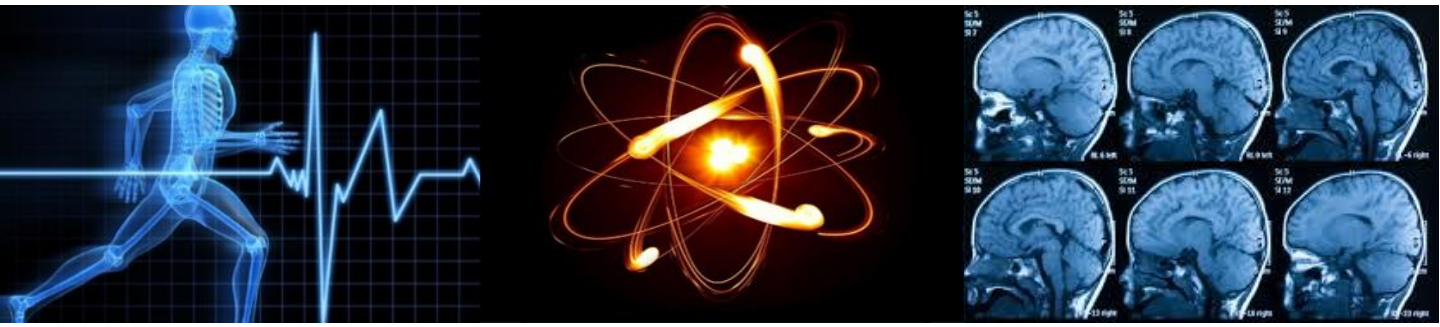
UNIVERSITY OF BIRMINGHAM

College of Life and Environmental Sciences
College of Engineering and Physical Sciences



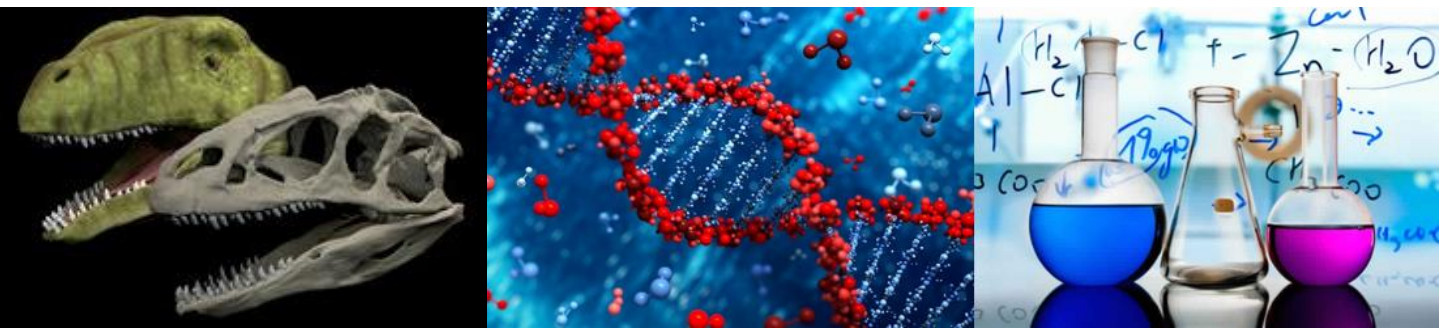
Postdoctoral Researcher Conference (EPS & LES)

Brought to you by EPS & LES PERCAT

Nicolson Building

Wednesday 20th June 2018

Postdoctoral and Early Researcher Career Development and Training



Welcome

Welcome to the PERCAT Postdoctoral Researcher Conference 2018. The Conference Organising Committee, on behalf of the EPS & LES PERCAT Committee, have the pleasure of hosting this conference for postdocs within the College of Life and Environmental Sciences (LES) and the College of Engineering and Physical Sciences (EPS).

As we all know, postdoctoral/early stage researchers are the foundation stone of any research group or institute. Their roles are often complex and can cover everything from generating data that leads to papers/grants/impact case studies, supervising students, presenting at conferences through to placing orders, organising the laboratory space and defrosting freezers! A good postdoc is worth their weight in gold and can make the difference between success or failure of a project. It is an exciting time in our careers where we can experience new places, people and scientific areas. However, it can also be a challenging, bewildering and difficult time for many. During this stage, postdocs will be making decisions about which group/scientific area/country to work in, developing CVs to be competitive for fellowships or positions, learning management and teaching skills, or deciding whether to pursue a career in academia/industry or indeed making a complete career change. All of this is going on whilst also getting on with personal lives and trying to balance work with family. No wonder we are tired! However, help is at hand. PERCAT was established specifically to help postdocs and early stage researchers navigate through this career stage by providing support, resources and access to opportunities.

The aim of this conference is to showcase and celebrate the wonderful work of our postdocs/early stage researchers in LES and EPS and we have selected the very best from a high number of high quality abstracts. We will also be hearing firsthand from researchers about their experiences inside and outside of academia, and from Dr Anne-Marie Coriat, Head of research careers at the Wellcome Trust. Importantly, today is about networking so make the most of the breaks to meet new people and find out about the support and training opportunities available. All of this with free food and drinks, what more can we want?! If you have any questions then please do not hesitate to approach any of the organising team.

We hope you will have an enjoyable, enlightening and career-enhancing day.

Conference Organising Committee, L – R: Farhat Khanim, Rian Griffiths, Sarah Lee, Jennifer Thomson, Alex Wilson, Stefano Tommasone.

Programme - morning

9.00	***Registration and refreshments***
9.30	**Welcome and opening remarks** **Prof Andy Schofield**, Head of College, Engineering and Physical Sciences
9.45	**Oral Session 1 – Chairs Alex Wilson and Doug Browning**
	A new window on climates of the past: development of a new proxy for reconstructing atmospheric moisture budgets from leaf wax lipids **Yvette Eley**, LES, Geography, Earth and Environmental Sciences
10.00	Resistance is futile! Using predictive mathematical models to optimise the treatment of bacterial infections **Paul Roberts**, EPS, Mathematics
10.15	Decoding quantum technology for assessing the underworld **Twana Haji**, EPS, Engineering
10.30	**Postdoctoral Careers and Experience**s: "My science career perspective: Feeling your way, Flexibility, and Family" **Dr Juliet Coates**, Senior Lecturer in Plant Molecular Genetics, School of Biosciences, LES
10.45	***Refreshments, networking, posters***
11.15	**Oral Session 2 – Chairs Stefano Tommasone and Paul Roberts**
	"Gone with the Wind" Understanding crop losses due to wind and rain **Genora Joseph**, EPS, Engineering
11.30	Advancing Healthcare Technologies: Bone Augmentation with Biologically Analogous Mineral **Erik Hughes**, EPS, Chemical Engineering
11.45	Surfaces matter: the tricky business of introducing biomaterials into the body **Mary Wood**, EPS, Chemistry
12.00	The Quest for Universal Life **Amaury Triaud**, EPS, Physics and Astronomy
12.15	**Postdoctoral Careers and Experience talk**: "There and Back Again" **Dr Zoe Schnepp**, Birmingham Fellow, School of Chemistry
12.30	***Lunch, networking, posters***

Programme - afternoon

13.30	**Keynote Lecture** **A career in research – what's ahead and how to navigate your way** **Dr Anne-Marie Coriat**, Head of Research Careers at the Wellcome Trust Chair Farhat Khanim
14.15	**Oral session 3 – Chairs Rian Griffiths and Mary Wood**
	The Rise of Garage Science: Making Recombinant Protein Production as Cheap as Chips **Doug Browning**, LES, Biosciences
14.30	Bulk Nanobubbles: their Existence and Longevity **Ananda Jadhav**, EPS, Chemical Engineering
14.45	Sitting about, effects on body and mind **Sandra Agyapong-Badu**, LES, Sport, Exercise and Rehabilitation Sciences
15.00	***Refreshments, networking***
15.30	**Postdoctoral Careers and Experiences – Chairs Sarah Lee and Anne-Marie Labandera Nadeau**
	"Moving from research to Research Support" **Dr Pete Noy**, Senior Research Facilitator, College of Medical and Dental Sciences
15.45	"Ions in Innsbruck, London and L.A. – a postdoc journey" **Dr Alex Wilson**, Research Fellow - Atom Interferometry, School of Physics and Astronomy
16.00	"Fostering a new career path whilst working as a Post Doc" **Dr Veemal Bhowruth**, Business Development Manager, UoB Enterprise
16.15	**Prize giving and closing remarks** **Prof Tim Softley**, FRS, Pro VC for Research & Knowledge Transfer
16.30	***Finish***

Speakers

Professor Andy Schofield Welcoming Remarks

Professor Andy Schofield is Pro-Vice-Chancellor and Head of the College of Engineering and Physical Sciences (EPS). He assumed this role in July 2015 and is responsible for seven Schools (Chemical Engineering, Chemistry, Computer Science, Engineering, Mathematics, Metallurgy and Materials, Physics and Astronomy). He is a theoretical physicist by background with research interested in the quantum properties of matter and particularly the phenomena of correlated electrons including superconductivity, magnetism and novel properties. He won the Maxwell Medal and Prize from the Institute of Physics for this work. Andy was a student at Gonville and Caius College, Cambridge for both his undergraduate degree and his PhD at the Cavendish. He then won a junior research fellowship at Caius. Andy left Cambridge for a two year postdoctoral job at Rutgers, USA. He then won a Royal Society University Research Fellowship in Cambridge which he later moved to Birmingham in 1999 when he became a lecturer. He was promoted to professor in 2002 and was Head of the School of Physics and Astronomy from 2010-2015.

Professor Tim Softley Prize Giving and Closing Remarks

Professor Tim Softley is the Pro-Vice-Chancellor for Research and Knowledge Transfer at the University of Birmingham. As such his responsibilities are to lead the University's research performance with the aim of positioning the University firmly amongst the leading research universities in the UK.

He takes a lead role on research resources at the University; investment in its research base and on working to improve the University's grant capture, including research funding from business and industry. He also leads the University's strategic research collaborations with partners in the UK, Europe and worldwide and is a member of the Russell Group EU Advisory Group. He oversees the work of the University's tech transfer wing, University of Birmingham Enterprise. He was previously Head of Chemistry at the University of Oxford. He chairs the University's Research Committee, which oversees the work of the Early Career Research Staff Development Operational Group.

Speakers

Dr Anne-Marie Coriat
Keynote Lecture

Anne-Marie Coriat is Head of UK and Europe Research landscape at the Wellcome Trust. Between 2015 and 2018 she was Head of Research Careers and was responsible for the development of Trust strategy, policy and practice on research careers.

Anne-Marie received her degree in chemistry and environmental sciences from Cardiff University and then worked in the Birnbaumer lab at Baylor College of Medicine in Houston, Texas. On her return to the UK, she worked as a biochemist in the NHS before completing a PhD in Manchester. She then worked as postdoctoral researcher at UMDS Guy's Hospital where she investigated the molecular mechanisms of sex determination in the American alligator.

Before joining the Trust, Anne-Marie was Director for Capacity Skills and Infrastructure at the MRC and Chair of the Research Councils UK Research Group. Anne-Marie joined the MRC in 1995 and held various positions including Head of Neurosciences and Mental Health; Head of the MRC Southwest Regional Centre and Head of Science programmes.

Dr Juliet Coates
Postdoctoral Careers and Experiences

Juliet is a senior lecturer in the School of Biosciences. She completed a Natural Sciences degree in Cambridge. Unsure what her favourite subject was, she chose a 4-year PhD programme in London enabling a choice of research areas, where she got interested in developmental biology and evolution, undertaking a PhD on social amoebae. She moved to Cambridge for a post doc for personal reasons, spending 2 years working on worm neurobiology and behaviour using molecular biology. Juliet then felt sufficiently confident to work independently and was lucky enough to gain a Fellowship to use molecular tools to research plant evolution and development. This led to another 3 years in Cambridge: at the end of her fellowship she moved to Birmingham for a lectureship in Plant Molecular Genetics and has been there ever since. Juliet is a single parent and primary carer for her son: she works both part-time and flexibly and is registered as a disabled employee. She was the School of Biosciences Equality and Diversity Champion for 6 years and has been part of the University's Athena SWAN working group since 2011.

Speakers

Dr Zoe Schnepp
Postdoctoral Careers and Experiences

Zoe Schnepp is passionate about green chemistry, both in her research and the potential for changing negative public perceptions of chemistry. With diverse interests in nanotechnology, catalysis and materials from biomass, Zoe leads a growing group in the School of Chemistry at the University of Birmingham. Prior to her Birmingham Fellowship, she held Postdoctoral Fellowships in the International Center for Young Scientists at the National Institute for Materials Science in Japan and the Max Planck Institute for Colloids and Interfaces in Germany. She received her PhD from the University of Bristol. In her spare time Zoe enjoys running, gardening and playing hockey.

Dr Pete Noy
Postdoctoral Careers and Experiences

Pete Noy is a Senior Research Facilitator who has been part of the research development team in the College of Medical and Dental Sciences since November 2016. He started his time in the team supporting the Institute of Clinical Sciences and took on a new role covering the Institutes of Metabolism and Systems Research and Cardiovascular Sciences in November 2017. Prior to his time in research support, Pete was a post-doctoral research fellow at the University. He came to the University of Birmingham for his PhD in molecular immunology and took up two postdoc positions here as well. One post was with Prof Roy Bicknell, working on tumour endothelial markers and novel endothelial receptors in the cardiovascular system, and the other in Biosciences, with Dr Mike Tomlinson, working on uncharacterised membrane tetraspanins and the regulation of the molecular scissor ADAM10 in the cardiovascular system.

Speakers

Dr Alex Wilson
Postdoctoral Careers and Experiences

Alex Wilson is currently a Research Fellow in the Quantum Technology Hub at the University of Birmingham and is part of the Atom Interferometry team within the School of Physics and Astronomy. Alex has held fellowship positions at the Universities of Innsbruck (Austria), Düsseldorf (Germany), Sussex (UK), and UCLA (United States). After graduating from Imperial College in London, and one year later with a masters degree from the University of Manchester, Alex began a PhD programme at the National Physical Laboratory. A strontium ion trap experiment was developed with strategic research goals in the areas of cavity-QED and sideband cooling. Alex was awarded a doctorate from the University of Strathclyde in 2001. Alex has research interests in precision gravimetry, laser and electronic cooling techniques of trapped atoms and ions, cold chemistry of ion-neutral interactions, narrow linewidth lasers, and the implementation of quantum optics techniques to produce new designs for quantum sensors and quantum computing hardware. He has published more than nine technical papers in reputable scientific journals and has considerable experience of laboratory teaching and mentoring post-graduate students.

Dr Veemal Bhowruth
Postdoctoral Careers and Experiences

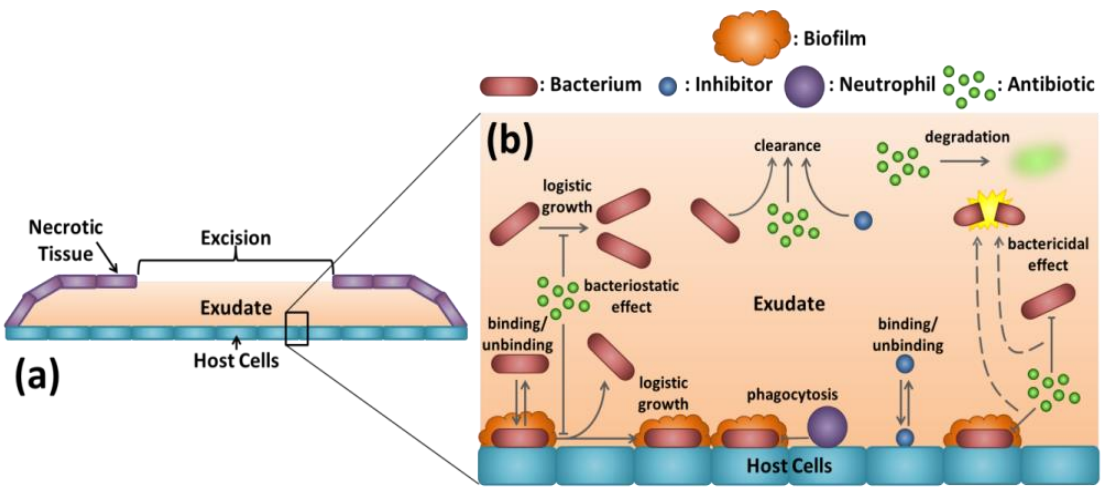
Veemal is a Business Development Manager at UoB Enterprise (formally Alta Innovations) and is responsible for protecting and commercialising intellectual property (IP) from the colleges of LES and MDS and advising on all matters of IP law. He also supports translational activities within these colleges and helps manage relationships between commercialisation partners and the university. Veemal has over 10 year's research experience as a chemist whilst working within the School of Biosciences at the University of Birmingham under the supervision of Prof Gurdyal Besra and was involved in synthesising new drug therapeutics and vaccines against Tuberculosis. His technical expertise spans the multi-disciplinary fields of chemistry, biology and immunology. Prior to joining UoB Enterprise, Veemal spent two years working for MidTECH Innovations, the NHS Innovations hub for the West Midlands. The role provided him with hands-on-experience of protecting a variety of healthcare related technologies, engaging with business working within the sector and negotiating on commercial contracts. Having experienced the translation of his own research, his curiosity around IP law grew and Veemal decided to complete a PG Certificate course on IP law at Brunel University whilst doing his Post Doc. Veemal now helps academics to translate their ideas into marketable opportunities.

Abstracts – Oral Presentations

Name:	**Yvette Eley[1],** Michael Hren[2]
School:	[1]Geography, Earth and Environmental Science, [2]University of Connecticut
Field of research:	Paleoclimatology
Title:	**A new window on climates of the past: development of a new proxy for reconstructing atmospheric moisture budgets from leaf wax lipids**
Abstract:	As human activities continue to increase the amount of CO_2 in Earth's atmosphere, we need to look deeper into the geological past to try to find time periods with comparable atmospheric CO_2 levels in order to predict what our future may hold. Changes in CO_2 are linked to shifts in mean annual temperature and disruption of hydrological regimes, however at present there are few quantitative moisture proxies that are applicable to deep geological time. Fortunately, chemical traces from living organisms can be preserved in the rock record for many millions of years and record a range of environmental information. Organic compounds from the waxy surface of plants are particularly valuable as they can be found in almost all terrestrial and marine sediments. Here, we introduce a new proxy for atmospheric moisture, derived from modern climate and leaf wax biomarker distribution patterns from North and Central America. Plants have a direct genetic pathway to regulate the production of lipids in response to osmotic stress, which is manifested in a change in the distribution of simple organic compounds such as straight-chain hydrocarbons. From our modern calibration dataset, we have identified that the Average Chain Length (ACL) of these lipids is statistically related to mean annual vapor pressure deficit (VPDav), the difference between the total amount of water that the atmosphere can hold at a given temperature, and the actual amount of water it is holding. To evaluate this new proxy, we applied it to the Armantes section of the Calatayud-Daroca Basin in Central Spain, that spans the Middle Miocene Climatic Optimum (MMCO, ~17-15 million years ago) and the Middle Miocene Climate Transition (MMCT, ~15 - 13 million years ago). Reconstructed mean annual VPD rises from 0.13 to 0.92 kPa between 16.5 and 12.4 million years ago, indicating a substantial drying through the MMCT. These data are consistent with fossil assemblages and mammalian stable isotope data, highlighting the potential of this new organic molecular tool to revolutionise our ability to quantify hydrologic variability over geologic timescales.
References:	[1] Y. Y. L. Eley, M. T. Hren, Reconstructing vapor pressure deficit from leaf wax lipid molecular distributions. Sci. Rep. 8, 3967 (2018).

Abstracts – Oral Presentations

Name:	**Paul A. Roberts,** Ryan M. Huebinger, Emma Keen, Anne-Marie Krachler, Sara Jabbari
School:	Mathematics
Field of research:	Mathematical Biology
Title:	**Resistance is futile! Using predictive mathematical models to optimise the treatment of bacterial infections**
Abstract:	As the development of new classes of antibiotics slows, bacterial resistance to existing antibiotics is becoming an increasing problem. A potential solution is to develop treatment strategies with an alternative mode of action. In this talk, we consider one such strategy: anti-adhesion therapy. Whereas antibiotics act directly upon bacteria, either killing them or inhibiting their growth, anti-adhesion therapy works by competitively inhibiting the binding of bacteria to host cells. This prevents the bacteria from deploying their arsenal of virulence (disease-causing) mechanisms, while simultaneously rendering them more susceptible to physical clearance. We develop the first mathematical models to describe the application of an anti-adhesion/antibiotic combination therapy to a bacterial (Pseudomonas aeruginosa) burn wound infection in the rat (see Figure 1). We use our models to predict optimum treatment regimes, seeking to minimise the time taken to eliminate the bacterial burden and the probability that it will develop resistance to our treatments. Our findings will serve to guide future experimental and clinical trials, revolutionising the way we treat bacterial infections. Figure 1: Diagrams showing the wound geometry and model structure. (a) Wound geometry pictured in the transverse plane. The host cells are covered by a liquid layer known as the exudate, which is itself covered by necrotic tissue, except in the region of the excision where the exudate is exposed to the air. (b) Diagram displaying the structure of the mathematical model.



Abstracts – Oral Presentations

Name:	**Twana Haji,** Asaad Faramarzi, Nicole Metje, David Chapman
School:	Civil Engineering
Field of research:	Condition assessment of infrastructure
Title:	**Decoding quantum technology for assessing the underworld**
Abstract:	Our buried infrastructure, such as tunnels and sewerage networks, form an important part of our urban environment and play a major role in the quality of our life. A large number of these infrastructures were constructed long time ago and they are in critical need for repair or replacement. Problems arising from the collapses and failures of these structures can cause disastrous consequences, interminable disruption and even fatal injuries. Furthermore, their locations are not always precisely known which requires significant destruction to the ground in order to locate them. The lack of accurate knowledge about their location also increases the possibility of damaging them when excavating the ground for other purposes. Current technologies used for condition assessment of buried structures, while useful in some cases, are suffering from various limitations that reduce and restrict their field applications. For instance, they are only applicable to certain materials and ranges. Furthermore, none of them can provide adequate and comprehensive information about the structural stability of the buried assets and their supporting ground. Taking advantage of the quantum technology gravity gradiometer, this research proposes solutions to overcome the limitations associated with the currently available tools used for condition assessment of underground features. The aim of this work is to develop a powerful numerical approach, using a combination of finite element analyses (a numerical approach to solve complex equations) and artificial intelligence, to accurately decode microgravity data obtained from quantum technology gravity sensor to provide complete and detailed information on overall stability and reliability of buried structures and the supporting ground. The outcomes of this project will significantly improve the way engineers understand the condition of buried assets, and enable streetwork practitioners to make informed decisions which can avoid unnecessary disruptions to the roads, prevent fatal injuries and excessive expenditures.

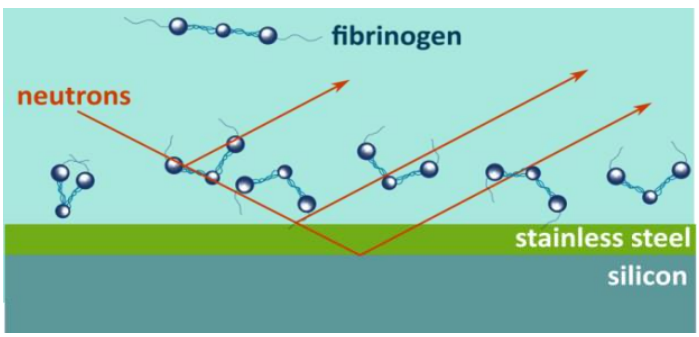
Abstracts – Oral Presentations

Name:	**Genora M.D. Joseph,** Mark Sterling, Chris J. Baker
School:	Civil Engineering
Field of research:	Wind Engineering – agricultural meteorology
Title:	**"Gone with the Wind." Understanding crop losses due to wind and rain**
Abstract:	Crop lodging, defined as the permanent displacement of crop stems from the vertical due to rainfall and wind forces, occurs as a consequence of wind-induced buckling of the plant stem or failure of the root anchorage system. Lodging causes reduction in yield and grain quality, thus incurring substantial losses to the agricultural sector. For instance, in a severe lodging year, UK cereal growers can sustain losses in excess of £100 million [1]. In other parts of the world, staple crops such as rice and maize also experience lodging. It is estimated that rice and maize lodging in China and Mexico respectively, reduces yield by up to 40% and incurs annual losses in the region of $1500 million. In an effort to address this significant challenge to global agricultural productivity, sustainability and food security, this project will build on novel research at the University of Birmingham which has previously applied structural wind engineering principles to develop a generalised model to characterize the lodging of wheat due to wind-induced forces, [2], [3], [4]. The current research uses field and laboratory investigations of dynamic crop responses to wind loading to calibrate and validate the generalized lodging model [5], for application to other types of crop, namely maize and rice grown in Mexico and China. Consequently, the model will utilize inputs consisting of site meteorology, topography and crop morphology to determine lodging parameters for the specific crop and the associated risk of lodging. It is envisioned, that the lodging model will form the basis of an agronomic decision-making tool that farmers and agronomists in the UK and low and middle-income countries can ultimately use to inform the strategic implementation of crop husbandry practices which mitigate lodging risk.
References:	[1] Berry, P.M., Spink, J.H, Griffin, J.M., Sylvester-Bradley, R., Baker, C.J., Scott, R.K., Clare, R.W., (1998). Research to understand, predict and control factors affecting lodging in wheat. Home-Grown Cereals Authority Research Project No. 169. HGCA, London, 131 pp. [2] Baker, C., (1995) The Development of a Theoretical Model for the Windthrow of Plants. Journal of Theoretical Biology, 175, pp 355-372 [3] Baker, C., Berry, P., Spink, J., Sylvester-Bradley, R., Griffin, J., Scott, R., Clare, R., (1998) A Method for the Assessment of the Risk of Wheat Lodging. Journal of Theoretical Biology, 194, pp 587-603 [4] Baker C., Sterling, M., Berry, P., (2014) A generalised model of crop lodging. Journal of Theoretical Biology, 363 pp 1–12. [5] Sterling, M., Baker, C., Berry, P., Wade, A., (2003) An experimental investigation of the lodging of wheat. Agricultural and Forest Meteorology, 119, pp 149–165

Abstracts – Oral Presentations

Name:	**Erik A. B. Hughes,** Sophie C. Cox, Megan E. Cooke, Owen G. Davies, Richard L. Williams, Thomas J. Hall, Liam M. Grover
School:	Chemical Engineering + NHIR Surgical Reconstruction and Microbiology Research Centre (SRMRC)
Field of research:	Biomaterials
Title:	**Advancing Healthcare Technologies: Bone Augmentation with Biologically Analogous Mineral**
Abstract:	Researchers have been formulating bone replacements based on hydroxyapatite (HA, $Ca_5(PO_4)_3OH$), the main mineral constituent of bone, for many years. Although synthetic variations of this material are chemically similar to native bone mineral, the level of structural organisation and crystallinity is very different. Bone mineral is typically of very low crystallinity and exhibits precisely defined architectures, including microscale tubular networks. In contrast, synthetic HA is typically of high crystallinity and is absent of microstructural complexity due to being heat treated prior to use. Heat treatment encourages crystal growth, which is responsible for increasing overall crystallinity and structural densification. In this research, a methodology has been developed that enables biologically analogous bone mineral to be generated from a gel/solution interface[1,2]. The mineral consists of low crystallinity HA that forms as tubes resembling native bone microstructures, such as Haversian canals, which serve as conduits for blood vessels in mineralised tissues. Formation of this tubular mineral can occur within physiological conditions from spheres of hydrogel pre-loaded with calcium ions. When these spheres are placed into phosphate rich solutions, structured mineralised tubes are formed. Spheres that are brought into close contact with one another are able to unite through tube entanglement, forming a whole construct. This phenomenon can be utilised to successfully augment critical size bone defects through mineral generation in situ. It was shown that this process not only supported the formation of a poorly crystalline scaffold similar in composition and microstructure to bone mineral, but additionally the material stimulates pre-osteoblast gene expression associated with osteogenic differentiation and mineralisation in vitro. This is the first example of a bone augmentation material that is able to form biologically analogous structures in situ. Moreover, the rapid formation of structured mineral aids in hardening the calcium-loaded hydrogel within defect spaces. Therefore, this material may serve as a better scaffold for bone formation over synthetic bone augmentation alternatives.
References:	[1] E. A. B. Hughes, R. L. Williams, S. C. Cox and L. M. Grover, Langmuir, 2017, 33, 2059–2067. [2] E. A. B. Hughes, S. C. Cox, M. E. Cooke, O. G. Davies, R. L. Williams, T. J. Hall, L. M. Grover, Advanced Healthcare Materials. https://doi.org/10.1002/adhm.201701166.

Abstracts – Oral Presentations

Name:	**Mary Wood**, K.L. Browning, R. D. Barker and S. M Clarke
School:	Chemistry
Field of research:	Surface chemistry
Title:	**Surfaces matter: the tricky business of introducing biomaterials into the body**
Abstract:	When a biomaterial such as a hip replacement or arterial stent enters the body, it is covered with proteins from the blood plasma within a matter of seconds. How these proteins interact with the biomaterial is crucial to how well it will be accepted by the body. For example, fibrinogen, a protein that plays a key role in formation of blood clots at injury sites, is known to adhere strongly to many surface types. If this adhesion causes the protein to unfold and change in structure, it may lead to uncontrollable clotting that blocks blood veins, with potentially fatal consequences. Understanding these protein-biomaterial interactions is, therefore, of great importance. Here, a suite of sophisticated surface study techniques have been used to characterise in detail the adsorption of fibrinogen and albumin, another abundant plasma protein, on surgical stainless steel surfaces. Neutron reflectometry (NR) offers a unique opportunity to determine the compositions, thickness and roughness of such buried layers in situ and with almost atomic-level accuracy. Our results revealed that the fibrinogen molecules do not, as previously supposed, sit either upright or flat on the surface, but adopt a more complex structure with maximum density a short distance from the surface. Two other complementary techniques—quartz crystal microbalance (QCM) and circular dichroism—were used to confirm a significant change in the protein secondary structure upon interaction with the metal surface. These results taken together suggest that the protein is unfolding or denaturing, which may then give rise to undesirable clotting[1]. Finally, it was shown that pre-coating the surface with the albumin protein was able to significantly decrease the adsorption and unfolding of the fibrinogen protein, and that careful pretreatment of the biomaterial surface is necessary to ensure long-term integration in the body[2[. 
References:	[1] Wood, M. H.; Browning, K. L.; Barker, R. D.; Clarke, S. M. J. Phys. Chem. B 2016, 120, 5405. [2] Wood, M. H.; Payagalage, C. G.; Geue. T. J Phys. Chem. B 2018, In Press.

Abstracts – Oral Presentations

Name:	**Amaury Triaud,** and the SPECULOOS consortium.
School:	Physics & Astronomy
Field of research:	Exoplanets
Title:	**The Quest for Universal Life**
Abstract:	Physical laws are universal, and likewise, chemistry functions in the same way anywhere in our Universe. Our exploration of the Solar system has revealed that geological processes are likely universal too. It is therefore natural to ask whether the same is true for biological processes. The first step is to identify life forms elsewhere, and measure how frequently they occur, and under which conditions they exist. My research concentrates on the discovery and study of exoplanets, with a particular focus on those that could reveal whether biology is active. We have come a big step closer with the recent identification of a number of temperate Earth-sized planets orbiting small stars in the vicinity of the Solar system. In this talk we will explore the reasons we seek such planets, how we detect them, how we learn more about them, and how we might one day identify signs for active biology at the surface of a far removed world.

Abstracts – Oral Presentations

Name:	**Douglas F. Browning,** Stephen J. W. Busby
School:	Institute of Microbiology and Infection, School of Biosciences
Field of research:	Microbiology/ Biotechnology
Title:	**The Rise of Garage Science: Making Recombinant Protein Production as Cheap as Chips**
Abstract:	The production of recombinant biopharmaceuticals, e.g. antibody fragments and growth hormones, is a billion dollar industry, with many therapeutic proteins being expressed in the bacterium Escherichia coli. Most of the E. coli expression systems used for recombinant protein production (RPP) were constructed in the last century and all of them require an inducer molecule, such as IPTG (isopropyl-β-D-thiogalactoside), to switch on expression of the target protein. However, such inducer molecules can be toxic to the cell and are extremely expensive, with IPTG costing up to £44000 per kg. To reduce the cost of RPP, we have engineered completely new E. coli RPP expression systems, which use cheap and freely available inducer molecules. Using our systems we show that target proteins, such as human growth hormone (hGH), can be expressed to high levels and that this is comparable to standard RPP systems. As many of our inducer molecules are present in household products, often found in garages and garden sheds, we demonstrate that controlled, high level RPP can be easily achieved using unconventional inducers, making RPP truly "as cheap as chips"!

Abstracts – Oral Presentations

Name:	**Ananda Jaysing Jadhav,** Mostafa Barigou
School:	Chemical Engineering
Field of research:	Chemical Engineering
Title:	**Bulk Nanobubbles: their Existence and Longevity**
Abstract:	Bulk nanobubbles are a novel, revolutionary class of bubbles. They pose many challenges to our understanding of bubble physics and behavior, yet a wide range of industrial applications have already been suggested including surface cleaning, drug delivery, ultrasound imaging, tissue preservation and food flavor retention. Based on Epstein-Plesset theory, the lifetime of bulk nanobubbles should be of the order of microseconds, but we experimentally confirm here rare reports that these nanobubbles display long-term stability. Such extraordinary longevity has not been explained, however, and has, thus, generated a fair amount of controversy in the literature about the origin and existence of bulk nanobubbles. In this study, suspensions of bulk nanobubbles were produced in water, and a technique which indirectly tracks nanoparticles and analyses their Brownian motion in real time was used to visualize the nanobubbles and measure their size distribution and number concentration. The typical number concentration was found to be in the range of 1.0×10^{9}–2.0×10^{9} bubbles/mL and the mean diameter was 70–130 nm. The stability of the nanobubble suspensions was monitored over a period of 3 months. The zeta potential of the nanobubble suspensions was measured by a Zetasizer Nano ZSP showing a significant electrical surface charge of around –30 mV. Whilst the number density decreased gradually over time; the mean diameter remained constant, thus suggesting the absence of bubble coalescence, breakup, and Ostwald ripening. We show that these nanobubbles enjoy another peculiar property which is the existence of a significant negative charge on their interface. Based on the results obtained, we propose, for the first time, a rational explanation for the longevity of bulk nanobubbles.

Abstracts – Oral Presentations

Name:	**Sandra Agyapong-Badu,** Anna Whittaker, Carolyn Greig
School:	Sport, Exercise and Rehabilitation Sciences
Field of research:	Ageing and Sedentary Behaviour
Title:	**Sitting about, effects on body and mind**
Abstract:	Background: Sedentary behaviour (SB) has been identified as a risk factor for cardiovascular diseases, independent of physical inactivity. Current studies have demonstrated the long-term effects of SB, but few have investigated the acute effects. The aim of this project was to identify some of the main effects of different periods of sitting time on mind and body in a group of older men and women. Methodology: Community dwelling older adults (n=50), aged > 70 years, were recruited for a randomized crossover trial. Participants underwent baseline assessment of lower limb muscle power, blood pressure, cognitive function and physical function before observing a 1, 2, or 4-hour bout of uninterrupted sitting on three separate days. Outcome measures were repeated immediately after the period of sitting was completed. Participants were permitted to watch television, read, sew or knit but were not allowed to sleep. The study was conducted within the Wellcome Trust Clinical Research Facility (WTCRF), University Hospitals Birmingham. Results: Sitting time reduced physical performance and lower limb muscle power in older adults. Mean arterial pressure was significantly elevated after the 4hour sit (103.58±10.99) compared to the 1h sit (96.75±11.33), (p=0.02). Participants reported a negative change in mood (pre 4hr; 17.5±8.1; post 4hr; 15.4±5.1: p=0.32), vitality and performed worse in the cognitive tests following the 4-hour sit. Conclusion: Uninterrupted period of sitting resulted in reduced muscle power and physical function, negative change in mood, lower vitality, high blood and mean arterial pressure in healthy older adults. This project has generated new knowledge with potentially high impact in terms of important practical messages to ensure older people spend less time sitting. These findings will enable the design of interventions to reduce SB as well as inform professionals and policy makers on what duration of sedentary behaviour will lead to adverse outcomes.
References:	[1] Dunstan DW, Barr ELM, Healy GN, et al. Television viewing time and mortality: the AusDiab study. Circulation. 2010;121(3):384-391 [2] Ekelund U, Steene-Johannessen J, Brown WJ, et al. Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women. The Lancet. 2016; 388(10051): 1302-1310

Abstracts – Posters 1

Name:	**Qinghua Yu,** Yongliang Li
School:	Chemical Engineering
Field of research:	Energy storage
Title:	**Properties and optimization of composite heat storage materials fabricated by cold sintering approach**
Abstract:	In this study, shape–stabilized $NaNO_3$/$Ca(OH)_2$ composite heat storage materials (HSMs) were prepared using cold sintering (CS) approach. In the HSMs, the $NaNO_3$ was used as phase change material (PCM) and the sintered $Ca(OH)_2$ as matrix material to encapsulate $NaNO_3$ and prevent it from leakage during charging and discharging processes of thermal energy. The CS approach is a low carbon fabrication method using a transient aqueous environment to promote the densification of matrix so that PCM can be coated at a low temperature without melting. The success of CS approach depends on several operating parameters such as temperature, pressure, water content and particle size of matrix material. The PCM/matrix mass ratio is also crucial to the thermal storage capacity and mechanical strength of the HSMs. Therefore, the effects of the key operating parameters and the PCM/matrix mass ratio on microstructures, thermal properties and mechanical properties of the HSMs were explored in details in this research to obtain the optimum comprehensive properties. The microstructures of the HSMs were observed by scanning electronic microscope (SEM) and the distributions of chemical elements were tested by energy-dispersive X-ray spectroscope (EDS) to capture sintering and coating effects. The thermal properties of the HSMs were measured by differential scanning calorimeter (DSC) before and after a large number of thermal cycles. Fourier transformation infrared spectroscope (FT–IR) and X–ray diffractometer (XRD) were used to investigate the chemical structure and crystalloid phase of the HSMs. The thermal reliability of the HSMs was analyzed by thermogravimetric analyzer (TGA). The mechanical properties of the HSMs were also measured by Lloyd X Materials Testing Machine. This study could open a novel perspective for fabrication of composite HSMs.
References:	[1] Leng G, Qiao G, Jiang Z, Xu G, Qin Y, Chang C, et al. Micro encapsulated & form-stable phase change materials for high temperature thermal energy storage. Appl Energy 2018;217:212-20. [2] Guo J, Guo H, Baker AL, Lanagan MT, Kupp ER, Messing GL, et al. Cold Sintering: A Paradigm Shift for Processing and Integration of Ceramics. Angew Chem Int Ed 2016;55:11457-61.

Abstracts – Posters 2

Name: **Claudia Simm,** Robin May

School: Biosciences, IMI

Field of research: Antifungal Research

Title: **Novel approach of antifungal high-throughput screening targeting heavy metal homeostasis**

Abstract: Iron and zinc are essential micronutrients that play a crucial role in many cellular functions. Many invasive pathogens require these metals for proliferation and virulence within the host. Consequently, host cells are able to withhold iron and zinc from pathogens, via a process called nutritional immunity, whilst many microorganisms have in turn evolved mechanisms to scavenge micronutrients extremely effectively. Candida albicans uses an array of high- and low-affinity iron and zinc transporters. The expression of these transporters is regulated by metal-responsive transcription factors such as Csr1 (zinc) and Hap43 (iron), and their expression reflects micronutrient availability within the cell. During metal replete conditions, these transcription factors interact with metal-responsive-elements in the promoter regions of genes involved in metal uptake and inhibit transcription. Conversely, if metal concentrations drop gene transcription will be initiated.

Here I present an antifungal drug screen that exploits this metal regulon. The promoter regions of zinc and iron responsive genes were amplified and fused to the red fluorescent protein dTomato. These zinc and iron sensors were integrated into the genome of Candida albicans and used to perform a high throughput screen against a chemical library of 1200 compounds. Hit compounds were identified by their induction of fluorescent protein expression as an indicator for reduced labile metal ion concentration in Candida. For both metals a hit rate of 2% was observed. Three compounds which have not been described as antifungal agents previously have been identified and will be taken further into mode of action studies. These compounds either as stand-alone drug or in combinational therapy could offer an alternate therapeutic strategy for life-threatening systemic fungal infections.

Abstracts – Posters 3

Name:	**Ian A. Pocock;** Dr Richard S. Grainger
School:	Chemistry
Field of research:	Molecular Synthesis and Catalysis
Title:	**Controlled release of reactive di- and triatomic molecules**
Abstract:	Small di- and triatomic molecules are all around us. H_2O, O_2, N_2, CO_2, SO_2, CO, O_3, NO_2 and N_2O are among the first chemicals we are introduced to in our scientific education; they directly impact on our lives and are well known to the general public. Such molecules are long-lived and hence easily studied. Short-lived di- and triatomic molecules are equally important but far more difficult to study: they cannot be readily isolated or stored, and instead must be generated in situ if their science is to be investigated. Their intrinsic reactivity allows access to chemistry and biology which is not possible for their more stable brethren. For example, the reactive diatomic sulfur monoxide (SO), a molecule which rapidly disproportionates in less than a second, can be trapped in situ to make valuable organic compounds. The triatomic nitroxyl (HNO) spontaneously dimerises and then dehydrates to N_2O, yet has been shown to be beneficial in the treatment of heart conditions. This research addresses the challenge of generating SO and HNO in a controlled manner conducive to synthetic or biological applications, through the use of novel molecular scaffolds. The preparation of these new delivery systems will allow for the investigation of previously unexplored di- and triatomics, exemplified through the first study of the diatomic selenium monoxide (SeO), a molecule which has been scarcely reported in the literature, for which there is no current means of generation, yet could lead to important and novel selenium-containing compounds upon trapping.
References:	**Publications by Grainger Group: SO generation:** (i) Grainger, R.S.; Procopio, A.; Steed, J. W. *Org. Lett.* **2001,** *3*, 3565-3568; (ii) Grainger, R. S.; Patel, B.; Kariuki, B. M. *Angew. Chem. Int. Ed.* **2009,** *48*, 4832-4835. (iii) Grainger, R. S.; Patel, B.; Kariuki, B. M.; Male, L.; Spencer, N. *J. Am. Chem. Soc.* **2011,** *133*, 5843-5852. **HNO precursor:** Patel, B.; Carlisle, J.; Bottle, S. E.; Hanson, G. R.; Kariuki, B. M.; Male, L.; McMurtrie, J. C.; Spencer, N.; Grainger, R. S. *Org. Biomol. Chem.* **2011,** *9*, 2336-2344.

Abstracts – Posters 4

Name:	**Elise R Facer-Childs[1,2,5*],** Brunno Machado de Campos[3], Benita Middleton[4], Debra J Skene[4], Andrew P Bagshaw[2,5]
School:	[1]Biosciences, [2]Centre for Human Brain Health, [3]School of Medical Sciences, University of Campinas, Campinas, Brazil, [4]Faculty of Health & Medical Sciences, University of Surrey, Guildford, [5]Psychology
Field of research:	Sleep and Chronobiology
Title:	**Diurnal Variation of The Brain's Intrinsic Motor Network in Circadian Phenotypes Predicts Physical Performance**
Abstract:	BACKGROUND: Functional connectivity (FC) of the motor network (MN) is often used to investigate how intrinsic properties of the brain are associated with elements of physical performance. In addition, the MN is a key feature in clinical work to map the recovery to stroke and aid the understanding of neurodegenerative disorders. Diurnal variations in muscle strength have been widely reported, with the majority of studies showing peaks in the evening, but others reporting highest muscle strength in the morning. These contradictory findings could be a result of not classifying individuals into circadian phenotype groups i.e. if someone is an 'lark' or an 'owl'. Furthermore, functional imaging techniques are rarely included in sleep and circadian research on physical performance. METHODS: This study investigated FC between Early and Late circadian phenotypes and time of day in 32 healthy, right handed individuals (13 male, 23.1 ± 4.2 years) using functional MRI. The predictive effects of FC of the MN on an index of physical performance (isometric grip strength), were explored using generalized estimating equations. RESULTS: Significant diurnal variations in physical performance were identified as a whole group and in each Circadian Phenotype group. In addition we show, for the first time, significant differences in FC of the MN between ECPs and LCPs, as well as between different times of day. These differences were able to predict physical performance measures. CONCLUSIONS: In summary, circadian phenotype and time of day are significant predictors of FC within the MN in the waking human brain, supporting the need to include clear sleep and circadian assessments in neuroimaging and performance research. These differences in the brain's functional architecture at rest are predictive of differences in muscle strength, and may represent an underlying mechanism by which circadian phenotype affects performance.

Abstracts – Posters 5

Name:	**María Gálvez Sánchez,** Robert Steinberger-Wilckens
School:	Chemical Engineering
Field of research:	Energy. Centre for Fuel Cells and Hydrogen Research
Title:	**Challenges to achieve longer lifetime in SOFC technology**
Abstract:	The energy sector plays a central role for the improvement in the quality of the life in Europe. Increasing population and higher energy demands in developing lifestyles or the economy in general require efforts in development, improvement, and marketing of cleaner and more efficient electricity generating systems. Solid Oxide Fuel Cell (SOFC) have emerged as a promising electricity source for stationary, transport and portable applications. This technology consists of two major materials components: ceramic for the fuel cells and steels for the interconnections. An SOFC produces electricity directly from oxidation of hydrogen or methane. The advantages this system offers are direct conversion, fuel flexibility (hydrogen or hydrocarbons), higher efficiencies, benefits to the environment, modularity, and possibility to use in combined heat-and-power generators (CHP). In order to fully realise the potential benefits, it is necessary to improve the long-term performance as well as reduce manufacturing costs. It is therefore, necessary to develop an advanced understanding of the challenges confronting science in improving the durability of SOFC systems. The main problems on the anode (fuel) side are redox cycling and carbon formation when hydrocarbons are used as fuel. On the air side, cathode poisoning associated with chromium evaporation from the interconnect is a major challenge. Moreover, newly formed phases at any interface will affect chemical, mechanical or/and transport properties of the ceramic components negatively. This work reviews the current state of the art about the major problems to solve in this field, as well as some proposed solutions.

Abstracts – Posters 6

Name:	**Laura-Jayne Ellis,** Stephen Kissane, Eugenia Valsami-Jones, and Iseult Lynch
School:	Geography, Earth and Environmental Sceiences
Field of research:	Environmental Nanoscience
Title:	**Multigenerational effects of titanium dioxide and silver nanoparticles on Daphnia magna: gene expression and morphological changes in the presence or absence of aged nanomaterials**
Abstract:	Environmental releases of silver nanoparticles (AgNPs) from consumer goods may lead to increased concentrations in fresh water wetlands and pose a risk to fresh water aquatic organisms. Daphnia magna were chosen as the model fresh water species since they are well characterized, and reproduce by creating genetically identical offspring. This is well suited for monitoring stress/adaptive change to their environments. The present study focuses on the exposure of pristine engineered and chemically aged AgNPs to Daphnia magna in standard high hardness Daphnia medium (HH combo) and a UK modelled class V natural water, over 4 subsequent generations. Populations were also split after parental exposure to allow for possible recovery observations. We observed that exposure to the aged AgNPs in the natural Class V eater had less toxic effects compared to those in the HH combo medium. Survival, reproduction and growth were significantly decreased in individuals exposed to the pristine AgNPs in the HH combo media. Tail and eye defects were also recorded. Histological accumulation of the AgNPs supported the assumption that NPs manifest themselves as particulates in the gut region, and the uptake/internalized concentration of the pristine AgNPs compared to the aged AgNPs (in both water conditions) was always higher. We were also able to see some recovery in the fourth generations (removed from subsequent parent exposure) in all conditions. Gene expression analysis support that AgNPs have toxicological impacts from chronic exposure irrespective of particle aging. This study provides evidence that the variation in results between the two water conditions provides important insights regarding the need for realistic exposure scenarios including the need to test aged NPs that mimic environmental transformations before exposure. Furthermore, parent exposure significantly effects the subsequent off spring, although, if the offspring are removed from exposure, the recovery is slow between the later generations.

Abstracts – Posters 7

Name:	**Sophie A. Archer[1],** Angela, J. Murray[1], Joseph Wood[2], Brajendra K. Sharma[3], and Lynne E. Macaskie[1]
School:	[1] Biosciences, [2]Chemical Engineering, [3] Illinois Sustainable Technology Center, Prairie Research Institute, University of Illinois, Urbana-Champaign, USA.
Field of research:	Applied Microbiology

Title: **Bio-catalytic upgrading of heavy and pyrolysis oils: optioneering of fossil, biorefined, and renewable resources**

Abstract:

As fossil fuels deplete, attention is turning to higher carbon-emitting and environmentally-damaging extraction methods to use heavy oils and bitumens. In situ catalytic upgrading can use precious metals (PMs), such as platinum and palladium, in a once-through process. PM catalysts are efficient and clean at decreasing oil viscosity, but prohibitively expensive, and sacrificed use wastes limited PM resources. Current developments involve the recovery of otherwise-lost PMs from waste sources using bacteria, to make low grade, effective, biologically based nanoscale sacrificial catalysts. For carbon neutral alternatives, pyrolysis oil from renewable biomass (wood/algae) can produce similar liquid fuels to fossil sources after upgrading, distillation and refining [1,2].

A comparative assessment showed that biorefined catalysts were comparably effective to commercial catalysts in heavy oil upgrading and suffered less fouling via accumulated 'coke' [3], whereas pyrolysis oils benefited more from commercial catalytic upgrading [4-7]. This is attributable to the production of the bio-PM neo-catalyst being more intensive than that of commercial catalysts. The production pathways were assessed and quantified within a life cycle analysis, which will underpin respective business cases taking into account environmental and techno-economic factors.

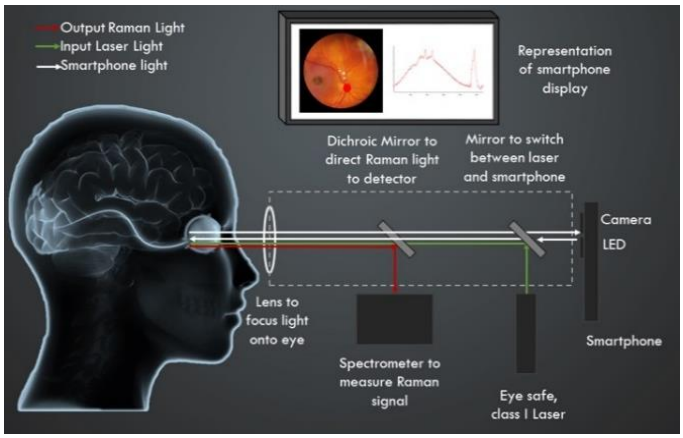
References:

[1] Hart A, Leeke G, Greaves M, Wood J. (2014) Energy and Fuels. 28. 1811-1819. [2] Wang Y, Chen Y, He J, Li P, Yang C. (2010) Energy Fuels. 24. 1502-1510.
[3] Kunwar B, Deilami SD, Macaskie LE, Wood J, Biller P, Sharma BK. (2017) Fuel. 209. 449-456.
[4] Hart A, Omajali JB, Murray AJ, Macaskie LE, Greaves M, Wood J. (2016) Fuel. 180. 367-376.
[5] Al-Marshed A, Hart A, Leeke G, Greaves M, Wood J. (2015) Energy and Fuels. 29. 6306-6316.
[6] Al-Marshed A, Hart A, Leeke G, Greaves M, Wood J. (2015) Industrial and Engineering Chemistry Research. 54. 10645-10655.
[7] Hart A, Wood J, Greaves M. (2017). Journal of Petroleum Science and Engineering. 156. 958-965.

Abstracts – Posters 8

Name:	**Weiwei Hou,** Massimiliano Di Luca
School:	Psychology
Field of research:	Haptic rendering, contact modelling
Title:	**Delay evaluation in haptic rendering**
Abstract:	Haptic rendering enables users to manipulate virtual objects and experience simulated physical properties such as elasticity, texture, and mass. This technology would have great potential for application in virtual reality, gaming, training, and telerobotics if it weren't for its inherent limitations. One of the most prominent ones is the lag of the force and vibrations provided to the user. Delay not only can negatively affect the user experience, but it could even cause dangerous instabilities. In impedance-type haptic devices, the delay can be divided into three components: (1) the time required to obtain the input pose of the haptic device, (2) calculation of the reaction force, and (3) force output via the haptic devices. The input time and the output time are device-dependent and the calculation time is application-dependent. A method is proposed for the evaluation of each of the three components and the characterization of the acceptable consequences for the user. A novel measurement method has been tested on different haptic devices. Moreover, a psychophysical experiment has been conducted to evaluate the effect of delays while rendering various virtual objects. The results are used to define guidelines for haptic rendering and telemanipulation.

Abstracts – Posters 9

Name:	**Michael Clancy[1],** Carl Banbury[2], Antonio Belli[3] and Pola Goldberg-Oppenheimer[1]
School:	1.Chemical Engineering, 2. The Physical Sciences for Health (Sci-Phy) Doctoral Training Centre, School of Chemistry, 3. Institute of Inflammation and Ageing.
Field of research:	Raman Spectroscopy and Traumatic Brain Injury
Title:	**Development of point-of-care diagnostic technologies for the assessment of patients with Traumatic Brain Injury**
Abstract:	Traumatic brain injury (TBI) is fast becoming one of the most prominent causes of death and disability worldwide(1), with countless people every day being injured through sport, road traffic accidents, falls, or violence. In the UK, the National Institute of Healthcare Excellence (NICE) reported that the annual number of TBI cases presented at emergency departments was ~1.4 million(1). Although this is considered as an underestimate as it is speculated that many mild cases of TBI may not be presented at hospitals. With TBI, it is often the secondary, unseen, effects of the initial impact that can cause the most complications(2). Therefore, it is a key facet of TBI care to be able to effectively assess the health of the brain in order to guide therapy. This is a particular issue in the pre-hospital setting where only a limited range of monitoring techniques are currently available. The aim of this project is to develop a portable Raman spectroscopy system, which can be used in the pre-hospital setting, in order to diagnose and assess the level of a TBI. Raman spectroscopy can provide a chemical fingerprint of the sample being analysed, allowing for the identification of biological molecules that can give clinicians an indication of brain health. Raman spectroscopy relies on a type of light scattering known as Raman scatter and accounts for only 1 in every 1 million scattering events, so the Raman signal is very small. To assess brain health, we propose using the eye as a 'window' to the brain where we can illuminate the optic nerve with a laser and collect the Raman scattered light to produce a chemical fingerprint of its contents. A smartphone will be used to image the back of the eye and also to display the Raman results (Design shown below). 

Abstracts – Posters 10

Name:	**Christopher John Parkinson** on behalf of the NA62 collaboration
School:	Physics and Astronomy
Field of research:	Elementary Particle Physics
Title:	**Taking a close look at the fabric of the Universe**
Abstract:	At a fundamental level the fabric of the Universe is made up of particles, which interact according to a handful of well-known forces. Our current understanding of the fundamental particles and forces, called the Standard Model of particle physics (the SM), has been validated at energies up to 1TeV by more than a century of experimental endeavor. Above this energy scale, however, the SM breaks down. New particles are needed to stablise the SM and make it a valid description of the Universe once again. Perhaps surprisingly, it's possible to find evidence for these new particles by taking a close look at decays of the charged Kaon (a well-known particle that is included in the SM). This is the ultimate goal of the NA62 experiment, which is currently operating in the North Area of CERN. The first results from NA62 were recently presented at international conferences.

Abstracts – Posters 11

Name:	**Darren Andrew Smith,** NO Wand, RK Neely.
School:	Chemistry
Field of research:	Biophysical chemistry (microscopy, DNA)
Title:	**Identifying pathogens with DNA barcodes**
Abstract:	Antibiotic resistance is now one of the greatest threats to public health. By 2050, it has been estimated that the societal and financial cost, if not tackled, will be US$100 trillion.[1] Rapid diagnosis of infections can help inform antibiotic therapy; improving treatment efficacy and preventing inappropriate use of antibiotics. Identification of unknown pathogens within a sample can be achieved by using the fact that each organism has a unique DNA sequence. Unfortunately, most high-throughput, low-cost technologies use short sequence reads, which are difficult to assemble into complete genomes – making the task of identifying pathogens non-trivial. DNA hybridisation techniques, (e.g. PCR, DNA microarrays), can identify specific pathogens or resistance genes, but rely on known targets. Barcodes are simple, easily read patterns that can unambiguously identify an object. Here, we simplify the underlying DNA sequence under investigation by modifying specific motifs (e.g. 5′-TCGA-3′) with fluorescent labels.[2] By stretching single molecules of labelled DNA onto a surface it is possible to create a series of, sequence dependent, bright and dark bands: DNA barcodes. These DNA barcodes can be read using single-molecule fluorescence microscopy. Once scanned, an observed barcode pattern can then be compared to a library of reference patterns, which correspond to candidate pathogens within the sample. Thus, pathogens that are present can be rapidly identified by scanning the DNA barcode prepared from the sample. Unlike some other approaches, very little DNA material is required for analysis since experiments are performed at the single-molecule level. Additionally, the streamlined protocol allows the whole identification process to be completed within a day of the DNA being extracted from the sample.Beyond pathogen identification, ongoing experiments are showing promising results in extending the utility of DNA barcoding to providing sequence context to other DNA-based processes that can be probed by fluorescence-based method (such as replication).
References:	[1] Piddock, L. J. V. Reflecting on the final report of the O'Neill Review on Antimicrobial Resistance. The Lancet Infectious Diseases 16, 767–768 (2016). [2] Vranken, C. et al. Super-resolution optical DNA Mapping via DNA methyltransferase-directed click chemistry. Nucleic Acids Res., 42, e50 (2014).

Abstracts – Posters 12

Name:	**Kyriakos Xenofon Kallis,** J.M. Herreros and A. Tsolakis
School:	Mechanical engineering
Field of research:	Gasoline engine after-treatment systems and emission characterization
Title:	**Greener vehicles**
Abstract:	The emergence of green technologies is one of the most important advancements of human ingenuity for the improvement of quality of well-being. These technologies are implemented in all aspects of everyday life. One of them is the after-treatment system in automotive vehicles which constitute an important factor for the reduction of toxic gaseous and particulate emissions – that can be harmful for the natural environment and human health, especially in the epitome of Man's ecosystem, the city. Despite the great performance improvement of the internal combustion engines, the ones so necessary for our transportation, it is evident that further engineering advancements are considered to enhance their environmental behaviour. The three-way-catalyst (TWC) introduced a method of converting dangerous gaseous emissions such as nitrogen oxides (NOx) or unburned hydrocarbons into less detrimental products while gasoline particulate filters (GPF) presented a way of removing harmful particulates from the exhaust of vehicles. However, the cost of the after-treatment system is considerably high due to the use of precious metals, and as such, improvements can be made, either by enhancing the performance or reducing the cost of the after-treatment system for vehicles. Therefore, research activity focused on introducing more active and cheaper catalysts and filters. In the Mechanical Engineering test facilities we are investigating these novel technologies that developed in research labs or industry and evaluating their performance. The modern four-cylinder gasoline direct injection (GDI) engine at our disposal provides invaluable feedback about particulate matter and pollutant emissions characterization, to the manufacturers due to the real-life conditions that these catalysts are subjected to, while at the same time irreplaceable on-line information is assembled and analysed for multiple physicochemical phenomena, during the removal of the emissions. The data is then used to assist the manufacturers to construct novel advanced after-treatment systems.

Abstracts – Posters 13

Name:	**Kinga Winczura,** Pawel Grzechnik
School:	Biosciences
Field of research:	RNA biology
Title:	**The role of the oncoprotein CREPT in 3'-end formation of messenger RNA in human cells**
Abstract:	Accurate control of gene expression is essential to all organisms. One of the regulatory mechanisms of gene expression is maturation of mRNA 3'-end, which is essential for mRNA stability, export and translation. The human protein CREPT (Cell cycle-Related and expression-Elevated Protein in Tumor) is a proto-oncogene and putative mRNA 3' end processing factor, which has been shown to be overexpressed in 80% of cancers, including colon, lung, liver, breast, stomach and cervix cancers. Intriguingly, CREPT depletion or overexpression lead to decreased or increased cell proliferation and tumor growth, respectively. However, little is known about CREPT molecular functions. CREPT has been shown to interact with the C-terminal domain (CTD) of the RNA Polymerase II (Pol II) and to bind to promoters and 3'-ends of some genes suggesting roles for CREPT in transcription and mRNA 3' end processing. Furthermore, the absence of CREPT has been reported to cause accumulation of RNA:DNA hybrids (R-loops), which are physiological intermediates of the transcription process but, if unresolved, may lead to genomic instability. We seek to investigate roles of CREPT in mRNA transcription and 3' end processing and its possible connections with carcinogenesis. To this end, we will apply CRISPS/Cas9 gene editing to establish cell lines expressing CREPT fused to an affinity capture tag V5 and an auxin-inducible degradation tag AID. Next, we will perform analyses to study CREPT's chromatin distribution and effects of CREPT depletion on transcription dynamics and mRNA processing. Our analysis will broaden the understanding of mRNA biogenesis and significantly contribute to the current knowledge of fundamental processes governing regulation of gene expression and carcinogenesis.

Abstracts – Posters 14

Name:	**Maartje Spetter,** P Rotshtein[1], JM Thomas[2], CT Dourish[3], M Hallschmid[4], M Lee[5], S Higgs[1]
School:	[1]Psychology, [2]Department of Psychology, Aston University, [3] P1vital, Wallingford, [4]Institute for Medical Psychology and Behavioural Neurobiology & DZD, University Tübingen. [5]Department of Psychology, Swansea University
Field of research:	Nutritional Neuroscience

Title: **The effect of satiation on cognitive processes**

Abstract: Natural satiation attenuates activity in reward-related brain regions and increases activity in cognitive control areas, but little is known about the specific underlying cognitive processes. This study assessed the effect of satiation on reward, memory and behavioural control processes. Twenty-seven participants (10 male, BMI 22 kg/m^2, age 21y) were tested on 2 separate test days, either after eating a meal to satiation or after not eating for 4 h (satiated vs. premeal: order counterbalanced). They completed a battery of cognitive tasks, measuring both behavioural and brain responses. Food images (but not non-food images) were rated as less appealing in the satiated condition ($p<0.001$). Choice of a delayed food reward in a delay discounting task was increased in the satiated condition ($p=0.005$), whereas there was no effect of satiation on monetary reward choice ($p=0.9$). In a Go-NoGo task assessing impulsive responding and attention, there were more omission errors (a failure to respond on a go-trial) in the satiated condition ($p=0.01$) suggesting reduced attention to the go stimuli. Free recall for food and non-food words was unaffected by nutritional state ($p=0.5$). These results suggest that satiation shifts preference from immediate to future food rewards and reduces attention to salient stimuli. The next step is to investigate the mediating neural mechanisms.

Abstracts – Posters 15

Name:	**Sara Hassan,** Peter Lee
School:	Geography, Environment and Earth Sciences
Field of research:	Urban Planning and Inclusive Growth
Title:	**Realities of Collaborative Planning with Communities in transition: The Case of USE-IT! Birmingham**
Abstract:	USE-IT! Unlocking Social and Economic innovation Together is a European Regional Development funded project and one of 17 projects funded across Europe and the only successful UK bid. USE-IT! is a model for teaching led research and innovation that identifies students and trained researchers from the community as a resource in regeneration, demonstrating the important role that university can play with urban-regional partners and stakeholders in developing action research programmes that connect poor and vulnerable communities to large infrastructure projects happening in their neighbourhoods. This research novels a new approach in urban planning research through using community researchers as key investigators for emerging themes from these communities building on principals of collaborative planning that: all knowledge is equal, co-production of knowledge and agendas for placemaking, realistic but not rigid and the plurality of arenas and sites. The USE-IT! Project has trained 36 community researchers; identified 100+ people with unrecognised skills and is developing a social enterprise capacity. The aim is to develop a sustainable community research resource for the city-region contributing to collaborative planning processes and the co-production of knowledge in one of the largest brownfield sites being developed in the UK.
References:	[1] Bisschops, S. and Beunen, R., 2018. A new role for citizens' initiatives: the difficulties in co-creating institutional change in urban planning. Journal of Environmental Planning and Management, pp.1-16. [2] Brand, R. and Gaffikin, F., 2007. Collaborative planning in an uncollaborative world. Planning Theory, 6(3), pp.282-313. [3] Goodson, L. and Phillimore, J. eds., 2012. Community research for participation: From theory to method. Policy Press. [4] Murray, M. and Dainty, A. eds., 2013. Corporate social responsibility in the construction industry. Routledge. [5] Richardson, L., 2014. Engaging the public in policy research: are community researchers the answer?. Politics and Governance, 2(1). [6] Seltzer, E. and Mahmoudi, D., 2013. Citizen participation, open innovation, and crowdsourcing: Challenges and opportunities for planning. Journal of Planning Literature, 28(1), pp.3-18. [7] Stoker, G. and Evans, M. eds., 2016. Evidence-based Policy Making in the Social Sciences: Methods that Matter. Policy Press.

Abstracts – Posters 16

Name: **Anne-Marie Labandera[1]**, Hannah Tedds[1], Michael Holdsworth[2] and Daniel J. Gibbs[1]

School: [1]Biosciences, [2]Plant and Crop Science Division, University of Nottingham

Field of research: Plant Sciences

Title: **Identification of oxygen-regulated chromatin modification targets via the N-end rule pathway of proteolysis in plants**

Abstract:

Oxygen sensing in plants is crucial to produce the right cellular outcomes in response to developmental changes and environmental stresses such as flooding. The N-end rule pathway is a highly evolutionarily conserved proteolytic system that targets proteins for degradation based on their N-terminal amino acid. The oxygen sensing branch of the N-end rule pathway involves the degradation of MC-initiating proteins which are firstly oxidized in presence of oxygen, and then targeted for ubiquitination by the E3 ligase PROTEOLYSIS6 (PRT6).

The *Arabidopsis thaliana* Vernalization 2 (VRN2) is an MC-initiating protein that is part of the Polycomb Repressive Complex 2 (PRC2), which regulates epigenetic gene silencing through trimethylation of lysine 27 on histone 3 ($H3K27me3$) in the chromatin of target loci. VRN2 is known to repress the *Flowering Locus C (FLC)* in vernalizing conditions (long periods of cold or winter), ensuring that flowering occurs in Spring.

Here we show *in vitro* and *in planta* that VRN2 protein levels are regulated by the N-end rule pathway, and that VRN2 is stabilized in hypoxic and vernalization conditions. Besides its known role in flowering, we found that a lack of VRN2 in mutant lines results in longer primary roots, suggesting its involvement in repressing root growth. Along with other reported roles, this indicates that VRN2 has other targets in addition to *FLC*.

A combined approach involving $H3K27me3$ chromatin immunoprecipitation/sequencing (ChIP-seq) and RNAseq is being performed in order to identify uncharacterized targets of VRN2. We are comparing WT, *vrn2* mutant and *prt6* mutant (where VRN2 is constitutively stabilised) lines in control and vernalized conditions. Genes downregulated in the transcriptomics approach that overlap with genes marked by $H3K27me3$ in the ChIP-seq experiments when VRN2 is stabilized, will be considered VRN2 targets and further validated *in vitro* and *in vivo* to uncover the global targets of VRN2.

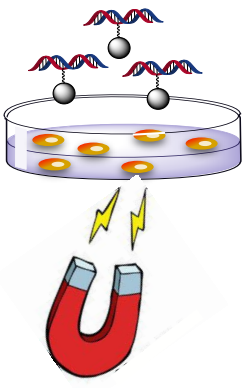
Abstracts – Posters 17

Name:	**Ravi K. Biroju,** Wolfgang Theis
School:	Physics and Astronomy
Field of research:	Two dimensional nanomaterials for energy and catalysis
Title:	**Engineered Two Dimensional (2D) Nanomaterials for Energy & Catalysis**
Abstract:	Research on 2D nanomaterials is rising in all branches of science and engineering after the discovery of graphene [Nobel prize in 2010, UK]. Considerable attention is focused on new candidate 2D materials by modifying materials structurally or engineering target architectures to achieve desired physicochemical properties.[1-2] There are several strategies to develop 2D materials to overcome current limitations and raise the enhanced device performance to new levels in many energy and catalysis related applications.[3-4] It is important to understand the underlying mechanisms of these strategies to gain fundamental insights into engineered layered nanomaterials design into achieving tailored properties. Here, we address the most recent development of engineering of 2D nanomaterials and their significant effects in catalysis technologies from our Research work.
References:	{1} Geim, A. K.; Novoselov, K. S., Nat. Mater. 2007, 6 (3), 183-191. {2} Geim, A. K.; Grigorieva, I. V., Nature 2013, 499 (7459), 419-425. [3] Biroju, R. K.; Das, D.; Sharma, R.; Pal, S.; Mawlong, L. P. L.; Bhorkar, K.; Giri, P. K.; Singh, A. K.; Narayanan, T. N., ACS Energy Lett., 2017, 1355-1361. [4] Biroju, R. K.; Choudhury, B.; Giri, P. K., Cat. Sci. & Technol., 2016.

Abstracts – Posters 18

Name:	**Francis H Robertson,** David Soper, Frederick Bourriez, Mingzhe He, Chris Baker, Mark Sterling and Hassan Hemida
School:	Civil Engineering
Field of research:	Wind engineering and vehicle aerodynamics
Title:	**An experimental investigation of the airflow surrounding a platoon of lorries**
Abstract:	Given recent advances in autonomous vehicles (AVs) there is a growing prospect that it will soon be common for multiple AVs, to travel close together, safely and at high speed, in what is known as a platoon. When vehicles travel in proximity, the reduction in air pressure behind an upwind vehicle, in a region known as the wake, reduces the pressure on the front of the downwind vehicle tending to reduce drag. As such, this may lead to improved fuel efficiency with benefits in terms of cost reductions and reduced CO_2 emissions. This study aims for the first time to provide an understanding of the airflow surrounding a platoon of lorries and the aerodynamic forces they experience. This includes both the benefits (e.g. drag reduction) and problems (e.g. stability) associated with driving through a vehicle's wake. Novel experiments were undertaken, using a moving rig at the University of Birmingham TRansient Aerodynamic INvestigation (TRAIN) rig facility, to investigate the flow surrounding a platoon of 8, equally spaced, 1/20th scale lorries (shown in Figure 1), with 3 different separations between vehicles.  Figure 1: The TRAIN rig and platoon of model lorries. Measurements included the velocity and pressure of the flow at vehicle sides as well as the pressure on vehicle surfaces. Flow behaviour was found to be comparable to that found from previous research on container freight trains [1] and is dependent on the spacing between vehicles with peak velocities reaching higher magnitudes at larger spacing. Velocity and pressure oscillate with peaks and troughs corresponding to the front and rear of each lorry respectively.
References:	[1] D. Soper, C. Baker and M. Sterling. Experimental investigation of the slipstream development around a container freight train using a moving model facility. J. Wind Eng. Ind. Aerod., 135:105-117, 2014.

Abstracts – Posters 19

Name:	**Elodie Jagu,** Robert K Neely
School:	Chemistry
Field of research:	Chemistry
Title:	**Synthesis and applications of magnetic DNA**
Abstract:	DNA contains all the information necessary for life. This information is stored as a code made up of only four chemical bases: adenine (A), guanine (G), cytosine (C), and thymine (T). The order of theses bases, or sequence, determines information available for building and maintaining an organism. This sequence is divided into genes and we know that these genes can be turned on or off by simple chemicals modifications, which don't alter the DNA sequence. This phenomenon is known as epigenetics. Methyltransferase enzymes play a huge role in epigenetic regulation of gene expression. This protein catalyses the transfer of a methyl group from the cofactor S-adenosyl-L-methionine (AdoMet) onto DNA, RNA or protein targets. DNA methylations occur on precise sites and modulate gene activity. In addition to methyl groups, methyltranferases can catalyse DNA transalkylation reactions with extended chemical moieties. In our lab, we use this enzyme as a tool to modify DNA. To a certain extent, we can attach any chemical moiety to a specific site of DNA. In particular, we use this enzyme to label DNA and bind it to a magnetic bead, which made DNA magnetic. This allowed easier DNA purification or magnetofection into cells. The magnetofection is highly efficient method that uses magnetic fields to transported DNA into target cells. Methyltransferase directed functionalisation of DNA by magnetic bead could be a tool for epigenetics study. Furthermore, application in transfection could be powerful for the study of the function and regulation of genes or a new method for gene therapy. 
References:	[1] Methyltransferase-Directed Labeling of Biomolecules and its Applications. Angew. Chem. Int. Ed. Engl. 2017, 19,5182-5200. doi: 10.1002/anie.201608625. [2] A general strategy for direct, enzyme-catalyzed conjugation of functional compounds to DNA. Nucleic Acids Res., 2018. doi: 10.1093/nar/gky184.

Abstracts – Posters 20

Name:	**Daniel Murrant,** Jonathan Radcliffe
School:	Chemical Engineering
Field of research:	Energy Storage
Title:	**Developing a Strategic National Roadmap for Energy Storage in the UK**
Abstract:	Additional energy generation from variable renewable energy sources (RES) like wind and solar is required to mitigate climate change, but what happens when the wind isn't blowing and the sun isn't shining? Energy storage (ES) offers a solution; RES can be stored when it is available for use when it's not. There are several ES technologies available, however they each have their own technical and non-technical characteristics resulting in technology-specific barriers and opportunities [1, 2]. This Roadmap, the first of its kind in the UK, aims to identify the role ES technologies may play in meeting future UK energy system challenges, and the innovation needed to enable this. The roadmap was developed through a process of energy system scenario analysis and technology trajectories informed by expert review, participatory workshops and current publications. The results produced addressed several key areas including: • Future UK energy system challenges • Future ES opportunities • Research gaps of specific ES technologies The energy system challenges and ES opportunities were focused around managing the impact of increased RES and the electrification of heat and transport. Common research gaps included improved safety, a stronger manufacturing base, and significant levels of investment and innovation to reduce technology costs. Key messages for the near and medium term were developed: Near-term; • The growth in variable RES is driving the need for quick response ES (e.g. ancillary services) • Batteries are beginning to become competitive in some markets • A continued strengthening of the R&D base for ES is needed Medium-term (2020-2030); • Growing take-up of electric vehicles will have significant impact on the need for ES • More inter/intra-day peak shifting/load levelling needed to maximise utilisation of grid-connected RES • A shift to more localised energy generation will lead to a requirement for smaller scale decentralised ES.
References:	[1] Luo, X., et al., Overview of current development in electrical energy storage technologies and the application potential in power system operation. Applied Energy, 2015. 137: p. 511-536. {2} Aneke, M. and M. Wang, Energy storage technologies and real life applications – A state of the art review. Applied Energy, 2016. 179: p. 350-377.

Abstracts – Posters 21

Name:	**Anna-Maria Caridis,** Claudia Simm[1], Alessandro Di Maio[1], Philippa Knowles[1], Bethany Gorman[1], Rebecca Jones[1], Douglas Ward[1], Udo Oppermann[2], Chas Bountra[2], Farhat Khanim[1], Richard Bryan[1]
School:	Biosciences, [2]Structural Genomics Consortium, University of Oxford, Oxford, UK
Field of research:	Bladder cancer research
Title:	**JQ1, a novel agent in the treatment of non-muscle invasive bladder cancer**
Abstract:	Urothelial bladder cancer (UBC) is the 7th most common cancer in Western societies with approximately 10,700 new cases and 5,000 deaths attributed to UBC per year in the UK. Non-muscle invasive bladder cancer (NMIBC) represents 75-80% of bladder cancer cases. The current standard of treatment of NMIBC comprises intravesical (via catheter) mitomycin C (MMC), however <50% of patients will enter remission and attain a long-term recurrence-free cure. Epigenetic changes (functionally relevant changes to the genome that do not involve a change in the DNA sequence) are commonly found in UBC and are associated with poorer outcomes. In collaboration with the Structural Genomics Consortium (Oxford), we screened a panel of epigenetic modulators for their ability to synergise with MMC against UBC cell lines and identified JQ1, an inhibitor of BRD4, a BET domain protein. JQ1 alone was able to reduce the viability of UBC cell lines in a dose-dependent fashion. Furthermore, when JQ1 was given in combination with MMC, it increased the efficacy of the latter, further reducing cell viability. MMC arrests cells in the S/G_2 phase of the cell cycle, whereas JQ1 caused a $G_{0/1}$ cell cycle arrest, depleting cells in S and G_2/M. JQ1 also rescued the cells from MMC-induced DNA damage, possibly by arresting the cells in the $G_{0/1}$ phase. Apoptosis (programmed cell death) was at least partially responsible for the cell death observed. Finally, JQ1 was able to modulate the protein expression of BRD4, but not C-MYC or EZH2. We have demonstrated that treatment of UBC cell lines with a single 1 hour pulse of JQ1 is successful in significantly reducing the viability of these cells. Furthermore, when combined with MMC, JQ1 improves the efficacy of MMC, rivalling or even improving the effectiveness of BCG treatment.

Abstracts – Posters 22

Name: **Alessandro M De Nunzio[1],** Utku S Yavuz[2], Eduardo Martinez-Valdes[1], Dario Farina[3], Deborah Falla[1]

School: [1]Centre of Precision Rehabilitation for Spinal Pain (CPR Spine), Sport, Exercise and Rehabilitation Sciences, [2]Institute of Applied Mechanics, University of Stuttgart, Stuttgart, Germany, [3]Department of Bioengineering, Imperial College London, London, UK

Field of research: Sensory-motor Improvement in Rehabilitation

Title: **Electro-tactile stimulation of the posterior surface of the neck induces forward leaning during upright posture**

Abstract:

Sensory information from muscle and joint proprioceptors play an important role in postural control . Proprioceptive afferences from the neck region, evoked using muscle vibration, lead to strong forward leaning of the body during posture [1]. However, it is not yet certain whether the skin proprioceptive receptors (cutaneous mechanoreceptors), have a substantive contribution to postural control, since vibration influences all the receptors from the skin to the muscles. The study aim was to investigate the postural effect of cutaneous mechanoreceptor afferences using electro-tactile stimulation of the posterior neck.

The position of the Centre of foot Pressure (CoP) from ten healthy young volunteers was acquired before, during and after a subtle electro-tactile stimulation over their neck (Mean±SD = 5.1±2.3 mA, sinusoid at 100Hz) during upright stance, eyes closed. The trial was divided into 30s consecutive phases, "Pre" (stimulation off), "Stim" (stimulation on) and "Post" (stimulation off). Mean of the CoP oscillations, along the antero-posterior (A-P) and the medio-lateral (M-L) direction, was calculated. Statistical evaluations were performed using a one-way, repeated measures ANOVA across the three acquisition phases (Pre, Stim, Post).

Mean±SD of the CoP A-P position was 12.08±11.88 mm and -2.5±7.03 mm at Stim and Post, respectively compared to Pre phase, indicating a net forward movement of the mean CoP position of approximately 1.2cm induced by the stimulation, which was significantly different from the Pre ($p=0.031$). No changes of the CoP M-L position were observed ($p>0.05$).

A clear anteropulsion of the body was induced via subtle electro-tactile stimulation of the posterior aspect of the neck. Neck electro-tactile stimulation could be used to develop wearable assistive devices to induce forward leaning of the body towards a safer standing position as optimisation of postural control [2].

References:

[1] Courtine, G., et al., Stance- and locomotion-dependent processing of vibration-induced proprioceptive inflow from multiple muscles in humans. J Neurophysiol, 2007. 97(1): p. 772-9.

[2] De Nunzio, A.M., et al., Electro-tactile stimulation of the posterior neck induces body anteropulsion during upright stance. Exp Brain Res, 2018. 236(5): p. 1471-1478.

Abstracts – Posters 23

Name:	**Chunping Xie,** Yongliang Li and Jonathan Radcliffe
School:	Chemical Engineering
Field of research:	Energy storage, energy economics
Title:	**A techno-economic analysis on decoupled energy storage systems in the UK**
Abstract:	This techno-economic analysis provides a research framework to evaluate the economic feasibility for decoupled energy storage systems. Comparison is made between Pumped Hydro Storage (PHS) as the most mature energy storage technology, and Liquid Air Energy Storage (LAES) as a novel cryogenic technology. Further research can also include other decoupled technologies such as Compressed Air Energy Storage (CAES), Thermal Energy Storage (TES), etc. A key feature of PHS and LAES is that their charge, discharge and storage components are fully decoupled so that the specific capacities of charge unit, storage unit and power recovery unit can be designed independently according to the individual requirements and costs. In the meanwhile, both PHS and LAES are able to get revenue by energy price arbitraging or taking part in the ancillary service market. By running simulations on Matlab with UK's half-hourly electricity spot price in 2015, this research develops an optimization algorithm to seek for the optimal size combination of the components to maximize the net present value (NPV) for a decoupled energy storage system. Besides, other economic objectives such as NPV per unit, payback period, and inner rate of return are also given. By comparing economic feasibility between PHS and LAES, conclusions are drawn on how much is the profitability difference and suggestions are made on how to promote emerging technologies on energy storage market.
References:	[1] Xie, C., et al., An economic feasibility assessment of decoupled energy storage in the UK: With liquid air energy storage as a case study. Applied Energy, 2018. 225: p. 244-257.

Abstracts – Posters 24

Name: **Michaela Gkantou,** Marios Theofanous, Charalampos Baniotopoulos

School: Civil Engineering

Field of research: Steel Structures

Title: **Response And Design Of High Performance Steel Structures**

Abstract: Traditionally carbon steel has been used for structural engineering applications. Recently there has been increasing usage of high performance steels in the construction industry. High strength steel (HSS) in structural engineering can potentially lead to lighter structures. The reduced self-weight of HSS structures allows for lower construction costs and transportation workloads, which in turn lead to lower carbon emissions and energy use. Stainless steel (SS) is a novel construction material that can be utilised in a range of structural applications due to its favourable structural properties, including high stiffness, strength and ductility, durability and excellence corrosion resistance which hence eliminates the need for a protective coating, thus reducing the maintenance cost over the life-cycle of a structure. Similarly, emerging techniques (i.e. prestressing) offer potential additional advantages and optimized solutions. Particularly in long span structures, prestressing can allow the mitigation of deflections. Carbon steel is well researched and there are a lot of design rules based on experimental and numerical data. With the emergence of high performance steels most of these rules have been assumed to apply to these steels without proper experimental validation to maintain consistency in design. This has led to overly conservative design, particularly for SS. For this reason, research projects on the structural response of high performance steels have been conducted. In order to ensure that the design provisions are both safe and economic, a series of experimental and numerical studies are carried out to investigate the ultimate behaviour of HSS and SS structures. On the basis of the results, the applicability of design specifications to high performance steels is assessed.

References:

[1] Gkantou M, Kokosis, G, Theofanous M, and Dirar S (2018) Plastic design of stainless steel continuous beams. Journal of Constructional Steel Research. Journal of Constructional Steel Research. ttps://doi.org/10.1016/j.jcsr.2018.03.025.

[2] Gkantou M., Theofanous M and Baniotopoulos C (2016) On the structural response of high strength steel prestressed trusses. A numerical approach. In the 11th HSTAM International Congress on Mechanics Athens, Greece. 27 – 30 May 2016.

[3] Gkantou M, Antoniou N, Theofanous M and Baniotopoulos C (2017) Compressive behaviour of high strength steel cross-sections. Proceedings of the Institution of Civil Engineers-Structures and Buildings 170(11): 813–824.

[4] Gkantou M, Theofanous M, Wang J, Baniotopoulos C and Gardner L (2017) Behaviour and Design of high strength steel cross-sections under combined loading. Proceedings of the Institution of Civil Engineers-Structures and Buildings 170(11): 841–854.

[5] Wang J, Afshan S, Gkantou M, Theofanous M, Baniotopoulos C and Gardner L (2016) Flexural behaviour of hot-finished high strength steel square and rectangular hollow sections. Journal of Constructional Steel Research 121: 97–109.

Stands

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https://intranet.birmingham.ac.uk/eps/research-support/index.aspx
https://intranet.birmingham.ac.uk/les/college-services/crso/index.aspx

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https://intranet.birmingham.ac.uk/finance/be/about.aspx

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https://intranet.birmingham.ac.uk/planning/rpt/index.aspx

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PERCAT helps to ensure that the Colleges recognise and work towards meeting the principles set out in the Concordat to Support the Career Development of Researchers, 2008, and employ best practice in support of the Vitae Researcher Development Framework.

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https://www.vitae.ac.uk/

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The Career Development Toolkit for Researchers is provided by jobs.ac.uk and is aimed at post-doctoral researchers who have gained one to two years' experience in academic research. This toolkit offers some general starting points for those wanting to reflect on their career to date and to begin to formulate an ongoing career strategy.
https://www.jobs.ac.uk/careers-advice/resources/ebooks-and-toolkits/career-development-toolkit-for-researchers

Further resources can be found on the EPS & LES PERCAT webpages and in the fortnightly EPS & LES PERCAT email bulletins.