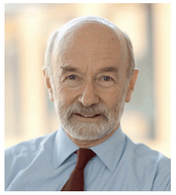
CSAR

Cambridge Society for the Application of Research

AWARDS RECEPTION 2019

9 APRIL | OLD SCHOOLS | CAMBRIDGE

Welcome



Welcome to the 2019 CSAR PhD student awards reception.
Our aim is to recognise excellence in research and particularly in its application. This year we received a record number of over 200 applications. We have been delighted to recognise outstanding examples from across the University with many Departments represented. We hope that the awards will enable the winners to extend their research and their horizons.

CSAR recently celebrated its 50th birthday and our aim of encouraging the application of research remains as relevant as ever. Over the coming year we plan to extend our activities beyond the very successful awards scheme and lecture series to bring together younger researchers and young professionals from local industry and commerce. We would be very pleased to hear from people who would like to help us in that endeavour and particularly from local companies who would like to be more involved in linking their young professionals with the Cambridge research community.

The work of CSAR is entirely supported by its members and donors. We are grateful for their continuing support and on this occasion for the very generous private donations that fund the awards. For this evening's reception we are particularly grateful for the support from TTP - itself a leading example of how research can be applied to the creation of novel, world leading products and systems.

Do please take the opportunity to mingle with guests from across the Cambridge community. We look forward to seeing you at CSAR events through the year.

Professor Sir Mike Gregory

President, CSAR
On behalf of The Council

CSAR was founded in 1964 by the then Master of Churchill College – Sir John Cockroft. The aim was to build bridges between the University and Industry to encourage the more active exploitation of emerging ideas. The Society has evolved over the years and extended its remit to what might today be called the public engagement with science and the encouragement of young researchers in addition to a regular and well-attended programme of distinguished lectures and visits which are open to the public.

The lecture programme seeks to introduce the latest scientific and technological ideas to a wider public through leading figures in their field. The Society is fortunate in being able to attract many world leading figures including, in recent years Dr. Hannah Fry (Associate Professor in the mathematics of cities at University College London) Professor Ed Bullmore (Department of Psychiatry, University of Cambridge) Professor Aoife McLysaght (Smurfit Institute of Genetics, Trinity College, University of Dublin).

A student award competition was launched in 2013 and has become a major part of our activities. Over 150 applications are typically received from young researchers able to demonstrate both the excellence of their research and the opportunities for its application. Up to ten awards are made and this year the achievements are being recognized through a reception in the University Combination Room.

CSAR is run by volunteers. Membership subscriptions and on-the-door payments allow us to run our lecture series. Donations and grants to the charity allow us to subsidise attendance by students, school students and teachers. The CSAR Student Awards are funded solely from donations.

"Superb - a very complex subject made intelligible to the lay person. The speaker's in-depth knowledge was as clear as her presentation"

"This was an important subject delivered by a leading expert with surprising things to say. Thoroughly enjoyable."

UPCOMING CSAR LECTURES

Dr. Giles Yeo, Addenbrooke's Hospital, University of Cambridge "Gene eating"

Professor Tamsin Mather, Department of Earth Sciences, University of Oxford "Volcano watching: weapons of ash eruption."

Professor Danielle George, School of Electrical and Electronic Engineering, University of Manchester "Innovative engineering: From the Antikythera Mechanism to the Square Kilometer Array."

ABOUT THE COMPETITION

Last year Vice Chancellor Professor Stephen Toope, met with the 2018 CSAR PhD Student Award winners in his office together with several CSAR Council members.

The PhD Student Awards of £1000 are intended to recognise outstanding research with real world application and to assist students to pursue their research or careers. PhD students in any discipline currently studying at the University of Cambridge are eligible to apply. The applicant is initially required to submit a description of their research and its real world application, of no more than 100 words, to be submitted online.

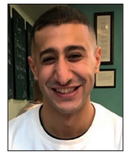
There is one round of applications each year, closing in December. The selection committee then has the task of sorting through over 150 applications to decide on who to interview. References are taken up and interviews are conducted around February. The number of awards is not set, rather it is determined by the quality of applicants.

Student Award winners are asked to give a brief presentation about their work to CSAR membership before a scheduled lecture, which allows their research to reach a wider audience, and allows those who generously contribute to see how their donations are helping students with important work. Award winners are invited to a meeting with the Vice Chancellor of the University of Cambridge.

This year, as most years, the Awards have been funded solely by donations.

The Finalists

THE FINALISTS



Karim Ahmed

MRC Cancer Unit

Karim is an MB/PhD student at Trinity College, currently in the eighth year of study. He is in the fourth year of his PhD, and is very grateful to be funded by the School of Clinical Medicine, and to have the opportunity to work under Professor Ashok Venkitaraman at the MRC Cancer Unit. His aim is to harness knowledge and technology to provide solutions to important medical problems. Karim's doctoral research combines biochemistry, cell biology and bioinformatics to understand and control a process that drives up to half of all cancers.

APPLICATION SUMMARY

1 in 5 people worldwide and 1 in 2 people in the UK will be diagnosed with cancer. Although there are many types of cancer, they are all fundamentally caused by mutations of cellular DNA. Work on the mechanisms of mutation in cancer could therefore have an impact on many cancer types. One mutational process (APOBEC) has recently been described to drive up to half of all cancers. My research has identified the mechanism underlying this, and used this understanding to identify a class of therapeutics that can control the mutational process. These findings may have significant clinical utility.

Tommaso Busolo

Department of Materials Science and Metallurgy

Tommaso Busolo is a PhD student in the Kar-Narayan lab at the Department of Materials Science. He received a MEng degree in materials science from the University of Manchester and an MRes degree in Nanotechnology from the University of Cambridge. His current research is focused on smart textiles for energy harvesting and sensing applications. Alongside his PhD, Tommaso is passionate about social entrepreneurship and has collaborated with several healthcare and textile startups.

APPLICATION SUMMARY

The potential of wearable biosensors is currently limited by battery technology. Batteries make these devices bulky, inconvenient and unappealing. A promising solution is triboelectric smart textiles. These textiles can convert the kinetic energy from body movement into electricity, whilst being seamlessly integrated into clothing. I have developed a unique triboelectric yarn based on functional polymers integrated with a conductive nanomaterial core. The project is a collaboration between three groups in Cambridge and one in Krakow, Poland. This yarn has remarkable mechanical strength and promising energy harvesting performance, demonstrating its potential as power supply platform for wearable biosensors

Sean Chia

Department of Chemistry

After completing his undergraduate chemistry degree at University College London, Sean moved to Cambridge to pursue an MPhil and eventually a PhD at the Centre for Misfolding Diseases in the Department of Chemistry, under the sponsorship of the Agency of Science, Technology, and Research (A*STAR) in Singapore. Sean's research focuses on developing small molecules against the aggregation of the amyloid-b peptide, which is considered as a key molecular pathway in Alzheimer's disease (AD). In the future, Sean aims to use the research to form the basis of a rational and sustainable drug discovery programme for AD and other protein misfolding diseases.

APPLICATION SUMMARY

Alzheimer's disease is a neurodegenerative disorder characterised by the deposition of insoluble aggregates of the peptide amyloid- . There is currently no disease-modifying treatment, in part due to an incomplete understanding of how to prevent the aggregates from forming. My work focuses on developing a strategy to systematically develop and optimise small molecules to prevent the aggregation of A. This work has led to the opening of a spin-off biotechnology therapeutics company, and this strategy is going to be generally applied to drug discovery efforts in other protein misfolding diseases, such as Parkinson's disease, and type II diabetes.

Yeonsik Choi

Department of Materials Science and Metallurgy

Yeonsik Choi obtained his B.S. (2009) and M.S. (2011) degrees from Yonsei University, Korea in Materials Science and Engineering. He spent 2011-2015 as a senior researcher in the Advanced Materials Development Team at LG Chem. Ltd. R&D Center, Korea, working on carbon nanotube-polymer nanocomposite for electronic devices. In 2019, he received a Ph.D. in Materials Science from University of Cambridge, UK. Currently, he is a Postdoctoral Research Scholar in the Center for Bio-Integrated Electronics at the Northwestern University, USA.

APPLICATION SUMMARY

Static electricity is a common phenomenon in our daily lives but its effect is usually not welcomed and considered negative. Then, why don't we positively utilise such effect as a power source? My research is focused on an energy generator that scavenges power from an ambient vibration via electrostatic effect. To make them practical, I have invented polymer nanoconfinement method to enhance energy transfer efficiency, and recently filed a patent with Cambridge Enterprise to commercialise this device. I believe this will lead to develop a new type of energy harvester that can increase the lifespan of wearable devices.

THE FINALISTS

Bethany Connolly

Department of Chemistry

Bethany is a 3rd year PhD student at Jesus College, an associate member of the Cambridge nanoDTC and an executive member of the Jesus College MCR committee. Working in The Department of Chemistry and The Department of Chemical Engineering and Biotechnology, she is developing novel materials for environmental gas storage. Bethany is specifically interested in designing industrially viable metal-organic frameworks and nanoparticle composite materials for the storage of gas-fuels including methane and hydrogen. Storage of these gasses is typically dangerous, expensive and inefficient. Working internationally with research groups in the USA and Spain, she has developed industrially viable materials which demonstrate benchmark storage of both natural gas fuel and carbon dioxide. In collaboration with Cambridge Enterprise, Bethany has filed for patent of these materials and she is coordinating with Chemical Engineers at Immaterial Labs to aid pilot-plant scale production.

APPLICATION SUMMARY

Worldwide access to clean natural-gas is essential if environmentally acceptable energy needs are to be realized. Yet applications are limited by current technology; the U.S. Department of Energy's gas storage target, 263 cm3 cm-3 (65 bar), has never been achieved by a commercially viable material. I have developed a novel, monolithic metal-organic framework which is chemically, thermally and mechanically stable. This unique material exhibits a benchmark natural-gas working capacity of 261 cm3 cm-3 (100 bar), representing a vital technological advancement in commercial gas storage e.g. for automobiles. Correspondingly, I have filed a patent in collaboration with Cambridge Enterprise and Immaterial Labs.

Charles Dunlop

Cancer Research UK CI

Charles is a third-year PhD student at the CRUK Cambridge Institute, working within the Pharmacology and Drug Development Group. The group focusses on combination treatments for pancreatic cancer. Before his PhD, Charles studied Bsc Biomedical Sciences at the University of Southampton. The course included a placement year, during which he worked at AstraZeneca as a cell scientist, using genome-editing techniques to generate physiologically relevant models for drug screening. Charles has continued to work closely with industry partners during his PhD, since the project involves the investigation of early-phase compounds in pancreatic cancer models.

APPLICATION SUMMARY

In the UK, less than 5% of patients diagnosed with pancreatic cancer survive five years. For decades, the standard treatment has been gemcitabine, but the survival benefit is modest. During my PhD I have investigated the drug AZD6738, which improves the efficacy of gemcitabine. The combination of AZD6738 and gemcitabine regresses pancreatic tumours in mice, thus a Phase 1 clinical trial is starting in 2019. I am now investigating whether individual variability in certain genes can make cancer cells more sensitive to the combination. This will help predict which patients are most likely to respond positively to the novel treatment.

Neli Frost

Faculty of Law

Neli is a Ph.D. Candidate of the Faculty of Law at the University of Cambridge, under the supervision of Professor Eyal Benvenisti. Her research focuses on the impact of information and communication technology companies on the freedom of communication across borders, and on the case for their regulation in international law. Neli holds an LL.M and LL.B from Tel-Aviv University, as well as a B.A in East Asian Studies. Neli previously worked both as a teaching assistant in international law for undergraduates in Tel Aviv University, and as a research assistant to several projects in the field. Neli is also a member of the Israeli Bar and has clerked for a judge in Tel-Aviv's Magistrate Court.

APPLICATION SUMMARY

My dissertation confronts the challenges posed by the rise to power of social media companies and their control of data and access to information. It identifies how these companies regulate communication and flow of knowledge, and demonstrates how this structures public spheres and discourses counter the common good and welfare of the international community, thereby compromising human rights and freedom of speech. The research further explores potential normative and legal justifications for states and the international community of states, to intervene and respond to these challenges, providing guiding lines to law and policy makers in the field.

Emma Garnett

Department of Zoology

Emma read Zoology at the University of Cambridge for her Bachelor's degree; she then spent two years studying in five different countries for an Erasmus Mundus Master in Applied Ecology. For her thesis Emma spent four months on the Galápagos assessing the importance of mangrove habitats for juvenile fish communities. Emma is currently researching which interventions work to reduce the environmental impact of diet. This project spans the natural and social sciences as well as public health and behavioural psychology. She is working with Cambridge cafeterias to test whether placing the vegetarian options first in buffets (changing order), increasing the number of vegetarian options served (increasing availability) or altering prices can increase sales of vegetarian meals. The work is one of the finalists in a global Solution Search for behavioural approaches to mitigating climate change. Emma has discussed her research in outreach events including the Cambridge Festival of Ideas, Soapbox Science, Earth Optimism and the Cambridge Science Festival. More generally, she is interested in understanding how to overcome economic, social and psychological barriers to sustainable resource use.

APPLICATION SUMMARY

Reducing meat consumption in high-income countries is vital to mitigate climate change and improve population health. I am working with Cambridge colleges to test if changing cafeteria layout, the proportion of vegetarian options or making small changes in price can increase sales of vegetarian meals. Doubling the proportion of vegetarian options is the most effective of these strategies; increasing vegetarian sales by an average of 70%. My research has been submitted as evidence for a Committee on Climate Change consultation and is a finalist in a global competition for behavioural solutions to reduce greenhouse-gas emissions.

THE FINALISTS

Magda Gerigk

Department of Engineering

Magda is currently in the final year of her PhD in Engineering. Her background is in Chemistry (BSc) and Biotechnology (MPhil), both completed at the Gdansk University of Technology. Funded by the Cambridge Cancer Centre, Magda's PhD project is aiming to develop a microfluidic-based assay for investigating glioma-vascular interactions. The organ-on-a-chip platform includes an artificial microvessel to mimic the blood-brain barrier, which is interfaced with a 3D stem cell culture to enable tracking of cell-cell and cell-microenvironment cooperation. After completion of her PhD, Magda would like to continue a career in academia, focusing on scaling up microfluidic-based platforms and modelling the complexity of tumour mass.

APPLICATION SUMMARY

Glioblastoma is the most common and lethal malignant primary brain tumour, with a median survival of 14 months. With the urgency to provide a technology for identifying new candidate drugs for treating glioblastoma and the push to reduce in vivo approaches, my PhD project focuses on the development of an organ-on-a-chip model to study the interactions between glioblastoma and vasculature. My chip is optimized for a 3D culture of patient-derived glioblastoma cells and includes an artificial microvessel which mimics the blood-brain barrier. I have therefore established a clinically relevant tumour model that can be used for investigating resistance to chemotherapy.

Garazi Gomez de Segura

Department of Engineering

Garazi is a last year PhD student in Computational Fluid Dynamics in the Engineering Department. She received her MSc in Aerospace from the Technical University of Madrid, where she was awarded the Airbus Award for best academic record in the specialisation of 'Aeroplanes'. In addition, she obtained an MSc from Institut Supérieur de L'Aéronautique et de L'Espace in Toulouse, as well as a Research Master in Fluid Dynamics from the same university. During this period, she also worked as an intern in ONERA (the French Aerospace Lab) in France and the von Karman Institute for Fluid Dynamics in Belgium. In 2015 she started a PhD in Cambridge. Her research focuses on a novel technology, anisotropic permeable substrates, to reduce friction drag in aeroplanes and other transport vehicles, which would translate into substantial fuel savings, reducing carbon emissions and the environmental impact. The promising results of her work have generated interest from Airbus and the US Air Force. In recognition of her work, in 2017 she received the Amelia Earhart Award, which is globally awarded to talented women pursuing PhDs in aerospace-related sciences. During her free time, Garazi plays handball for the University Team and enjoys going on hikes.

APPLICATION SUMMARY

Transportation is responsible for 25% of European greenhouse emissions. My PhD focuses on a novel technology, anisotropic porous coatings, to reduce friction drag in aeroplanes and other modes of transport. I have demonstrated the potential of this technology to provide up to 20% drag reduction, twice that of state-of-the-art riblet coatings, which will be incorporated in the next generation of airliners. This drag reduction would translate into substantial fuel savings, thus reducing cost and lowering environmental impact. Recently, Airbus and the US Air Force have shown great interest in our idea and collaborations with them may arise in 2019.

Francis Grant

Babraham Institute

Francis graduated from the University of East Anglia in Biological Sciences with a year in industry. His thesis explored how key intracellular signalling mechanisms control T cell function during adaptive immune responses. His subsequent work in the industrial sector contributed to the development of novel therapeutics to treat autoimmune diseases and cancer. Francis is now undertaking a Ph.D. in Rahul Roychoudhuri's lab at the Babraham Institute, exploring the different mechanisms that control regulatory T cell heterogeneity in health and disease.

APPLICATION SUMMARY

Although immunotherapies can cure cancer, their efficacy is restricted to a minor proportion of patients. In addition, patients suffer from side effects caused by inflammation at non-tumour sites. I used functional mouse genomics and computational analyses of human tissue samples to better understand the specific features of the immune system within cancer. These analyses identified molecules expressed only by particular subsets of tumour-resident immune cells. These molecules represent novel drug targets, which could be used to modulate the immune response against cancer cells. This led to a collaboration with Cancer Research UK to develop a novel class of immunooncology drugs.

Ibrahim Humoud

Clinical Neurosciences

Ibrahim graduated from the Goethe University Frankfurt (Germany), which was followed by two years of residency in abdominal and traumatic surgery at the hospital of Bülach, Canton of Zurich (Switzerland). To explore his interest in Neuroscience, Ibrahim completed an MSc in Neuroscience at University College London. Specifically, he investigated the role of glial cells in vascular homeostasis and disease. Ibrahim continued to pursue his interest in Neuroscience by enrolling in a PhD in Clinical Neurosciences in which he is currently the holder of the Vice-Chancellor Award of the Cambridge Trust. His project is based in the Dementia Research Institute at the University of Cambridge and focuses on common mechanisms of neurodegeneration and their therapeutic potential. On the completion of his PhD, Ibrahim's aim is to combine scientific research with clinical application by applying the expertise and knowledge that he has gained through both his medical degree and his research projects.

APPLICATION SUMMARY

Neurodegenerative diseases, including Alzheimer's Disease and related dementias, inflict a tremendous global burden. Effective therapies are urgently needed. My translational research simultaneously targets two independent cell-protective pathways to lower cellular stress and protect the brain. My research shows that a combinational drug therapy is markedly neuroprotective, increasing survival in two disparate models of neurodegeneration. These results highlight a novel potential therapy strategy for dementia. Importantly, as these therapies are currently licensed for other diseases, they could potentially be rapidly repurposed for the treatment of neurodegenerative disease, shortening the arduous drug discovery process.

THE FINALISTS

Carol Ibe

Department of Plant Sciences

Carol is a PhD student and Gates scholar at the Department of Plant Sciences, University of Cambridge. Her research aims to understand how the rice crop associates with mutualistic fungi whilst simultaneously defending itself against Magnaporthe oryzae, a detrimental fungus that causes rice blast disease. Carol has identified the role of three lysin motif receptor-like kinases in regulating the intracellular accommodation of M. oryzae in rice roots, a novel finding that potentially defines a symbiotic signalling function that has been recruited by the pathogen to trick, invade and gain control of the plant host machinery. Alongside her PhD, Carol runs a non-profit organisation, JR Biotek Foundation that she started to build capacity of African agricultural researchers who can effectively tackle food and nutrition insecurity on the continent. Carol is deeply passionate about training Africa's next generation of scientists.

APPLICATION SUMMARY

Rice is the most important food crop for developing countries; however, its global production is threatened by rice blast, a deleterious fungal disease caused by Magnaporthe oryzae. My research aims to understand how the leaf pathogen Magnaporthe interacts with rice roots. I have discovered that two rice protein receptor kinases (CERK1 and CEBiP) involved in immunity during leaf infection, are required for intracellular accommodation of the pathogen in the root. This novel finding describes a potential new mechanism used by the pathogen to trick, invade and gain control of the crop machinery, a useful insight that will guide the development of effective disease control strategies against rice blast.

Leen Kalash

Department of Chemistry

After earning her Master's degree in Chemistry from the American University of Beirut with High Distinction, Leen has completed her PhD in Cheminformatics and Computer-aided drug design at the Department of Chemistry of the University of Cambridge. Her PhD research focused on the computational design of compounds targeting multiple protein targets for the treatment of multi-factorial diseases, and it has been published in several papers and presented in various local and global conferences. She won several poster prizes, best speaker award, and ABTA Honorable Mention for her PhD research in the category of Natural & Life Sciences. Her computational studies led to the discovery of novel compounds targeting two proteins, namely the A(2A)R and the PDE10A, with therapeutic potential for treating lung cancer. These compounds were more effective than single targeted compounds in producing a biological response, which kills lung cancer cells correlating with the increased presence of the A(2A)R and PDE10A proteins in these cells.

APPLICATION SUMMARY

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Marina Konstantatou

Department of Engineering

Marina was educated at the School of Applied Mathematical & Physical Sciences, Athens. Later on, she moved to London to study at the Emergent Technologies & Design program at the Architectural Association. Being a mathematician specialised in advanced CAD & CAM technologies her objective is to apply her diverse background on design oriented research & development. Currently she is pursuing her doctoral studies at the University of Cambridge, Department of Engineering on geometry-based structural analysis, design, and optimisation. The theme of Marina's PhD research focuses on structural analysis, design, and optimisation methods based on 19th century graphic statics literature.

APPLICATION SUMMARY

My PhD research focuses on the bidirectional analysis and design of structures through geometry. This approach is fundamentally different to current practise. A real-life application of these geometrical methods is the design of structures, such as exoskeletons of skyscrapers, bridges, and large infrastructure projects, which have purely axial forces rather than bending. This significantly reduces the amount of construction material required for the project. Thus, it contributes to the movement for more sustainable, lightweight, and structurally efficient geometries. My work has been already published in journal papers, conference proceedings, and I am currently co-authoring 3 chapters of a book.

Samer Kurdi

Department of Materials Science and Metallurgy

Samer was born in Jordan and grew up in Canada, but spent much of his research life living and working in Europe, allowing him the opportunity to work with diverse groups, learn new languages and about different cultures. Samer has most recently worked at the Japanese National Institute of Materials Science (NIMS) expanding his global collaborations. This follows up on his PhD research at Cambridge, fabricating materials to design sensitive memory devices to meet security demands in current information technologies. Outside of research, Samer has taken on roles to promote social equality and a healthy lifestyle; for example, he is a co-founder of Majico (www.majico.org), a social enterprise developing water treatment solutions for the developing world. He also plays basketball at a competitive level, playing two years for the University of Cambridge Blues Basketball team."

APPLICATION SUMMARY

My research focuses on addressing capacity limits in conventional memory devices, due to restrictions on further miniaturization. I have fabricated innovative materials from sustainable and environmentally friendly components. These show novel switching properties with improved stability, crucial to safety and security demands in current information technologies. My results gained the attention of researchers elsewhere (including the ISIS Neutron & Muon Source and Imperial College London), who are now studying my films using very specialized techniques, and have led to receipt of the Japanese National Institute of Materials award, allowing me to conduct research in their facility at Tsukuba.

THE FINALISTS

Yuanyuan Liu

Department of Engineering

Yuanyuan's background is in industrial design (BA), design management (MA) and Inclusive healthcare design - she is currently completing her PhD in the Engineering Design Centre of the Department of Engineering. Her PhD focuses on exploring the application of Inclusive Design to the improvement of healthcare services, especially in community-based rehabilitation. Yuanyuan's ambition is to become a thought-leader, professor and practitioner in multi-disciplinary research, particularly in areas that combine users' experience, technology and design. She hope to use her knowledge to impact and change the world and make people's lives better.

APPLICATION SUMMARY

Chronic diseases account for 75% of deaths worldwide. Rehabilitation controls the rate of deterioration, but the percentage of people in rehabilitation is extremely low (<10%) due to problems with patients' access. Understanding people's capability-related needs (i.e., vision, hearing, mobility, dexterity, thinking and communication) is a prerequisite for their access to healthcare services. I have developed an inclusive tool for healthcare stakeholders to understand the gap between patients' capability-related needs and service uptake requirements, thus significantly improving patients' accessibility (>62.5%). The results have been applied to NHS pulmonary rehabilitation services and have the potential to improve rehabilitation for other chronic conditions.

Sharon Neufeld

Department of Psychiatry

Sharon is a quantitative psychologist whose PhD in Psychiatry assesses the effectiveness of mental health treatments in adolescents and young adults. Having previously worked in Developmental Psychiatry, Sharon has developed a model of mental illness and wellbeing which addresses the commonalities among psychiatric diagnoses, which can help explain why multiple disorders often respond to the same treatments. Prior to this she worked on a diverse range of issues in mental health from gender development in young children to coping interventions for people living with HIV/AIDS in first and third world countries. Following her PhD Sharon hopes to research other mechanisms which drive mental health treatment effects using a sample of depressed adolescents who participated in psychological treatment for depression.

APPLICATION SUMMARY

Greater insight into mental health during the developmentally sensitive period of adolescence and young adulthood is crucial to treatment and prevention of mental illnesses. I have demonstrated the effectiveness of community mental health treatment in two separate cohorts of young people and ascertained the role of family functioning in making these treatments effective. My research has been cited in academic literature, in clinical guidelines in the UK and Australia, and as part of NHS good practice evidence. Demonstrating effectiveness of mental health services and elucidating contributing mechanisms can help focus treatment, reducing treatment costs, to improve young people's mental health.

Tim Pearce

Department of Engineering

Tim Is a PhD student in engineering at the University of Cambridge, having spent one year on exchange with the Alan Turing Institute. Previously he completed an M.Eng, and then spent several years working in the finance sector with EY in data analytics and financial forecasting. His research is broadly concerned with making neural networks, the building blocks of today's AI systems, aware of their uncertainty. This leads to safer, more reliable, and ultimately more useful AI.

APPLICATION SUMMARY

Neural networks form the building blocks of today's Artificial Intelligence (AI) systems. They have mastered video games and beaten the world's best Go player. Although impressive, they have little notion of how sure they are in their decisions. For many real-world AI applications, such as healthcare recommendation systems or self-driving cars, it is vital that systems be aware of and express their uncertainty – this creates safer, more cautious, and ultimately more useful systems. My work explores how to make this possible. I've developed a practical method that combines estimates of several neural networks, interpreting their variance as their uncertainty.

Veselina Petrova

Clinical Neurosciences

Originally from Bulgaria, Veselina moved to the UK ten years ago when she was awarded the HMC scholarship to study at a British boarding school – Dollar Academy. After achieving A grades in her Highers and Advanced Highers, she was admitted to study towards a BSc degree in Biomedical Sciences at the University of Edinburgh. In her final year, Veselina carried out her dissertation project in Prof. Tara Spires-Jones' laboratory where she worked on characterising some of the major pathological changes in a novel mouse model of Alzheimer's disease. She graduated from her BSc degree with a first-class degree and Honours in Neuroscience. For the work on her dissertation, Veselina was awarded "Best Student in the Neuroscience Honours Class" and "Undergraduate of the Year for 2015" by the British Neuroscience Association. Veselina was then accepted to pursue her PhD in Clinical Neurosciences at the University of Cambridge in Prof. James Fawcett's laboratory on a Gates Cambridge scholarship.

APPLICATION SUMMARY

Human nerve cells rarely regenerate after injury. Conditions that damage nerves, such as spinal cord injury and glaucoma, can therefore cause permanent paralysis or blindness. I identified a protein that induces regeneration after damage to brain cells in a dish or to optic nerves in intact animals. Introducing this protein to human patients via gene therapy has the potential to cause regrowth and functional recovery. By studying how this protein functions, I have identified new pathways for enabling regeneration. This will not only accelerate drug discovery, but will open new avenues for future research into repairing the injured nervous system.

THE FINALISTS

James Pollard

Department of Geography

James is a coastal geographer with specific interests in coastal risk assessment and management. His PhD research investigates the interactive relationship between coastal flooding and erosion risk, particularly during extreme storm surge events. Working with the Judge Business School Centre for Risk Studies, James has developed an approach to assess coastal flood risk on a global scale. Methodologically, this work employs a 'big data' approach utilising sequential satellite imagery, global storm surge datasets and coastal elevation maps to determine flood risk globally. The coastal flood risk model was applied to 279 cities included in the Cambridge Risk Index. The Risk Index was launched at Willis Towers Watson, London, this December and the model which underpins it is used to provide corporate risk profiling services such as supply chain mapping and assessment of long term corporate resilience. Future work will focus on 'cascading risk' - instances in which coastal flooding may interact with other threats (nuclear accident, power outage, windstorms) to impact on the world's most populous cities.

APPLICATION SUMMARY

Given that 13% of the world's urban population resides in coastal zones < 10m below sea level, one of the most severe threats to the successful functioning of future cities will be coastal flooding. Uniting satellite, elevation, and coastal flooding datasets, I have developed a model capable of mapping flood risk in any city in the world. Results from the model are being used by the Cambridge Centre for Risk Studies to inform the Lloyds City Risk Index - a platform to show economic losses across 279 cities from man-made and natural threats.

Sakthy Selvakumaran

Department of Geography

Sakthy is a Chartered Civil Engineer who has worked across different countries and cultures in design, construction and international development roles. These roles include designing new structures on mega-projects like the Crossrail trainline in London, assessment to upgrade UK infrastructure assets, and working on sites to reconstruct housing destroyed by earthquakes. She returned to academia from industry with a drive to work on new technologies that could improve resilience and reduce vulnerability of infrastructure within the urban environment. Sekthy's PhD in the Engineering Department applies rapidly advancing radar satellite imagery technologies which can monitor millimetre scale changes on the earth's surface. Her achievements during this research period include being appointed to the Young Professionals Panel of the UK National Infrastructure Commission, being named on the Forbes 30 Under 30 Europe List, and receiving the IET Leslie Paddle Scholarship for Postgraduate Studies.

APPLICATION SUMMARY

The widespread deterioration and recent collapses of bridges, dams, tunnels and other key services highlights the importance of structural health monitoring. My research investigates advances in satellite measurement to support civil engineers in monitoring millimetre scale movements that could indicate signs of failure. It has shown how such technology could have been used to spot signs of failure of a bridge that collapsed during flooding, and signs of problems which closed a large flyover. Major asset owners have declared interest in supporting the development of this research into early warning systems that could be used in real life.

Christina Smyrilli

Department of Engineering

Christina studied her undergraduate degree at the University of Cambridge, specializing in Civil, Structural and Environmental Engineering. She has then moved on the CDT in Future Infrastructure and the Built Environment, also in the Engineering Department, for her MRes and PhD. Her research investigates the relationship between water and sanitation infrastructure in rural developing areas, and how gender relates to activities performed by men and women and the use of infrastructure within WASH. The main case studies for her PhD have been Puerto Rico and Uganda, while visits to Peru, Mexico and India were also made to inform the research. She aspires to work in the International Development sector, promoting gender equality through engineering projects.

APPLICATION SUMMARY

My research is interdisciplinary, examining the impacts of infrastructure for the provision of clean water and safe sanitation facilities in rural developing areas on the gender roles assumed within the household and the community. I undertook fieldwork in Puerto Rico, leading a research project for Oxfam America, looking at the impacts of hurricane Maria on water and sanitation practices on men and women. The study resulted in practical recommendations for Oxfam's emergency and recovery programme in Puerto Rico around water and sanitation, which are currently being implemented, as well as in the publication of a research report presenting the findings.

Hamish Symington

Department of Plant Sciences

Hamish graduated with a degree in Biochemistry from Cambridge in 2002, but subsequently left academia and trained as a graphic designer and software developer. He has now returned and is studying the pollination of strawberries. Wild pollinator numbers are in decline; Hamish is looking at improving pollination from a plant science perspective, finding out what floral traits are most attractive to pollinators, using a range of 25 cultivars of domestic strawberry. Armed with this knowledge, he will be able to work with plant breeders to produce cultivars which are more pollinator friendly, improving yield and revenue for the farmer, and providing floral resource to better support wild pollinator populations.

APPLICATION SUMMARY

One in every three mouthfuls of food we eat relies on pollination, yet wild pollinator numbers are in decline. Zoologists are looking at how to reverse that decline; I'm looking at improving pollination from a plant science perspective, finding out what floral traits are most attractive to pollinators, using a range of 25 cultivars of domestic strawberry. Armed with this knowledge, I will be able to work with plant breeders to produce cultivars which are more pollinator friendly, improving yield and revenue for the farmer, and providing floral resource to better support wild pollinator populations.

THE FINALISTS

Taylor Uekert

Department of Chemistry

Taylor grew up in San Diego, California and studied Nanoengineering at the University of California San Diego from 2012 to 2016. In addition to her studies, she also conducted research on perovskite solar cells in the Laboratory for Energy Storage and Conversion, and completed summer internships at the University of Oxford and ZAE Bayern in Erlangen, Germany. Supported by the Cambridge Trust, she joined the Nanoscience and Nanotechnology Doctoral Training Centre (NanoDTC) at the University of Cambridge in 2016, and is currently conducting her PhD research on photoreforming of plastic waste in the Reisner Lab in the Department of Chemistry.

APPLICATION SUMMARY

Did you know that 150 million tons of plastic are thrown away every year? This represents not only a severe environmental hazard, but also a waste of valuable resources. My research addresses this growing plastic challenge via a catalytic method for transforming waste into hydrogen fuel. Despite the simplicity of the process – it only requires plastic, water, a photocatalyst and the energy in sunlight to make hydrogen – it is still an emerging, lab-scale technology. I am working on optimizing and up-scaling this process so that we can help turn plastic waste into useful products in a sustainable and economic way.

Anna Yakovleva

Department of Pathology

After graduating with a bachelor's degree in Biochemistry from King's College London, Anna joined the Calicivirus Group at the University of Cambridge as a PhD student under the BBSRC DTP programme. Her research aims to develop thermostable vaccines which hold the potential to lower vaccine associated costs, and in turn, increase access to vaccination programs around the world. Throughout her time at Cambridge, Anna has led groups of undergraduate and postgraduate students in research projects addressing global health policy through the student-run think tank Polygeia, first as an editor and currently as president. In the future, she wants to focus her work on tackling global health inequalities through innovative laboratory, field, and policy work.

APPLICATION SUMMARY

Each year, an estimated 15 million deaths are caused by infectious diseases, of which 25% are considered 'vaccine-preventable'. However, vaccination efforts in areas of the world with tropical climates and poor electrical infrastructure are costly and often not viable. This is due to the unstable nature of vaccines which are highly dependent on cold-chain environments to conserve efficacy during manufacture, delivery, and storage. Recent advances made by our team in the development of a novel protein stabilising technology, have enabled me to successfully engineer cold-chain independent vaccine and biologic candidates against several important human pathogens during my PhD.

Previous Winners

PREVIOUS WINNERS

SAIF SYED AHMAD
CSAR WINNER

"Being a recipient of the prize has been fantastically beneficial for me in a number of ways. Firstly, I used the prize money to fund my attendance to a research meeting in Paris where I also presented a research poster. The meeting was an excellent learning opportunity for me and allowed me to meet researchers I may collaborate with in future. Secondly, I had the privilege of presenting my research at a CSAR meeting at Churchill College which was a well-received and highly rewarding experience. Thirdly, I had the opportunity to be a judge the Award in 2018 and this experience was a fantastic learning experience enabling me to learn about novel research and see how research abstracts are viewed from a judge's perspective. Importantly, being an Award Recipient has helped me secure other exciting opportunities within academia. Having completed my PhD I am now focusing my research into understanding how we can improve the treatment of breast cancer. As a current postdoc, I was selected for an exciting Leadership Development Programme, supported by the Canada-UK Foundation and the University of Cambridge, which promotes the careers of outstanding postdocs, enabling them to become future world-leaders and entrepreneurs who will potentially create new technologies, jobs and generate economic growth. https://www.opda.cam.ac.uk/career-development/CanadaUK-fellowships."

ALEKSEJ POPEL
CSAR WINNER

"The CSAR Student Award given to me allowed me to cover living expenses over my stay at the Division of Radiochemistry at Lomonosov Moscow University in March to April 2014 to conduct experimental work for my PhD. I was fortunate that during my visit the International Lomonosov Conference for Young Scientists took place at the University. I was able to take part in the Conference, where I presented my results on characterisation of irradiated and unirradiated single crystal thin films of UO2, and even managed to get a Conference award for this work. Apart from my work, I took this opportunity to enjoy the cultural heritage of Moscow."

CRAIG PEARSON
CSAR WINNER

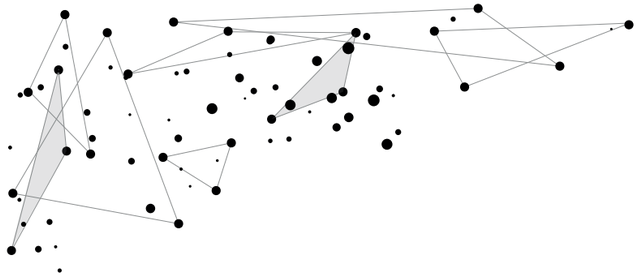
"I am a PhD student who studies the connection between the eye and the brain. My doctoral research focused on a group of neurons that arise in the retina and project through the optic nerve to the brain. Damage to these neurons—due to injury or disease such as glaucoma—is irreversible, as they do not spontaneously regenerate. My objective was to modify the molecular environment in the optic nerve to promote the growth of these damaged cells. In mice, I discovered that delivering an enzyme to the optic nerve which modifies the structure of certain growth-inhibiting sugar molecules enables neurons to regenerate farther following an acute injury than in control-treated mice. In the future, I hope to develop integrated therapies that have the potential to regenerate visual neurons and restore sight in humans. I used funding from the CSAR to co-found a scholarship program for young scientists interested in vision research. The Peter Watson International Scholarship (PWIS), a partnership between the University of Cambridge and the National Institutes of Health (NIH), is a national award open to UK high school students. In April, 2018, two winners selected by a distinguished awards committee received an all-expenses paid trip to the United States, where they visited the NIH and the National Eye Institute, toured laboratories and research facilities, met directly with faculty, visited the U.S. Capitol, and presented their winning research projects. The scholarship also received funding from the Cambridge Eye Trust and the Biomedical Research Alliance, and was recently renewed for a second year. Funding from CSAR also enabled me to travel to the Association for Research in Vision and Ophthalmology (ARVO) conference in Honolulu, Hawaii, where I presented my research on optic nerve regeneration, networked with leading scientists in my field to devise combinatorial treatments using my enzyme, and shared the outcomes of our first PWIS award. I look forward to continuing with these efforts as I move forward in my career as a vision scientist."

TIESHENG WANG
CSAR WINNER

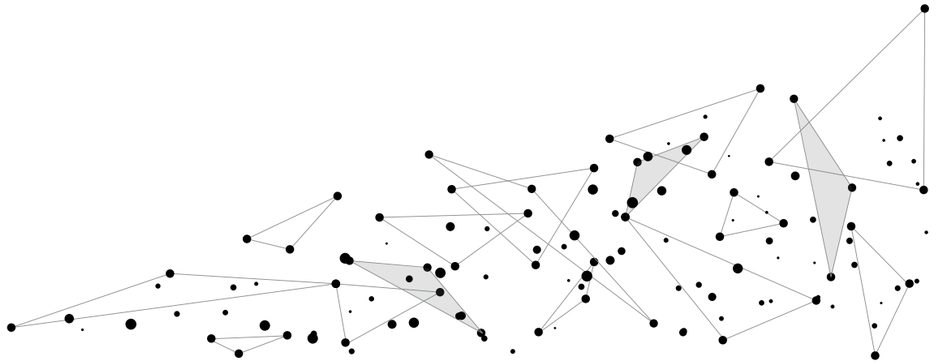
"After receiving my MRes in Sensor Technologies and Applications from the University of Cambridge (Darwin College), I joined Department of Materials Science and Metallurgy at the University of Cambridge (Darwin College) in 2015 as a PhD candidate supervised by Dr R. Vasant Kumar and Dr Stoyan K. Smoukov and working closely with Professor Anthony K. Cheetham. My PhD focuses are about (i) pushing the fundamental boundaries in creating metal-organic framework-related hybrid materials using nano-confinement and (ii) creating multifunctional materials with interpenetrating structures that show benefits in sensing, energy storage, and catalysis. I was awarded one of the 2018 CSAR PhD Student Awards for Applied Research as recognition for my achievement in designing and prototyping a flexible polymeric supercapacitor electrode. Such the electrode material has interpenetrating structure woven like the red and white of a candy cane and improves not only charge storage capability but also electrochemical/mechanical robustness. The CSAR awarded funding was used to support my trip to the US for the American Chemical Society (ACS) National Meetings in New Orleans, where I was interviewed about my research on the "candy-cane like supercapacitor". The CSAR student award encouraged me to explore and develop interpenetrating polymer network (IPN) materials that can benefit sensing and energy storage. So far, one provisional patent has been filed and numerous articles have been published from this project. Furthermore, in collaboration with Cambridge Enterprise, I am exploring the commercial aspects of the research achievements. I was offered a postdoctoral research associate (PDRA) position at the University of Sydney, Australia. I plan to work there for 2 years and then start a faculty position in China."

ALL PREVIOUS WINNERS

Saif Syed Ahmad, Jennifer Ashworth, **Mohamad Farshard Aslam,** Alexander Avramenko, **Vaibhav Bhardwaj,** Fernando Bravo, **Laura Burzynski,** Katerina Christofidou , **Michael Coto,** Nathaniel Davis, **Joachim Dias,** Vera Garup, **Petro Giannaros,** Ashish Goel, **Michael Hart,** Chen Jiang, **Nicholas Jones,** Edmund Kay, **Douwe Kiela,** Siang Boon Koh, **Jan Lyczakowski,** Olivia MacLeod, **Sarah Madden,** Andrew McCombie, **Jan Mertens,** Evan Miles, **Elizabeth Moore,** Alain Naef, **Girish Nivarti,** Lewis Owen, **Craig Pearson,** Luca Peruzzotti-Jametti, **Katrin Pfeil,** Aleksej Popel, **Advait Sarkar,** Himansha Singh, **Wilberth Solano,** Andrea Strakova, **Fiona Strobridge,** Oliver Taherzadeh, **Edward Tan,** Tiesheng Wang, **David Williams,** Teng Zhao



With Thanks



WITH THANKS

The CSAR Council wishes to express its warmest thanks to the people and organisations who have made the awards programme and ceremony possible, including:

AWARD SPONSORS:

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ABOUT CSAR

CSAR is not just student awards and lectures. We endeavour to make time around all events for people to meet, talk and network. Lectures are usually held at Churchill College where there is ample parking for those coming from outside Cambridge. Lecture attendees can have dinner in the college canteen joining other attendees and the speaker over a glass of wine. Coffee and biscuits are served before lectures, and if the lecture needs to be discussed or debated further, this is usually done in Churchill's bar. Recent speakers have included Billy Boyle (co-founder Owlstone Medical), Dr Demis Hassabis (co-founder and CEO of DeepMind, Vice President of Engineering at Google DeepMind), Dr Hermann Hauser (co-founder and Partner, Amadeus Capital Partners), and Dr Menelas Pangalos (Executive Vice-President, Astra Zeneca).

Visits are interesting and informative and can initiate useful links between different companies. The recent visit to Huxley Betram Enginneering was described as "fascinating" and "utterly absorbing". Other visits have included Airbus Defence & Space, TWI, e-Go Aeroplanes, Cambridge University Botanic Gardens and The Sainsbury Laboratory, TTP, and Carl Zeiss.

"I thoroughly enjoyed the visit, which I found very inspiring. The history of the Maxwell Centre and the wealth of ideas and accomplishments of the scientists working there were breathtaking."

"Very clear talk ... at a level that we could all understand. It put research into context and let us see the way forward. Really enjoyed it and found it very informative, Thank you."

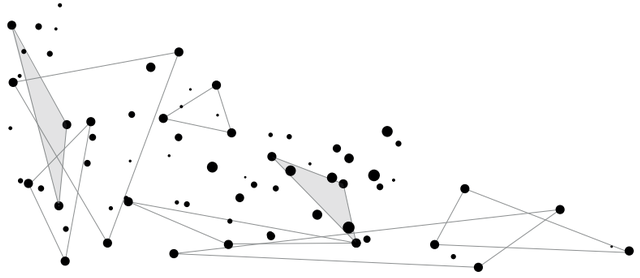
WHERE NEXT FOR CSAR

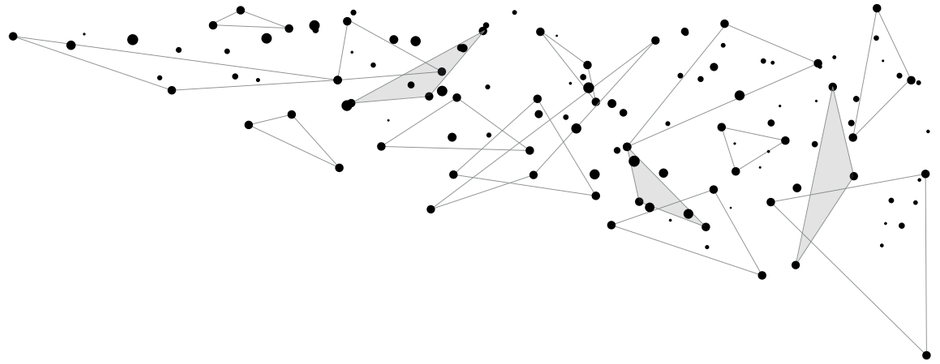
CSAR has enjoyed substantial growth under recent Presidents David Adamson and Sir David Wallace. This year we will be starting new activities that will help us to fulfill our “mission”. Indeed the need to apply research rapidly and productively has never been more acute. We would be delighted to hear from younger members of the Cambridge academic and industrial “ecosystem” with interests in the application of research, and from those who would like to help encourage and bring them together.

MORE INFORMATION

To find out more about CSAR, and to keep up to date with our latest events, please visit our website:

www.csar.org.uk





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