UNIVERSITY OF BIRMINGHAM

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

Postdoctoral Researcher Conference

Thursday, 1 July 2021: 13:00 – 16:30

Friday, 2 July 2021: 09:30 – 13:15

PERCAT | Postdoctoral and Early Researcher Career Development and Training

Welcome

Welcome to the PERCAT Postdoctoral Researcher Conference 2021!

Sponsored by:

eppendorf

The Conference Organising Committee, on behalf of the EPS & LES PERCAT, is pleased to host this conference for the postdocs in the

College of Life and Environmental Sciences **(LES)**

and

College of Engineering and Physical Sciences **(EPS)**.

Here you can:

Showcase & celebrate the high quality research!

Share research/life experiences!

Meet new people!

Find support and opportunities!

We hope you have enjoyable, enlightening and career enhancing days!

If you have any questions, please approach any members of the organising team.

Programme – Thursday 1st July 2021

Time	Event
12.45	**Join online**
13.00	**Welcome and Opening Remarks** Prof Laura Green, Pro VC and Head of College, Life and Environmental Sciences Host: Emma Monaghan
13.10	Introduction to PERCAT Erik Hughes, EPS, Chemical Engineering
13:15	**Oral Session 1** – Chairs: Emma Monaghan, Amanda Pearce
13.15	*Joining forces with industry to reach new frontiers in precision timing with quantum clocks* **Markus Gellesch**, EPS, Physics and Astronomy
13.30	**Postdoctoral Careers and Experiences:** *Stepping away from research, but not too far* **Stefano Tommasone**, European and International Funding Officer for LES and EPS (Chemistry, Chem Eng, Maths)
13.45	**Poster spotlight session 1** Lightening presentations from our poster presenters
14.05	**Break, virtual poster session**
14:40	**Oral Session 2** – Chairs: Amanda Pearce, Andreea Radu
14.40	*Youths with conduct disorder exhibit reduced learning from punishment but not reward: a computational modelling study* **Ruth Pauli**, LES, Psychology
14.55	**Sponsor Presentation:** Eppendorf
15.10	*Tough photodegradable plastics with adaptable properties* **Josh Worch**, EPS, Chemistry
15.25	**Break**
15:40	**Oral Session 3** – Chairs: Valentina Borghesani, Rachel Vincent
15.40	*Real time genomic epidemiology of antimicrobial resistance in travellers* **Steven Dunn**, LES, Biosciences
15.55	**Postdoctoral Careers and Experiences:** *Start to Exit: From academia to spin-off to trade sale* **Adrian Burden**, Technology Entrepreneur and former Royal Society Entrepreneur in Residence at UoB
16.10	*Investigating Acute Compartment Syndrome: a condition where your muscles choke your blood vessels!* **Pranav Vasanthi Bathrinarayanan**, EPS, Chemical Engineering
16.25	**Close**

Programme – Friday 2nd July 2021

Time	Event
09.30	**Keynote lecture** *Blue and Batteries: from Academia to Industry and back* **Prof Emma Kendrick**, Chair of Energy Materials, Metallurgy and Materials Chairs: Lin Chen, Yazid Lakdar
10.15	**Poster spotlight session 2** Lightening presentations from our poster presenters
10.35	**Break, virtual poster session**
11:10	**Oral Session 4** – Chairs: Erik Hughes, Santosh Kumar
11.10	*Delusional realities and true hallucinations* **Clara Humpston**, LES, Psychology
11.25	*Liquid Air Energy Storage for Decarbonising Energy Network* **Xiaohui She**, EPS, Chemical Engineering
11.40	*Feeding a drowning world in the face of climate change* **Rory Osborne**, LES, Biosciences
11.55	*Electric Vehicle Charging from Rail Traction Network* **Masood Haijan Foroushani**, EPS, Engineering
12.10	**Break**
12:25	**Postdoctoral Careers and Experiences** – Chairs: Erik Hughes, Santosh Kumar
12.25	*Reflecting on my Career Experience – managing setbacks and getting myself back on track* **Amy Burrell**, LES, Psychology
12.40	*Two shoes – one pair? Between community-based (youth) research and environmental policy-consulting* **Susanne Börner**, LES. GEES
12.55	**Prize Giving and Closing Remarks** **Prof Tim Softley**, FRS, Pro VC for Research & Knowledge Transfer Host: Archie Kubba
13.10	**Close**

Poster Breakout Rooms

Rooms	First Name	Last Name	Collage	School
1	**Aditya**	**Garai**	EPS	Chemistry
	Jo	**Cutler**	LES	Psychology
2	**Owen**	**Jones**	EPS	Chemistry
	Hasna	**Fadhila**	EPS	Civil Engineering
	Anil	**Pal**	EPS	Chemistry
3	**Simon**	**Caulton**	LES	Biosciences
	Stavros	**Drakopoulos**	EPS	Metallurgy and Materials
	Yujie	**Xie**	EPS	Chemistry
4	**James**	**Hodgson**	LES	GEES
	Jaimie	**Miller-Friedmann**	EPS	Physics and Astronomy
	Manoj	**Ravi**	EPS	Chemistry
5	**Barbara**	**Clough**	LES	Biosciences
	Amrita	**Sikder**	EPS	Chemistry
6	**Sameh**	**El Sayed**	EPS	Chemistry
	Ramy	**Abdallah**	EPS	Mechanical Engineering
7	**Fazeelat**	**Duran**	LES	Psychology
	Stephen	**Fielden**	EPS	Chemistry
8	**Samuel**	**Lara-Reyna**	LES	Biosciences
	Valentina	**Borghesani**	EPS	Chemistry
	Matthew	**Butler**	EPS	Mathematics
9	**Jennifer**	**Frommer**	EPS	Chemistry
	Samuel	**Lellouch**	EPS	Physics and Astronomy
	Venelin	**Kovatchev**	LES	Psychology
10	**Pooja**	**Kumari**	EPS	Chemistry
	Peter	**Kutas**	EPS	Computer Science

Speakers

Opening and closing speakers

Professor Laura Green

Opening Remarks

Prof. Laura Green is Pro-Vice-Chancellor and Head of the College of Life and Environmental Sciences at the University of Birmingham.

She is an epidemiologist whose key research interest is in endemic diseases of farmed livestock. She implements multidisciplinary approaches, working with biologists, mathematicians and psychologists to understand disease processes and control, and adoption of changes in practice by end users.

She has collaborated with scientists and knowledge exchange providers to improve the health and welfare of livestock.

She was awarded the Royal Agricultural Society research medal in 2013 and an OBE for services to the health and welfare of farmed livestock in 2017. She is a member of the BBSRC Council.

Professor Tim Softley

Prize Giving and Closing Remarks

Professor Tim Softley FRS 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 led the University's preparations for the 2021 Research Excellence Framework (REF 2021). He also leads some of 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 chairs the University's Research Committee, which oversees the work of the Early Career Research Staff Development Operational Group. He headed School of Chemistry at the University of Oxford, before moving to Birmingham in September 2015.

Speakers

Keynote speaker

Professor Emma Kendrick

Prof Emma Kendrick is the Chair of Energy Materials, at the School of Metallurgy and Materials, University of Birmingham, since 2018.

Prior to this she held a readership at the Warwick Manufacturing Group, University of Warwick for 2 years. The move to academia came after spending 10 years in industry; 7 years at SHARP Labs of Europe as Lead Scientist and Chief Technologist in Energy Storage, and 3 years in two start-up companies, FiFe Batteries and Surion Energy, developing new lithium-ion battery technologies.

She pursued two PDRA positions, at Surrey and Loughborough Universities. She holds a BSc in Chemistry from the University of Manchester, a Master's degree in New Materials from Aberdeen University and a Doctorate from Keele University.

Speakers

Career talks

Straight after getting his Ph.D. in Chemistry (Italy – 2016), which included a short parenthesis as a visiting researcher in France, Stefano moved to the UK and joined the University of Birmingham as Research Fellow in Organic Chemistry and Bionanotechnology.

He then decided to hang his lab coat, and in 2020 he became a European and International Funding Officer. His role as funding expert involves disseminating opportunities and supporting Birmingham academics with their grant applications to foreign funding bodies. In his spare time, he is also a freelance scientific writer.

The talk will provide an overview of his journey, with highlights on some unexpected, and sometimes unplanned, decisions that he made. He will also discuss the approach he adopted in order to find a new position from the moment he decided to leave academia and explore new avenues.

Dr Stefano Tommasone

Dr Adrian Burden

Dr. Adrian Burden was trained as a materials scientist and is a serial entrepreneur. He worked in academia, industry and in technology startups.

During this talk, he will highlight the trials and tribulations of starting and growing a business, and what it is like to work in a small company environment.

He will also reference his own experience of transitioning from a post-doctoral researcher working in a university laboratory to becoming a founding CEO of a venture-capital financed company.

Speakers

Career talks

Dr Amy Burrell

I joined University of Birmingham as a Research Fellow in January 2021.

The first 10 years of my career (post MSc) was predominantly in research roles (in academia and the commercial sector). I was made redundant during the recession (late 2010), when I was part way through a part time PhD.

I moved into a training role in a sister company and stayed with them until I completed my PhD (2013). I then landed my research dream job working on my PhD topic.

However, 18 months into a 2 year contract my father was diagnosed with early onset Alzheimer's and I had to make some tough career decisions. I sidestepped into Lecturing (for a steady contract and income) and spent 6 years in a predominantly teaching role (at two different institutions).

However, I never lost my passion for research and at the end of 2020 I returned to research.

Currently employed as a Marie Curie Global Fellow (MCGF), Susanne will share her experience on how walking down the two different paths of community-based (youth) research and environmental policy-consulting helped her successfully apply for and implement a MCGF.

Previously, she worked as a consultant for rural development and climate change in an international consulting firm with projects in Latin America, Africa, and Asia. Susanne also holds a PhD in political sciences from the University of Frankfurt with a focus on community participation and environmental justice.

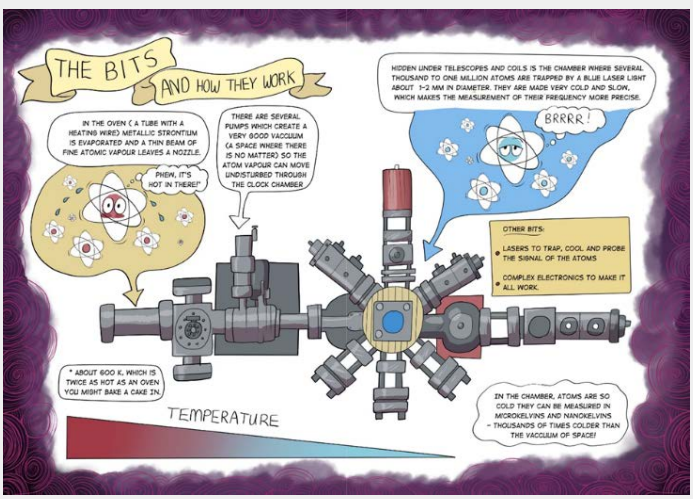
She will show how the two -seemingly very different- 'shoes' of academia and policy-consulting can ultimately make one very nice pair, and how her previous experience helped build bridges between diverse research disciplines and research cultures. With an interest in applied and impact-oriented participatory research, Susanne aims to identify pathways for strengthening youth agency and integrating youth knowledge into public policies for a sustainable and healthy urban development.

Dr Susanne Börner

Abstracts for Oral Presentations

Abstracts – Oral Presentations

Talk 1

Name:	**Markus Gellesch, Jonathan Jones, Qiushou Sun, Alok Singh, and Yeshpal Singh**
Affiliation:	School of Physics and Astronomy, University of Birmingham
Field of research:	Physics, Cold Atoms, Quantum Technology, Precision Timing
Title:	**Joining forces with industry to reach new frontiers in precision timing with quantum clocks**
Abstract:	Many aspects in our modern day life heavily rely on precision timing – satellite navigation and network synchronization are prominent examples. These technologies are based on atomic clocks which use the energy difference between two quantum states of an atom as frequency reference. Atomic clocks are complex machines, and state-of-the-art clocks with record precision (around one second off over the age of the universe) occupy large laboratories. Here in Birmingham, in the "Clock Team" of the Quantum Technology Hub Sensors and Timing, we work on the next generation of atomic clocks. These clocks work with optical frequencies, i.e., with colourful laser light, and are nowadays often referred to as quantum clocks. We strive to make these clocks smaller and robust so that they become transportable and can be used outside of laboratory environments [1]. Tying in with our focus on transportability, we collaborate with industry partners to turn lab prototypes into commercial applications. An important part of my work is to help our industry partners understand how quantum clocks work and what is needed to build one. In my talk, I will put research on the next generation of atomic clocks into the context of knowledge transfer that enables us to team up with industry partners to reach new frontiers in precision timing.  Quantum clocks: "The bits and how they work" – from the comic booklet "Athena and Tortoise", an outreached project with artist Helen Greetham (available at: http://quantumclocks.the-comic.org/).
References:	[1] Gellesch, M., Jones, J., Barron, R., Singh, A., Sun, Q., Bongs, K. and Singh, Y., 2020. Transportable optical atomic clocks for use in out-of-the-lab environments. Advanced Optical Technologies, 9(5), pp.313-325.

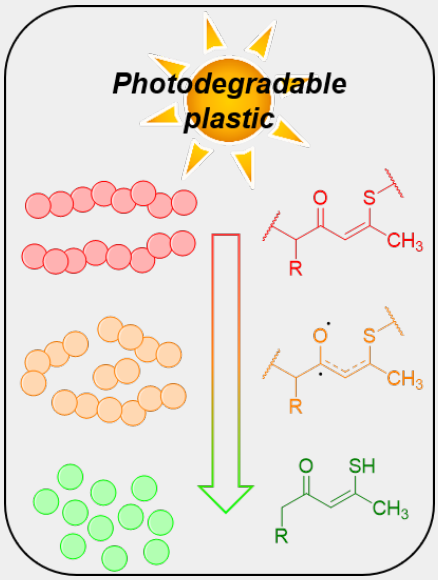
Abstracts – Oral Presentations

Talk 2

Name:	**Ruth Pauli[1], Inti Brazil[2], Gregor Kohls[3,4], Lisa Gistelinck[1], Stephane De Brito[1], & Patricia Lockwood[1]**
Affiliation:	[1] Centre for Human Brain Health, School of Psychology, University of Birmingham [2] Donders Institute for Brain, Cognition and Behaviour, Radboud University [3] Child Neuropsychology Section, Department of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy, University Hospital RWTH Aachen [4] Department of Child and Adolescent Psychiatry, Faculty of Medicine, TU Dresden
Field of research:	Psychology/cognitive neuroscience
Title:	**Youths with conduct disorder exhibit reduced learning from punishment but not reward: a computational modelling study**
Abstract:	Conduct disorders (CD) are serious developmental disorders, characterised by severe aggression and antisocial behaviour. They are among the leading causes for referral to youth mental health services. Theoretical accounts have long suggested that youths with CD have a reduced ability to learn from punishment. However, empirical studies of punishment learning in CD are scarce. New advances in computational modelling can precisely quantify learning ability in terms of 'learning rates' - how quickly associations are formed between behaviours and outcomes. Here we applied computational modelling to a learning task in a large sample of 675 youths with CD and 743 typically developing controls, aged 9-18 years. Participants were required to learn by trial and error whether to press a button to obtain rewards (points) or withhold pressing to avoid punishment (losing points). We fit and compared several computational models of task behaviour using a hierarchical expectation maximisation fitting procedure and Bayesian model comparison. Intriguingly, compared to controls, punishment learning rates were lower in youths with CD whilst reward learning rates did not differ. Youths with CD also had significantly higher biases to initiate responses regardless of the expected outcome, which could be captured by our computational model. These findings provide a mechanistic account of altered learning in youths with CD. The reduced learning from punishment, combined with increased biases for action initiation, is consistent with a clinical picture of poorer ability to learn from adverse consequences of behaviour as well as behavioural impulsivity. Importantly, however, there is no reduction in the ability to learn from positive outcomes. Our results contribute to a more detailed clinical picture of CD, which in the longer term will be crucial for developing evidence-based interventions.
References:	

Abstracts – Oral Presentations

Talk 3

Name:	**Joshua C. Worch, Maria Chiara Arno, Richard S. Grainger, Andrew P. Dove**
Affiliation:	School of Chemistry, University of Birmingham.
Field of research:	Sustainable plastics
Title:	**Tough photodegradable plastics with adaptable properties**
Abstract:	The "age of plastics" has had a phenomenal impact on advancing many technologies, from food to transportation to communications. However, our modern plastics economy is unsustainable with environmental impacts quickly mounting. Biodegradable plastics were envisioned as promising alternatives to petrol-based plastics, but there are recent concerns surrounding their "real-world" degradability. On the other hand, many plastics (or polymers) are notoriously susceptible to UV light deterioration. This ultimately makes the materials brittle and leads to the formation of microplastic fragments. Instead of treating photo-sensitivity as a liability, we leverage this property in a new class of polymers that can be fully photodegraded all the way to their constituent small molecules, rather than just breaking into small fragments. Additionally, many conventional plastics are synthesized using environmentally harmful metal catalysts that only operate effectively under extreme reaction conditions (high temperature or pressure and an oxygen-free atmosphere). Instead, we employed a mild organocatalyzed reaction that has no special precautions (tolerant of oxygen and moisture) to afford a range of polymers with diverse properties. Some of the materials were excellent plastics (strong and tough) and these were irradiated with UV light in order to probe their photodegradability. All plastics could be fully degraded, but we also found that the rate of degradation was influenced by the polymer structure, which can be easily adjusted. We believe that tough plastics with tailored photodegradation profiles present a viable alternative to both modern commodity plastics and biodegradable polymers. 
References:	

Abstracts – Oral Presentations

Talk 4

Name:	**Steven J. Dunn, Ann Snaith, Alan McNally.**
Affiliation:	Institute of Microbiology and Infection, University of Birmingham
Field of research:	Microbial Genomics
Title:	**Real time genomic epidemiology of antimicrobial resistance in travellers.**
Abstract:	Video Abstract: https://tinyurl.com/sjdunn Antimicrobial resistance (AMR) is a huge threat to global health, and is highly prevalent in low- and middle-income countries. International travel contributes to this substantially: of the 100 million annual visitors to tropical countries, 30–70% become colonized by multidrug resistant bacteria. The phenomenon has been well documented, but since sampling has only been conducted after travellers' return home, data on the actual colonization process are scarce. A group of 20 European volunteers visiting Lao People's Democratic Republic for three weeks provided daily stool samples. Acquisition of bacteria that are resistant to antibiotics was examined by selective stool cultures followed by whole-genome sequencing (WGS) of isolates. Daily sampling revealed that all participants had acquired antibiotic resistant bacteria at some time during their travels, with individual colonisation status varying day to day. WGS analysis revealed a transient pattern of colonization, with sequential acquisition of new strains. All but one participant acquired multiple strains. 78% of strains were resistant to commonly used advanced antibiotics, and 28% of strains were resistant to colistin, one of the last lines of defense against the AMR threat. This is the first study to characterize the dynamics of acquiring MDR-GN during travel in real time. Our data show multiple transient colonization events indicative of constant microbial competition, and an alarmingly high level of AMR circulating is Laos.
References:	

Abstracts – Oral Presentations

Talk 5

Name:	**Pranav Vasanthi Bathrinarayanan[1], Daniele Vigolo[1,2], Liam Grover1, Mark Simmons[1]**
Affiliation:	[1] School of Chemical Engineering, University of Birmingham [2] School of Biomedical Engineering, University of Sydney
Field of research:	Microfluidics/Tissue Engineering
Title:	**Investigating Acute Compartment Syndrome: a condition where your muscles choke your blood vessels!**
Abstract:	**Introduction:** Acute compartment syndrome (ACS) is an emergency orthopaedic condition in which a traumatic event such as fracture of a limb causes an increased pressure in the impact area which obstructs the flow of blood into the muscles of that limb. The lack of blood supply triggers rapid death of muscle cells, ultimately resulting in irreversible damage of the muscles. Treatment of ACS involves an invasive procedure called fasciotomy in which the different muscles of the limb are surgically cut open (and kept open for 48 hours!) in order to release the pressure in the muscles and facilitate blood flow. **Problem:** Early diagnosis of ACS is key to prevent permanent muscle loss. However, existing methods fail to accurately diagnose ACS leading to either misdiagnosis or delayed which ultimately results unnecessary surgical interventions. **Methodology:** The current study aims to develop such a novel in-vitro model of a blood vessel system in order to mimic the ACS condition as closely as possible. Microfabrication techniques were employed to create micron-scale channels in which the blood vessels cells would be cultured (Figure 1). The cell-lined channels would then be subjected to pressure regimes similar to those observed in ACS and the impact of different pressure regimes on the cell behaviour would be investigated. The experimental data from these in-vitro models would be augmented by complex computational and machine learning models which would ultimately lead to the development of an algorithm that would ultimately enable better diagnosis of ACS.
References:	

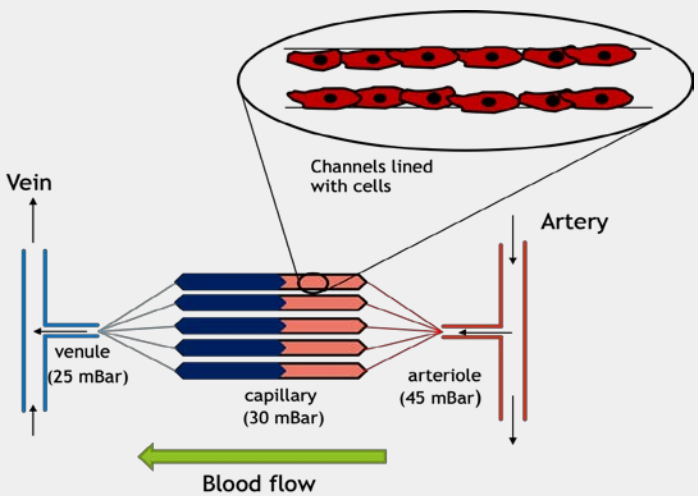


Figure 1. Diagrammatic representation of the micro-scale channels used to develop an in-vitro model of ACS. A magnified portion of the channel shows the blood vessel cells lining the channel inner surfaces.

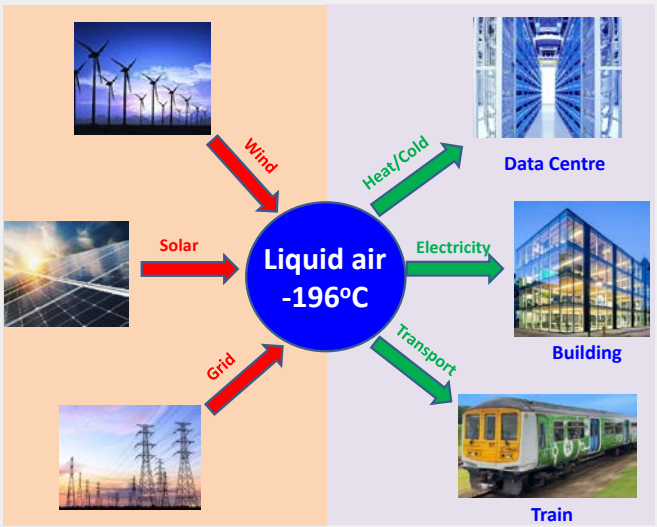
Abstracts – Oral Presentations

Talk 6

Name:	**Dr Clara Humpston, Professor Matthew Broome**
Affiliation:	Institute for Mental Health, School of Psychology, University of Birmingham
Field of research:	Mental health (Schizophrenia and related psychoses)
Title:	**Delusional realities and true hallucinations**
Abstract:	Most of us would never wonder, let alone doubt, whether the thoughts in our heads are indeed our own or whether we can fully trust our perceptions. What happens when our thoughts and perceptions are no longer trustworthy? Auditory-verbal hallucination is the medical term given to the experience of hearing voices or a sense of being spoken to with no speaker present. Whilst hearing voices is by no means equivalent to having schizophrenia, the latter is a chronic condition that severely impacts an individual's functioning and usually strikes in late adolescence to early adulthood, when the individual begins to build an independent life. As such, the effects of schizophrenia on a young person's life are often devastating. The heavy stigma associated with such a diagnosis adds to the already overwhelming burden on the individual. The neurobiology of hallucinations is still poorly understood, let alone their relationships with other symptoms often found in schizophrenia, such as interferences in thinking processes where the sufferer loses control over internal psychological processes. In order to study schizophrenia in its full complexity, a purely neurobiological approach will fall short. By bringing expertise from other disciplines, such as phenomenology (the study of a person's subjective experiences), we will learn much more about the patients' self-experiences, their daily struggles with the illness and how they cope with or even overcome their condition. My vision is that findings from my research will act as the bridging point between multiple disciplines in philosophy, psychiatry and computation.
References:	Humpston, C. S., & Broome, M. R. (2020). Thinking, believing, Hallucinating self in schizophrenia. The Lancet Psychiatry, 7(7), 638-646.

Abstracts – Oral Presentations

Talk 7

Name:	**Xiaohui She, Tongtong Zhang, Xiaodong Peng, Yulong Ding**
Affiliation:	School of Chemical Engineering, University of Birmingham
Field of research:	Energy storage
Title:	**Liquid Air Energy Storage for Decarbonising Energy Network**
Abstract:	Climate change is a global challenge that has raised much concern, which mainly results from carbon emissions by the use of fossil-fuel. To address this issue, it is suggested to use renewable energy rather than fossil-fuel. However, renewable energy is usually intermittent: solar energy is only available in the daytime and wind energy is fluctuated. Therefore, it is necessary to store the renewable energy and then release it to end-users as required. Liquid Air Energy Storage is a large-scale electrical energy storage technology. It stores renewable energy in the form of liquid air, which is later released to produce stable power for end-users. Therefore, Liquid Air Energy Storage is also referred as 'Air Battery'. Liquid Air Energy Storage has many advantages, such as large energy storage density, no geographical constraints, fast response to user demands, etc. However, it is only able to provide power for end-users, which leads to a lower energy efficiency of 50-60%. To address this issue, we develop a multi-functional Liquid Air Energy Storage system, which not only provides power but also heat/cold for end-users. The energy efficiency is improved up to 75%, which is comparable to the widely used Electrochemical Energy Storage (i.e., battery). Therefore, the multi-functional Liquid Air Energy Storage is promising for decarbonising power and heat/cold sectors. 
References:	X She, T Zhang, X Peng, et al. Journal of Thermal Science 30 (2021), 1-17 X She, X Peng, B Nie, et al. Applied Energy 206 (2017), 1632-1642

Abstracts – Oral Presentations

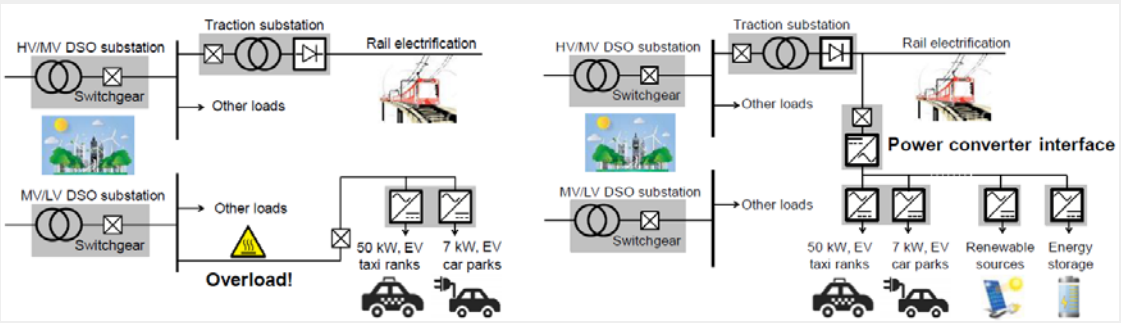
Talk 8

Name:	**Rory Osborne, Anne-Marie Labandera, Daniel J Gibbs**
Affiliation:	School of Biosciences, University of Birmingham
Field of research:	Plant development
Title:	**Feeding a drowning world in the face of climate change**
Abstract:	It is overwhelmingly clear that climate change will be one of the greatest challenges to the longevity of human survivability. One particular threat is an increase in global population alongside less predictable weather and a decrease in agriculturally viable land. If 59% of crop losses can already be attributed to flooding, where does this leave us when climate change is expected only to increase flooding events globally? To reduce food insecurity worldwide we must develop strategies to limit damage to food outputs, beginning with understanding how plants respond to flooding. Here we report VERNALIZATION2 (VRN2), an Arabidopsis thaliana protein that epigenetically reduces gene expression. VRN2 is stabilised when oxygen levels are low (hypoxia), synonymous with flooding conditions. Typically, VRN2 is stable only in areas of high cell division (root tips, shoot tips) where oxygen is naturally low, but becomes stable throughout the whole plant during hypoxia. Mutant plants lacking VRN2 are less able to tolerate hypoxic environments, suggesting it has a role in flooding responses. We show that these mutants also produce longer roots and flower earlier than control plants, and using computational and molecular biology hypothesise that VRN2 confers tolerance to flooding by restricting the plants signals to grow in waterlogged soil (promotes quiescence). VRN2 is an exciting model to understand not only how plants sense oxygen and grow in response to flooding, but how this response can be 'remembered' and passed on to the next generation.
References:	

Abstracts – Oral Presentations

Talk 9

Name:	**Dr Masood Hajian and Dr Pietro Tricoli**
Affiliation:	School of Engineering, University of Birmingham
Field of research:	Clean Transportation
Title:	**Electric Vehicle Charging from Rail Traction Network**
Abstract:	The trend in using electric vehicles (EVs) is ever fast growing mainly due to environmental issues using traditional combustion engines and concerns on long term availability of fossil fuels. While using EVs can address both challenges, securing a reliable and cost-effective charging mechanism for EVs is quite vital. This is of great importance considering total high electricity power demand of EVs traditionally provided by distribution network as shown in Fig. 1a. As the number of EVs increases, higher power load is demanded and as thus a major and costly upgrade on distribution network substation infrastructure including step down transformer, and protection switchgear will be necessary. This project investigates application of an alternative solution using train traction supply for EV charging as is shown in Fig. 1b. These networks are designed for much higher capacity than is normally required considering reliability issues. Additionally, the substations will be under variable loading with maximum power demand applied when trains are passing nearby. Consequently, a large reserve capacity exists on each feeder substation which can be exploited for EVs parked at train stations. This releases distribution network from excessive EV loading and enables traction network efficient use as well. A power electronic converter is investigated to enable EV charging network connection to traction supply available in medium voltage DC or single-phase AC. Local energy sources including battery banks and PV panels are also proposed to support EV charging system in the event of power shortage in the upstream traction network.
References:	M. Moschella, M. Murad, E. Crisostomi, F. Milano, "Decentralized Charging of Plug-in Electric Vehicles and Impact on Transmission System Dynamics", IEEE Transactions on Smart Grid, October 2020. A.F. Rodrigues, A.F. Cardador, A.P. Cucala, A.J. Lopez, R.R. Pecharman, A.D. Laporte, C.R. Sanchez, " Charging Electric Vehicles Using Regenerated Energy from Urban Railways", in IEEE Vehicle Power and Propulsion Conference (VPPC), 11-14 Dec 2017. J. Pouget, B. Guo, L. Bossoney, J. Coppex, D. Roggo, C. Ellert, " Energetic simulation of DC railway micro-grid interconnecting with PV solar panels, EV charger infrastructures and electrical railway network", in IEEE Vehicle Power and Propulsion Conference (VPPC), 18 Nov- 16 Dec 2020. P.M. Torres, G. Navarro, M. Blanco, M. Lafoz, " Multifunctional test bench for the emulation and testing of electric vehicle fast-charging from urban railway power lines", in IEEE International Conference on Industrial Technology (ICIT), 17 – 19 March 2015

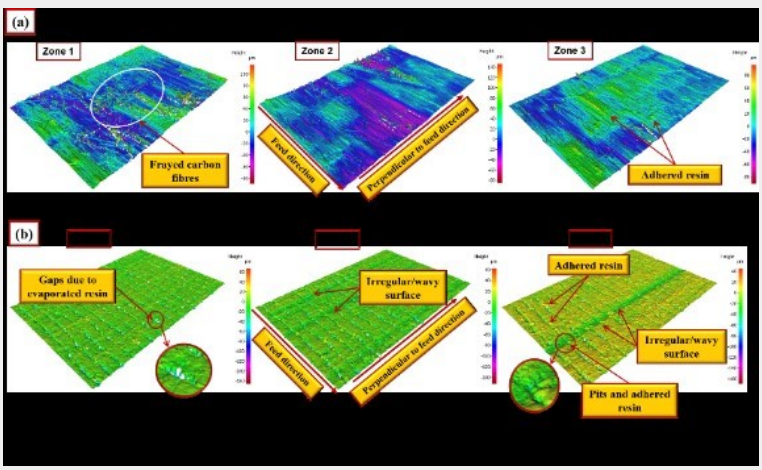


a. b.

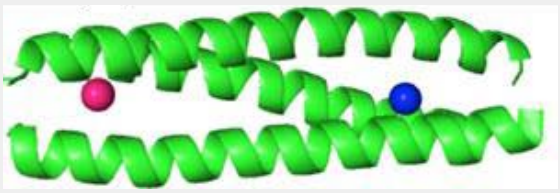
Fig. 1. EV charging system. a. Traditional connection to distribution network, b. Proposed connection to traction network

Abstracts for Poster Presentations

Abstracts – Posters

Name:	**Ramy Abdallah, Richard Hood and Sein Leung Soo**
Affiliation:	Department of Mechanical Engineering, School of Engineering, University of Birmingham
Field of research:	Advanced manufacturing of composites
Title:	**Electrical discharge machining of carbon fibre reinforced plastic composites**
Abstract:	Carbon fibre reinforced plastic (CFRP) composites are increasingly employed in high performance aerospace and automotive applications due to its favourable attributes such as low density, high specific strength/stiffness and corrosion resistance compared to metallic materials [1, 2]. Conventional machining operations including drilling and milling are typically utilised to produce structural assembly holes or achieve part geometric tolerance, but are prone to high tool wear which induce workpiece defects such as delamination and fibre pull out leading to deterioration of component mechanical properties. Therefore, the present work aimed to assess the feasibility of wire electrical discharge machining (WEDM) as an alternative for cutting unidirectional CFRP composites, which is a non-conventional machining technique more commonly used for electrically conductive, metallic based materials.
	 *Fig. 1. 3D surface topography plots of machined surfaces exhibiting the highest MRR when cutting (a) parallel and (b) perpendicular to fibre direction.*
	The influence of key process parameters together with cut direction (parallel and perpendicular to fibre orientation) were investigated. Results showed a ~ 16% increase in material removal rate was achieved when machining parallel to fibre direction compared to cutting perpendicular to the fibres, although relatively larger average slot widths and poorer workpiece surface roughness (Sa) was observed, which was attributed to the Joule heating effect. Workpieces machined parallel to fibre direction were generally free of any major edge defects, in contrast to severe delamination observed on both the top and bottom surfaces of specimens cut perpendicular to fibre orientation.
References:	[1] Qiu X, Li P, Ni Q, Chen A, Ouyang P, Li C, Ko TJ (2018) Influence of machining parameters and tool structure on cutting force and hole wall damage in drilling CFRP with stepped drills. Int J Adv Manuf Technol 87:857–865. [2] Konig W, Wulf C, Graβ P, Willerscheid H (1985) Machining of fibre reinforced plastics. CIRP Ann Manuf Technol 34(2):537–548.

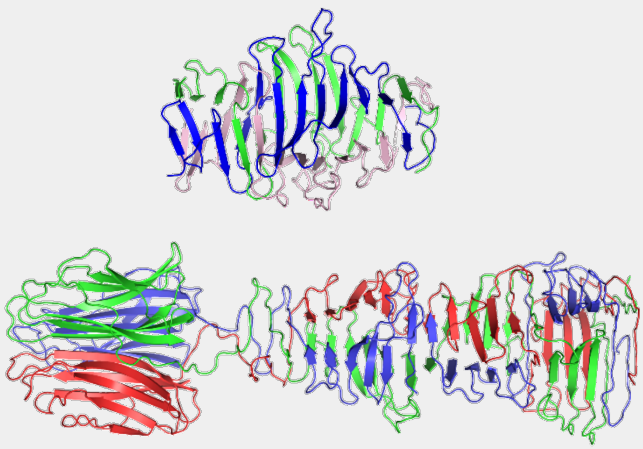
Abstracts – Posters

Name:	**Valentina Borghesani and Anna F.A. Peacock**
Affiliation:	School of Chemistry, University of Birmingham
Field of research:	Peptide de novo design, chemistry coordination
Title:	**Lanthanide Binding Site Engineered within De Novo Designed Coiled Coil.**
Abstract:	Development of de novo designed coiled coils offers the possibility of incorporating engineered metal binding sites to achieve new function, and reactivity.1-3 Engineering lanthanide binding sites into de novo designed coiled coil peptides is a promising approach to combine the attractive photophysical properties of the lanthanide ions, with the advantages of a de novo designed coiled coil scaffold which is capable of selectively binding different lanthanide ions at well-defined locations and tuneable distances. Work within the Peacock group has shown that translating the binding site along the coiled coil, at 1nm intervals, generates a series of coiled coils, some of which can selectively discriminate between the different lanthanide ions based on their size.3 Using these designs and exploiting the coiled coil scaffold to achieve the spatial control and alignment of different Ln(III) ions necessary it will be possible to generate a new class of homo and hetero bi- or tri-metallic lanthanide complexes to develop the up-converting metalloproteins. Furthermore, binding sites can be engineered with the coiled coil scaffold suitable for four distinct binding sites at the helical interface between two coiled coils. Finally, the impact of glycerol on lanthanide ion accessibility to the binding site is evaluated. In fact, when the binding site is placed at the interface with the solvent the glycerol could have an important effect on the selectivity, in particular in the presence of multiple lanthanide binding sites. This poster presents these very recent findings in the area looking at the site characterization of the resulting lanthanide coiled coil complexes.  Figure 1 Cartoon representation of the peptide and its double binding sites. This research has been funded by the European Union's Horizon 2020 Research and Innovation Programme under the Marie Sklodowska-Curie Grant Agreement No 841956
References:	A. J. Gamble and A. F. A. Peacock, in Protein Design: Methods and Applications, ed. V. Köhler, Springer New York, New York, NY, 2014, DOI: 10.1007/978-1-4939-1486-9_11, pp. 211-231. M. R. Berwick, D. J. Lewis, A. W. Jones, R. A. Parslow, T. R. Dafforn, H. J. Cooper, J. Wilkie, Z. Pikramenou, M. M. Britton and A. F. A. Peacock, Journal of the American Chemical Society, 2014, 136, 1166-1169. M. R. Berwick, L. N. Slope, C. F. Smith, S. M. King, S. L. Newton, R. B. Gillis, G. G. Adams, A. J. Rowe, S. E. Harding, M. M. Britton and A. F. A. Peacock, Chemical Science, 2016, 7, 2207-2216.

Abstracts – Posters

Name:	**Matthew Butler, Amin Rahmat, Azar Gholamipour-Shirazi, Tom Montenegro-Johnson**
Affiliation:	School of Mathematics, University of Birmingham
Field of research:	Applied Maths
Title:	**Shape change of temperature-responsive hydrogels**
Abstract:	Hydrogels are polymer networks that can absorb and retain large amounts of water, which can result in substantial swelling. Unlike most materials that expand upon heating, some hydrogels significantly reduce in volume in response to a temperature increase, as the polymer becomes more hydrophobic and expels water. Recent work has shown how this temperature-dependent size change can be exploited to design shape-changing structures that respond to heating and cooling, such as bilayers with different swelling responses that deform out of plane as the layers differentially shrink or swell. Using a combination of theoretical, numerical and experimental approaches, we are investigating this temperature-responsive shape change and designing 3D-printed structures that could be used to control microswimmers and smart microfluidic devices.
References:	

Abstracts – Posters

Name:	**Simon Caulton[1], R Elizabeth Sockett[2] and Andrew Lovering[1]**
Affiliation:	[1] Life and Environmental Sciences, University of Birmingham [2] Medical School, University of Nottingham
Field of research:	Bdellovibrio
Title:	**Getting a Grip: Identifying Potential Bdellovibrio Adhesins**
Abstract:	Bdellovibrio bacteriovorus is a predatory bacterium that invades the periplasm of Gram-negative bacteria and digests the host from within. As such they show promise as an exciting and novel biological therapeutic for bacterial infection. Little is known about the molecular mechanisms of attachment and invasion, and therefore it is crucial that we understand these processes in order to use Bdellovibrio effectively. B. bacteriovorus strain HD100 has at least 19 genes that show low homology with phage tail-spike proteins, which include both S74 and non-S74 cell wall surface anchor proteins. In phage these proteins are essential for adhesion to bacteria, mostly binding to bacterial O-antigen, and therefore it is possible that they perform the same purpose for B. bacteriovorus. We have expressed and crystallised the C-terminal portions of two adhesin genes. The first is a putative S74 adhesin Bd3182. Following expression, the S74 fold autoproteolyses, releasing the putative adhesin domain from the chaperone. Solving the atomic resolution structure of the adhesin-like portion of Bd3182 at 1.1 Å shows that the protein forms a trimeric beta helix, similar to that of phage tail-spike proteins. A cleft is observed on each face of the trimer, forming a potential binding site for O-antigen. The second is a non-S74 adhesin, Bd2133, which forms a beta helix stalk with a novel C-terminal beta sandwich domain similar to that of viral sugar binding proteins. 
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Abstracts – Posters

Name:	**Barbara Clough, Daniel Fisch, Robert Evans, Samuel Lara-Reyna, Imtiaz Solim, William Channel, Eva-Maria Frickel**
Affiliation:	Institute of Microbiology and Infection, School of Biosciences, University of Birmingham
Field of research:	Host pathogen interaction
Title:	**Toxoplasma restriction in immune-stimulated human retinal cells**
Abstract:	The parasitophorous vacuole (PV) serves as the 'transaction interface' between Toxoplasma and host. It has been shown that there are differences in these 'transactions' dependent upon the host species, the parasite strain and cell type. Toxoplasma strains are restricted to a few clonal variants in Europe and North America and the parasite is largely controlled by immunocompetent people in these regions. This contrasts with the occurrence of multiple diverse Toxoplasma strains in South America where ocular Toxoplasmosis is prevalent. In human umbilical endothelial cells (HUVEC), we have previously shown that Toxoplasma strains actively invade and proliferate within these cells with a proportion of parasites being eliminated in an acidified vacuole after immune stimulation of the cells by interferon gamma (IFNγ). This IFNγ-dependent killing partly relies on recruitment of host effectors to the PV, a process which appears to be initiated by Lys63-linked ubiquitin. Here, we compare the host defence molecules involved in controlling Toxoplasma strains common in Europe and North America with those more virulent strains from South America in retinal pigment epithelial cells (ARPE-19). We determine their significance using a high-throughput automated image-based assay to determine parasite clearance and replication in order to establish a mechanism for parasite killing.
References:	

Abstracts – Posters

Name:	**Jo Cutler[12], Jonas P. Nitschke[34], Claus Lamm[3], Patricia Lockwood[12]**
Affiliation:	[1] School of Psychology, University of Birmingham [2] University of Oxford [3] University of Vienna [4] McGill University
Field of research:	Psychology
Title:	**Age is associated with increased but more biased prosocial behaviour across the globe**
Abstract:	Population ageing is a global phenomenon, with significant implications across society. Prosocial behaviours – actions that benefit others – might change as people age and are acutely critical during the COVID-19 pandemic. We present findings from a global preregistered study (total n = 46,576, 67 countries) testing the link between age and prosocial behaviour. We indexed two prosocial measures: i) physical distancing to protect others and ii) willingness to donate to a national and an international charity responding to the COVID-19 pandemic. Age positively predicted prosociality on both measures, with higher levels of distancing (Fig. 1a) and donations amongst older adults. Results were robust to internal replication and controlling for perceived risk of infection and subjective wealth respectively. Despite larger donations overall, older adults were more biased than younger adults in choosing who to help, donating more to national charities (Fig. 1b) but less to international charities (Fig. 1c). Age was also linked to higher ingroup preference, the tendency to favour one's own group and its characteristics over that of other groups. Levels of trait ingroup preference positively predicted distancing and national giving, but negatively related to international giving. We show that age is robustly associated with willingness to help others across the globe, but that helping becomes more biased towards ingroups, people more similar to ourselves. These findings have important implications for predicting the social and economic impacts of an ageing society, as well increasing compliance with public health measures and encouraging charitable donations in times of global crisis.
References:	

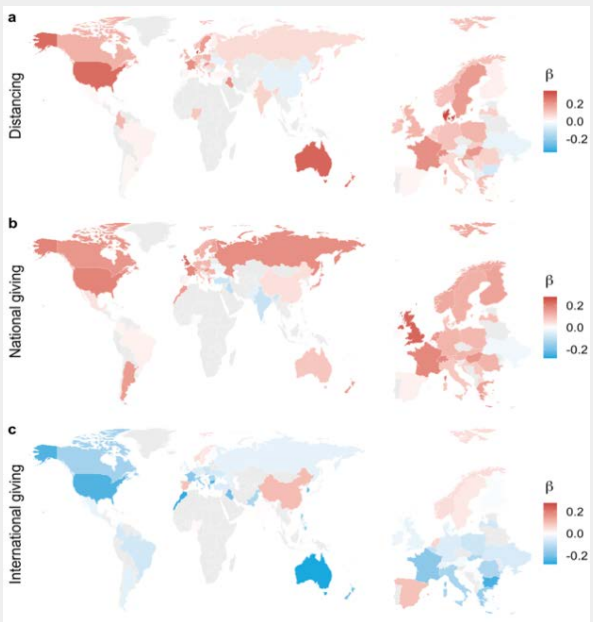
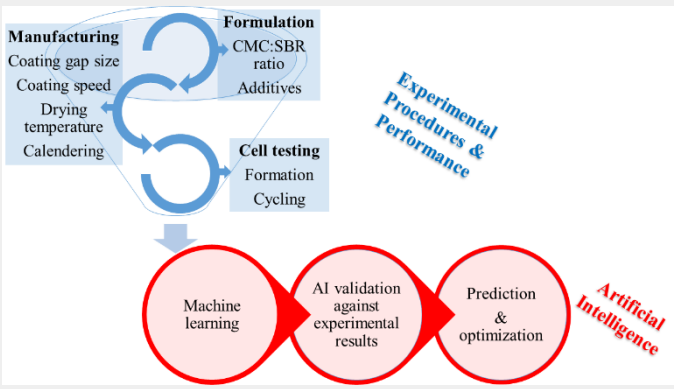


Fig. 1. The effect of age on distancing and donations across the globe. (a) Age positively associated with distancing in most countries **(b)** Older adults donated more to a national charity but **(c)** less to an international charity in most countries. β values are standardised regression coefficients for the effects of age on prosocial behaviour.

Abstracts – Posters

Name:	**Stavros X. Drakopoulos, Emma Kendrick**
Affiliation:	The Energy Materials Group, School of Metallurgy and Materials, University of Birmingham
Field of research:	Li-ion batteries, electrode manufacturing, electrical energy storage
Title:	**Optimization of the manufacturing process of graphite-based Li-ion half cells.**
Abstract:	Understanding the manufacturing parameters that lead to higher energy density, improved rate capability and longevity is critical to designing lower cost graphite electrodes. Thus, the optimization of the manufacturing procedure for Li-ion batteries is a major issue in the scientific and commercial battery world. The key aspects that constitute a good-performing cell are efficiency, high initial capacity, and long-lasting cycle life, using low cost and environmental impact methodologies. For that particular reason, we have developed a high mass loading graphite-based anode electrode employing CMC and SBR as binders, whilst avoiding volatile solvents. Here we present some initial work based around the optimisation of the manufacturing protocols and the relationships of the slurry and ink properties to the final performance parameters of these high energy electrodes. A systematic analysis of 27 different formulation and manufacturing protocols to make high graphite loading electrodes, aimed at maximising the energy density and cycle life is discussed. A data-base with the input and output parameters was populated, and used in training an artificial intelligence model for further understanding of the effect of manufacturing changes upon the final electrochemical properties. Validation of the model was performed upon data not included in the training. This model was used to predict a new formulation and manufacturing process to produce thick graphite-based electrodes
References:	Kendrick, E. (2019). CHAPTER 11. Advancements in Manufacturing. In Future Lithium-ion Batteries (Royal Society of Chemistry), pp. 262–289.



Abstracts – Posters

Name:	**Dr Fazeelat Duran and Professor Jessica Woodhams**
Affiliation:	University of Birmingham
Field of research:	Mental health and well-being/ Applied Psychology
Title:	**Impact of distressing material on intelligence and analytical practitioners working in police and law enforcement organisations A qualitative approach.**
Abstract:	Numerous professionals in analytical and secondary investigative roles are exposed to distressing material on a daily basis with full immersion in the details of sexual violence, torture, murder and arson. Although, these professionals are exposed in greater depth and frequency to violent material than some front-line staff, they are rarely the subject of research. This research explored the impact of traumatic material on the mental health and wellbeing of intelligence and analytical practitioners' in police and law enforcement. Sixteen semi-structured interviews were conducted with these practitioners and the transcribed data were analysed using template analysis. Seven key themes were identified 'Exposure to traumatic material', 'Role attractor', 'Cognitive processing of material', 'Negative influence', 'Risk factors', 'Protecting factors' and 'Support'. The preliminary findings indicated that these professionals' were exposed to a wide range of traumatic material on a day-to-day basis in different forms, such as written reports, images, and videos. However, they were attracted to this role because of its challenging nature and their desire to help people. The mode through which they receive information about trauma and the ways they analyse it differed for these professionals. Those participants whose mode of exposure included both a visual and audio element seemed at greater at-risk of developing strong negative emotions like sadness and anger. The constant exposure to this material negatively influenced their feelings about home and social life. For example, they were more worried about their loved ones as they perceived the environment to be risky and some of these practitioners were vigilant when making new friends. High workload and feeling under-valued, along with the exposure to distressing material was causing psychological distress and sleep problems. Employer support and a number of mitigating factors were used to cope with the impact of this material on their mental health and wellbeing. In summary, our findings provide an in-depth understanding of why and how the work these professionals are engaged in could cause harm to their wellbeing, and that effective strategies/interventions are required to maintain their mental health and wellbeing while in these important roles.
References:	

Abstracts – Posters

Name:	**Hasna Fadhila**
Affiliation:	School of Engineering, University of Birmingham
Field of research:	Applied Computational Fluid Dynamics
Title:	**Numerical Investigation of Flow in Water Desalination Membranes**
Abstract:	Despite progress to ensure access to clean water worldwide, water scarcity still affects a large portion of the world's population. Conventional water sources such as lakes, rivers, and good-quality groundwater are being exhausted to meet these needs, resulting in an increase in the demand for the desalination of saline groundwater and seawater. Reverse Osmosis (RO) is one of the most widely used technologies for water desalination, in which permeable membranes are used to separate polluting particles from the water. However, these particles can develop a buildup on the membranes, i.e. fouling, which causes flow blockages and increases maintenance requirements. Therefore, the aim to develop an efficient RO system relies on an accurate prediction of flow phenomena within these membranes. To achieve this, Computational Fluid Dynamics (CFD) is used to numerically investigate flow in an RO membrane channel, which contains spacers between the membrane sheets. These spacers have been known to affect flow mixing, increase pressure losses, and create areas of limited flow in which fouling is more likely to occur. To fill in a knowledge gap presented by existing literatures, a time-dependent three-dimensional numerical simulation is carried out in a membrane channel containing multiple spacer unit cells. Transient periodic behaviour is observed in the channel which varies depending on location along the channel. This transient behaviour can improve membrane resistance to fouling which introduces the possibility of flow control for fouling avoidance. To investigate the effect on transport of particulates, future work would include an incorporation with a particle model or a mass transfer. This information can be used to develop more accurate prediction models, leading to more efficient water desalination processes in the future.
References:	Kendrick, E. (2019). CHAPTER 11. Advancements in Manufacturing. In Future Lithium-ion Batteries (Royal Society of Chemistry), pp. 262–289.

Abstracts – Posters

Name:	**David A. Leigh[1], Jonathan J. Danon[1], Stephen D. P. Fielden[1,2], Jean-François Lemonnier,[1] George F. S. Whitehead[1] & Steffen L. Woltering[1]**
Affiliation:	[1] Department of Chemistry, University of Manchester [2] School of Chemistry, University of Birmingham
Field of research:	Supramolecular Chemistry
Title:	**Weaving a molecular endless knot**
Abstract:	Knots are fundamental elements of structure, exploited in basic tools and materials from shoelaces to fishing nets and woven fabrics. At the molecular level, knots form spontaneously in flexible polymer chains and are found in DNA and *ca.* 1% of proteins in the protein data bank.[1] Methods to programme the formation of entanglements in synthetic molecular chains are however limited, so the implications of knotting in molecules remain unknown.[2] Here I present the construction of a molecular 'endless' knot via an interwoven grid.[3] This strategy allows access to a knot that cannot be obtained by previous methods. Molecular strands were designed so that bonding to templating metal ions resulted in the formation of a 3×3 interwoven grid (Figure 1). The termini of adjacent strands were then connected to produce the closed knot. Subsequent removal of the templates allowed the endless knot, an important symbol in various cultures and religions, to be isolated. Incorrect strand connections gave simpler analogues of the knot. Comparison of the proton nuclear magnetic resonance (^{1}H NMR) spectra of the analogues showed that reptation (snake like movement of the knotted strand) became slower with increasing degree of strand entanglement. This work details a new method of molecular knot synthesis and gives deeper understanding into their properties. Future work will involve extending the interwoven grid strategy and developing applications of these unique molecular structures.
References:	*1.J. Phys. Condens. Matter* **27**, 354101 (2015). *2.Angew. Chem. Int. Ed.* **56**, 11166–11194 (2017). *3.Nat. Chem.* **13**, 117–122 (2021).

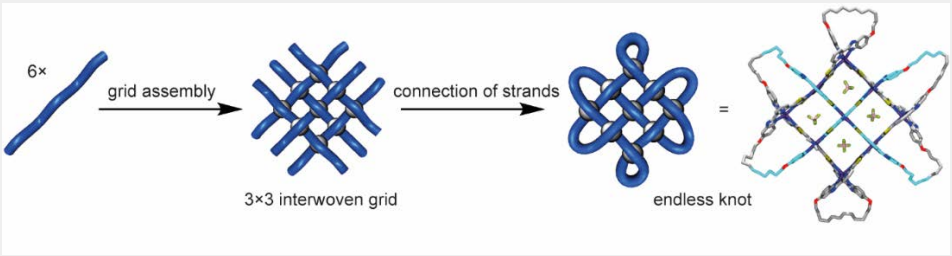
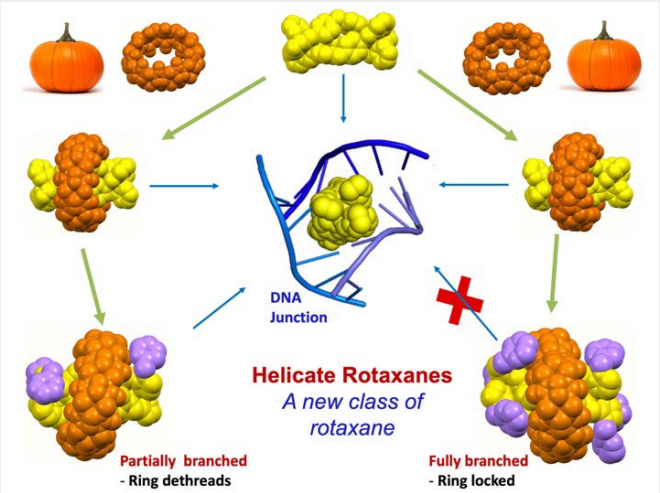


Figure 1. Synthesis of a molecular endless knot via a 3×3 interwoven grid.

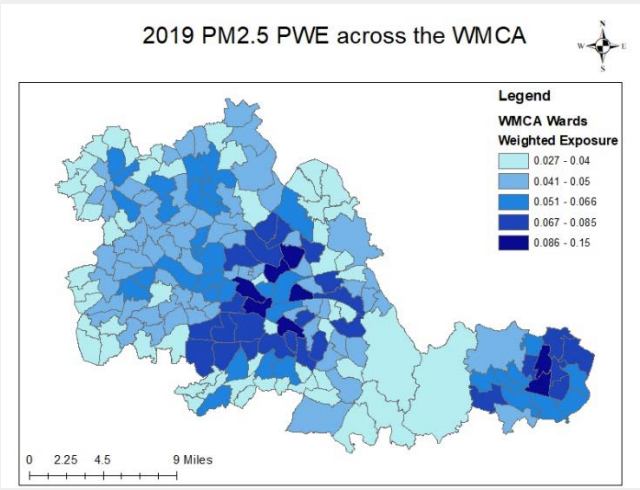
Abstracts – Posters

Name:	**Jennifer Frommer, Jessica Hawkins, Ben Allott, Thomas Wilks, Rachel O'Reilly**
Affiliation:	School of Chemistry, University of Birmingham
Field of research:	Functional DNA, chemically modified DNA
Title:	**The development of covalently bound DNA catalysts**
Abstract:	The best-known function of DNA is as the storage medium for genomic information – the basis of life. However, the development of an in vitro selection method (known as SELEX) made the development of artificial functional RNAs and DNAs possible.[1] Since then, various functional DNAs have been identified, widening the scope of applications for DNA.[2] An important class of functional DNAs are DNAzymes, which are capable of catalysing reactions. The most prominent DNAzyme-catalysed reaction is the cleavage of another nucleic acid substrate. In recent years however, there has been a growing interest in the development of catalytic DNAs promoting reactions of small molecule substrates, which is more useful for applications including pharmaceutical synthesis.[3] This has been achieved by using ligand-modified DNA to form DNA-metal complexes, in which the catalyst is bound non-covalently. Our work is focused on the development of catalysts covalently bound to DNA, which are more similar to the reactive groups that endow proteins with their biological activity.[4] These catalysts do not rely on the presence of a heavy metal ion and could therefore be used as biosensors in in vitro and in vivo methods.
References:	[1] a) A. D. Ellington and J. W. Szostak, *Nature*, **1990**, 346, 818–822; b) C. Tuerk and L. Gold, *Science*, **1990**, 249, 505–510. [2] R. Micura and C. Höbartner, *Chem. Soc. Rev.*, **2020**, 49, 7331-7353. [3] P. M. Punt et al., *J. Am. Chem. Soc.*, **2021**, 143, 3555−3561. [4] D.L. Nelson and M. M. Cox (**2000**) Lehninger, Principles of Biochemistry, 3rd edition, Worth Publishers, New York

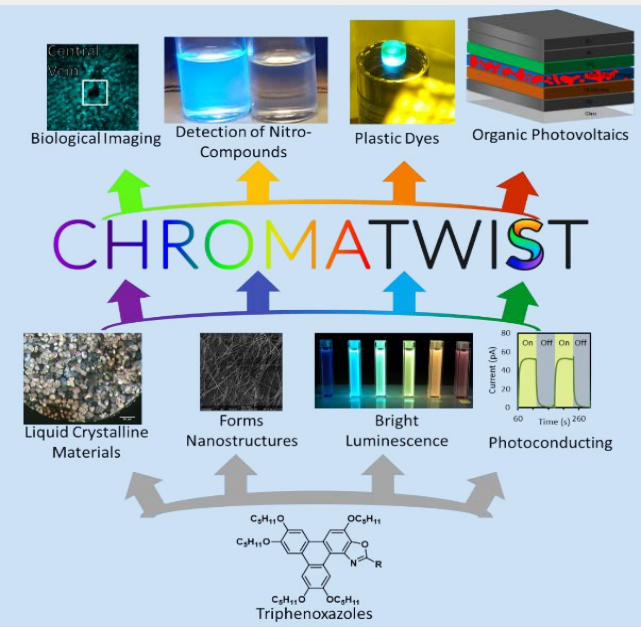
Abstracts – Posters

Name:	**Aditya Garai**
Affiliation:	School of Chemistry, University of Birmingham
Field of research:	Bioinorganic Chemistry
Title:	**Switching DNA Junction Binding ability of metallosupramolecular Nano-cylinder Helicates by rotaxination**
Abstract:	A new class of rotaxane that is created by our research group at the University of Birmingham, UK. this is the first report of this kind of rotaxane. The principle involves inserting a three-dimensional, cylindrical, nanosized, self-assembled supramolecular helicate into a large cucurbit[10]uril macrocycle as the axle.1 The resulting pseudo-rotaxane is readily converted into a proper interlocked rotaxane by adding branch points to the helicate strands that form the surface of the cylinder (like branches and roots on a tree trunk). The supramolecular cylinder that forms the axle is itself a member of a unique and remarkable class of helicate metallo-drugs that bind Y-shaped DNA junction structures and induce cell death.2While pseudo-rotaxanation i.e., the capped cylinder without CB10 does not modify the DNAbinding properties, proper, mechanically interlocked rotaxanation transforms the DNA-binding and biological activity of the cylinder. The interesting observation is the ability of the cylinder to de-thread from the rotaxane (and thus to bind DNA junction structures) is controlled by the extent of branching: fully-branched cylinders are locked inside the cucurbit[10]uril macrocycle, while cylinders with incomplete branch points can de-thread from the rotaxane in response to competitor and being available for binding to the Y shaped junction binding. The number of branch points can thus afford kinetic control over the drug de-threading and release. 
References:	1. Catherine A. J. Hooper, Lucia Cardo, James S. Craig, Lazaros Melidis, **Aditya Garai**, Ross Egan, Viktoriia Sadovnikova, Florian Burkert, Louise Male, Nikolas J. Hodges, Douglas F. Browning, Roselyne Rosas, Fengbo Liu, Fillipe V. Rocha, Mauro A. Lima, David Bardelang, Simin Liu and Michael J. Hannon " Rotaxanating Metallosupramolecular Nano-cylinder Helicates to Switch DNA Junction Binding " *J. Am. Chem. Soc*. **2020**, *142*, 20651-20660. 2. Lucia Cardo, Michael J. Hannon "Non-covalent metallo-drugs: using shape to target DNA and RNA junctions and other nucleic acid structures" 5 Feb 2018, *Metallo-drugs: Development and Action of Anticancer Agents*. Walter de Gruyter GmbH & Co. KG, p. 303-324 22 p.(Metal Ions in Life Sciences; vol. 18).

Abstracts – Posters

Name:	**James R. Hodgson[1], James Hall[2], Suzanne Bartington[2] and William J. Bloss[1]**
Affiliation:	[1] School of Geography, Earth and Environmental Sciences, University of Birmingham [2] Institute of Applied Health Research, University of Birmingham
Field of research:	Clean Air and Air Pollution
Title:	**Metrics for assessing fine particulate matter concentrations, health impacts and progress measures in the West Midlands**
Abstract:	Air pollution has been recognised as the largest environmental risk to public health in the UK, resulting in approximately 40,000 premature deaths or up to six months average reduction in life expectancy1. One of the key pollutants for which health based guidance concentrations are set is particulate matter (particle diameters <2.5µm and <10µm corresponding to PM2.5 and PM10 respectively. Short and long-term exposure to air pollution is strongly linked to several detrimental health outcomes; including increased risk of cardiovascular and respiratory disease, poor cognitive development and the emerging evidence regarding onset of dementia and related diseases1. Those most at risk are children, pregnant women the elderly (>65 years), and those with pre-existing cardiovascular and/or respiratory illnesses1. Analysis of Defra air quality maps across the West Midlands region for 2019 show that 41% of the population live under PM2.5 levels above World Health Organisation limits and contributes to 1,400 premature deaths annually. This is coupled with an economic cost in excess of £575 million per year. An air quality metric, 'population weighted exposure' has also been calculated alongside deprivation data to determine the impact of pollution on wards across the West Midlands. In addition, three air pollution reduction scenarios are examined to determine the extent to which improvements in air quality may occur and who would benefit. Results suggest that the most deprived locations within the region currently suffer from the highest pollution levels and these areas would see the greatest improvements in air quality under all scenarios. 
References:	[1]Royal College of Physicians (2016) Every breath we take, The lifelong impact of air pollution, https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution

Abstracts – Posters

Name:	**Owen Jones, Gregory O'Callaghan, Michael Butlin, Dennis Zhao, Karolis Virzbickas, Alex P. G. Robinson, Jon A. Preece**
Affiliation:	School of Chemistry, School of Chemical Engineering, University of Birmingham
Field of research:	Chemistry
Title:	**Triphenoxazoles: From Properties to Products**
Abstract:	Luminescent dyes are divided into two subgroups: phosphorescent dyes (usually metal containing) and fluorescent dyes (usually non-metal containing), both with their own advantages and disadvantages. The luminescent triphenylene derivates covered in this poster improve upon traditional limitations of fluorescent dyes, enabling their use in multiple applications. Triphenoxazoles are comprised of an aromatic triphenylene core surrounded by flexible chains facilitating the packing of molecules into columnar stacks which form hexagonal supramolecular structures, a columnar hexagonal liquid crystalline phase. In addition, the donor (triphenylene core) – acceptor (R group) structure of triphenoxazoles enable impressive luminesce properties, including high brightness and emission across the entire visible spectrum following UV excitation. The emissive properties of triphenoxazoles are tuneable by modifications to the molecular structure, meaning the emission colour can be targeted prior to synthesis (a property not commonly seen for any fluorophore). Furthermore, triphenoxazoles have been observed to be photoconductive and generate a current when illuminated with UV light. This combination of properties has led to the filing of five patents[1] and the subsequent creation of a spinout company, ChromaTwist Ltd, which is currently looking to bring these materials to the flow cytometry and bio-imaging reagents markets. 
References:	1. WO2019180444 (A1), **2019**, WO2019180445 (A1), **2019**, P287461WO, **2021**, P287054WO , **2021**, P287055WO , **2021**

Abstracts – Posters

Name:	**Venelin Kovatchev[1], Phil Smith[2], Mark Lee[2], and Rory Devine[1]**
Affiliation:	[1]School of Psychology, University of Birmingham [2]School of Computer Science, University of Birmingham
Field of research:	Natural Language Processing; Developmental Psychology
Title:	**Training Machine Learning Algorithms to Score Children's Mindreading Ability**
Abstract:	In our research we create machine learning systems that can automatically score children's ability to understand others' thoughts, feelings, and desires (also known as "mindreading" or "theory of mind"). We implement state-of-the-art technologies from Natural Language Processing, such as Transformer neural networks and Data Augmentation techniques. We collaborate closely with researchers from computer science and psychology to obtain the necessary data, design and train the machine learning systems, and ensure the quality of the performance. Our automatic solution performs very well in terms of automatic statistical evaluation measures. We further validate the quality of the scoring with experts in developmental psychology and by directly incorporating the machine learning in a psychological research on mindreading. The results indicate that the best system, a Transformer neural network, performs on par with human raters. Our work facilitates the large-scale research on mindreading in childhood and early adolescence. The automatic solution reduces the time and cost of scoring. It also improves the consistency and reliability. This is also the first work that uses Natural Language Processing in the context of mindreading. It opens many possibilities for further collaboration between computer scientists and researchers in developmental psychology.
References:	Kovatchev, V., Smith, P., Lee, M, and Devine, R., "Can Vectors Read Minds Better Than Experts? Comparing Data Augmentation Strategies for the Automated Scoring of Children's Mindreading Ability" at Proceedings of the Joint Conference of the 59th Annual Meeting of the Association for Computational Linguistics and the 11th International Joint Conference on Natural Language Processing (ACL-IJCNLP), 2021 Kovatchev, V., Smith, P., Lee, M, Grumley Traynor, I., Luque Aguilera, I., and Devine, R., "What is on your mind?" Automated Scoring of Mindreading in Childhood and Early Adolescence at Proceedings of the 28th International Conference on Computational Linguistics (COLING), 2020

Abstracts – Posters

Name:	**Pooja Kumari[1], Claire Doswell[1], Jarrod Williams[2], Matthias Ehrhardt[2], Melanie M. Britton[1]**
Affiliation:	[1]School of Chemistry, University of Birmingham, Birmingham, UK [2]Department of Mathematical Sciences, University of Bath, Bath, UK
Field of research:	Magnetic Resonance Imaging of Batteries
Title:	**NMR spectroscopy & MR imaging of Li-ion batteries**
Abstract:	This research is part of the Faraday Institution project on quantitative imaging of multi-scale dynamic phenomena at electrochemical interfaces. This is part of a consortium of other researchers developing a framework to enable thorough understanding of battery function across multiple length scales using the synergy of many available techniques. Microscopic structural features and chemical variabilities in the electrode materials can be captured by scanning electron microscopies (SEMs), such as plasma focused ion beam SEM and scanning transmission electron microscopy (STEM). Electrode-electrolyte interfacial activity and topography at the nanoscale can be provided by electrochemical imaging and dynamic electrochemical impedance spectroscopy (DEIS). Further insight into molecular processes can be acquired using Raman spectroscopy and nuclear magnetic resonance (NMR) spectroscopy. Additionally, macroscopic behaviors across the electrode and electrolyte can be captured using magnetic resonance techniques such as NMR and magnetic resonance imaging (MRI).[1, 2] MRI is able to probe the electroactive species and dendrite growth directly through ^{7}Li MRI and indirectly through higher resolution ^{1}H MRI using the signal from the carbonate electrolyte[3] , whilst NMR provides information on the speciation of the charge carrier. MRI is able to probe both metallic and electrolytic Li including the desolvation mechanism during the initial stage of SEI formation. When these multi-model imaging techniques are combined with well-established mathematical modeling techniques, it offers increased resolution and higher sensitivity with shorter image acquisition time. Herein, we have been using ^{7}Li NMR and MRI and ^{1}H MRI to acquire time-resolved information about the electroactive species within the battery. In order to conduct these experiments, we use a non-magnetic plastic Swagelok cell that enables the radio frequency (RF) radiation to penetrate the cell. This ensures airtightness and that the cell is comparable to other techniques. The chemical shift of the ^{7}Li NMR signal reveals the different chemical species within the cell in addition to quantitative information about Li microstructure formation. Furthermore, we have been using ^{7}Li MRI in combination with ^{1}H MRI of the electrolyte to explore the dendrites and SEI formation at the electrode-electrolyte interface. Additionally, we are investigating machine learning methods to improve the signal-to-noise ratio of the ^{7}Li MR images and reduce the acquisition time by using higher resolution ^{1}H MR images from the same sample.
References:	1. M. M. Britton, Chemphyschem, 2014, 15, 1731 – 1736. 2. M. M. Britton et al., J Phys Chem Lett, 2013, 4, 3019-3023. 3. J. M. Bray et al., Nat Commun., 2020, 11, 2083.

Abstracts – Posters

Name:	**Péter Kutas**
Affiliation:	School of Computer Science, University of Birmingham
Field of research:	Cryptography
Title:	**Post-quantum cryptography: the vaccine of internet security**
Abstract:	Internet security is based on the hardness of factoring large numbers and other classical number theoretical problems. Even though this does not propose an immediate threat, once one has access to large-scale quantum computers, all currently deployed protocols will become vulnerable. Experts say that in 10 to 20 years the possibility of a usable quantum computer is very real. In order to avoid the sudden collapse of the entire internet we must prepare early. We need to transition to cryptographic solutions which remain secure in the post-quantum world. There are several different types of candidates for quantum-resistant cryptography. My research area is isogeny-based cryptography, which is a descendant of elliptic curve cryptography (ECC). Classical ECC is insecure in the quantum world because we know how to compute any discrete logarithms with a powerful enough quantum computer. Isogeny-based cryptography is still secure as it relies on computing maps between elliptic curves, which is still hard for a quantum computer to solve. The most prominent candidate in this area is SIKE (Supersingular Isogeny Key Exchange) which is a Round 3 alternate candidate in NIST's (National Institute for Standadization and Technology) post-quantum cryptography competition. My research focuses on the security of SIKE and related constructions. In particular recently we showed the following results: • An improved classical attack exploiting torsion-point information • A hidden shift quantum attack on an overstretched version of SIKE, which is possible by a new computable group action which was previously thought to be impossible • Discovering the potential for backdoor curves which make improved attacks possible and are potentially indistinguishable from random curves Even though none of these results break SIKE, we have obtained a much clearer picture of its security which is important before standardization.
References:	

Abstracts – Posters

Name:	**Samuel Lara-Reyna, Barbara Clough, Daniel Fisch, Robert J. Evans, Imtiaz Solim, William Channell, Eva-Maria Frickel[1]**
Affiliation:	[1] Institute of Microbiology and Infection, School of Biosciences, University of Birmingham
Field of research:	Immunology
Title:	**The metabolic world of macrophages and the role of Guanylate-binding proteins in glycolysis**
Abstract:	Macrophages are important innate immune cells that are involved in the clearance of microorganisms, antigen presentation and production of inflammatory cytokines. Macrophages can be polarized into a pro-inflammatory (M1), or anti-inflammatory (M2) subtype. M1 macrophages are associated with an increase in glycolytic activity, due to the disruption of the Krebs cycle. Guanylate-binding proteins (GBPs) are highly transcriptionally induced by infection and inflammation through the action of interferons and bacterial components. GBPs are intracellular host defence molecules driving direct control of microorganism. GBPs assemble cellular signalling cascades leading to host cell death as a means of controlling pathogen infection. Thus, we hypothesised that GBPs not only mediate direct anti-pathogen functions but might be important regulators of macrophage metabolism. We investigated the capacity of expression of GBP1-5 to impact macrophage metabolism by downregulating these GBPs (Fig. 1A) and measuring mitochondrial and glycolytic potential using a seahorse analyser (Fig1. B-F). Our metabolic analyses indicate that GBPs, specially GBP2, 3 and 5, have a significant role in the regulation of glycolysis, but not mitochondrial metabolism (Fig. 1B-F). Basal, compensatory and induced glycolysis were significantly downregulated by siGBPs 2, 3 and 5 (Fig. 1B-F). These findings might have an important impact in the clearance of several microorganisms and the production of cytokines in macrophages, as these phagocytic cells show high glycolytic levels upon infection. Macrophages are important protectors of the human body; therefore, it is essential to define the molecular pathways that regulate immune homeostasis in these cells.
References:	

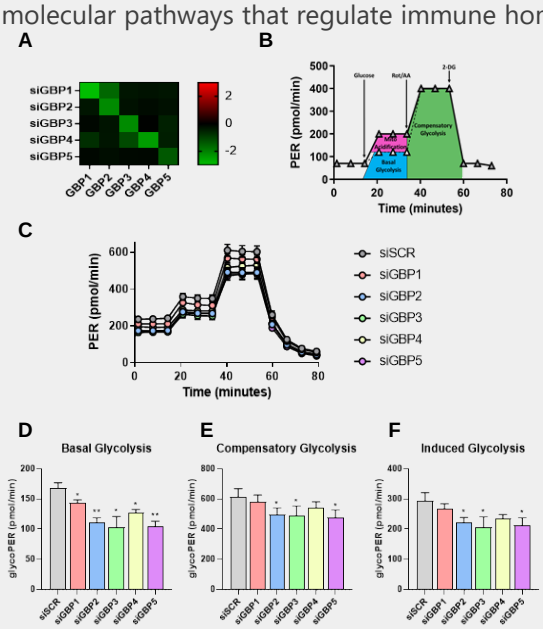


Figure 1. Overview of glycolysis in THP-1 monocyte-derived-macrophages pre-treated with siRNAs for GBPs.
A) mRNA relative expression (HPRT) of the transcripts shown. All values are compared to siSCR and transformed to LOG2FC ±SEM(n=4).
B-F) Macrophages were stimulated with IFNg/LPS for 24 hours and ECAR and OCR were measured after stimulation of cells as shown in panel B (n=5). All data are presented as mean ± SEM. PER (Proton Efflux Rate) Statistical comparisons were performed by two-way ANOVA followed by Dunnett's multiple comparison test, *p< 0.05,**p<0.01.

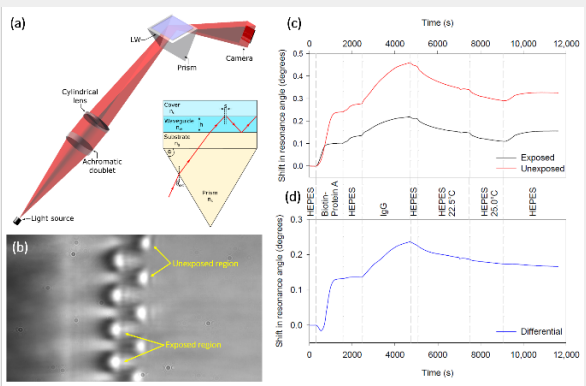
Abstracts – Posters

Name:	**Samuel Lellouch, Rustin Nourshargh, Mehdi Langlois, Sam Hedges, Kai Bongs, Michael Holynski**
Affiliation:	School of Physics and Astronomy, University of Birmingham
Field of research:	Quantum technologies
Title:	**Circulating pulse cavity enhancement as a method for extreme momentum transfer atom interferometry**
Abstract:	Large scale atom interferometers promise unrivaled strain sensitivity to midband gravitational waves, and will probe a new parameter space in the search for ultra-light scalar dark matter. These atom interferometers require a momentum separation above 10^4 hbar k between interferometer arms in order to reach the target sensitivity. Prohibitively high optical intensity and wavefront atness requirements have thus far limited the maximum achievable momentum splitting. We propose here a scheme for optical cavity enhanced atom interferometry, using circulating, spatially resolved pulses, and intracavity frequency modulation to overcome these limitations and reach 10^4 hbar k momentum separation. We present parameters suitable for the experimental realization of 10^4 hbar k splitting in a 1 km interferometer using the 698 nm clock transition in 87Sr and describe performance enhancements. Although technically challenging to implement, the laser and cloud requirements are within the reach of upcoming cold-atom based interferometers. Our scheme satisfies the most challenging requirements of these sensors and paves the way for the next generation of high sensitivity, large momentum transfer atom interferometers.
References:	

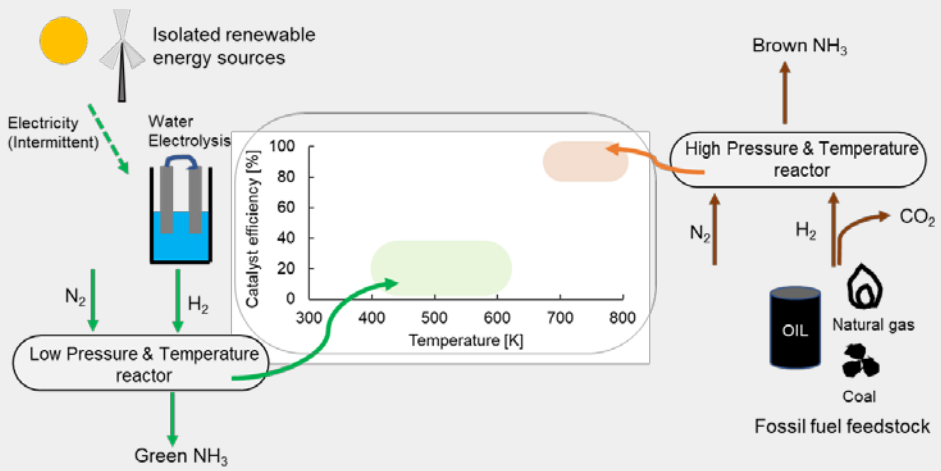
Abstracts – Posters

Name:	**Jaimie Miller-Friedmann**
Affiliation:	School of Physics and Astronomy, University of Birmingham
Field of research:	Physics Education and Gender Studies
Title:	**Centering Women of Colour in Physics: Which UK physics and astronomy departments are most effective in recruiting and graduating BAME women?**
Abstract:	Centering Women of Colour in Physics is an international, co-funded NSF (US)-ESRC (UK) research project to identify the university physics and astronomy departments that are most effective in recruiting, retaining, and graduating women and women of colour. For the UK data we have combined HESA and NSS data using data science methodology to render an 'effectiveness score' to quantitatively classify and sort all UK physics and astronomy departments into a tripartite distribution of efficacy and best practice. Factors include proportions of BAME students attending that university, proportions of female BAME faculty teaching in the department, and overall student satisfaction with their course, among others. Preliminary findings show that new universities tend to be better at recruiting and graduating BAME women, whilst old universities (ancient, Russell Group, etc.) tend to excel at recruiting and graduating women of all races and ethnicities. Future research will involve qualitative investigation into specific current practices in top ten departments, thus providing an opportunity for all physics and astronomy departments in the UK to implement programmes that will most effectively widen participation.
References:	

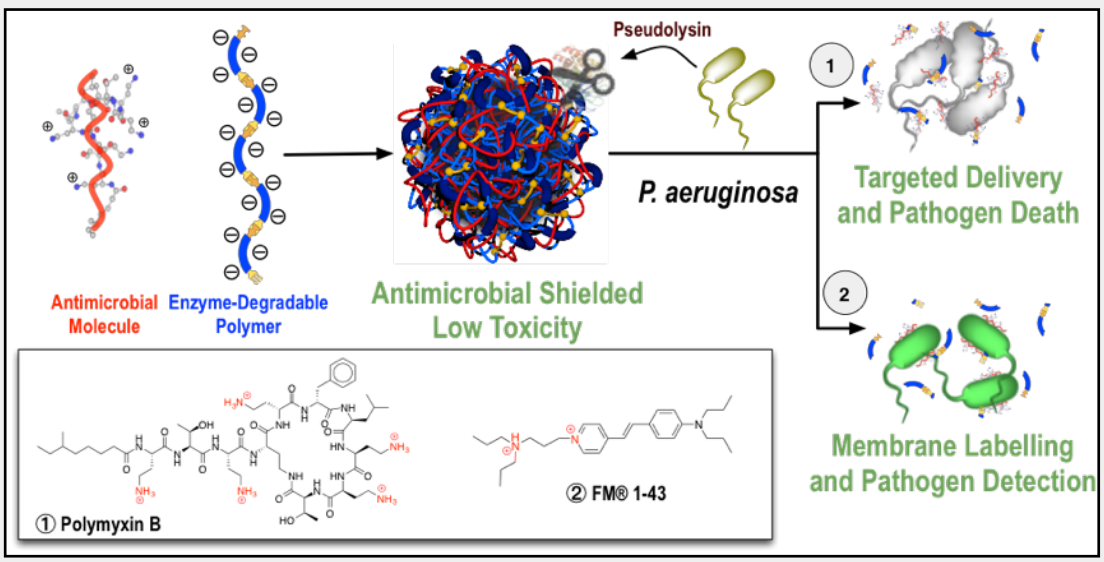
Abstracts – Posters

Name:	**Anil Kumar Pal[1], Hazel J. Dixon[1], Nicolas J. Goddard[2], Ruchi Gupta[1,*]**
Affiliation:	[1] School of Chemistry, University of Birmingham [2] Process Instruments UK Ltd
Field of research:	Optical Biosensor
Title:	**Photofunctionalised hydrogels based self-referenced optical leaky waveguide biosensor**
Abstract:	Leaky waveguides (LWs) are a type of refractive index based label-free optical biosensors that have gained considerable interest to deliver high sensitivity (Figure 1(a)) [1]. However, minimizing common-mode effects such as variations in temperature, wavelength of light sources, and sample composition is a concern of great importance for practical applications [2]. We report a novel self-referenced diffraction-based leaky waveguide biosensor comprising arrays of interspersed sensor and reference regions in a thin (~2µm) chitosan film. The sensor and reference regions were created by the attachment of streptavidin to the chitosan film via a photocleavable biotin linker and selectively removing the streptavidin by shining the film at 365 nm through a photomask having alternative strips of opaque and transparent regions with ~1 mm width (Figure 1 (b)) [3]. The differential sensing was carried out for two analytes (protein A-biotin and IgG) while reducing the environmental and non-specific effects such as changes in temperature, and sample composition caused by non-absorbing and absorbing species up to ~98%, ~99%, and ~97% respectively, compared to the absolute measurements (Figure 1 (c and d)). Self-referencing is necessary to realize the full potential of label-free optical biosensors for measuring analyte concentrations in real samples which are complex mixtures, and to enable analysis of samples outside of laboratories where temperature drifts and fluctuations occur.  Figure 1. (a) Schematic of the LW instrumentation and a ray diagram showing partial confinement of light in LWs, (b) output of a diffraction-based LW after selectively removal of streptavidin by exposure to 365 nm for 8 min, (c) absolute and (d) differential shifts in the resonance angles of the self-referenced LW during binding of analytes (biotin-protein A and IgG) and temperature changes during HEPES washing. Acknowledgments The authors are grateful to the Engineering and Physical Sciences (EPSRC) for funding (Grant numbers: EP/N02074X/1 and EP/N02074X/2).
References:	1.Alamrani, N.A.; Greenway, G.M.; Pamme, N.; Goddard, N.J.; Gupta, R. Analyst **2019**, 144, 6048. 2.Yu, F.; Knoll, W Anal. Chem. **2004**, 76, 1971. 3.Pal, A.K.; Goddard, N.J.; Dixon, H.J.; Rupta, R. Biosensors **2020**, 10(10), 134

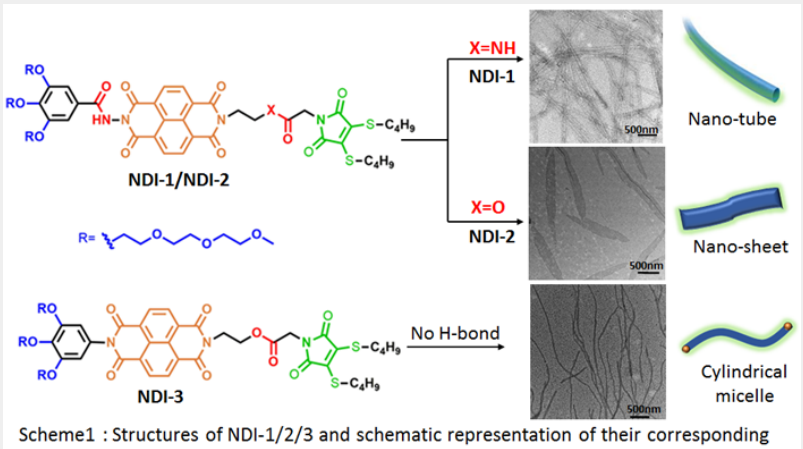
Abstracts – Posters

Name:	**Manoj Ravi, Joshua W. Makepeace**
Affiliation:	School of Chemistry, University of Birmingham
Field of research:	Heterogeneous Catalysis / Energy Storage / Green Ammonia
Title:	**Sustainable carbon-free ammonia synthesis – can heterogeneous catalysts drive the transformation?**
Abstract:	From playing a pivotal role in feeding the world population since the turn of the 20th century to burgeoning interests in its use as a carbon-free fuel and an energy store, ammonia's contribution in supporting human life continues to be immense. The current technology for ammonia manufacture – the Haber-Bosch process – employs a metal catalyst under high temperatures and pressures to produce ammonia from nitrogen and hydrogen, with the latter being synthesized from a fossil fuel-feedstock (Figure). Consequently, ammonia production is responsible for over 1% of global CO2 emissions. The urgent decarbonisation of ammonia production requires a transition to hydrogen produced from renewable electricity (water electrolysis). This technology is better suited to smaller-scale ammonia production, which in turn demands a catalyst which works under milder conditions. However, conventional catalysts are not effective at low temperatures and pressures (Figure), motivating the quest for materials that unlock greater performance under these conditions.  Figure: Ammonia synthesis routes and differences in catalyst efficiency. Designing next-generation ammonia synthesis processes requires an understanding of the design principles for high-performing catalysts. We present a perspective on the diverse approaches to catalyst design that have enabled considerable improvements in reaction rate under mild conditions. By collating data for a range of different catalysts, we identify the common attributes of the best-performing materials and outline guiding principles for future development. Building on this analysis, we benchmark state-of-the-art catalyst performance against industrial viability criteria and derive key performance metrics for next-generation catalysts to realize economically viable green ammonia production.
References:	C. Smith, A. K. Hill and L. Torrente-Murciano, Energy & Environmental Science, 2020, 13, 331-344; J.-P. Lange, Catalysis science & technology, 2016, 6, 4759-4767

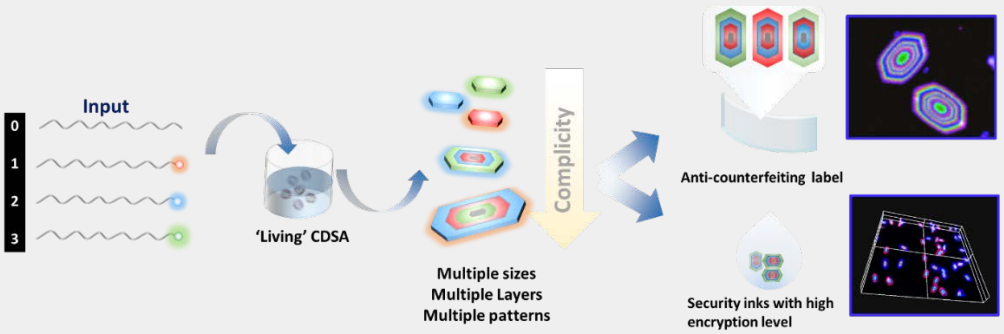
Abstracts – Posters

Name:	**Sameh El Sayed, Francisco Fernandez-Trillo**
Affiliation:	School of chemistry, University of Birmingham, B15 2TT Birmingham, UK
Field of research:	Nanomaterials, Antimicrobial drug delivery
Title:	**Enzyme-Degradable Polyion-Complex (PIC) Particles for the delivery of antimicrobial peptide polymyxin B**
Abstract:	PIC particles are stabilised by these electrostatic interactions between its components, and thus are especially suited for the delivery of charged (bio)molecules (e.g. nucleic acids and proteins), which are prevalent in nature. This way, delivery vehicles can be formulated without the need to introduce chemical modifications to these (bio)molecules and as a result the biological activity of these molecules should be maintained upon release. Here, we describe novel polyion complex (PIC) particles for the delivery of Polymyxin B (Pol-B), an antimicrobial peptide currently used in the clinic as a last resort antibiotic against multidrug-resistant gram-negative bacteria. Towards this end, we have prepared polymer containing peptide sequence (-Glu-Gly-Leu-Ala-) this sequence is selectively degraded by *pseudolysin*, an elastase produced by opportunistic pathogen *Pseudomonas aeruginosa*.[1] A range of conditions for the controlled assembly of Pol-B with polymer containing peptides has been identified which let us prepare stable colloidal PIC particles containing different Pol-B:Polymer ratios. Their stability under simulated physiological conditions (i.e. pH, osmotic pressure and temperature) characterised. Furthermore, preliminary evaluation of the antimicrobial activity of these Pol-B containing PIC particles has been performed, by monitoring their effect on the growth of *Pseudomonas aeruginosa*, an opportunistic gram-negative bacterium. 
References:	Insua, I., Wilkinson, A. & Fernandez-Trillo, F. Polyion complex (PIC) particles: Preparation and biomedical applications. Eur. Polym. J. 81, 198–215 (2016)

Abstracts – Posters

Name:	**Amrita Sikder, Yujie Xie, Marjolaine Thomas and Rachel K. O'Reilly***
Affiliation:	School of Chemistry, University of Birmingham
Field of research:	Supramolecular Polymer and soft materials
Title:	**Impact of H-bonding on Tailoring Tunable Morphology of Supramolecular Luminescent Polymers**
Abstract:	Self-assembly is one of the most fundamental characteristics of life. Nature uses self-assembly to build supramolecular materials that possesses fascinating properties (self-healing, adaptive, reconfigurable and responsive) which are fundamental for many complex biological functions. Understanding the self-assembly processes of biological systems facilitates the fabrication of novel supramolecular materials and vice versa.1 Although significant work has been done in the field of supramolecular self-assembly to develop innovative materials, still it remains a challenging task to precisely control the morphology of a particular self-assembled system and mostly depends on trial-and-error method. Scientists have long endeavoured to develop alluring nanostructures by introducing various noncovalent forces to the constituting building blocks of the amphiphile. Hydrogen-bonding is one of the important noncovalent interaction that can be utilized to generate elegant nanostructure2 by imparting directionality in the self-assembled systems and DNA double helix, folding of proteins are to name a few that exist in nature. Therefore, exploration of H-bonding mediated self-assembly is of fundamental interest. Here we have demonstrated the impact of H-bonding on supramolecular assembly of structurally near identical π-amphiphiles (Scheme 1) by systematically varying the number of H-bonding units. NDI-1 with two H-bonding units formed nanotubes in aqueous medium. Interestingly, when the amide bond was replaced by an ester group, the amphiphile NDI-2 revealed nano-ribbon morphology. Whereas, NDI-3 lacking any H-bonding functionality formed cylindrical micelles. Spectroscopic measurements revealed that H-bonding plays a crucial role in molecular packing which was reflected in the fluorescence properties of the self-assembled systems as well. Highlights of these results will be described in the presentation.  Scheme1 : Structures of NDI-1/2/3 and schematic representation of their corresponding Nanostructures formed by aqueous self-assembly.
References:	1. S. Zhang; Nat. Biotechnol. 2003, 21, 1171-1178. 2. A. Sikder, S. Ghosh; Mater. Chem. Front., 2019, 3, 2602-2616.

Abstracts – Posters

Name:	**Yujie Xie, Rachel O'Reilly**
Affiliation:	School of Chemistry, University of Birmingham
Field of research:	Polymer materials, fluorescent materials
Title:	**Living Crystallization-Driven Self-assembly (living-CDSA) Based Soft Microbarcodes for Information Storage and Anti-counterfeiting**
Abstract:	With increasing attention directed to exploring microscale events, more effective tools are needed to fully understand processes at the micro-level. Micro-barcoding is a versatile technique that provides multiplex and high-throughput information storage for micro.[1] Particularly, optical multiplexing or fluorescent barcoding has recently attracted increasing interest, largely owing to its high sensitivity, fast signalling, and minimally invasive non-destructive nature.[2-4] Therefore, the design of new matrix for precisely write and read the fluorescent based information at micro and nano scale level is of great potential in the area of fields of biological, medicinal, and material sciences. Living crystallization-driven self-assembly (living-CDSA) is a novel approach for generating the controllable polymer assembles with programable size and surface chemistry. In this study, a serial of fluorescent coded 2D CDSA platelets were designed with the different layered fluorescent information input at nano to micro scale. The special localization of the different fluorescent information on layered 2D structure can be simply manipulated by adding the different homopolymers during the self-assemble process, which allowed the fast and programmable encoding and further applied as the anti-counterfeiting label. 
References:	1. Y. Xie, M. C. Arno, J. T. Husband, M. Torrent-Sucarrat & R. K. O'Reilly, Manipulating the fluorescence lifetime at the sub-cellular scale via photo-switchable barcoding. Nat. Commun., 11, 2460-2468 (2020) 2. Jin, D., Xi, P., Wang, B., Zhang, L., Enderlein, J. van Oijen, A. M. Nanoparticles for super-resolution microscopy and single-molecule tracking. Nat. Methods 15, 415-423 (2018). 3. Shikha, S., Salafi, T., Cheng, J. & Zhang, Y. Versatile design and synthesis of nano-barcodes. Chem. Soc. Rev. 46, 7054-7093 (2017). 4. Yang, M., Liu, Y. & Jiang, X. Barcoded point-of-care bioassays. Chem. Soc. Rev. 48, 850-884 (2019).

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