives - such as those of individuals who are not cisgender men - our work broadens conversations within audio research. Embracing aural diversity offers valuable insights that could improve audio technology and music education methods, ultimately fostering more inclusive and personalised auditory experiences.

Abstracts for PGR / ECR Poster Presentations Day 1 (30th April)

(PP1-1) **Should Naked Credit Default Swaps (CDS) be Banned? - A General Equilibrium Analysis of Market Consequence**

X Liu, M Pascoa

Credit default swaps (CDS) are financial instruments that allow investors to hedge against the default risk of underlying debt assets. In particular, investors are not required to hold the underlying asset, a practice referred to as a "naked" CDS purchase. In history, naked CDS purchases have raised concerns about financial stability due to their flexibility to realize leverage. In response to systemic risks highlighted during the Eurozone sovereign debt crisis, the Eurozone banned naked CDS purchases in 2011. However, this ban is controversial. Our paper examines the impact of such a ban on the security market. We interpret CDS purchases as an alternative mechanism for investors to short-sell securities. Surprisingly, we find that banning naked CDS purchases may depress the underlying security market. Different from previous asset pricing literature on the finance field, we develop a two-period general equilibrium model with central clearing to reflect institutional features of the current European market, where risk-neutral agents have different beliefs (optimistic or pessimistic) about trading their assets. The mass of optimists and pessimists are endogenously determined in equilibrium. Our finding shows that banning naked CDS motivates the pessimist to reduce CDS purchases and instead increase security short sales, triggering a decline in security prices. This paper contributes to the literature on the interdisciplinary of finance and economics. We highlight a novel channel through which constraints on naked CDS purchases can backfire. The results also have implications for security pricing, market regulation, and welfare analysis in the financial market.

(PP1-2) **The Impact of Language Issues on the Experience and Sense of Belonging of International Students: A Study in UK Universities**

J Y Chen

The challenges faced by international students are complex, diverse, and dynamic. This study reframes the concept of belonging through an intersectional and dynamic sociological lens, situated within the broader context of higher education and international student migration, and introduces the relevance of language issues to belonging within this framework. By challenging static and binary understandings of belonging—commonly found in existing research that frames it as fixed or universal—this study highlights its non-linear and evolving nature, revealing how students continuously negotiate their place within academic and social identities. In addition to exploring international students' views on belonging within their study abroad experiences and their perceptions of the relationship between language issues and belonging, this study also examines how they perceive and evaluate the support services provided by universities and their perceived effectiveness in fostering belonging.

The study adopts a qualitative methodology, using two rounds of semi-structured interviews conducted six months apart, alongside monthly diary entries submitted over the same period. Participants respond to reflective prompts based on keywords provided by the researcher, recording their reflections through monthly diary entries. The second interview builds on insights from the first interview and diary reflections, allowing for targeted and in-depth exploration of emerging themes. By focusing on non- native English- speaking international doctoral students in the social sciences at UK universities—comparing experiences across both Russell Group and non-Russell Group institutions—the study explores key factors that participants associate with belonging within independent and individualized academic environments. The study calls for more context-sensitive approaches that recognize the fluid academic, linguistic, and social identities of international students, while also respecting diverse perspectives on belonging—including the possibility that belonging may not always be desired or experienced.

(PP1-3) **Green Chemical and Hydrogen Production via Ethylene Glycol Electrolysis using Gold Catalysts**

N Srinivasan, H Luo, R Dorey, Q Cai

The electrochemical conversion of plastic waste into clean fuels and commodity chemicals has gained significant interest due to its economic and environmental benefits. Electrolysis of ethylene glycol (EG), a promising approach for sustainable hydrogen production, can be directly linked to the chemical recycling of polyethylene terephthalate

(PET) plastics. This process not only reduces plastic waste but also enables the partial oxidation of EG to high-value glycolic acid, a thermodynamically favourable route that enhances green hydrogen production. However, achieving selective oxidation to glycolic acid remains challenging due to the concurrent formation of byproducts, particularly formic acid.
To address this, we investigate the oxidation mechanism of EG on state-of-the-art gold catalysts, aiming to inform the design of more selective and earth-abundant alternatives such as iron and cobalt. Through electrochemical techniques - including cyclic voltammetry and chronoamperometry - we evaluate the catalytic performance of gold under varying conditions such as time, pH and ionomer content. High-performance liquid chromatography (HPLC) is employed to analyse product distribution, providing critical insights into reaction selectivity. These findings serve as a foundation for proposing a mechanistic pathway for EG oxidation on gold, which will be further validated using in-situ spectroscopy.

(PP1-4) **Biodiversity effects of crop residues for bioenergy**
S J Tudge, A Duden, Z M Harris, R Murphy, A De Palma
Bioenergy production is predicted to increase to reduce global reliance on fossil fuels and limit the effects of climate change. Crop residues could provide a large share of the biomass for future bioenergy production, and cereals constitute almost three-quarters of global crop residues. Thus, cereal crop residues could be used to produce bioenergy on a large scale in the future. Cereal residues are currently managed for other purposes or left on fields; therefore, bioenergy demand could increase the amount of residues removed from fields. The retention of crop residues on fields is known to have positive effects on soil health and soil biodiversity. Yet, relatively little is known about the effects of removing crop residues from fields on biodiversity outside of soils, hindering our ability to assess the sustainability of crop-residue-derived bioenergy. Therefore, we investigated the effects of removing cereal crop residues on local vertebrate abundance and species richness. We combined field measurements of vertebrate biodiversity in cereal croplands with global maps of crop production and residue management. Our statistical models showed that vertebrate abundance was positively associated with the proportion of crop residues left on fields. Vertebrate richness showed a more complex relationship, peaking when approximately 65% of crop residues remained on fields. We also found that crop residue production was consistently associated with declines in vertebrate abundance and richness, whereas crop yield had a weaker effect on richness and a more complex relationship with abundance. Our results suggest that increased removal of cereal crop residues for bioenergy could have negative consequences for vertebrate abundance; however, in some cases, there could be positive effects on vertebrate richness. Therefore, removing more crop residues could have mixed effects on vertebrates, with potential implications for conservation, pest control and ecosystem services.

(PP1-5) **Leading change in residential care: A qualitative study to develop Dementia Care Mapping for future implementation**
AF Paiva, A Barbosa, L Collins
Background: Dementia Care Mapping (DCM) is an observational tool used to deliver person-centred care (PCC) for people living with dementia. While the research to date has demonstrated the positive impact of DCM in care homes, more needs to be understood about the implementation and uptake of DCM and staff understanding of person-centred care in practice.
Aim: This project aims to provide robust evidence and recommendations for practice for the implementation and uptake of PCC and DCM in practice.
Methods: A constructivist grounded theory study that aimed to understand the perspectives, experiences and understanding of care home staff and DCM mappers of implementing PCC. It aimed to explore ways to improve the implementation of PCC using DCM.
Findings: This study offers a nuanced understanding of PCC within care home settings, particularly focusing on the formulation of care plans and its implications for the practical implementation of PCC principles. Through comprehensive data analysis and theoretical conceptualisation, the study reveals a complex interplay between managerial perspectives, staff practices, and organisational dynamics. While care plans are deemed essential documentation for individualised care, their creation often imposes administrative burdens on managers, detracting from meaningful interactions with residents. This tension underscores the need to bridge the gap between bureaucratic requirements and the genuine delivery of PCC. The study highlights the importance of reconceptualising PCC beyond mere documentation, emphasising the significance of everyday actions and

interactions that prioritise residents' individuality and well-being. Participants' perspectives shed light on the inherent conflict between the concept f of PCC and its practical application, especially in the context of formulating care plans. Despite efforts to tailor care plans to residents' needs, the emphasis on paperwork may hinder the value of spontaneous, person-centred interactions carried out by care staff.

(PP1-6) **Accelerating skin product formulation design: Early decision-making for rapid formulation optimisation**

Y Zhang, Y Xiao, D Tsaoulidis, T Chen

Formulated products in pharmaceuticals, cosmetics, and personal care require careful design to achieve specific functional and therapeutic outcomes. A key challenge is optimising ingredient compositions to control active substance permeation through the skin, which is crucial for therapeutic efficacy, safety, and product performance. Traditional in vitro permeation tests (IVPT) using excised human skin are effective but time-consuming, often requiring up to 24 hours per formulation. This prolongs development cycles and increases resource use, necessitating more efficient approaches. We propose a novel early decision-making algorithm (EDMA) to accelerate formulation optimisation. By integrating Gaussian Process Regression (GPR) and the Probability of Exceedance (PoE), EDMA identifies promising formulations early, even under prediction uncertainty. Applied to ibuprofen gel-cream formulations, EDMA demonstrated accurate early predictions of higher drug permeation, reducing the need for full 24-hour IVPT runs. This shortened the development timeline and enabled reliable decisions before experiments concluded. In conclusion, EDMA offers a flexible, data-driven solution that streamlines the formulation development process. By enhancing decision-making and reducing testing times, it opens avenues for rapid innovation across pharmaceutical, cosmetic, and personal care products.

(PP1-7) **Organic Photovoltaics for Sustainable Indoor Energy Applications**

W VU Wickramasinghe

The demand for sustainable energy solutions in low-power electronics has driven interest in indoor photovoltaics (IPVs). Organic photovoltaics (OPVs) offer a compelling alternative for powering indoor devices, thanks to their high efficiency under artificial lighting, mechanical flexibility, and potential for low-cost manufacturing. OPVs present unique advantages, including tunable spectral response, ease of integration with energy storage systems, and adaptability to a wide range of electronic applications. Compared to other IPV technologies, such as perovskite and copper indium gallium selenide (CIGS) solar cells, OPVs offer superior stability and safety. While perovskite cells demonstrate high power conversion efficiency under low-light conditions, their lead-based composition raises toxicity concerns. CIGS cells, though efficient, require rare elements and complex fabrication. OPVs, in contrast, use non-toxic materials and can be printed on flexible substrates, enabling seamless integration into wireless sensors, IoT networks, and energy-autonomous systems.

This presentation will explore how OPVs can be optimized for indoor energy harvesting through advancements in circuit design, power management, and system integration. Key considerations include impedance matching for maximized power extraction, novel supercapacitor technologies for charge storage, and direct integration with low-power microcontrollers. By bridging innovations in electronic engineering, photovoltaics, and energy storage, we can accelerate the adoption of OPV-powered systems, reducing reliance on disposable batteries and enabling next-generation self-sustaining electronics.

Through this interdisciplinary approach, it is expected to highlight the role of electronics engineering in unlocking the full potential of OPVs for indoor energy applications other than optimization of OPV material systems and demonstrate how bridging disciplines can drive innovation in sustainable electronics.

(PP1-8) **A Budget-Constrained Optimization Framework for Mitigating Domino Effects: Integrating Safety Barriers and Emergency Response Resources**

Shuya Hou, Siyu Deng, Tao Chen, Valerio Cozzani, Bin Zhang, Oleksiy V. Klymenko

In chemical facilities, mitigating domino effects under limited budgets is a critical challenge. This study proposes a co-optimization framework that jointly allocates safety barriers (SBs) and emergency response (ER) resources to minimize accident escalation risk under budget constraints. The optimization of SBs first before adding ER resources (SB & ER) and the simultaneous optimization of both (SB + ER) are compared. The results demonstrate that the co-optimization SB + ER measures significantly reduce incident propagation probability, particularly for high-risk chemical storage facilities. Compared to optimizing SBs alone, the SB + ER achieves a faster reduction in

accident escalation probabilities across multiple scenarios, even under constrained budgets. Radar charts show that SB+ER maintains the lowest overall failure probabilities among all budget levels, while simply adding ER resources after barrier placement (SB & ER) achieves only moderate improvements. Furthermore, sensitivity analyses show that SB+ER strategy reaches the point of reduced profitability at lower budget thresholds, whereas relying on SB delays this tipping point to a higher level of investment. Hence, SB+ER not only provides a more robust reduction in risk but also yields diminishing returns at a lower budget, allowing facilities to meet or exceed targeted relative risk reduction (RRR) goals more cost-effectively. These findings highlight the practical benefits of a combined risk management strategy, enabling plants to optimize investments in both SBs and ER resources for safer operations with minimal total expenditure.

(PP1-9) **AI-based Energy Management System for Electrolyser**

J Mao, L Xing, D Sebastia-Saez, X Jin

This study presents an AI-based Energy Management System (EMS) for water electrolysers, combining advanced machine learning algorithms with Model Predictive Control (MPC) to enhance hydrogen production and energy efficiency. The system uses real-time operational data—such as voltage and temperature—to predict key performance indicators including hydrogen yield, energy consumption, and Faraday efficiency. A dynamic multi-input multi-output model captures both short-term responses and long-term trends, allowing the EMS to rapidly adapt to varying load conditions and grid disturbances. By continuously learning from feedback data, the MPC adjusts control parameters in real time, improving system performance and reducing operational costs. This predictive capability is particularly important under intermittent renewable energy inputs, such as wind and solar, where power fluctuations can significantly impact efficiency and stability. The EMS anticipates these variations and proactively adjusts operational strategies, ensuring reliable and efficient hydrogen production. Moreover, the proposed system demonstrates strong scalability and adaptability, making it applicable to other electrochemical systems such as CO_2 electroreduction and nitrogen reduction. Compared to traditional control strategies, this AI-enhanced EMS offers more flexible, autonomous, and precise control across diverse operating conditions and application scenarios.

(PP1-10) **The bioavailability of insect compared to animal protein in younger, middle-aged and older adults**

J.A.G. Rutherford, R.M. Elliott, R. Thatcher, G.P. Knott, J. von Gerichten, B.A. Fielding, R.M. Manders

Introduction: A global shift towards sustainable food sources is emerging due to the environmental impact of animal food production. Insects offer a novel, sustainable protein source with high protein content and lower resource demands. This is particularly relevant for older adults, as protein intake is crucial for maintaining muscle mass and preventing frailty. This study examined the digestibility of insect-derived protein compared to whey protein by assessing gastric emptying (GE) and the impact of ageing on protein digestion.

Methods: In a randomised, double-blind crossover design, 30 healthy adults were divided into three age groups: younger (25.9±5.5 yrs), middle-aged (46.7±4.9 yrs), and older (76.5±4.2 yrs). After fasting overnight, baseline breath and blood samples were collected. Participants then consumed either a cricket or whey protein muffin (20g protein) containing a carbon-13 (13C) stable isotope tracer. Breath samples were collected over four hours postprandially to measure expired air as 13CO2 excretion, indicating GE. Blood samples were also collected to assess plasma amino acid concentrations. The process was repeated with the opposite protein source a week later. Modelling was used to analyse and interpret GE data, determining the time to peak 13C release from the stomach (t lag) and the time for 50% of 13C to empty into the small intestine (t half). One-way and two-way ANOVAs and paired t-tests assessed differences in means between protein sources and age groups, with statistical significance set at $p<0.05$.

Results: Both protein sources resulted in similar 13CO2 excretion (~28% recovered at 240 minutes), with no significant differences in t lag or t half between cricket and whey protein ($p>0.05$) or across age groups ($p>0.05$).

Conclusion: GE of cricket protein is comparable to whey protein and remains unaffected by ageing, suggesting insect protein is a viable, bioavailable alternative to traditional animal protein in healthy adults across the lifespan.

(PP1-11) **Circular Bioeconomy Through Food Waste Management and Valorization: Strategies, Challenges, and Innovations**

RH Hafyan, Jadhukhan and S Gadkari

A substantial volume of food waste (FW) presents significant challenges, including risks to biodiversity and nature, as well as adverse economic and environmental consequences. Current FW management practices are designed

to address these issues by minimizing waste generation throughout the food supply chain (FSCW). In fact, FW holds the potential for transformation into valuable products. This not only presents economic opportunities but also helps alleviate environmental burdens, contributing to the promotion of a sustainable circular bioeconomy. Effectively managing FW requires a systematic evaluation using organized methodologies to minimize adverse impacts, maximize economic returns, and gain social acceptance. However, this becomes particularly challenging in developing countries dealing with technically weak waste management systems, limited financial resources, and insufficient public cooperation. Decision-making in such contexts becomes intricate due to conflicting criteria, necessitating the use of specialized decision-making tools. The integration of sustainability evaluation frameworks with decision-making tools empowers decision-makers to assess multiple alternatives and identify the most sustainable solutions. This review explores the potential products derived from both FW management practices and FW biorefinery, considering economic and environmental factors. In addition, It comprehensively investigates the strategic approach of integrated FW biorefinery to enhance the sustainability aspect of the processes. In conclusion, this study discusses essential aspects in the development of decision-making approach for FW management selection. It underscores the importance of considering economic viability, environmental impact, and social acceptance in the decision-making process to promote a more sustainable and effective FW management strategy.

(PP1-12) **Hearing the unheard: Voices of young fathers with a history of domestic violence in their childhood**
D M Brenchley

Despite growing knowledge about the lives of young fathers, there remains a gap in understanding about how domestic violence, as a child, informs their journeys and identities as fathers. In contrast to studies about young mothers and their children, young fathers have remained relatively invisible in research (SmithBattle et al., 2019). This presentation shares a proposed study that aims to address unanswered questions and improve understanding about the lived experiences of young fathers.

A stereotypical narrative about young fathers is frequently perpetuated in the media and academic studies. Portrayed as absent, reckless and feckless they are denounced as a burden to society and public resources whilst still a child or young adult (Neale and Tarrant, 2024). Despite the moral panic promoted by this negative image, research suggests that young fathers often strive to be 'good parents' however they can be overlooked by professionals or regarded in terms of risk rather than a resource to their children (Ladlow and Neale, 2016). Young fathers describe stigma due to their age, perceived troubled backgrounds, and a mixed response, from professionals, to their involvement and engagement in the lives of their children and services (idiom).

This presentation provides the multidisciplinary audience with an overview of what research already tells us about young fathers and how the proposed study will contribute to this knowledge. In addition, the planned, sensitively, constructed research design will be shared. This combines quantitative and qualitative methods and aims to explore the beliefs, aspirations and perceived needs of young fathers, who have experienced domestic violence as a child, using a pragmatic methodological approach.

The impact of this proposed research provides opportunities to enable the voice of young fathers to be heard and to make recommendations with the aim of influencing practice, policy and future interventions to support this group of parents.

(PP1-13) **What do we know about autistic and/or ADHD healthcare staff? A scoping review**
C Clee, A Cox, A Conolly

Background: Scant research exists regarding the prevalence, experiences or needs of autistic and/or ADHD nurses and other practicing healthcare staff. However, there is increasing research on neurodivergence in the wider population, with greater understanding about neurodivergent individuals' experiences and supportive needs. This presentation will report a scoping review that systematically identified and mapped the breadth of internationally published evidence reporting on autistic and/or ADHD healthcare staff, including nurses and other clinical disciplines.

Methods: The scoping review followed Arksey & O'Malley's (2005) framework: (1) identification of the research question/aim, (2) relevant studies identified through systematic search, (3) study selection, (4) emersion in data, followed by extraction and charting, (5) summarising and reporting of results, and (6) consulting with stakeholders to inform or validate scoping review findings. Also adhered to were the JBI principles and guidelines for conducting

and reporting on scoping reviews and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-Scr).
Results: The search strategy and subsequent screening resulted in 14 articles for final inclusion and review. The included articles mapped four key areas: (1) issues with disclosure and stigma; (2) challenges of working as an autistic/ADHD healthcare professional; (3) the positive attributes relating to working as an autistic/ADHD healthcare professional; and (4) factors that help or hinder working as an autistic/ADHD healthcare professional. Alongside these areas, the need for further research and training were highlighted.
Conclusions: The scoping review clearly highlights a pressing need for more research exploring the lived experience and needs of autistic and/or ADHD practitioners working in healthcare settings. Current research has predominantly focused on autistic Doctors, with only a handful of articles exploring other disciplines, including nursing. To challenge workplace-based factors including possible stigmatisation, concerns regarding disclosure and other challenges of working as an autistic/ADHD healthcare professional, several of the articles highlight the need for further research and specific training for managers and colleagues.

(PP1-14) **Emerging arthropod-borne Orthoflavivirus: Tembusu Virus**
A Martyn, D A Marston, G Lo Iacono, M Petite, N Johnson
Arthropod-borne Orthoflaviviruses are an emerging threat to the UK. Orthoflaviviruses that have recently been detected in Europe with cases on the rise include West Nile Virus, Bagaza virus and Usutu virus with migratory birds facilitating the translocation. A related virus, Tembusu Virus is an emerging arthropod-borne Orthoflavivirus first identified in Malaysia in 1955 which remained largely undetected until 2010. In recent years it has spread dramatically through Malaysia, Thailand, China and Taiwan causing devastating disease in the duck farming economy. The zoonotic potential of this virus is uncertain. In order to prepare for the potential introduction of Tembusu Virus into Europe, my project has developed qRT-PCR assays for the sensitive detection of this virus and for assessing the ability of this virus to infect UK mosquitoes. Initially, pan-flavivirus SYBR Green qRT-PCR was used to amplify Tembusu Virus RNA and develop a positive control for future experiments. In addition, I have designed primer pairs for locations across the genome. One combination, that amplifies a segment of the NS3 protein-coding sequence, produced optimal results. In conclusion, this project contributes to the understanding of the neglected arbovirus Tembusu virus with the associated risks of potential introduction into Europe and the UK.

(PP1-15) **Carbon Capture and Utilization: Hydrogenation of CO_2 to Methanol Using Dual-Functional Materials for Sustainable Carbon Recycling**
A Goksu, T R Ramirez, M S Duyar
The rising concentration of atmospheric CO_2, primarily driven by fossil fuel combustion, industrial activities, and deforestation, has led to global climate change, ocean acidification, and environmental instability. As CO_2 is a major greenhouse gas responsible for global warming, reducing its emissions is crucial for mitigating these adverse effects. Various strategies, such as the adoption of renewable energy sources, energy-efficient technologies, and afforestation, have been implemented to lower CO_2 levels. Additionally, Carbon Capture and Utilization (CCU) has emerged as a promising approach to not only capture CO_2 from industrial emissions but also convert it into valuable products, reducing reliance on fossil resources and supporting a circular carbon economy.
Among various CCU pathways, the hydrogenation of CO_2 to methanol offers a sustainable route to transform captured CO_2 into a useful fuel and chemical feedstock. Methanol, a key intermediate in the chemical industry, can be synthesized efficiently using Dual-Functional Materials (DFMs), which integrate CO_2 capture and catalytic conversion in a single system. DFMs possess both adsorption sites for CO_2 capture and catalytic sites for hydrogenation, enabling the direct conversion of CO_2 to methanol under mild conditions. This approach enhances process efficiency, reduces energy requirements, and eliminates the need for separate capture and purification steps.
In this study, Pd/ZnO exhibited the highest methanol production, whereas PdCaO/ZnO yielded the lowest. No methanol formation was observed at 150°C, 350°C, or 400°C. Additionally, methane production was detected when using Pd/SiO_2 and $PdCaO/SiO_2$, both of which demonstrated notable efficiency. These findings confirm that Pd/ZnO can facilitate methanol synthesis under ambient pressure, while CaO/SiO_2 proves to be effective for methane production.
By leveraging DFMs, CO_2 emissions can be effectively reduced while simultaneously producing a valuable carbon-neutral fuel, contributing to sustainable energy solutions.

(PP1-16) **CFD-DEM modelling of static mixers in Circulating Fluidised Bed risers for enhanced heat transfer performance**

F Jalili Jamshidian, C Wu, J Sadhukhan, D Tsaoulidis

Circulating fluidized bed (CFB) risers are widely used in energy, chemical, and environmental applications, where optimizing multiphase flow dynamics is critical for improving efficiency. One key challenge in these systems is achieving uniform particle distribution and effective heat transfer, which directly impact reactor performance. This study explores the role of static mixers in enhancing these parameters within a CBF riser.

Using Computational Fluid Dynamics-Discrete Element Method (CFD-DEM) simulations, two configurations are compared: (1) a conventional riser with a hollow pipe and (2) a riser incorporating a KSM static mixer in the top half. The impact of the mixer on particle residence time distribution and convective heat transfer is assessed to determine its effectiveness in improving flow uniformity and thermal performance.

By introducing controlled turbulence, the KSM static mixer is expected to enhance particle dispersion and extend residence time, resulting in more uniform heat transfer and higher convective heat flux. The results will provide insights into the design of energy-efficient multiphase flow systems for industrial applications, including clean energy production, chemical processing, and waste-to-energy conversion.

(PP1-17) **Determining the Regulation of IRG1 and the Impact of Itaconate on Vascular Inflammation**

P Patel, M Diotallevi, M J Crabtree

Rationale: Atherosclerosis is a chronic inflammatory condition where macrophages play a central role in disease progression. A key feature of activated macrophages is the production and secretion of itaconate, a potent anti-inflammatory metabolite synthesized by cis-aconitate decarboxylase (IRG1). Despite its significance, the regulation of IRG1 and its impact on itaconate production remain poorly understood. In the context of atherosclerosis, where macrophages accumulate in the subendothelial space, the downstream effects of itaconate on neighbouring vascular cells, such as endothelial and smooth muscle cells, are equally unexplored. This study aims to elucidate both the regulation of IRG1 and the effects of itaconate on vascular inflammation, offering insights into novel anti-inflammatory pathways and potential therapeutic targets.

Methods and Results: To investigate the regulation of IRG1, co-immunoprecipitation and mass spectrometry identified several binding partners, with surface plasmon resonance (SPR) confirming the interaction between iNOS and IRG1. Further analysis using high-performance liquid chromatography (HPLC) identified iNOS as a negative regulator of itaconate production. To explore the effects of itaconate on vascular cells, endothelial and smooth muscle cells were treated with 4-octyl itaconate (4-OI) or itaconate. Subsequent screening using PCR, Western blotting, and proteomics revealed upregulation of specific pathways in response to itaconate and distinct differences between the effects of 4-OI and endogenous itaconate.

Conclusion: Regulation of IRG1 by protein-protein interactions controls the production of itaconate in macrophages, providing insights into novel anti-inflammatory pathways. Macrophage-derived itaconate significantly impacts vascular cells, driving the activation of key pathways with therapeutic potential. Additionally, the distinct effects between endogenous itaconate and its derivatives offer additional opportunities for therapeutic development in modulating vascular inflammation and atherosclerosis progression.

(PP1-18) **Advancing Li–CO2 Battery Efficiency with Caesium Phosphomolybdate for Enhanced CO2 Conversion and Energy Storage**

M Masoudi, N Xavier, J Wright, T M Roseveare, S Hinder, V Stolojand, Q Cai, R C. T. Slade, D Commandeur, S Gadkari

Significant effort has been focused on developing sustainable approaches to reduce atmospheric CO2 by converting it into valuable products. In this context, rechargeable lithium-CO2 (Li–CO2) batteries, which utilise CO2 as an energy carrier, offer promise for both CO2 reduction and energy conversion and storage, contributing to a net-zero economy and global sustainability. Li–CO2 batteries have recently gained attention as potential alternatives to traditional lithium-ion batteries, due to their higher theoretical energy density (1876 Wh kg-1) and discharge voltage (~2.8 V).

However, the practical use of Li–CO2 batteries has been hindered by the sluggish kinetics of the CO2 reduction reaction (CRR) and the CO2 evolution reaction (CER) during discharge and charge. This causes pivotal issues such as large overpotential between CRR and CER, short cycle life, capacity fading, poor reversibility, and safety concerns. Thus, it is imperative to design and develop efficient catalysts that enhance the CRR/CER kinetics and

reduce the charge potential. Although various types of cathode catalysts have been investigated in Li–CO2 batteries so far, their real-world application is mostly restricted by limited availability, high cost, and synthesis complexity.
This study reports, for the first time, the application of a Keggin-type polyoxometalate as a bifunctional redox catalyst. Herein, caesium phosphomolybdate (CPM) was synthesised via a simple and low-cost solid-state method at room temperature. The prepared CPM cathode in a Li–CO2 battery exhibited a high discharge capacity of 15,440 mAh g-1 at 50 mA g-1 and a long stability of 107 cycles at 50 mA g-1 with a limited capacity of 500 mAh g-1. The battery displayed an ultralow overpotential of 0.67 V, outperforming many noble metal-based catalysts. Abundant electroactive sites, oxygen-enriched surface, and mesoporous morphology of CPM make it a stable and efficient catalyst, which significantly facilitates CO2 adsorption and release during battery cycling.

(PP1-19) **Rebalancing Systemic and Cellular Energy Dysmetabolism In Chronic Lymphocytic Leukaemia Through Exercise Training**

U Zaheer, E Miles, A Avramovska, V Srikumaran, A Hulton, L Li, C Jeary, A Sitlinger, R Walewska, B Fielding, D B Bartlett

Chronic lymphocytic leukaemia (CLL) cells abnormally express lipoprotein lipase (LPL), an enzyme typically restricted to adipocytes and myocytes for lipid-mediated energy utilisation. This enables CLL cells to store and utilise lipids to the detriment of healthy tissues. In vitro studies suggest that reducing fatty acid availability may limit CLL proliferation; however, little is known about how patients can modulate this process in vivo. Exercise training offers a systemic, non-pharmacological approach to counter metabolic dysregulation, with potential benefits for tumour control and overall health.
We conducted a 12-week exercise trial involving five treatment-naive (TN-CLL) and five previously treated (Td-CLL) patients. We assessed the metabolic fate of ingested lipids before (Baseline) and after (Post-Intervention) the program. Patients consumed a meal containing 200mg palmitic acid tracer (13CPA), and blood samples were collected hourly for 3 hours (T0h-T3h). In plasma and immune cells (PBMC), we assessed 13CPA enrichment, total fatty acids, plasma triacylglycerol (TAG) and non-esterified fatty acids (NEFA) using mass spectrometry and data analysed using RM-ANOVA.
Post-meal ingestion, 13CPA enrichment in plasma TAG and NEFA increased steadily from T1h-T3h ($p<0.001$). At Baseline T3h, TN-CLL exhibited higher plasma 13CPA-TAG and unlabelled PA-TAG incorporation than Td-CLL ($p<0.001$). Post-Intervention T3h, TN-CLL 13CPA-TAG levels decreased ($p<0.05$) and were no longer significantly different than Td-CLL. TN-CLL 13CPA-NEFA enrichment increased post-Intervention compared to Td-CLL ($p<0.05$), suggesting enhanced hydrolysis. Similarly, 13CPA uptake into PBMCs, which was higher in TN-CLL at Baseline T3h ($p<0.05$), declined following the intervention.
This pilot study demonstrates the feasibility of stable isotope tracing to assess in vivo lipid uptake in CLL. Exercise training in TN-CLL patients reduced lipid uptake, suggesting a shift towards a more balanced and healthier metabolic profile. Further research is needed to determine whether exercise can disrupt the lipid dependence of CLL cells.

(PP1-20) **Framing Academic Adaptation as Self-Formation: Chinese Students' Reflexive Engagement with UK Higher Education**

J Zhou

International students' academic adaptation is often conceptualised through a deficit lens, assuming that they must adjust to the host academic culture by assimilating into pre-existing norms. However, this perspective overlooks the agency, reflexivity, and evolving identities of students as they navigate their new learning environments. This study reinterprets academic adaptation as a process of self-formation, emphasising how Chinese students in UK universities actively engage with pedagogical, linguistic, and sociocultural challenges. Drawing on Marginson's (2023) self-formation framework, this research explores how students negotiate disequilibrium, external constraints, reflexivity, and evolving identities to construct their own academic trajectories. Based on a qualitative study of Chinese postgraduate students from both IELTS-based direct entry and Pre-sessional Programme (PSP) pathways, this research examines how authentic assessment influences their self-formation. Findings highlight how students critically engage with academic expectations, navigate mismatches between prior learning experiences and UK pedagogical practices, and develop hybrid academic identities. The study also reveals a misalignment between standardised language assessments and real-world academic demands, shaping students' reflexivity and self-formation processes.

By positioning adaptation as self-formation rather than passive adjustment, this research challenges traditional narratives of international student experience and contributes to discussions on authentic assessment as a catalyst for self-formation. The study offers insights for higher education institutions on fostering inclusive and transformative academic environments that support international students beyond assimilationist models."

(PP1-21) **Multidisciplinary Optimisation of Wind Farms Through Experiments and Data-Driven Modelling**
IT Beyaz
Wind energy makes up an increasingly larger proportion of national electricity generation. As on- and off-shore wind farms are funded and planned, the area of development and power density are becoming increasingly important metrics. One method of potentially improving wind farm power output is via the mixing of different types of wind turbines. While this has been investigated computationally for singular cases with specific conditions, little experimental work has validated these findings. One issue with experimental investigations of wind farms includes direct output power measurements of the turbines, as it can be difficult to directly quantify individual turbine performance for larger wind farms and configurations where the number of turbines vary. To address this, a direct torque sensing mechanism is developed using strain gauges in order to quantify the power output of an individual turbine and compared with a 6-component force balance to assess the merits in direct power measurements using such equipment. Both techniques are in agreement, but before optimising the wind farm as a whole, the instrumentation needs to be further developed to measure output power of the individual turbines. This would then be applied to multiple wind turbines in a wind farm to determine how the individual performance is affected by varying conditions and set ups in front of the turbine. This data could then be used to optimise a configuration for a given parameter space using data driven methods. The work overall has implications for public policy and implementation of wind power projects, as it would indicate novel ways of configuring wind power, on and off shore.

(PP1-22) **An Efficient Approximate Non-Myopic Joint-Entropy Sampling Method for Multifidelity Gaussian Process Active Learning**
Xiaoyang Luan, Tao Chen, Xilu Wang**
Accurately modeling computationally expensive systems often relies on surrogate modeling techniques such as multifidelity Gaussian processes, which integrate cheaper, lower-fidelity (LF) data with more accurate but high-cost, high-fidelity (HF) data. While myopic active learning strategies (e.g., maximum variance sampling) effectively improve local approximation accuracy by focusing on immediate gains, they frequently overlook the potential long-term benefits of a more strategic sampling plan—particularly when dealing with global response surfaces that are highly complex or multi-modal. In contrast, true non-myopic methods, which evaluate multiple future steps, offer a more comprehensive decision-making framework but typically require solving high-dimensional Markov decision processes, incurring computational overhead that is impractical in most engineering scenarios. To address this limitation, we propose an approximate non-myopic approach that leverages a joint-entropy criterion for multifidelity active learning. By assessing the combined information gain of pairs (or small batches) of candidate points relative to their cost, our method retains valuable lookahead advantages without the prohibitive burden of fully non-myopic formulations. At each iteration, the model is updated based on newly acquired LF or HF data, and hyperparameters—particularly the correlation parameter linking LF and HF surrogates—are re-estimated to maintain an accurate global representation. Numerical experiments on benchmark functions and real-world engineering problems show that this approximate non-myopic framework achieves significantly improved global accuracy and sampling efficiency over purely myopic strategies, all while controlling computational complexity. Consequently, the proposed method provides a practical solution for scenarios in which both budget constraints and predictive fidelity are paramount.

(PP1-23) **Passion and perseverance in Open or Private Online Course continuance**
P Panicker
Introduction: Learners register for online courses out of interest as they are passionate about enhancing their skills as part of Continued Professional Development (CPD) or skill development. Despite high quality content delivered by subject matter experts and at the convenience of learning in a flexible environment, only 10% of registered learners complete the course. There are multiple factors that influence the retention of online learners, and continuance intention, defined as the willingness of individual to continue to use and engage in the online learning

that they have registered for, and its relationship with individual and social characteristics has been poorly researched.
Aim: To evaluate learners' 'intention to continue' for doing online courses
Methods: In this mixed methodology, participants registering for an online course will complete a pre-course survey exploring their learning goals and individual (namely consistency of interest and perseverance) and social (support from family, friends, peers, teachers) characteristics that can influence intention to continue. After a fixed period of time, a follow up survey would be sent to explore continuance intent. Both surveys can be completed within 10 minutes. Participants who complete both surveys will be invited to take part in an online interview to explore the experience of learning online.
Outcomes: The study intends to identify individual and social characteristics that influence intension to continue with online courses.

(PP1-24) **Plant-based diets for older adults in care homes: A realist synthesis**
SD Whyton
Around 425,000 older adults reside in care homes in the UK. Mealtimes are highly important in care settings, providing a connection to previous routines, quality nutrition, and enabling social connections (Evans, Crogan and Shultz, J. Gerontol. Nurs, 31, pp. 11-17, 2005). Often, meals are not tailored to residents' preferences, negatively impacting their wellbeing (Abbey, Wright and Capra, Nutrients, 7, pp. 7580-7592, 2015). 8000 plant-based residents currently reside in care home, with 33% of homes containing a vegetarian (Plant-Based News, 2024). Choosing this diet may be due to religious, environmental or animal welfare reasons. Plant-based diets could also reduce risk of developing age-related chronic illness (Thompson et al., JAMA Network Open, 6, pp. e234714-e234714, 2023). Implementing plant-based diets into care homes could increase autonomy of choice and allow residents to thrive. For those already following a plant-based diet prior to care, it ensures they can withhold their dietary beliefs. Currently, little research focuses on food choice in care homes, with most mealtime-based interventions looking into oral nutritional supplements, dining modifications and staff training. This systematic review takes the form of a realist synthesis, allowing the generation of initial program theories. Literature retrieved will be screened for relevancy and rigour, aiming to answer how, why, in what context and for whom a plant-based meal intervention will work for. From the creation of initial program theories, an intervention will be designed which will be applied in vivo. Dependant on the results, dissemination will be aimed towards policymakers with a view to ensure mandatory provision of at least one plant-based option, ensuring autonomy of choice for all residents.

(PP1-25) **Non-linear analysis of clinically normal equine and human electrocardiograms: a method to detect paroxysmal arrhythmias**
V Alexeenko, S Durward-Akhurst, C Marr, K Jeevaratnam
Paroxysmal arrhythmias are cardiovascular conditions which are difficult to diagnose due to their intermittency. The clinically accepted technique for diagnosing them is based on capturing arrhythmia episodes within long electrocardiogram (ECG) recordings. However, pro-arrhythmic alterations of heart tissue might potentially be detected by non-linear analysis of clinically-normal electrocardiograms (ECGs) even in between arrhythmia episodes.
Paroxysmal atrial fibrillation (PAF) is a clinically significant cardiac arrhythmia and a major cause of stroke in humans. It is also linked to cognitive decline, and heart failure. Up to 30 000 strokes can be prevented and ameliorated annually in the UK if a rapid and inexpensive screening technique could be devised. PAF is also the most frequent equine arrhythmia, which affects athletic performance of racehorses. Therefore, it might be expedient to develop the methods to diagnose this condition in both species.
We hypothesised that the proarrhythmic background present between fibrillation episodes in paroxysmal AF (PAF) might be detectable by complexity analysis of apparently normal sinus-rhythm ECGs. In a human study, we analysed 28s hand-held ECG recordings which were converted to binary strings using threshold crossing and beat detection parsing algorithm, and estimated their complexity using Lempel-Ziv '76 estimator. We developed a risk score which allows correct identification of human PAF patients with 85% sensitivity and 83% specificity, with receiver operating curve area under curve (AUC) parameter of 0.92. In our equine study artefact-free 60s fragments of ambulatory ECGs recordings were annotated using the feature detection method and Lempel-Ziv '76 and Titchener complexity estimators. A heart-rate corrected equine ECG complexity metrics which offer similar

performance (AUC 0.95 for Lempel Ziv and 0.90 for Titchener complexity) using five or more 60s ECG strips per patient.
It could be expected that these techniques might form a feasible basis for detection of paroxysmal arrhythmias in both humans and horses.

(PP1-26) **Prehabilitation during neoadjuvant chemotherapy results in an enhanced immune response in oesophageal adenocarcinoma tumours**

EK Stratton, CJ Rayner, DB Bartlett, SK Allen, T Wooldridge, T Seymour, S Sunshine, J Hunt, D King, I Bagwan, J Sultan, SR Preston, AE Frampton, NE Annels, N Abbassi-Ghadi

Purpose: For patients with locally advanced oesophagogastric cancer, the standard of care in the UK is neoadjuvant chemotherapy (NAC) followed by surgery. Prehabilitation exercise can improve physiological function and fitness. As no studies have assessed tumour infiltrating lymphocyte (TIL) responses in humans during NAC undergoing prehabilitation, we aimed to determine whether prehabilitation increased TILs.
Experimental Design: We enrolled 22 patients with locally advanced oesophageal cancer on a randomised control trial comparing 16 weeks of low-to-moderate intensity twice weekly supervised and thrice weekly home-based exercise (Prehab: N=11) to no prehabilitation (Control: N=11). We analysed peak cardiorespiratory fitness ($\dot{V}O_2$peak) before NAC, after 8 weeks of NAC (Post-NAC) and following 8 weeks of NAC recovery before surgery (Pre-Surgery). We assessed tumours by high-resolution multispectral immunohistochemistry (mIHC) and NanoString spatial transcriptomics.
Results: We observed $\dot{V}O_2$peak maintenance during NAC for Prehab that significantly increased at Pre-Surgery and a significant reduction in $\dot{V}O_2$peak Post-NAC in Controls. CD8+ lymphocytes were higher in the tumours for Prehab compared to Controls. Levels of CD56+ and CD56dim NK TILs were higher in Prehab tumours. Further, Prehab had increased maturity of tertiary lymphoid structures (TLS). We observed positive relationships between the changes in $\dot{V}O_2$peak from Base to Post-NAC and the frequencies of CD8+ TILS, PDL1+ cells, and GrzB+ TILS.
Conclusions: We show that exercise training during NAC, which improves cardiorespiratory fitness, is associated with increased frequencies of TILs and maturity of TLS. These data suggest that exercise during NAC enhances the immune system, possibly to be suitable for immunotherapy.

(PP1-27) **Investigating the Prostate Cancer Microbiome and Tumour Immune Microenvironment to Underpin Ethnic Disparity in Prostate Cancer Clinical Outcomes**

J R Thetford, B Haagsma, J Aning, R Eeles, L Meira and N Annels

Prostate cancer substantiates significant ethnic disparity observed across various cancers worldwide. Men of African ethnicity exhibit a 60% higher lifetime incidence with twice the mortality compared to their white counterparts. Such disproportionate cancer burden necessitates thorough exploration of prostate cancer biology, specifically the microbiome and the tumour immune microenvironment (TiME) within ethnic populations.
A UK cohort of 114 ethnic patients with stage 3 prostate adenocarcinoma was procured as post-prostatectomy FFPE specimens. Patient tissues were processed accordingly for whole-genome single nucleotide polymorphism genotyping to correctly establish patient ancestry, in addition to self-described ethnicity and patient clinical data, which was retrospectively obtained.
Histopathological dissection of pathologist annotated tumour regions allowed for extraction of tumour-enriched and normal-adjacent genomic DNA for metagenomic sequencing. Profiling the microbial communities within distinct intraprostatic niches allows for identification of differences between malignant and normal tissue for the wider content of PCa, in addition to ethnicity specific microbial differences which have been studied previously due to the microbiome being heavily influenced by an individual's ethnicity. Specific microbial signatures have been linked to prostate cancer carcinogenesis and progression due to the effect of microbial dysbiosis on several cancer-related processes, including the TiME.
To investigate the TiME, industry-leading spatial proteomics technology, the MACSima Imaging Platform is being utilized to perform an exhaustive characterization of 16 ethnic prostate cancer specimens from Black-, Black-Caribbean, Asian and White patients. This collaboration with Miltenyi Biotec will enable analysis of tumour core, invasive margin and distant-normal prostate comprising 48 regions of interest, each stained with 135 antibodies.

(PP1-28) **Comparative pathogenesis and immune dynamics of porcine respiratory coronavirus and pandemic H1N1 influenza in a swine model**

Ehsan Sedaghat-Rostami[1,2], Ashutosh Vats[1], Liu Yang[1], Basudev Paudyal[1], Brigid Veronica Carr[1], Emily Briggs[1,2], Bhawna Sharma[1], Nicos Angelopoulos[1], Christine Rollier[2], Katherine Marougka[3], Cornelis A.M. de Haan[3], Kristien Van Reeth[4], Francisco J. Salguero[5], Wilhelm Gerner1, Elma Tchilian[1,2]

Coronaviruses and influenza viruses are major global threats, responsible for seasonal infections and pandemics and are a significant economic and healthcare burden worldwide. This study characterises the differences in virulence, pathogenesis and host immune response dynamics between porcine respiratory coronavirus (PRCV) and pandemic H1N1 influenza virus (pH1N1) in a large natural host, the pig. Two groups of fifteen pigs were intranasally infected with either PRCV or pH1N1, and 6 pigs were used as non-infected control. Five pigs from each infected group and 2 pigs from control group were euthanised at 1-, 5- and 12-days post infection (DPI). Daily nasal swabs were collected and viral shedding, pathological changes, and immune responses analysed.

PRCV viral shedding was greater and detectable in nasal swabs until day 7, whereas pH1N1 levels declined by day 5. PRCV-infected pigs showed more severe respiratory pathology, with higher viral load in lung tissue and bronchoalveolar lavage (BAL) fluid, particularly at 5 DPI, implying greater lower respiratory tract involvement. Histopathological analysis exhibited widespread epithelial necrosis and inflammation in PRCV-infected lungs. Immunohistochemistry and Iowa scoring further confirmed a higher presence of PRCV antigen (nucleocapsid) in the upper and lower respiratory tract compared to pH1N1 antigen (nucleoprotein).

PRCV infection induced robust immune response in the BAL, characterized by increased IFN-γ and IL-2-secreting cells at 12 DPI. Intracellular cytokine staining showed a higher proportion of antigen-specific cytokine-secreting CD4, CD8, and γδ T cells in PRCV-infected pigs. Additionally, a significantly higher proportion of antigen-specific B cells was detected in both blood and BAL of PRCV-infected animals.

These findings demonstrate that PRCV and pH1N1 exhibit differential pathogenesis and immune responses, with PRCV infection associated with heightened mucosal immune activation, increased viral replication, and greater pathology in both the upper and lower respiratory tract. The study also suggests that PRCV induces a broader systemic immune response, whereas the immune activation following pH1N1 infection remains primarily restricted to the respiratory tract. These findings will contribute to a deeper understanding of both coronavirus and pH1N1 pathogenesis and host immune interaction.

(PP1-29) **Seeking Care, Facing Barriers: The Healthcare Experiences of Trans and Gender-Diverse (TGD) Emerging Adults in the UK**

R Figueiredo, F Fasoli, H Frith

Access to primary and gender-affirmation care is affected by several systemic and interpersonal barriers that transgender and gender-diverse (TGD) individuals often encounter when seeking support. Such barriers can contribute to the stress individuals experience when navigating the healthcare system. This qualitative study examined the healthcare-related experiences and expectations of 15 TGD emerging adults (18-25 years) who were asked questions about their experiences and expectations of engaging with healthcare and gender-affirming care. The questions addressed several issues: (1) Gender identity, (2) Healthcare access and use experiences, (3) Healthcare expectations, (4) Engagement in risk behaviours, and (5) Parental and partner support experiences. A thematic analysis was conducted to analyse the data.

Four main themes emerged from the analysis. Barriers to care access, on the one hand, involved systemic and interpersonal obstacles (e.g., long NHS waiting lists) that relate to specific discriminatory experiences as the ones described by the minority stress model. These different types of barriers impact the likelihood of individuals seeking care. Another theme highlighted the importance of considering the specific individuals' journeys as these influence their choices and experiences seeking care. Parental support emerged as a highly nuanced aspect. This theme underlined the differences in the support received and how it relates to other factors (e.g., religion) showing that individuals have either very positive or negative experiences. The combination of these barriers, the individual's journey, and the lack of parental support pushes many individuals to engage in health risk behaviour (e.g., DIY hormones) within a specific context where several factors play a role. These findings underscore the significance of considering how TGD emerging adults access and engage with practices that involve health risks and implementing interventions to enhance healthcare support for the TGD community.

(PP1-30) **The complexity of life is loopy: Integrating biological and mathematical methods to investigate feedback loop regulation of gene expression**

J Bryant, A Rocco, A P Gerber

The average human body contains about 37 trillion cells. Each contains identical DNA, yet over 200 human cell-types exist. Gene expression controls the variety and quantity of protein 'building blocks' produced from DNA/RNA molecules to maintain physiological health and unique cellular functions. Post-transcriptional autoregulation is a mechanism where RNA-binding proteins (RBPs) bind their own mRNAs, enabling the fine-tuning of their own expression and influencing variation between identical cells (noise). Notably, around two-thirds of human RBPs and one-third of yeast RBPs contain binding sites in their own mRNAs, indicating broad potential for autoregulation. However, quantitative measurements and mathematical models to clarify this process remain limited.

Pumilio (PUM) proteins are an evolutionarily conserved family of RBPs implicated in early development and ageing. PUM proteins bind target mRNAs via PUM recognition elements (PREs) and regulates translation into proteins. Critically, we found that PUM proteins from yeast to humans contain one or more PRE in their own mRNAs, indicating potential for evolutionary conserved autoregulation.

To investigate the impact of this proposed autoregulation we focus on PUM equivalents in baker's yeast called Puf3p, Puf4p, and Puf5p. We have been applying CRISPR-Cas9 gene engineering to fluorescently tag Puf proteins in yeast cells and mutate predicted PREs to prevent interaction. Gene expression and noise are quantified with a range of biological techniques and incorporated into predictive mathematical models. Our data indicates that disrupting these potential autoregulatory binding sites in mRNAs modestly increases protein abundance and noise by 5 to 20 %, suggesting negative feedback. Models will be developed further to address phenomena including intrinsic noise and multi-site regulation.

Our research shall provide insights into the role of autoregulation within the intricate and fundamental post transcriptional gene regulatory network while our models could ultimately provide a framework to study the autoregulation of hundreds of other RBPs.

(PP1-31) **Unveiling the Neural Foundations of Numerical Cognition: A Longitudinal fNIRS Study in Toddlers**

IM Sahiner, A Grandison, R Chiou, M Soltanlou

How do young children develop an understanding of numbers? The development of numerical cognition, transitioning from non-symbolic to symbolic understanding, is a cornerstone of human cognitive abilities. Non-symbolic numerical knowledge emerges early in life and underpins symbolic understanding. While non-symbolic number processing has been extensively studied in infants and symbolic processing in preschoolers, a gap exists in understanding the longitudinal neural and behavioural development of numerical cognition in toddlerhood. Our interdisciplinary approach allows us to map the neural foundations of numerical cognition during toddlerhood and understand how these abilities evolve. We anticipate identifying key changes in the brain's frontoparietal network, particularly in regions involved in numerical processing. Furthermore, we examine whether parental brain activity during numerical tasks relates to their child's neural development, providing insights into early learning and intergenerational influences.

Using functional Near-Infrared Spectroscopy, a non-invasive brain imaging technique, we measure brain activity in toddlers at 1 year 6 months and 2 years 6 months. They will engage in non-symbolic numerical tasks, such as numerical adaptation and comparison by naturalistic stimuli of Sesame Street. At the first time point, parents also complete age-appropriate non-symbolic numerical tasks while their brain activity is recorded. Additionally, behavioural measures, including verbal counting, language skills, and executive functions, are assessed alongside home learning environments to explore external influences on early numerical development.

Data collection will begin in autumn 2025. We anticipate revealing neural changes within the frontoparietal network, specifically the intraparietal sulcus, across the two time points. These changes are hypothesised to reflect developmental trajectories in numerical cognition. The findings will enhance theoretical models of numerical cognition by clarifying the developmental trajectory of non-symbolic and symbolic systems, and inform early identification of individual differences in children. This research will also offer new perspectives on the heritability of cognitive skills in numerical learning.

(PP1-32) **Vertical Farming Around the World: Unveiling Cultural Drivers and Barriers to Consumer Adoption**

H Rodrigues, L Timotijevic, Z Harris, M Raats

Environmental challenges related to food production and consumption, particularly agriculture's role in climate change and long-term food security, have gained significant attention in policy discussions. Vertical Farming (VF) has emerged as a potential solution to address these issues in urban settings. However, successful implementation and consumer adoption of VF may face considerable barriers. This study explores global perceptions of VF, focusing on cultural factors that influence acceptance and obstacles to widespread adoption. A bibliographic analysis was conducted using keywords like "vertical farming" and "consumer perception" in databases such as Web of Science and Google Scholar. Out of 42 empirical articles, 33 were selected for final analysis. Consumer responses were categorised by geographic region, examining motivations, opinions, and behaviours regarding VF. The results revealed that consumers in the USA had the most positive attitudes towards VF, driven by sustainability and product quality. In contrast, German consumers were more sceptical, perceiving VF as "unnatural" despite recognising its sustainability potential. Mediterranean consumers, particularly in cities with rooftop agriculture, valued the environmental benefits and local freshness of soilless crops, with higher income and education correlating with more favourable perceptions and a willingness to pay more. In Shanghai, there was high social acceptance of indoor agriculture, driven by ecological and social benefits, though experts raised concerns about economic feasibility. In the UK and Ireland, predominantly young, well-educated consumers showed a willingness to pay the same or higher prices for VF produce, driven by sustainability and quality. However, UK chefs raised concerns about the "unnaturalness" and taste of VF produce. In France, food retailers emphasised performance expectancy and facilitating conditions as key drivers for VF adoption in urban retail, though high initial costs and perceived risks posed barriers. These findings are discussed through the lens of cross-cultural consumer behaviour and technology adoption.

(PP1-33) **Black and Blue: Examining the experiences of Black Police Officers in the Metropolitan Police**
M D Korell

Current evidence suggests officers from Black, Asian and Minority Ethnic backgrounds (BAME) working in the Metropolitan Police Service experience higher rates of disciplinary processes, compared to their white counterparts. This research seeks to examine the lived experiences of black police officers serving in the MPS, to better understand the causative factors that affect their shared experiences and how they impact their lives and careers. These factors have been broken down into three categories, namely; misconduct and its processes: police culture; and recruitment and retention. The research objectives are three pronged; 1) to understand how the culture of the MPS affects the experiences of black officers in the organisation, 2) to better understand the disproportionality of the high rate of disciplinary procedures against Black officers in the Met and finally 3) to understand the wider impacts on recruitment and retention. This will be accomplished through the critical examination of policing culture, the impact on officers and their families and the application of institutionalised racism. From research so far, we know the MPS are institutionally racist and have consistently been under public scrutiny for the marginalisation of black and minority ethnic groups, both internally and externally. I hypothesise that the grounding of the disparity is embedded in the misuse of systemic processes against minority officers. Particularly by using the informal pillars of police sub-culture to target, isolate and disrupt the progression and existence of Black officers within the organisation. This research seeks to contribute to a deeper understanding of the experiences of black police officers in the MPS and expose the tactics used to systematically stem progression. The intention is to develop a diagnostic tool that will readily identify the application of institutionalised racism, moving society as a whole a little closer to fairness.

(PP1-34) **Optimising Carbon Capture and Conversion Using Dual-Function Materials: A Computational Approach to Sustainable Energy**
M Dolat

Addressing climate change requires innovative solutions that combine insights from multiple disciplines. This research focuses on dual-function materials (DFMs), a class of engineered substances that can both capture carbon dioxide (CO_2) and convert it value-added chemicals (here methane) in a single system. This makes them highly suitable for Power-to-Gas (PtG) technologies, which store renewable electricity as synthetic natural gas.

Our team developed a dynamic simulation model of the DFM process using advanced numerical techniques in Python. The model captures the full cycle of operations which comprises CO_2 adsorption, purging and hydrogenation (conversion to methane. We applied Bayesian optimisation, a statistical learning approach, to

identify operating conditions that balance three goals: high methane productivity, high CO_2 conversion, and high product purity.

The study integrates chemical engineering, computer science, and data-driven optimisation, providing a reproducible framework for evaluating and improving DFM performance. Our results show that small changes in flow rates and stage durations can significantly affect system efficiency. We used Pareto front visualisations to illustrate trade-offs between competing objectives, offering guidance for real-world decision-making.

By reducing the need for complex purification steps and enabling on-site CO_2 recycling, this work contributes to cleaner industrial practices and energy systems. The project also lays the groundwork for techno-economic analysis and integration with bioenergy and waste treatment sectors, showing strong potential for broader applications in the UK and beyond.

This study exemplifies how bridging computational modelling, material science, and sustainability can accelerate the development of climate solutions.

Abstracts for PGR / ECR Poster Presentations Day 2 (1st May)

(PP2-1) **Show choices, licensing and a pandemic: a study into the British amateur theatre musical scene**
E. Hales
My interest lies in examining why certain musicals fall from grace or are no longer as popular to stage in the UK. I have researched within amateur companies to understand the hesitancy in staging certain shows and the reasons for those they feel are the most popular with audiences today. Looking through programmes from previous years of local amateur theatre groups, it is notable how contemporary musicals are disproportionately staged or proposed, relative to golden-age and classical musicals.
This area of study has received little previous scholarly research and attention. Through interviews with amateur theatre companies, licensing companies, and audience members, I aim to illuminate the difficulties amateur theatre faces in selecting suitable shows to perform, and explore what audiences are choosing to watch. One of the main research questions is whether or not the Golden Age musicals (by which I mean My Fair Lady, Oklahoma!, Carousel etc) and being less frequently staged if audiences prefer contemporary shows.
Given the time at which my research is taking place, it simply wouldn't be possible to undertake this study without making central consideration of the pandemic. After theatres opened back up following the Covid-19 pandemic, it seems most amateur theatre groups have performed at least one of Legally Blonde, The Addams Family, 9 to 5, Calendar Girls, Kinky Boots, and Shrek. What is it about these shows that makes them keep being requested and licensed? Are they indeed popular with audiences and box office hits, and if so, why?

(PP2-2) **A Novel Thermo-Responsive and Biodegradable Vinyl Ester Polymer for Biomedical, Drug Delivery, and Adhesive Applications**
Y Kerdi, P Roth
This project originates from the synthesis of a novel vinyl ester monomer and the development of its corresponding polymer via RAFT (Reversible Addition–Fragmentation Chain Transfer) polymerisation. The resulting polymer is water-soluble, exhibits a low glass transition temperature (Tg = -45°C), and features a tunable lower critical solution temperature (LCST) within the physiological range, making it a strong candidate for thermo-responsive biomedical applications.
A key finding is that LCST decreases with increasing molecular weight, offering precise control via RAFT polymerisation. Higher molecular weight polymers displayed LCST values just above body temperature (~42°C), making them suitable for hyperthermia-enhanced drug delivery. This is the first vinyl ester-based polymer reported to exhibit an applicable LCST, representing a significant advance in smart polymer design. Furthermore, the monomer structure serves as a foundation for developing a novel class of functional vinyl ester monomers, expanding the range of biodegradable and stimuli-responsive materials.
Preliminary biodegradation studies using porcine liver esterase (PLE) indicate hydrolysis into poly(vinyl alcohol) (PVA), a well-known biodegradable and non-toxic polymer. Unlike conventional PVA, produced by hydrolysing poly(vinyl acetate) and often prone to partial crystallinity and low organic solubility, the PVA formed here shows enhanced solubility, offering improved processability and biomedical compatibility. Importantly, this platform allows for backbone degradability, which is not easily achieved in standard PVA systems. In addition, copolymerisation with thionodecalactone, a biodegradable lactone, is being explored to further enhance the degradability and tunability of the material platform.
Further biodegradation studies in microbial sludge environments are planned to evaluate environmental degradation potential. Cytotoxicity testing and LCST-triggered drug release profiling will be conducted to validate biomedical applications. Additionally, due to its low Tg, flexibility, and tackiness, the polymer shows strong promise for pressure-sensitive adhesive (PSA) applications.
This multidisciplinary PhD project bridges polymer chemistry, enzymology, pharmaceutical science, and environmental engineering to develop the next generation of smart, degradable, and eco-friendly materials.

(PP2-3) **Direct analysis of pesticides in complex matrices using SPME**

DL Pierre

Atmospheric solids analysis probe mass spectrometry (ASAP-MS) is a technique which uses a single quadrupole mass spectrometer for rapid and minimal sample preparation option for analysing analytes under ambient conditions. Borosilicate glass rods offer the lack of chromatographic separation, increasing matrix effects and limiting the sensitivity and detection of the analyte. The ASAP-MS coupled with biocompatible solid-phase microextraction (SPME) fibre tips addresses this issue. The analytes bind to the extraction fibres, pre-concentrating the target compound while minimising matrix interferences.

The study involved a comparative performance analysis of glass rods and SPME fibres for pesticides in artificial urine. Samples were prepared by drying two µL of the solution on the glass rod or extracting analytes with the SPME fibres using a multi-step process involving fibre conditioning, analyte extraction, and fibre washing while using minute volumes of reagents. The MS analysis was conducted in scan and single ion monitoring (SIM) modes with optimised conditions for heater temperatures and sample times. The glass rod method detected pesticides down to ppm/high ppb levels, while SPME fibres enabled detection at low ppb levels. The levels detected using SPME fibres are significantly lower than the maximum residue levels for EU and EPA regulations.

The findings demonstrate that SPME coupled with ASAP-MS significantly enhances the sensitivity of the analyte, offering a hopeful approach for trace analyte detection in complex matrices on different MS instrumentation. This method has broad applications for environmental monitoring, such as pesticide monitoring in food, water supply, honey, and beeswax.

(PP2-4) **Unravelling regulatory signaling interactions and metabolic changes underlying immune disorders through a Systems Biology approach**

FE Mousavi, M Barberis

The development of multi-dimensional multi-omics generates high volumes of data, allowing insight into the various levels of cellular regulation. Multi-omics, through differential expression analysis, provide biochemists targets to investigate further. In parallel, efforts are invested in the development of comprehensive maps of biochemical pathways, among which metabolic pathways such those collected in the Kyoto Encyclopedia of Genes and Genomes (KEGG) database. In the context of the rare condition PI4KA-related disorder, dysregulated targets available through metabolomics, lipidomics, and proteomics were mapped on KEGG biochemical pathways. Using an integrative approach, dysregulated metabolic pathways were identified and investigated to gain insight into the reactions linking dysregulated targets. Furthermore, literature-based knowledge helped to further shed light on the mechanism of biochemical dysregulation. Biochemical dysregulation in cell lines derived from patients with PI4KA-related disorder were highly localized in metabolic pathways, including the phospholipid metabolism, amino acid metabolism, TCA cycle, and glutathione metabolism. Interestingly, metabolic dysregulations were highly interconnected, exasperating metabolic dysregulation and forming a disease network, ultimately converging onto oxidative stress and impaired oxidative phosphorylation in the mitochondria. Literature-based investigation of targets and pathways of interest allowed for the development of hypotheses describing compensatory mechanisms the cell may employ to attempt maintaining cellular function. These include: (i) the positive feedback loop driving intrinsic myo-inositol containing phospholipid synthesis in response to myo-inositol deficiency in patient-derived cells, (ii) the junction between the TCA cycle and GABA shunt, a common point of regulation, and (iii) the multi-armed roles of Nrf2 in the regulation of oxidative stress response. Altogether, bridging multi-omics, literature data, and biochemical networks allows for a comprehensive, system-level understanding of the mechanism of a network disease, which can further inform experimental testing and target identification for therapeutic treatment.

(PP2-5) **Uncovering the Aortic Proteoglycanome in Thoracic Aortic Aneurysms**

A F Minns, R J Tuieng, A Eckersley, M J Sherratt, S Santamaria

The aorta is the largest blood vessel in the human body, responsible for carrying oxygenated blood from the heart into distant tissues and organs. The extracellular matrix (ECM) comprises many proteins responsible for the biomechanical properties of the aorta, such as elastin, collagens, and proteoglycans (which are heavily modified with glycosaminoglycans [GAGs]). Proteoglycan levels are known to be increased in thoracic aortic aneurysms (TAA), due to increased expression and dysregulated proteolysis. However, their high molecular weight, the presence of GAGs and their assembly into large macromolecular complexes, make it difficult to identify aortic proteoglycans and to characterise changes in their composition, proteolysis, and abundance. Here, we aimed to

optimize mass spectrometry (MS) techniques for characterisation of the human aortic proteoglycanome using aortic tissue from patients undergoing elective surgery for idiopathic TAA.
Aortic tissues from three idiopathic TAA patients were subjected to a variety of sample extraction (4M guanidine hydrochloride, sodium dodecyl sulfate or urea) and preparation methods for tandem MS/MS. Treatment with deglycosylation enzymes to remove GAGs was also investigated, as were a variety of digestion enzymes (GluC, Elastase, and trypsin). Finally, we attempted to enrich proteoglycan content through fast protein liquid chromatography (FPLC) following guanidine extraction. Relevant fractions were treated with deglycosylation enzymes before being analysed by MS/MS.
Guanidine extraction provided higher proteoglycan peptide intensities. These intensities were noticeably improved by addition of deglycosylation enzymes. FPLC extracts improved proteoglycanome detection, with many proteoglycans as the top identified proteins. Immunoblot analyses orthogonally confirmed this proteoglycan enrichment.
We have optimised a sample preparation method to assess proteomic and proteoglycanomic data from the human aneurysmal aorta, enabling a future comparison between multiple TAAD pathologies and non-aneurysmal controls. Future studies aim to identify novel biomarker candidates for these various pathologies.

(PP2-6) **A cross-sectional study of Sacrifice in Romantic Relationships: A sign of love or evidence of Ambivalent Sexism?**
E Mestanli Sari, E Hepper, A Hopkins-Doyle
Sacrifice involves prioritising another person's happiness over one's own, to prevent problems or make the other feel good, without guilt. People's beliefs can influence their behaviour and decision-making, including within romantic relationships. Ambivalent sexism—a framework including hostile and benevolent sexism—may shape how individuals engage in sacrifice by promoting traditional gender roles. Benevolent sexism encourages protective roles for men and caregiving roles for women, which might increase sacrifice tendencies. In contrast, hostile sexism emphasizes power in relationships, potentially decreasing willingness to sacrifice. Despite this, no study has yet examined the link between ambivalent sexism and sacrifice in romantic relationships.
This pre-registered study examined whether people with higher (vs. lower) hostile and/or benevolent sexism are more or less likely to make sacrifices in their romantic relationships. We conducted an online cross-sectional study with participants (N= 267) whose romantic relationship duration varied between 6 months and 30 years (M= 52.55 months, SD= 62.49). Participants reported on their frequency and motivations of making commonplace sacrifices in the last month.
Results showed that benevolent sexism was positively—but not significantly—associated with sacrifice frequency. Contrary to expectations, hostile sexism was significantly and positively related to sacrifice frequency. A significant moderating effect of gender indicated that both hostile and benevolent sexism were significantly and positively associated with frequency of sacrifice for men, but not for women. Furthermore, as hypothesized, people with higher (vs. lower) benevolent sexism were more likely to sacrifice with approach-oriented motivation, while people with higher (vs. lower) hostile sexism were more likely to sacrifice with avoidance-oriented motivation. Overall, findings highlight the role of ambivalent sexism in shaping sacrificial behaviour in romantic relationships. As the first known study to examine this relationship, these results offer new insights into the social-psychological processes behind sacrifice and call for further replication.

(PP2-7) **Gene expression and tissue profiles in the myocardial sleeves of the pulmonary vein in healthy and paroxysmal atrial fibrillated horses**
Arevalo-Turrubiarte M, Edling EC, Bronte Forbes, Victoria Kemp, Joe Weir, Celia Marr, Lewis R, Jeevaratnam K
Atrial fibrillation (AF) is a dysrhythmia affecting race performance in horses. Pulmonary vein (PV) influences on the initiation and maintenance of AF. Myocardial sleeves of the PV, which are prolongations of tissue toward the left atrium, have been investigated to better understand their spontaneous activation and effect in AF. Ion channels, responsible for cardiac action potential generation and electrical propagation are target-study of AF causes, in addition to this, the interest in investigating them is because they seem to interact with AF treatments. Thus, our study aims to expand the knowledge of the myocardial sleeves of the PV by exploring their gene expression profile and tissue structure in healthy and paroxysmal atrial fibrillated (PAF) racing horses. Heart was removed from the thoracic cavity, and tissue taken with a biopsy punch from the left and right atria and ventricle respective side. Myocardial sleeves from the pulmonary vein were dissected from the heart. RNA extracted from heart was analysed

by RNA sequencing. Myocardial sleeves of the PV were collected at the base of the PV in the left atria from healthy and PAF Thoroughbred racing horses. Total RNA was extracted and analysed by RNA sequencing and part of the tissue was processed for histology analysis. Gene Set Enrichment Analysis revealed positive enrichment in of gene ontology (GO) biological processes related to tissue development and in pathways related to energetic processes in PAF myocardial sleeves. Enrichment analysis of cellular and molecular functions showed an increase in genes related to GO pathways such as transportation and tissue components in the extracellular matrix in PAF horses.
The genes SCN5A and MYH7, which are involved in the electrophysiology of the heart, were significantly differentially expressed (p-adj < 0.05) between the control and PAF groups.
This study describes the myocardial sleeves of the pulmonary veins (PV) in healthy and PAF racing horses, and their structure and influence on cardiac electrophysiological functions.

(PP2-8) **Expanding The Scope of Degradability in Vinyl Polymers: Then, Now and Future**
S E Ige, N M Bingham, P J Roth
Sulfur-containing monomers have been established to promote the degradation of the otherwise non-degradable C-C backbone of vinyl polymers through copolymerization. Particularly, radical ring-opening polymerization of cyclic compounds such as thionolactones, cyclic allylic sulfides, and cyclic disulfides has been reported to produce biocompatible materials with inherent degradability,[1] thereby promoting plastic reduction and recycling and encouraging the application of polymers in drug delivery and tissue engineering. Herein, non-cyclic monomers containing thiocarbonyl groups are reported to copolymerize with vinyl monomers, thereby introducing heteroatoms into the backbone and enhancing the degradability of the copolymers. In 2023, Watanabe and Kamigaito[2] reported the successful incorporation of some thioformamides into vinyl copolymers, resulting in the degradability of the obtained copolymers. This research project explores the synthesis and copolymerization of further thioformamide derivatives and the degradation of their copolymers for a potential application in biomedicine. Four thioformamides were synthesized in moderate yields (40-60%) and copolymerized with vinyl monomers using AIBN at 70 °C in acetonitrile. The obtained copolymers were studied for degradability to identify a simple and sustainable method of degradation. The effect of functional groups on the rate and mechanism of degradation were also considered.
1. Lages, M.; Pesenti, T.; Zhu, C.; Le, D.; Mougin, J.; Guillaneuf, Y.; Nicolas, J., Degradable polyisoprene by radical ring-opening polymerization and application to polymer prodrug nanoparticles. Chem Sci 2023, 14 (12), 3311-3325.
2. Watanabe, H.; Kamigaito, M., Direct Radical Copolymerizations of Thioamides To Generate Vinyl Polymers with Degradable Thioether Bonds in the Backbones. J Am Chem Soc 2023, 145 (20), 10948-10953.

(PP2-9) **First time families - Experiences with higher education**
M I Sier
This study aims to explore how participation in higher education for individuals from non-university backgrounds is experienced both individually and collectively within a family unit. Widening participation policy is amongst the reasons that first in family university students are attending university at increasingly higher levels. Where there is a large body of research on FiF students themselves, little is understood about how their experiences of HE influences members of their family. This study aims to understand the individual and familial experience of HE and as such takes a qualitative approach. Multiple-perspective interviews will be carried out with members of the same family in order to understand how they make meaning out of their experience of an unfamiliar field such as higher education. Each member of the family will experience the same events in different ways, which leads them to construct individual interpretations of those events. These interpretations may lead then to the construction of a family reality. What is important for this project is that those invariably diverse and at times competing realities are heard. To understand the broader impact HE participation has on family dynamics, multiple perspectives from the home need to be explored. This research will seek to explore how the experiences of first in family students has an effect on their immediate family members. Their participation in education is not felt in isolation and current research shows that first in family students share their experiences with their immediate families and broader communities. In essence, this research will consider education as something that is a collective and relational experience rather than an individual pursuit.

(PP2-10) **Using bioinformatic and 3D modelling approaches to investigate the crosstalk between stellate cells and endothelial cells in pancreatic adenocarcinoma**

E Milne, F Abukunna, L Meira, P Campagnolo

Anti-angiogenic therapies aim to halt tumour growth by targeting the vascular cells that supply nutrients and oxygen; however, they have shown poor efficacy in treating patients with pancreatic adenocarcinoma (PDAC), despite the tumour itself being highly vascularised. The mechanisms underlying this are poorly understood, though the tumour microenvironment (TME) may play a significant role. The TME of PDAC consists of many different cell types, including endothelial cells and pancreatic stellate cells and the crosstalk between both have been poorly studied. Using 3D co-culture modelling and bioinformatic approaches, we aim to elucidate any interactions between these cells in the context of PDAC and understand any potential therapeutic targets.

By using different PDAC and pancreatic cell lines and co-culturing with both endothelial cells (ECs) and stellate cells (SCs) we have created 3D co-culture spheroids to look at morphology and distribution of cells.

Our results showed that addition of ECs and SCs to pancreatic cells produces more compact and rounded spheroids compared to mono-culture spheroids, indicating the presence of vascular cells increase cell-cell adhesion. Furthermore, SCs appear to aggregate with ECs in the centre of the spheroid, surrounded by pancreatic cells which may reflect a functional organisation. By leveraging publicly available single cell RNA sequencing PDAC datasets, it has been possible to identify differentially expressed genes in stellate cells populations in PDAC samples compared to 'healthy' stellate cells. Genes upregulated in PDAC were involved in extracellular matrix remodelling such as VCAN and SPARC, providing possible biomarker targets to assess in our spheroid model.

Overall, our 3D model, in combination with bioinformatics approaches, can be used to observe any dysregulated cellular crosstalk between different elements of the TME in PDAC.

(PP2-11) **Exploring and Enhancing Local Authority Social Workers' Complex Decision-Making: Bringing Together Professional, Psychological and Legal Expertise**

A Lilly, B Gardner, T Rakow, A Banks

In England, registered social workers in local authorities enact the Care Act 2014 (England), making consequential decisions about adults' care and support needs. Local authorities typically delegate complex decision-making to registered social workers as they are required to have a decision-making expertise. Complex decision-making can arise when a person's judgement or wishes, in the circumstances, put their well-being at risk of harm (e.g., when a person is seriously self-neglecting). In such complex decision-making, conflicting professional values are invoked which can be cognitively difficult to reconcile.

We applied our expertise in the psychology of decision-making to investigate this pressing societal concern. We developed, in collaboration with the Chief and Principal Social Workers, a new vignette-based methodology to measure decision-making quality and explore underpinning cognitive processes. In Studies One (n = 79) and Two (n = 90), decision-making quality was higher if participants considered the legal principle that the person's judgement might not promote well-being, but this was rare. In Study Three (n = 8), an inductive exploration, participants constructed, from only a little of the available information, a fixed explanatory frame, based on a misconceived principle about the inherent paramountcy of the person's judgement and wishes, which shaped and limited information search and synthesis. In Study Four (n = 75, n = 84), a deductive assessment of associations between information extracted and quality scores, a positive association was found, but information extracted was very limited.

We have now built an interdisciplinary, inter-university team, led by the University of Surrey, of psychologists, policymakers, practitioners and a leading barrister to undertake a number of related academic-policy initiatives. Notably, we are working with North Yorkshire Council colleagues to develop policy on complex decision-making, providing briefings on this to the Chief and Principal Social Workers.

(PP2-12) **A scoping review of psychological restoration following contact with blue spaces**

HY Huang

Spending time in natural environments can have powerful effects on mental wellbeing. While green spaces like parks and forests have been widely studied, blue spaces—environments featuring visible surface water such as rivers, lakes, and oceans—are gaining attention for their potential to support psychological restoration. This scoping review explores how blue spaces may reduce stress, support emotional balance, and restore attention, drawing on

two key frameworks in environmental psychology: Attention Restoration Theory (ART) and Stress Reduction Theory (SRT).
Following PRISMA guidelines, we searched three major academic databases for peer-reviewed studies published between 2000 and 2024. After removing duplicates and applying screening criteria, 104 studies were included in the final review. Most research focused on lakes, rivers, and oceans, while waterfalls, wetlands, and fountains were rarely studied. Studies varied in design, with a dominance of experimental and cross-sectional methods and fewer qualitative or long-term investigations. Among the blue space characteristics, water quality and soundscapes emerged as commonly studied factors.
Findings across studies were mixed: while many reported positive effects of blue spaces on stress reduction and attention restoration, others showed little or no effect, and some reported negative responses. Very few studies directly compared different types of blue spaces, limiting our understanding of what specific features contribute to psychological benefits.
This review highlights both the potential of blue spaces to support mental health and the need for more interdisciplinary research, especially studies that integrate perspectives from psychology, public health, environmental science, and urban design. Understanding the diverse roles of blue spaces could inform future planning and policymaking to create environments that promote wellbeing across different communities.

(PP2-13) **Understanding lived experiences of the pathway to cancer diagnosis for people with learning disabilities. A qualitative study**
NM Gil, A Cox, KL Whitake, RS Kerrison.
Background: Cancer is a leading cause of death and is responsible for at least one in six deaths, worldwide. Among people with learning disabilities (PwLD), cancer is the second leading cause of death, more likely to occur at a younger age, and often diagnosed at a late stage when it is difficult to treat. This means PwLD are more likely to die from cancer, than people without learning disabilities. Within the general population up to 85% of cancers are diagnosed following presentation of a symptom to primary care, however among PwLD, cancer is diagnosed by emergency presentation, more often than any other route. Previous research has reported that PwLD experience many barriers to accessing healthcare, which may explain why cancer is more frequently diagnosed via other routes. This study aims to understand PwLD experiences of the pathway to diagnosis, including recognising a possible cancer symptom and attending a primary care appointment to report this, thus entering the cancer care pathway.
Methods: We aim to purposively sample PwLD and the people who support them, who have experience of the pathway to cancer diagnosis, within the past year. Up to 20 semi-structured interviews will be conducted, exploring experiences of the pathway to cancer diagnosis, within the last two years. We will engage with local advocacy organizations, such as Active Prospects, who are specialists in facilitating PwLD -led co-production and research to address health inequalities.
Analysis: Thematic analysis will be used to identify and contextualise salient themes in an iterative process with multidisciplinary team members. Relevant health psychology theory, such as Leventhal's Common-Sense Model of Illness and Candidacy framework, will be used to conceptually link participants' appraisal of their symptoms, emotional and behavioural responses, and response to contact with health services.
Preliminary findings: Five interviews of people with lived experiences of learning disabilities have been completed to date, including three PwLD and two advocates working in senior positions within learning disability organisations. Analysis is ongoing, and initial findings suggest that PwLD face many barriers to timely diagnosis, including; previous negative interactions with healthcare, feeling anxious, difficulty with self-advocating, and poor communication from healthcare professionals, who are unfamiliar with working with PwLD.

(PP2-14) **Exploring the role of social pensions in reducing son preference**
MA Sarah
Amartya Sen's concept of ""missing women"" highlights a critical demographic imbalance caused by gender discrimination in countries like India and China, where prenatal sex selection and postnatal neglect of females persist. Son preference remains a significant issue, influencing fertility choices and resource allocation within households. Along with sociocultural and religious traditions, economic considerations also play a key role, with sons perceived as more economically valuable than daughters. Microeconomic theories suggest that parents view

children as assets that provide financial security in old age. In patrilineal societies, this expectation predominantly favours sons, as daughters are seen as temporary family members expected to join their husband's household.
While son preference exists in many developed nations, reflecting factors such as family name inheritance or business succession, a key distinction is India's heavy reliance on sons for old-age security. In developed nations, robust pension systems mitigate the need for parental dependence on sons. In contrast, India's pension coverage remains low (10.3% vs. ~90% in developed economies), reinforcing parental reliance on sons for financial stability.
I first develop an economic framework to examine how social pensions influence gender preferences in societies where sons are traditionally seen as providers for aging parents. By reducing parental dependence on sons, social pensions could challenge gender norms and reshape household preferences for sons. The paper analyses son preference before and after India's late-1990s social pension introduction. Using a difference-in-differences approach, I find evidence that pensions reduce son preference.
From a policy perspective, as societies age, pensions are becoming a crucial tool. Strengthening and expanding pension systems could enhance old-age security and influence social norms. While addressing the sex ratio may not be the primary goal, the broader impact of pensions on gender preferences warrants further consideration.

(PP2-15) **Investigating Symptom Variability and Treatment Response in Pernicious Anaemia: A Longitudinal Symptom Tracking Study**

A Thain, P Visser, K Hart, K R Ahmadi

Introduction: Pernicious anaemia (PA) is an autoimmune condition characterised by vitamin B12 deficiency due to loss of intrinsic factor. Iron deficiency (ID) is common in PA and may present with or without anaemia, as a single episode or a recurring issue each posing unique management challenges. Despite this, there are no formal guidelines for screening or managing ID in PA. This study aims to investigate the diagnosis, management, and screening of ID among PA patients.
Methodology: An online survey was designed in Qualtrics and distributed to members of the Pernicious Anaemia Society (PAS). It collected data on demographics, medical history, ID diagnosis and treatment, monitoring practices, and symptoms. Responses were anonymised and analysed descriptively.
Results: A total of 390 participants completed the survey, 79% (n=308) were female (mean age 62.7 [SD=11.8]). ID was reported both before and after PA diagnosis by 31% (n=119), with 16% (n=64) and 14% (n=54) reporting ID only before or after diagnosis, respectively. Among those reporting recurring ID (n=130), 37% (n=48) indicated their deficiency was not well-managed. Iron tablets were the most common treatment (73%, n=166), followed by iron infusions (8%, n=18). While 65% (n=148) reported improved iron levels, 28% (n=64) had no follow-up blood tests. Symptom improvement following treatment was reported by 63% (n=141). Alternative treatments were rarely offered to those without improvement (13%). Monitoring was infrequent, with 76% (n=170) reporting no regular checks. Many participants (42%) reported difficulty distinguishing between PA and ID symptoms.
Conclusion: ID in PA patients is often recurrent, poorly managed, and infrequently monitored, with variable treatment outcomes and insufficient follow-up. These findings highlight the urgent need for PA clinical guidelines to address gaps in monitoring and treatment, considering the unique aetiology of ID and potentially overlapping symptoms in this population. Enhancing clinical management could improve patient outcomes and quality of life.

(PP2-16) **Exploring Iron Deficiency in Pernicious Anaemia: A Survey of Diagnosis, Treatment and Management Practices**

A Thain, P Visser, K Hart, KR Ahmadi

Introduction: Pernicious anaemia (PA) is an autoimmune condition characterised by vitamin B12 deficiency due to loss of intrinsic factor. Iron deficiency (ID) is common in PA and may present with or without anaemia, as a single episode or a recurring issue each posing unique management challenges. Despite this, there are no formal guidelines for screening or managing ID in PA. This study aims to investigate the diagnosis, management, and screening of ID among PA patients.
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(PP2-18) **Biocoatings**: **Confining genetically modified Escherichia coli in coatings for hydrogen production**
K L Dunbar, A Beale, E Brogden, S Bon, M Sari, M Briceno de Gutierrez, B Dominguez, S Hingley-Wilson, J L Keddie
Hydrogen offers a source of energy that does not produce any greenhouse gases (GHGs) when combusted, and hence the global demand for hydrogen fuel is growing. Biohydrogen is an attractive alternative to more traditional hydrogen production methods because it does not require fossil fuel feedstocks, however, the yield needs to be increased for biohydrogen to be commercially competitive.
The aim of the research was to genetically modify Escherichia coli and confine them in biocoatings for the purpose of increasing hydrogen production.A biocoating is a waterborne colloidal polymer coating containing live bacteria. They have the potential to overcome many of the limitations presented by traditional bioreactors. Single gene knockouts of the mixed acid fermentation pathway (MAFP) were initially investigated by culturing anaerobically (without oxygen) in Balch tubes for 48 hrs, and the headspace gas measured using a residual gas analyser. The best performing single gene knockouts were then combined to produce double knockouts and hydrogen production measured using hydrogen microsensors (Unisense). E. coli were confined within a biocoating using a gelation method, wherein salt induces the coagulation of the colloidal particles, thereby avoiding water evaporation and reducing osmotic stress. This method significantly increased the bacterial viability compared to the conventional desiccation method.
Double knockouts of genes involved in the MAFP were found to increase the hydrogen yield, overcoming one of the key limitations of biohydrogen for large-scale production. The production rate of carbon dioxide (a greenhouse gas) was also significantly lower than the wildtype. The best performing modified E. coli had a hydrogen production rate that was 100 times higher than the wildtype strain. Interestingly, the hydrogen yield from biocoatings was higher than that obtained from E. coli in liquid suspension, suggesting a positive impact of cell confinement.

(PP2-19) **Digital Transformation and Tourism Performance: Views from Disciplinary and Interdisciplinary Perspectives**
Q Zhang, J Chen, G Li, Xy Jiao
Digital transformation (DT) has fundamentally reshaped socioeconomic activities and production systems, disrupting foundational theories while demanding both disciplinary and interdisciplinary perspectives to decode its impact. Despite growing scholarly interest in DT and performance, scholarly understanding remains fragmented regarding the theoretical foundations and mechanisms underlying DT's influence on tourism performance. To address these gaps, this study conducts a systematic literature review, clarifies the conceptual boundaries of DT and performance, and proposes a conceptual framework to elucidate the processes through which DT impacts performance.
This review synthesises the theoretical foundations of DT and performance while exploring their evolution and challenges in the digital age. Specifically, the article develops a theoretical framework to examine how DT influences performance across diverse disciplinary lenses, including economics, management, sociology, and psychology. Concurrently, we analyse interdisciplinary theories linked to DT and performance, demonstrating how bridging disciplines fosters shared conceptual frameworks to address complex scientific challenges. Over time, this synthesis cultivates emergent interdisciplinary fields.
Guided by the conceptual framework, the article dissects antecedents (e.g., technological infrastructure), influencing factors (e.g., organizational agility), strategic pathways (e.g., data-driven decision-making), and performance outcomes (e.g., resilience), revealing their interconnected dynamics. Building on these insights, we develop a research agenda to advance theoretical and empirical inquiries into DT-driven performance. Actionable

guidance is also provided to researchers, policymakers, and practitioners navigating digital disruption, with an emphasis on integrating disciplinary rigor and interdisciplinary collaboration.

(PP2-20) **Physical activity levels after pancreatico-duodenectomy are low leading to muscle loss and need to be optimised for better cancer outcomes**

M E Phillips, A E Frampton, K H. Hart

Introduction and aims: Enhanced Recovery After Surgery (ERAS) principles are well established in most surgical cohorts, but physical activity-based interventions after discharge from hospital are not widely studied. Improvements in physical activity levels (PAL) are associated with a higher likelihood of surgical resection, lower risk of readmission (1), and increased likelihood of completing chemotherapy (2). This subgroup analysis of a larger study aimed to quantify PAL and muscle mass after surgery to identify areas for further research.

Methodology: Patients wore wrist-based accelerometers for 28-days after surgery, completed physical activity questionnaires pre-operatively and at 1 month after surgery using the international physical activity questionnaire (IPAQ) long form. Ultrasound measurements of the rectus femoris muscles were undertaken at the same timepoints. This study was approved by the local ethics committee (21/LO/0139). Data analysis were carried out in SPSS (version 28, IBM, US)

Results: 35 patients (71% male, mean age 66 (9.5) years) due to undergo PD in a tertiary centre took part . Mean length of stay was 11 days (SD 7.7). PAL were highly varied with only 6 patients reaching 5,000 steps/day and 3 patients reaching 10,000 steps/day for one or more days. Six patients reported high PAL 1-month after surgery, their corresponding step counts (daily mean over the corresponding week) were 1396-7781 steps/day. IPAQ results did not predict step count, with no difference in step count between differing reported PAL (NS). When analysed individually, 25 patients (76%) demonstrated a reduction in muscle mass between the pre-operative and 1-month ultrasound. Muscle loss was greater in those with lower PAL, demonstrating a moderate correlation (R2=0.371).

Conclusion: Physical activity after PD is poor and may have a role to play in supporting patients to complete adjuvant chemotherapy. Further work should combine nutritional interventions and physical activity targets to support rehabilitation from PD.

(PP2-21) **Nutritional recovery after pancreaticoduodenectomy is often insufficient and requires optimisation**

M E Phillips, R Nangial, A E Frampton, K H. Hart

Aims: Enhanced Recovery After Surgery guidelines recommend patients should receive artificial nutrition after pancreaticoduodenectomy (PD) if they are unable to consume more than 60% of their nutritional requirements by day 7-10 post-operatively (1). This study aimed to identify if oral diet targets can be met with specialist dietetic support.

Methods: Demographics, nutritional status, dietary intake, and clinical outcomes were collected over a 24-month period. Ethical approval: 21/LO/0139. Data analysis were carried out in SPSS (version 28, IBM, US).

Results: Thirty-five patients (71% male, mean age 66 (9.5) years) due to undergo PD in a tertiary centre were recruited to this observational study. Pre-operatively malnutrition occurred in 63% of cases. Diabetes was diagnosed in 19% and iron deficiency in 55%. Dietary changes were implemented in 77% of patients, 92% were commenced on pancreatic enzyme replacement therapy (PERT), 1 patient was admitted for naso-jejunal (NJ) feeding and 17% commenced on oral nutritional supplements (ONS). At discharge, 4 patients were receiving NJ feeding, only 1 patient met >60% of their energy requirements at discharge with diet alone, 54.8% (n=17) exceeded 60% with ONS, 14% were unable to consume sufficient energy with ONS and 11% refused ONS or more aggressive nutritional support. Energy intake (percentage of requirements) improved between discharge and at one month: 71.9% (SD 19.1) to 84.6% (SD 29.9) (p=0.025). Only 9 patients (27%) met their nutritional requirements one month after discharge. Oral intake one month after surgery was associated with dose reduction in adjuvant chemotherapy (p=0.032).

Conclusion: Nutritional recovery under the supervision of specialist dietitians was still insufficient, but improved faster than in published clinical trials (2-4). Based on the ERAS guidelines, a further 29% of our patients should have commenced artificial nutrition before discharge. Future work should explore techniques to improve nutritional recovery to support adjuvant chemotherapy.

(PP2-22) **Promoting sustainable development in the UK pensions industry – Are the voices of pension beneficiaries being heard?**

B. Doran, S. Morse, W. Wehrmeyer, J Williams

Pension funds are the largest combined institutional investors in the world and the UK is currently the fourth largest pension market in terms of asset holdings. The integration of ESG (Environmental, Social and Governance) criteria into Defined Contribution DC (Defined Contribution) pension investments by pension funds, in line with pension beneficiary wishes and through a focus on socially responsible investing (SRI), may help combat environmental and social issues, improve risk-adjusted returns and help achieve the Sustainable Development Goals (SDG's). Given the size of the pension industry its power is significant, and the sector is anticipated to grow in importance in the coming years as governments seek to address increasing longevity, inter and intragenerational inequality and long-term economic growth, through sustainable investments, laws and regulations and stakeholder engagement.

Pension beneficiaries invest their money in their pension. Pension funds invest in corporates through asset managers. As shareholders in corporates in which they invest, asset managers potentially have much influence in corporate ESG policy. In many cases, ESG investment choice decisions are taken on behalf of pension beneficiaries without the pension beneficiary being consulted. This raises important questions such as whether pension beneficiary and pension fund/asset manager investment decisions align on total ESG and renumeration preferences or indeed individual Environmental(E), Social (S) and Governance (G) and Renumeration preferences? If this is not the case, then why not and what are the impacts?

(PP2-23) **Advancements in Trust-Region Filter Methods for Efficient Grey-Box Optimisation**

G Hameed, T Chen, A D R Chanona, M Short

Process systems optimisation has significantly evolved over the past century, efficiently handling equation-oriented (EO) nonlinear models. However, challenges arise when EO representations are unavailable for specific process units, requiring their integration as external functions without derivative information into EO models. This creates a fundamental challenge in optimisation.

Grey-box optimisation addresses this issue by combining EO (glass-box) models with black-box models (lacking derivative information). However, deterministic optimisation relies heavily on derivatives, making integrating black-box models difficult, especially when they are computationally expensive. For instance, in computational fluid dynamics, each simulation can be time-consuming, making frequent black-box evaluations a major bottleneck. To overcome these challenges, derivative-free optimisation (DFO) methods are preferred, aiming to minimise function calls while efficiently searching for the optimum.

Recent advancements, such as the trust-region filter (TRF) method, offer promising solutions for grey-box optimisation. The TRF method integrates surrogate modelling, trust-region strategies, filter mechanisms, and DFO principles. It allows non-monotonicity to explore non-linearity while simultaneously reducing the objective function and constraint violations associated with surrogate-based approximations. This work extends the TRF methodology to solve constrained grey-box optimisation problems more efficiently, significantly reducing external function calls and improving convergence rates.

The modified TRF leverages derivative information from glass-box components and, where available, derivatives from black-box models using Taylor series first-order approximations. Advanced surrogate modelling techniques, such as Gaussian Processes (GPs), further enhance performance by effectively managing noise and sparse data. Robustness is assessed using performance profiles and ratios, demonstrating that GP-based surrogates and Taylor series approximations improve convergence. Incorporating Hessian information further accelerates the optimisation process, making the algorithm more robust than variants relying solely on linear and quadratic surrogates.

This study establishes TRF as a powerful approach for grey-box optimisation, offering improved efficiency, accuracy, and robustness across various constrained problems.

(PP2-24) **DECO2: Decarbonation Options Optimisation (An Open-source Software Supporting Decarbonisation Journeys of Emerging Economies)**

G Hameed, Michael Short

Climate change is a dire threat to the health and prosperity of the planet and humanity. Evidence shows the significant impacts of anthropogenic activities on global warming, and thus global cooperation to mitigate such effects is essential. Every year, the COP (Conference of the Parties) summit is held to achieve the goal set by the

Paris Agreement, urging the international community to reduce the carbon footprint for the sake of current and future generations.
Developed countries are accountable for a huge portion of global greenhouse gas emissions, but recently there have been dramatic rises in emissions from less developed countries.
In particular, the carbon footprint from the ASEAN (Association of Southeast Asian Nations) countries continues to grow with rapid industrialisation and economic growth. Yet they are the most vulnerable countries affected by climate change. Considering the massive economic and societal impact of climate change, these countries must make transitions to a low-carbon economy.
To achieve such transitions, strategic planning is essential. The plan should integrate the current emissions, reduction targets, and viability of carbon-negative technologies. DECO2 (https://institute-for-sustainability.turtl.co/story/deco2/page/1) has been developed to support such planning processes in the ASEAN region to reach ambitious emissions targets. Based on rigorous mathematical optimisation models, this open-source energy planning software has Microsoft Excel-based interface for user-friendliness, and it enables detailed carbon emissions and budget planning.
By integrating diverse data sources and complex modelling capabilities, the software provides tailored solutions for energy decarbonisation, balancing economic, environmental, and technical considerations. The tool is designed to assist stakeholders in making informed decisions to enhance the adoption of renewable energy sources, improve energy efficiency, and achieve emissions reduction targets in alignment with regional sustainability goals and net-zero targets.
With DECO2, you can develop a comprehensive decarbonisation roadmap with efficiency and accuracy, and drive the transition towards low-carbon energy systems.

(PP2-25) **Sensory Inputs to Rhythmic Outputs: Opsins, Circadian Control, and Sleep**
AH Cooper, MO Parker
The circadian system functions like a biological computer, integrating diverse sensory inputs and generating rhythmic outputs that regulate behaviour and physiology. Opsins serve as key light-sensitive inputs, yet the functional roles of many remain unknown, particularly in their communication with the circadian system. Additionally, the mechanisms by which environmental light cues entrain locomotor rhythms remain unclear, and a universally accepted definition of sleep is still debated.
Larval zebrafish provide an ideal model to investigate these questions due to their genetic accessibility, rapid development, and transparent physiology. In particular, those younger than five days post-fertilisation (dpf) circumvent home office licensing requirements, enabling early-stage behavioural studies. So far, we have made strides in defining the locomotor phenotype of zebrafish before 5 dpf, paving the way for investigating both opsin involvement and sleep regulation. In the future, by integrating behavioural assays, molecular profiling, and circadian analysis, we aim to clarify how opsin-driven light perception influences locomotor entrainment. Additionally, we seek to refine the definition of sleep by incorporating physiological and behavioural parameters into AI-based models to distinguish sleep from wake states with greater precision.
This interdisciplinary approach bridges molecular neurobiology, chronobiology, and developmental physiology to deepen our understanding of how environmental inputs shape sleep and activity patterns in vertebrates.

(PP2-26) **3D Human IPSC-Derived Atrial Spheroids as a Novel Platform to Study Atrial Electrophysiology**
M L Trowbridge, R Sanwlani, R Simmonds, P Camelliti
Atrial fibrillation (AF) is the most common cause of cardiac arrhythmia globally, highlighting the need for an effective in vitro model to study cardiac physiology and contractility. Investigating human atrial cardiomyocytes in three-dimensional structures will enhance our understanding of their role in atrial physiology and open avenues to explore cell-cell interactions compared to two-dimensional cultures. In this study, we have engineered three-dimensional myocardial microtissues which could offer significant advantages in modelling atrial physiology in vitro and investigating cardiac contractile function and electrophysiology.
Human induced pluripotent stem cells (iPSCs) were differentiated into ventricular and atrial cardiomyocytes, which were then seeded into non-adherent microwells to form spheroids and into 48 well plates to form monolayers. Spontaneous contractility recordings were performed daily from the onset of cardiomyocyte beating, assessing contraction amplitude, time to peak contraction, and relaxation time. Additionally, calcium transients were recorded to evaluate calcium handling dynamics.

Contractility analysis shows that atrial spheroids have significantly shorter contraction duration in comparison to atrial monolayers (259 ± 27 vs. 474 ± 31 ms; p=0.0012, n=4/8), and higher contraction amplitude (444 ± 25 vs. 153 ± 17 a.u.; p<0.0001, n=4/8). Atrial spheroids display a higher spontaneous beating frequency compared to ventricular spheroids (2 ± 0.2497 vs. 0.4 ± 0.0367 Hz; p=0.0037, n=7) and shorter contraction duration after correction for inter-beat interval (289 ± 9 vs. 365 ± 7 ms; p=0.0015, n=4/3). Calcium imaging at 1.5 Hz stimulation reveals chamber-specific differences, with atrial spheroids showing significantly shorter time to calcium peak (67 ± 5 vs. 143 ± 6 ms; p<0.0001, n=5) and shorter calcium transient duration (289 ± 21 vs. 396 ± 11 ms; p=0.0018, n=5). Our results reveal distinct electrophysiological and contractile differences between atrial cardiomyocytes cultured in 3D spheroids and 2D monolayers, highlighting the influence of in vitro culture conditions on cellular behaviour. Atrial spheroids provide a more physiologically relevant platform, with an atrial-specific phenotype, offering promising applications for studying cell-cell interactions and their role in AF pathogenesis.

(PP2-27) **Positive Approach to Care (PAC): a realist evaluation study**

PO Adedokun, V Tischler

There is a need to increase the number of evidence-based psychosocial interventions to improve the care of those living with dementia. Realist approaches have been used to evaluate complex interventions in health and social care settings, including dementia care environments.

This project will use a Realist Evaluation to assess the Positive Approach to Care (PAC), a psychosocial intervention being used in UK dementia care settings. This focuses on Contexts, Mechanisms, and Outcomes that support its potential effectiveness. For this Realist Evaluation, there are 3 planned phases: First, conducting a stakeholder consultation study exploring current views on assisting those living with dementia during with mealtimes, including PAC in UK dementia settings, using qualitative methods. Alongside this, a realist synthesis of literature will examine the use of psychosocial interventions, which encompass caregiver approach and a tactile function in dementia care homes. Secondly, the current use of the PAC approach within UK social care settings as a dementia care intervention will be expanded upon using mixed methods. Participants will be recruited from care homes within the UK, including care workers, family carers and those living with dementia. Lastly, the feasibility of implementing PAC in UK social care settings will be considered, including the development of an initial program theory (IPT) underpinning its use.

This research will benefit the existing literature on PAC by expanding its ecological validity, as PAC studies are overwhelmingly focused on the United States of America (USA). This research will build evidence on a relatively novel approach in the UK context. From the results of this research, if PAC is found to improve the quality of care of the service users in the UK, it could influence policy regarding dementia care provision in the UK.

(PP2-28) **Changes in dendrite remodeling underlying sex-dependent traumatic stress susceptibility/resilience in the hippocampus**

M Giovenzana; S A Torrisi, S Rizzo, J Mingardi, F Drago, G M Leggio, L Musazzi

Background: PTSD is a multifactorial mental disorder that develops following highly traumatic experiences. Women are more frequently affected than men by the disease but the neurobiological basis for sex discrepancy in PTSD is still largely unknown. Previous evidence reported functional and morphological alterations in corticolimbic brain areas of patients with PTSD [1].

Aim: Evaluate sex-dependent morphological differences, in terms of dendritic length, at the level of pyramidal neurons in the CA1 region and dentate gyrus of the dorsal (dHPC) and ventral hippocampus (vHPC) in an animal model of PTSD. [2]

Methods: The model was obtained by exposing mice to prolonged acute isolation stress (AIS), and subsequent classification of the animals into susceptible and resilient, based on their behavioral phenotype [3]. After sacrifice, the brain was collected, and Golgi-Cox staining was performed on brain slices [4]. Images were acquired by light microscopy; the dendritic tree was reconstructed using Fiji ImageJ software [5].

Results: Female mice resulted more susceptible to AIS compared to males [2]. Variations in terms of dendritic length were obtained in the different hippocampal areas in male and female controls, as well as in resilient and susceptible mice. In dHPC the dendritic length of female mice was shorter compared to males. In CA1 from vHPC, the total dendritic length was increased selectively in susceptible males and not in females. In DG from vHPC, stress decreased the total dendritic length in resilient females but not in resilient males.

Conclusion: In dHPC, differences in dendritic lengths depend mainly on the sex of the animals while in vHPC on the behavioral phenotype after stress exposure. The attribution of a biological meaning to the morphological-structural alterations identified requires the interdependent consideration of several factors: sex differences, the classification of animals as resilient/vulnerable to stress, and the specific hippocampal subregion.

(PP2-29) **Development and Characterisation of A 3D Epicardial Cardiac Model**

K. Sackho, J. Duruanyanwu, R. Safakli, I. Smyrnias, A. Jawad, Y. Kim, P. Campagnolo

The epicardium provides progenitor cells and paracrine signals essential for cardiac development. Though dormant in adulthood, epicardial cells reactivate after cardiac injury to promote repair, yet in vitro models for these cells are scarce. This project engineered a multicellular heart spheroid model including the epicardial layer. Cardioids were formed with cardiomyocytes (rat neonatal or H9C2), fibroblasts (rat neonatal or human), and human endothelial cells in a 12,000:12,000:12,000 ratio. Epicardioids added 1,000 epicardial cells (adult pig EPDCs or mouse MECs) to replicate heart cellular composition. Spheroids were characterized via brightfield and flourescence microscopy and viability assays. Spheroids formed at a 1:1:1 ratio of fibroblasts, cardiomyocytes, and endothelial cells showed the highest roundness (0.948), with no central translucency after 3 days. Adding 1,000 epicardial cells resulted in the most intact epicardial layer, as shown by fluorescence imaging. EPDCs epicardioids were smaller than cardioids ($P \leq 0.05$), indicating epicardial cells confer compactness. CD31 and MSLN staining showed endothelial cell structures forming suggesting coronary-like organisation. H9C2 viability was decreased in MECs compared EPDC epicardioids and cardioids ($P \leq 0.01$). MEC epicardioids displayed more endothelial cells than other spheroids, suggesting a pro-angiogenic role of embryonic epicardial cells. Epicardial cells also promoted healthy H9C2 morphology. Challenge with TGF-β1 increased collagen expression, cellular debris release, cell density in spheroids. Epicardioids can investigate the role of adult large mammals epicardium as they mimic human heart physiology by enhancing spheroid compactness, healthy cardiomyocyte morphology and epicardial-endothelial organisation. They also exhibit physiological responses to stimuli.

(PP2-30) **Adapting Digital Business Models to Scale: A Case of Digital Technology Enterprises in Africa**

IK Akanisi Oguamalam

African digital enterprises face significant challenges in adapting their business models to scale beyond local markets, with only a small number of companies successfully navigating this process. While extensive research exists on scaling and business model adaptation in developed economies, little attention has been given to African digital technology enterprises and how the few that succeed manage to expand beyond their local context. This research explores how these enterprises adapt their digital business models to capitalise on entrepreneurial opportunities. Using a qualitative case study approach, semi-structured interviews were conducted with twenty African digital technology enterprises, and data were analysed using NVivo and Reflective Thematic Analysis. Findings indicate that key organisational activities, strategic dependencies, and key causalities that impact scale are critical for expansion into new markets while maintaining sustainability within the African business environment. This study contributes to the literature by providing insights into how African digital technology enterprises can strategically adapt and scale in a globalised economy, addressing a significant research gap.

Keywords: Digital Business Models, African digital technology businesses, Scaling

(PP2-31) **The Effects of Externally Applied Electromagnetic Fields on Intracellular Calcium and Neuronal Activity**

C Duringer, P Camelliti, J McFadden

Introduction: Electromagnetic fields (EMFs) modulate calcium homeostasis and neuronal activity in both in vitro and in vivo models, yet the underlying mechanisms remain unclear. Emerging models suggest that quantum phenomena, such as spin interactions and tunneling, may play a role. Understanding how externally applied EMFs influence biological systems could provide new insights into these processes. This study investigates the effects of EMFs on intracellular calcium dynamics in HEK293 cells and synaptic activity in hippocampal slices.

Methods: Wild-type HEK293 cells were loaded with the fluorescent calcium indicator Fluo-4-AM and an organic anion transporter inhibitor to prevent dye extrusion. After a 20-minute incubation, the dye was removed, and cells were allowed an additional 20 minutes for de-esterification. Baseline fluorescence was recorded before exposure to a 0.1 mT static magnetic field generated by a Helmholtz coil. Fluorescence was measured at 15, 30, and 60 minutes of EMF exposure.

Hippocampal slices (300 μm) from 11-week-old C57BL/6 mice were placed on a multielectrode array (MEA) to record spontaneous activity in the CA1 region. Slices were exposed to 10 Hz, 0.1 mT bipolar pulsed EMFs, and changes in field excitatory postsynaptic potential (fEPSP) amplitude, spike number, and field potential duration were analyzed.
Results: A 0.1 mT static magnetic field significantly decreased intracellular calcium ($[Ca^{2+}]$) at 30 minutes ($p < 0.001$) and 60 minutes ($p < 0.0001$). Pharmacological modulation and calcium-free conditions suggest this reduction is mediated by SERCA channels and suppression of store-operated calcium entry (SOCE). Similarly, a 1 mT field also significantly decreased $[Ca^{2+}]$ ($p < 0.05$), further supporting SOCE inhibition.
In hippocampal slices, bipolar pulsed EMFs significantly reduced fEPSP amplitude ($p < 0.01$) and increased spike frequency ($p < 0.05$) compared to baseline.
Conclusion: These findings demonstrate that externally applied EMFs modulate calcium homeostasis and synaptic activity. The suppression of SOCE and changes in neuronal excitability suggest EMFs interact with key regulatory mechanisms in neuronal function. The ability to modulate calcium signaling through non-invasive EMF exposure highlights its potential for targeted neuromodulation and novel therapeutic applications.

(PP2-32) **'We can be the bridge': Role of Mandarin in Pakistani higher education institutions and intercultural citizenship among students**
Adeeba Ahmad
This study examined the impact of Mandarin language learning initiative on promoting intercultural citizenship (ICit) in Pakistani higher education students in the absence of an explicit ICit policy. Within the context of China-Pakistan Economic Corridor (CPEC), this study explored experiences and development of ICit in Pakistani university students who have learned Mandarin as a foreign language. Qualitative data was collected through ten focus group discussions with 52 students across four universities, to explore, to what extent Mandarin initiative has contributed to the development of the four dimensions of the intercultural citizenship framework; intercultural knowledge and understanding, communication skills, attitudes and values, and action. The findings indicate that while learning Mandarin contributed to students' development of the four dimensions of intercultural citizenship concurrently, few aspects were more prominent, namely, intercultural knowledge and communication skills, attitudes and values, whereas, less emphasis was on the last dimension i.e., action. The key finding showed how students viewed language learning as a way of religious motivation, which contributes as a surprising finding as it is not a prominent theme in literature, but it can be useful to include in the ICit framework. The contribution of this paper is threefold; firstly, it brings to light the less explored area of Mandarin as a foreign language as opposed to English as a foreign language. In addition, extending the literature by bringing forth the voices from the South, in the heavily West dominated literature. Secondly, we propose adding education and religion component to the ICit framework in addition to the current political and linguistic area. Thirdly, it provides guidance for policymakers and educators on supporting students' development of ICit foreign language education practices in Pakistan and finally, makes recommendations for foreign language education to be framed around the aim of developing intercultural citizenship, specifically the aspect of action.

(PP2-33) **CP Link project: Bridging disciplines to support adults with cerebral palsy to age well**
E Ranzato, E Livingstone, M Creeger, V Stevenson, K Lowton, M Norris, C Kilbride, C Victor, K Smith
Cerebral Palsy (CP) is the most common lifelong physical disability in the UK, affecting over 130,000 adults. In the UK, people with CP are typically supported by specialist teams during childhood. However, upon reaching adulthood, they are often discharged from these services and transitioned to non-specialist care. This abrupt change is described by individuals with CP as "falling off a cliff." As a result, adults with CP often face a lack of coordinated support and reduced access to specialised healthcare. This is further complicated by early-onset ageing-related health issues, as people with CP are more likely to experience physical health conditions earlier than the general population. These physical health challenges are often accompanied by social isolation and increased mental health difficulties, which the literature has shown are common among adults with CP.
The first study of this project explores how ageing with CP impacts physical, social, and mental well-being and aims to identify good practices, gaps in support, and areas of unmet needs of adults with CP. So far, we have conducted semi-structured interviews with 12 adults aged 40 and over with CP and living in London. We are currently recruiting adults with CP and learning disabilities, who are under-represented in research. By the end of April, we expect to report findings from the sample of adults with CP, but not yet from the group with CP and learning disabilities.

Preliminary themes highlight challenges in accessing specialized support and social challenges related to ageing with CP. The findings from this study will inform the development of a specialised link worker role designed to support adults with CP to age well. The second study, a feasibility and pilot study, will assess the implementation and effectiveness of the CP link worker intervention, which will be delivered over one year in London.

(PP2-34) **The liposome-based adjuvant LMQ activates the NLRP3 Inflammasome in in vitro models of ageing**
A Sanchez-Martinez, L Broadbent, N Ridell, D Neple, G Marsman, A Milicic, C Rollier
Immunosenescence refers to the age-related changes in the immune system. Although most commonly associated with a decline in adaptive immunity, immunosenescence also affects innate immunity. These alterations lead to a decreased ability to fight infections and reduced vaccine immunogenicity and protection later in life. Vaccine adjuvants enhance the immune response induced by immunisation; understanding their mechanism of action using in vitro models is a valuable platform for developing more effective vaccines, particularly for older individuals. We aim to evaluate in vitro the capacity of various liposome-based adjuvants containing immunomodulatory compounds to activate human and mouse macrophages during immunosenescence. Mouse-bone-marrow-derived macrophages (BMDM) and human-monocyte-derived macrophages (HMDM) were stimulated in vitro with three liposome-based adjuvants: LM, LQ, and LMQ. Cell viability was assessed by detecting LDH release, and the secretion of IL-1β and TNF-α was quantified using ELISA. LQ did not induce the release of either IL-1β or TNF-α; however, it promoted the highest lactate dehydrogenase (LDH) release in cells derived from mice and humans. No significant differences were found when the responses from young versus old were compared. LM induced only low levels of TNF-α, without releasing IL-1β or LDH, and higher levels of TNF-α were observed in aged cells from mice. LM induced only low levels of TNF-α in cells from older adults. LMQ promoted the release of high levels of IL-1β and TNF-α to a similar extent in cells from both young and aged mice, as well as in cells from young and aged individuals. These findings suggest that the liposome-based adjuvant LMQ can activate the NLRP3 inflammasome and maintain this activation during ageing. A small increase in response to LM (TLR4-mediated signalling) in the context of ageing warrants further investigation. Whether these findings impact the immunogenicity during ageing in vivo for key pathogens (RSV) is currently under investigation.

(PP2-35) **The genetic architecture underlying schizophrenia, bipolar disorder and post-traumatic stress disorder**
A Goghlan, A Ronald
Schizophrenia (SCZ) and bipolar disorder (BP) are distinct disorders, yet they converge clinically and biologically. Both share psychotic features and affective disturbances, though they differ in symptom specificity. BP is characterised by mood oscillations between mania and depression. SCZ is marked by positive and negative symptoms, and cognitive deficits. They share genomic loci enriched for neuronal development and synaptic transmission. Such neurobiological characteristics suggest a SCZ-BP continuum marked by disrupted neurocircuitry which may explain similarities between mania and psychosis. SCZ and BP stem from an interplay between genetic vulnerability and environmental stressors. Stressful life-events, particularly childhood adversity, are associated with earlier onset and increased severity in both disorders.
The aim was to determine the genetic correlation (rg) values were between all traits and their significance. The null hypothesis was that the genetic correlation between the manic/psychotic and trauma phenotypes would be weak or negligible. Using large case-control GWAS summary statistics and genomic reference panel data, this project investigated the shared genetic architecture between SCZ, bipolar-I (BP-I), bipolar-II (BP-II) and post-traumatic stress disorder (PTSD). PTSD was included as a variable for trauma.
All correlations were positive. SCZ showed strong correlation (rg) with BP-I (rg = 0.66, pvalue = 1.4982e-98) and moderate correlation with BP-II (rg = 0.55, p-value = 1.992e-12) and PTSD (rg = 0.39, p-value = 7.3447e-56). BP-I and BP-II exhibited the highest correlation (rg = 0.87, p-value = 5.8123e-24), while BP-II also had a high correlation with PTSD (rg = 0.69, p-value = 1.2654e-17). The weakest correlation was between BP-I and PTSD (0.3, p-value = 2.2375e-29).
These findings support a continuum linking psychotic, affective, and trauma-related disorders through shared polygenic risk. Next we will use genomic structural equation modelling to see how non-trauma-related polygenic risk associated with SCZ, BP-I and BP-II is associated with infant neurodevelopment.