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CHALLENGE **CARDIFF**

THE RESEARCH MAGAZINE FOR CARDIFF UNIVERSITY

Summer 2017



Barriers to running revealed

Community organiser Ali Abdi asks
Dr Liba Sheeran how to get more people active

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Professor Colin Riordan
Vice-Chancellor

WELCOME TO CHALLENGE CARDIFF

Last year I had the honour of starting the IAAF/Cardiff University World Half Marathon Championships.

Over 16,000 people took part from elite runners such as Sir Mo Farah, to novices completing their first competitive race.

As title partner we worked with the IAAF and Run4Wales to provide free entry places, clothing and training support to 500 inexperienced and first-time runners from some of our most disadvantaged communities.

Our academics also took the opportunity to undertake unique related research.

In this edition of *Challenge Cardiff* you can read about research led by Dr Liba Sheeran from our School of Healthcare Sciences.

Dr Sheeran's research looked at what motivates people to run, as well as what deters them from running.

It's hoped the findings will help organisers of mass races to attract a wider range of entries in future, thus improving the nation's health.

Also featured in this edition is Professor Manu Haddad who leads the Morgan-Botti Lightning Lab, the world's only university-based lightning lab dedicated to aerospace research.

Alumnus Rhys Phillips, now a research engineer at Airbus, returned to Cardiff to interview Professor Haddad for this issue.

They discuss the importance of industry collaboration and how the high-impact research being conducted at the lab helps to keep the skies safe.

In the current uncertain climate, the effective management of crime and security is arguably one of the most important global challenges.

You can read about how our interdisciplinary Crime and Security Research Institute has brought together researchers working across crime, security and justice, to deliver with innovative research-led solutions.

Finally, the political situation in the United States of America continues to generate unprecedented levels of interest, comment and newspaper headlines worldwide.

In our What Made Me Curious feature, Professor René Lindstädt, Head of the School of Law and Politics, spoke to Dr Stephen Cushion from the School of Journalism, Media and Cultural Studies about what inspired him to pursue research into US politics and his thoughts on the impact of the Trump administration.

To find out more about the work featured in this issue, please go to our website.

Please contact challengecardiff@cardiff.ac.uk if you would like to challenge our academics on an issue that matters to you.

RESEARCH NEWS

University chosen as centre for UK's biggest dementia research initiative

Cardiff is playing a major role in the UK's biggest dementia research initiative with the launch of a £13m dementia research centre.

The new research centre in Wales is one of six centres across the UK which form part of the newly launched UK Dementia Research Institute (UK DRI). UK DRI is a £250m initiative, funded by the Medical Research Council, Alzheimer's Society and Alzheimer's Research UK, to find new ways to diagnose, treat, prevent and care for people with dementia. The selection of the new centres marks a significant investment for the UK DRI, with total funding for the foundation programmes and resources awarded to the centres reaching £55m.

With the potential to be awarded a further £17m in research funding over the next five years,

the UK DRI centre at Cardiff University is set to become the biggest investment Wales has ever received for scientific study into dementia.

Professor Julie Williams who is currently the Chief Scientific Advisor to the Welsh Government and Professor of Neuropsychological Genetics at Cardiff University will lead the new centre, and also become an Associate Director of the UK DRI.

Vice-Chancellor Professor Colin Riordan said: "Dementia diagnosis rates in Wales are the worst in the UK, impacting on support for affected individuals and their families. Given this national context, and the global burden of dementia, Cardiff University has made research on dementias a strategic priority and a cornerstone of our joint Clinical Innovation Strategy with the NHS. With the launch of the UK DRI at Cardiff University, we will build on this solid foundation to find new ways to combat dementia."

Up to 60 scientific researchers will be employed at the Cardiff centre over the first five years and will focus on understanding the disease mechanisms and developing new therapies. A programme of research development is expected to lead to an increase in scientific staff as it expands after the first five year phase.

The centre will build on the success of the MRC Centre for Neuropsychiatric Genetics and Genomics in Cardiff University and will utilise the discovery by scientists in Wales of more than 30 genes contributing to either Alzheimer's or Huntington's diseases. It will also complement the work of the University's Neuroscience and Mental Health Research Institute, the Systems Immunity Research Institute, the Cardiff University Brain Research Imaging Centre (CUBRIC), the Health and Care Research Wales Brain Repair and Intracranial Neurotherapeutics Unit and the Cardiff University Dementias Research Network.



New compound semiconductor hub at forefront of cutting-edge technologies

Funding awards from the Engineering and Physical Sciences Research Council (EPSRC) have created a hub of expertise in compound semiconductor (CS) technologies.

Many advances in our daily lives depend upon CS technology and the new hub will allow Cardiff University to drive developments that change the way we live.

The EPSRC Manufacturing Hub in Future Compound Semiconductors will work closely with the Compound Semiconductor Centre (CSC), a partnership between the University and global advanced semiconductor wafer manufacturer IQE.

Cardiff leads the hub with three key academic partners: University College London, The University of Manchester and the University of Sheffield.

The hub has also been awarded an additional £2m from the EPSRC for state-of-the-art

equipment that will help create 21st-century technologies. This latest award will allow the hub to develop technology that enables emerging trends, such as self-drive vehicles and 5G communications.

The hub now has a number of funded PhD positions working on compound semiconductor technology in collaboration with world-leading companies, and two new MSc courses in Compound Semiconductors which start in October.

Collaborating with Monash University

The University's Systems Immunity Research Institute and the Biomedicine Discovery Institute at Monash University have signed a memorandum of understanding (MoU) that will see the two institutes extend their collaborative activities

The five-year mutual agreement recognises highly productive joint projects already being conducted around inflammation and immunity, and provides a mechanism for enabling additional projects in the areas of research collaboration; exchange of materials, scholars and students; and co-operative seminars and workshops.

Current high profile projects include several on lymphocyte receptor biology and a joint study that has revealed how HIV-1 can evade the immune system.

Commenting on the HIV-1 study, Professor Jamie Rossjohn, a Welsh-born academic, based in Australia since 1995, and joint faculty with the Systems Immunity Research Institute, said: "This was an exciting and unexpected find that was only possible as a result of the close collaborative ties between Monash and Cardiff researchers."



Forging new links with China

Cardiff University has signed a memorandum of understanding (MOU) with Sun Yat-sen University that will see the two institutions working together in the field of breast cancer research.

The MoU was signed by Professor Nora de Leeuw, Pro Vice-Chancellor, International and Europe, from Cardiff University and Professor Erwei Song from the Sun Yet-sen Memorial Hospital, during a government delegation to China to promote Sino-UK links in biomedical sciences.

The MOU includes collaborative research in the areas of:

- Triple negative breast cancer (TNBC): This aggressive type of breast cancer (about 15-20% of all breast cancers) is difficult to treat, as it does not respond to hormonal therapies or to newer biological therapies. Both Cardiff University and Sun Yat-sen University have strong track records in laboratory and clinical breast cancer research, making them ideal research partners in the search for the underlying molecular basis of this group of tumours and the design/testing of novel therapies which can improve survival.
- Novel, targeted anti-cancer drugs directed against metastatic breast cancer: Both institutions have a shared interest in the identification and exploitation of novel targets for systemic anti-cancer therapy. This offers clear potential for collaborative development and testing of novel anti-cancer drugs, particularly in metastatic breast cancer.

- Clinical trials: Sun Yat-sen University has one of the largest breast cancer teams and best clinical facilities in China, in terms of number of patients, hospital beds, clinical service and tumour bio-banking. Cardiff University can offer its leading expertise in the design and conduct of clinical trials, through the College of Biomedical and Life Science's Centre for Trials Research and through the involvement of its academic clinicians.



Quality of working life in Britain



A £1m research project led by Professor Alan Felstead of the School of Social Sciences will provide a picture of the quality of working life in Britain.

Funded by the Economic and Social Research Council (ESRC), the Department for Education, and Cardiff University, the survey will involve 2,500-3,000 workers who will be interviewed face-to-face on their skills and experiences of working in Britain in 2017.

The resulting data will help chart and explain the changing pattern of job quality and job skills over time, and leave a lasting and valuable legacy resource for others to use.

Professor Felstead said: "We are living in an era of constant and rapid change, politically and economically. This project will provide robust and unique data on what this might mean for working people whose jobs may be put at risk or altered in some way because of changes in the economic climate, the introduction of technology or different ways of organising work."

The project is being carried out in collaboration with the ESRC Centre for Learning and Life Chances in Knowledge Economies (LLAKES) and University College London's Institute of Education.

This award is the 14th ESRC grant held by Professor Felstead and the sixth secured in the last four years.

£4m bid to find tomorrow's technologies

University scientists are joining a £4m project to develop technologies that support tomorrow's phone networks, space and defence systems.

The five-year programme, funded by the Engineering and Physical Sciences Research Council (EPSRC), is being led by the University of Bristol.

It will join Cardiff University and three other universities (Glasgow, Cambridge and Birmingham) as well as industry partners to develop next-generation technology that paves the way for 5G and 6G mobile phone networks and advanced radar systems.

Researchers believe diamond – due to its ultra-high thermal conductivity – is the best material for handling the energy needed to drive 5G and 6G networks.

Researchers will develop gallium nitride (GaN)-on-diamond high-electron-mobility



transistors (or HEMTs). Energy flows in these can be as high as the heat flux on the surface of the Sun.

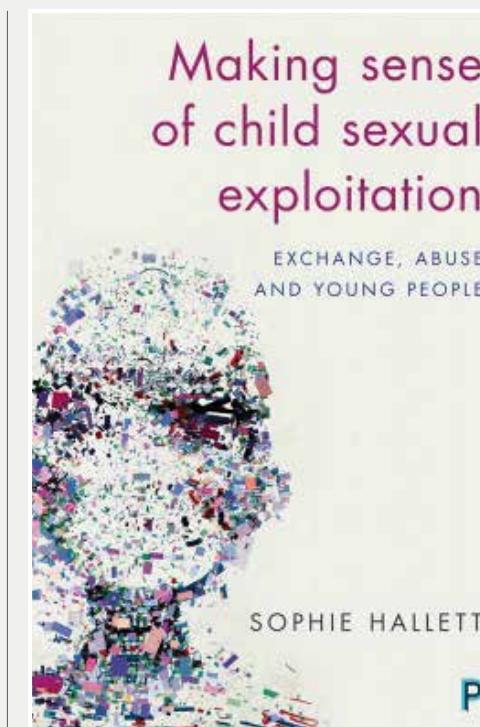
Experts say the research should help create devices with a more than fivefold increase in radio frequency power compared with today's commercially available transistors.

Not all sexually abused and exploited children are groomed

The increasing tendency to link child sexual exploitation (CSE) with grooming means some cases are being missed, according to an important new publication by Dr Sophie Hallett, of the School of Social Sciences.

Dr Hallett's book – *Making sense of child sexual exploitation: Exchange, abuse and young people* – sheds new light on the reasons that this exploitation takes place, including weaknesses in the welfare system, and the issues faced by children and young people. It puts forward the rarely heard voices of children and young people who have experienced CSE and the professionals who have worked with them.

Dr Hallett examines the way that child sexual exploitation is framed in today's society and the implications that has for responses to the issue. Central to the discussion are themes such as youth, childhood, care and power, making this book an important sociological contribution to an under-researched field.



Family court transparency

New research suggests that guidance given to judges to routinely publish their judgments is not being consistently followed, leaving the public with a patchy understanding of the family justice system in England and Wales. Issued in 2014, the guidance requires judges to send fully anonymised versions of judgements in certain types of cases to BAILII, a freely accessible legal research website. The intention was to enable both the press and the public to have a better understanding of the family justice system, by making it more transparent.

However, research undertaken by the School of Law and Politics and funded by the Nuffield Foundation, discovered significant local variations in following the guidance. An analysis of 837 judgments published in the first two years following the guidance found that only 27 judges and 12 courts sent in more than ten cases each to BAILII during this period. As a result, the media and the public are able to read more about judicial and social work decision making in certain parts of England and Wales than others.

Dr Julie Doughty, who led the research, said: "The judgments now published provide more information about the role of the family courts than was available prior to the guidance, but there are inconsistencies in the way courts have responded which can present a confusing and not necessarily representative picture of the system as a whole."



HealthWise Wales: Protecting tomorrow by helping today

There are many exciting research projects taking place across the country but none quite on the scale of HealthWise Wales – an ambitious initiative that is giving the public its say and collecting information for the health of a nation.

L: Dr Shantini Paranjothy

R: Owain Clarke

Owain Clarke (OC), BBC Wales Health Correspondent talks to Professor Shantini Paranjothy (MBBCh 1995) (SP), Population Health Research Theme Lead for the College of Biomedical and Life Sciences and Scientific Lead for HealthWise Wales.

OC: Tell me a bit about yourself and how you reached this point. Why are you interested in population studies?

SP: I trained as a doctor at the University of Wales College of Medicine and started working as a junior doctor in England, in obstetrics and gynaecology. Quite early on in my career, I learned about using data to inform how we make decisions about patient care. So I went off and did a master's degree in medical statistics and a PhD in epidemiology and learned that I really enjoyed understanding how we can use data to inform the decisions we make about the best way to provide care and to ensure that the medicine we practise is based on evidence that's meaningful.

One of my earlier studies at Cardiff was actually looking at the risk factors of gastroschisis – a congenital defect where a

foetus's abdominal wall doesn't form properly. When I first came to Cardiff as a public health registrar there was an increase in the number of cases, and some patterns, but no real knowledge of the causes. We found that nutrition played a big role, and mums who had folic acid supplementation during pregnancy were less likely to have gastroschisis. We also found that smoking was a big risk factor.

OC: Looking at many people and comparing them was a kind of craft that was pioneered here in Cardiff by the likes of Professor Archie Cochrane CBE and Professor Peter Elwood OBE with the Caerphilly cohort. They were quite defining pieces of research at the time. Explain to me more about how the sense of using what you see in populations to test evidence has really transformed medicine.

SP: There are lots of examples of that, from the early work of Sir Richard Doll, who looked at the effect of smoking, to the Caerphilly study where Professor Peter Elwood OBE showed that by adhering to the five healthy behaviours you can reduce your risk of dementia. And that's quite a powerful piece of information really, particularly when you

contrast it with data from the Chief Medical Officer for Wales' report which shows that a very small proportion of people, probably about 3%, actually do manage to do all of the five healthy behaviours.

OC: And those are now messages that we take for granted but they start with that pioneering bit of work in Caerphilly. As medicine advances, as we're now talking about genes and so forth, do things now need to be upscaled?

SP: Definitely, and I think that the era that we live in now – a big data environment - has really transformed how we do epidemiology. This, combined with our ability to now record-link data from different sources, means we can start to really look at different sub-groups with different characteristics.

OC: Are we seeing a revolutionary shift?

SP: I think so. It's certainly a new era with the addition of genetic discoveries, and data available from bio samples, which combined with standard epidemiology data can be very powerful.

OC: So you're looking at a whole host of people and asking questions. Can you explain to me the sorts of questions that you can now ask that you may not have been able to ask before?

SP: We can now ask questions that will help us find out things like why some people who live in a particular type of area have poorer health outcomes or more hospital admissions than others – what are the contextual factors that influence these differences. And we can look at how various environmental and social factors during the life course explain these differences, investigating their impact on future outcomes.

OC: Some may have seen the adverts on TV and some may have read about HealthWise Wales, inviting people to take part in this big project which is meant to better the health of the nation, put simply. How would you describe it?

SP: It's a great opportunity to take part in something that will contribute to the health of the nation. What that means is taking part in a big research project where your information

will be used to answer those important questions the NHS needs answers to, in order to plan their service for the future. And the information gathered also allows scientists to develop better and targeted treatments.

OC: So what do people signing up have to do?

SP: You sign up and you're given new questionnaires to answer every six months. There are two types of questionnaire: One which collects basic information about your health and lifestyle - such as nutrition, alcohol consumption, physical activity and mental health - and another which asks about specific topics. For example, we have a group of researchers in the School of Pharmacy and Pharmaceutical Sciences who are looking at public perceptions of medicine wastage. So we have a questionnaire that asks people their views of the value of the medicines that have been prescribed to them.

Also, if there are studies that are relevant to you and we know that from the information you've given us you fit the criteria, we will contact you to tell you about that, and then it's up to you if you want to take part. It also

gives the opportunity to take part in designing and developing some of the studies that are carried out. There is a big focus on involving the public with HealthWise Wales.

OC: In terms of its scale and ambition, is it unique?

SP: It is unique in Wales in that we're aiming to reach 260,000 people, about 10% of the adult population. There are big studies like this in the UK but what's really unique about this one is that we are looking at a younger age group which gives us the opportunity to put more of a focus on prevention. Because we're collecting data from an earlier age and following up, we can really start to learn what happens before disease develops. Also, comparisons on a large scale at population level are very powerful and informative for planning healthcare services.

OC: So you will have much more information to supplement the official statistics and research that goes on. By having much more information about who is answering these questions you will be able to see, in a richer amount of detail, things such as



which groups of people smoke in Wales, which groups of people don't do regular exercise and what might be the reason for that, looking back into their history. And you're also exploring the attitudes of various groups of the population, so there is also an opinion poll element to it.

SP: That's right, not only are we building a picture of lifestyle habits, but we are also linking to health outcomes. It gives us a better understanding of how the things that we do, and the combination of the things we do, impact on our health outcomes.

OC: So if there is a policy or a screening programme, you will also be able to see whether or not it's having an impact later on in life?

SP: If there was a new intervention or health policy, we can ask people about their exposure to it and track into the future what the outcomes are, years after it has completed.

OC: Who has expressed an interest in using what you will ultimately get from HealthWise Wales?

SP: We've had a lot of interest from the mental health research community to look at how we can recruit patients for their cohort studies. We're also working with various child health and development researchers,

looking at things like how early life exposures including during pregnancy can impact on health and development during childhood. We have developed specific questionnaires for pregnant women in HealthWise Wales that launched in May.

OC: I guess lots of biomedical companies will have an interest in populations that can be tracked, to see the impact of a new drug?

SP: I think that will come as HealthWise Wales develops. Until we reach bigger numbers it's not so feasible to do those types of studies, but what we are doing now is laying the foundations to enable that to happen.

OC: Who will be suggesting questions?

SP: It's mainly the research community that has been asking questions, but involving the public is a central part of the project. We have a public delivery board too, and we're working with them to develop opportunities for the public to work with researchers to suggest their own research questions and prioritise the work that is being done through HealthWise Wales.

OC: What's your ambition for the project?

SP: If we reach the 260,000 target, I think it will make a significant difference to the population overall in Wales because we know

that people who take part in our research studies actually have better health and better outcomes, just through the process of getting involved. I think it can make a difference to the population on a lot of levels, with the public being better informed and having a better understanding of research and how they can contribute to making things better in the future. It will also make Wales a great place to come and do research and make a step change to our ability to understand how to prevent and improve outcomes for the future. It's also about making evidence-based practice a part of our culture, putting a platform in place so there's a more streamlined process of evaluating and then turning that into policy, rather than having to set each study up every single time.

OC: What are your next steps?

SP: At the minute we have the media campaign going on so our focus is on recruitment and making sure we're using all possible opportunities. For example, we're training NHS nurses so that they are knowledgeable about the project and can talk about the leaflets with patients. We're also continuing to develop new questionnaires to ensure the relevance and quality of the information collected for scientific studies.

When lightning strikes

On average, every commercial aircraft is hit by lightning at least once a year. This may seem like a daunting prospect for those of us that regularly travel by air. However, thanks to the work of Cardiff University's Morgan-Botti Lightning Laboratory (MBLL), aircraft are very rarely troubled.



L: Rhys Phillips

R: Professor Manu Haddad

Indeed, if lightning were to strike an aircraft you were travelling on, it's likely that you wouldn't notice a thing, other than a bright flash.

The MBLL is the world's only university-based lightning lab dedicated to aerospace research and only one of a handful worldwide, providing a research and test capability for understanding and enhancing the science of lightning protection.

One of the main areas of focus of the £2.4m facility is to study protection systems for aerospace structures and fuel systems. The facility can generate controlled lightning with currents up to 200,000 amps, more than five times that of an average lightning strike.

The laboratory's work is no longer limited to aircraft, with research activities expanding into preventing the death of trees from lightning strikes, the development of cleaner and safer insulation gases, and potentially investigating electricity discharges in outer space.

Challenge Cardiff sent Rhys Phillips (BSc 2008) (RP), a research engineer at Airbus and Cardiff University alumnus, to talk to Professor Manu

Haddad (MH), Director of the MBLL, about the high-impact research being conducted at the lab.

RP: Tell us a little bit about your work and what you do at the University.

MH: My work is about high voltage systems. You can find high voltage systems in electric power networks, aerospace, vehicles, medical equipment and anything that is powered with more than 1000 volts.

RP: Can you give an example?

MH: In your car you have a coil for ignition, an x-ray machine, electric pylons and electric substations. All of these are powered by high voltage systems.

RP: Tell me about the group that you run here at the University. How big is it and what sort of facilities do you have to work in?

MH: We have two labs: one specialises in high voltage sources and high voltage phenomena; and we have the lightning lab which specialises in high currents.

RP: When it comes to the sorts of problems you solve, what is the difference? What sorts of problems would need to be done in a high voltage facility as opposed to a high current facility and vice versa?

MH: If I put it in a simple way, in high voltage labs we look at insulation and how good the insulation between two conductors is. If one conductor is at high voltage level and the other is at ground level, we need to make sure that there is no sparking between them.

In the high-current lab, it is the opposite. We want to know what the impact is of the current flowing through that test object. That is the case in the lightning lab where we are testing aerospace components when they are hit by lightning.

RP: What projects are you currently working on at the lightning lab?

MH: We have the Protection of Structures from Lightning Strikes (PROTEST) project which is an Airbus-led project funded by Innovate UK. That is looking at the effect of lightning on joints of carbon composites in aircraft. The

other project is looking at lightning effects on tropical forests.

RP: So two quite different projects?

MH: Yes, the latter is working with geographers and environmentalists from Exeter and Edinburgh universities. Our input is the understanding of lightning, the measurement of it, the characterisation of electrical properties, and where we expect the lightning strikes to happen in two rain forests in Nigeria and Cameroon.

RP: So in PROTEST, we put pieces of aerospace material into the lab and zap them to see what happens. In this other project are you putting pieces of rainforest into the lab and trying to blow them up with lightning?

MH: No, we're developing the techniques to measure lightning strikes within the lab, which can then be transported to the rainforests. Measurements can be done around trees and their roots.

RP: You're not looking at developing some sort of lightning protection for trees?

MH: No, we're looking at tree mortality in relation to lightning strikes.

RP: Outside of the lightning lab you have the high voltage lab. What sort of projects happen there?

MH: My main collaboration is with National Grid. We have a framework agreement with them which started in 2004. We have run over 50 projects in various areas which are of interest to them.

RP: Are there key discoveries that have come out of your research?

MH: In recent years we've been looking at insulation gases. Electrical systems need to be separated by large distances to avoid flashovers between conductors. If you use air, you need a lot of space. In order to reduce the size of these electrical systems, we use insulated systems that use a special insulating gas. The gas that is used is sulphur hexafluoride, SF₆, which is very bad for the environment – 24,000 times worse than carbon dioxide. When it escapes into the air, it can live for over 3,000 years, so the impact that it has on our planet is really bad. My current research is looking for an alternative gas to do the same job but without the damage to the environment and the global warming effect.

RP: As someone who does research in industry, we get to see the direct impact of our work when it is put on to a service or product developed by the company. In academia, you are a step back from that. Do you get to see the impact of your research or does it leave you and you're not quite sure where it goes?

MH: We have been working on outdoor insulation using new materials such as silicone rubber. We are now at a stage where we are working with National Grid on real textured insulators and installing them on the system, with a view to testing them and trialling them on the network. If that is successful, then within the next two to three years we could see our insulators being used on the network.

RP: How important is collaboration with industry for your research?

MH: I would say possibly 80% of my work is with industry, so it is very important. As engineers, we have specific knowledge in a particular area which is directly applicable to industry, whether it is in the power networks or in aerospace. That knowledge of high voltage of high electric field phenomena is important to industry.

RP: Presumably, there are going to be some challenges. Industry is going to have some objectives, you as an academic are going to have objectives, and they don't always necessarily match?

MH: Occasionally, there are those situations where industry is looking for a product or a solution to a particular problem, whereas, in our case, we want to do the research, and to get the basic understanding, but I think whichever problem we engage in, eventually we do both. We help industry to solve their problem but, at the same time, we improve our knowledge and fundamental research.

RP: I am speaking to you a few days after International Women's Day. In the UK, we know that the engineering workforce doesn't have a good gender balance. Women make up only 9% of the workforce and that hasn't changed for over 40 years despite the best efforts of many. You are in a position of influence. Do you think there is something you could be doing to change this within engineering?

MH: If I look at my group, I usually have around 40% female, maybe 60% male students. At the moment there aren't many women in the UK who specialise in high voltage engineering. There are many elsewhere in the world, but not so much here in the UK. We hope that by doing the kind of work we are doing in the lightning lab, we will get the younger generation to specialise in this area.

RP: It's a cool thing to be working on?

MH: I think so. It is something that people see as directly touching them because people fly on a daily basis. There is lightning on planes every year. It has more appeal than other areas of high voltage engineering, such as power networks for example.

RP: What happens if you wake up tomorrow and Airbus doesn't exist – no more collaboration is possible... are you looking at other collaboration opportunities?

MH: We talk to people in the defence sector, other aerospace companies, and their suppliers. At the moment, the lab has a certain capacity, and projects need to come in a certain order.

However, there is a lot of work to be done around lightning impact on other structures, ground structures, airborne structures and possibly more future technologies to come.

RP: If we think of the future of flight, in the more immediate future electric flight, and in the distant future flying cars, how does your work with lightning strike protection of aircraft translate to future technologies?

MH: I think it will be of direct importance because if you solve the problem of lightning on aircraft, whatever you learn from that experience will help you to solve problems with flying cars or with drones. The work that we do is not only generated by lightning phenomena but by fault currents within the system and the impact of those high currents will be the same.

RP: Do you have a gut feeling for what the next lightning project might be?

MH: Next week, I have a meeting with a UK group on atmospheric electricity and we are going to look at the electrical discharges in outer space. We are looking at other planets and beyond our own cloud-to-ground lightning phenomena.

"If you solve the problem of lightning on aircraft, whatever you learn from that experience will help you to solve problems with flying cars or with drones."

Professor Manu Haddad

Barriers to running revealed

In an age when the nation's health is under constant scrutiny, running is becoming a popular way of getting fit and healthy. During last year's IAAF/Cardiff University World Half Marathon Championships researchers and clinical experts from the School of Healthcare Sciences investigated what motivated people to run and what the barriers to exercise are.

A group of novice runners was invited to take part in two surveys, one before the race and one six months later.

Novice runner Ali Abdi participated in the World Half Marathon and has since helped to set up a running group in Grangetown, Cardiff, as part of a University engagement project. He spoke to Dr Liba Sheeran who led the research, to find out more about the project and how the findings are being used.

AA: Tell me about how you got involved with research involving novice runners at the Cardiff University World Half Marathon Championships?

LS: Our School had a long standing involvement with the Cardiff Half Marathon through providing soft tissue therapy and massage to the runners, using our physiotherapy students supervised by the lecturers and physiotherapy clinicians. Cardiff University sponsored the World Half Marathon and we were approached by the Communications and Marketing team about potential research opportunities.

This was a great chance to look at some more pertinent questions into physical activity and how people get into exercise. As physiotherapists we find that people are motivated to be physically active, but they are often hindered by injuries. We wanted to look at how different ways of helping them to prevent their injuries would impact on their longer term physical activity participation levels.

AA: Why did you choose to do this particular piece of research? What excited you about it?

LS: I am a runner. This is because running is accessible, relatively inexpensive and very easy to fit into people's lives. It is a great way to get physically fit and mentally strong.

As physiotherapists, we experience first-hand that starting to run exposes people to niggles which could potentially put them at risk of injury and deter them from running. We wanted to find out whether this is just something we see as clinicians or whether injury is a real barrier to getting and staying physically active when training for and eventually running a half marathon.

AA: That's really interesting. How did you find runners to take part in the research?

LS: We were able to approach novice runners in the 500 Club which was an initiative run by the IAAF's Athletics for a Better World social responsibility programme, sponsoring 500 first-time runners to take part in the race. The runners were recruited by the 2016 World Half Marathon organiser Run4Wales, with help from two of Cardiff University's engagement projects.

AA: I was actually one of the novice runners. What sort of questions did you ask and what else did you do with them?

LS: We asked them about their previous running experience and what their levels of participation were before they signed up to run the Cardiff University World Half Marathon. We also asked them about concerns they had about training, potential barriers that they encountered, and what would enable them to continue to exercise and take part in the training.

We also asked them about the things that could help them in training, like apps, and what advice they would find useful. We developed injury-prevention workshops to allow people to find ways in which they could prevent injuries, such as warm-up strategies, stretches, mobility and strength-for-running exercises. This was also supplemented by free online videos (<https://tackk.com/rtlwjz>) that people were able to access and use.

AA: What were the main findings of your research and did anything surprise you?

LS: The main finding was that these big events get people active and from the six-month follow-up survey results they keep them active.

The vast majority of runners found that using running monitoring apps or keeping a training diary were helpful strategies to continue to run.

We also found that people's busy lives often are perceived as a barrier to exercise. Other things that put people off were safety on roads and running alone.

For us as physiotherapists, the injury data was really important. We found that injury is a major concern for those starting to take part in regular exercise. For seven out of ten people this did hinder their training pattern. The injury-prevention workshops also significantly reduced the self-reported injury rates after the six months. Those who used those workshops did learn something which enabled them to remain physically active without injury hindering their progress.

“Ultimately, people need to feel happy and they need to enjoy it to come and run again.”

Dr Liba Sheeran

Ali Abdi

Dr Liba Sheeran



Ali Abdi and Dr Liba Sheeran with Nia Eva one of the members of the Run Grangetown Running Group

AA: I've helped set up an informal running group in Grangetown following my involvement in the Half Marathon, as a legacy to those novice runners. What advice can you give the runners?

LS: I think for the runners it is all about progressing gradually - accepting that sometimes pain from training and little niggles that come on and off are logical and an expected part of running. If something keeps consistently coming up, however, like a calf strain for example, it may need attention. This does not necessarily have to be a costly physiotherapy intervention but a light-touch advice on recovery and pacing to allow the overloaded structures to recover and supplement this with appropriate stretching and mobility exercises to optimise movement and load sharing. Often small things such as spacing the training runs out a little can make all the difference to recovery and being able to train and stay active.

AA: What advice can you give me to attract new runners to the group?

LS: From our findings the main thing is that people are motivated by running in groups that aren't necessarily challenging but provide social contact and a safe environment. Novice runners appear to feel more comfortable

exercising without that competitive element of club running.

One of the really good things that could potentially help is to create social running groups on people's doorsteps in their local area where they could feel safer to run. Organising groups of similar running standard where the runners feel more confident and less intimidated or worried about not being able to keep up with the pace. Ultimately, people need to feel happy and they need to enjoy it to come and run again. So the more fun and enjoyment running could bring, the better chance for retaining the numbers. Making the training more varied, utilising the environment, for example, running between lamp posts, running up and down steps, hill reps, step ups or lunges in well-lit areas etc could introduce variety, a fun element, and actually provide a really good running strength and conditioning work-out, protecting runners from injury.

AA: Thank you, that's really helpful. What do you hope will happen now? Do you think organisers of mass races will use the findings of your research to attract a broader range of runners?

LS: We've already had discussions with Welsh Athletics and Run Wales leaders who

took a great interest in our research. These organisations are already participating in various initiatives and schemes in line with our research findings. They are helping people to get physically active in less competitive environments. Run Wales, for example, set up social running group programmes in hard-to-reach areas in South Wales.

On the back of our research findings, we teamed up with Welsh Athletics and submitted an application to the Knowledge and Economy Skills Scholarship (KES2) scheme funded by the Welsh Government and the EU for a PhD studentship on a project titled 'Running in the Valleys: It's all downhill from here!' Looking to embed our injury prevention workshops into the social running groups in South Wales and evaluate the impact on physical activity participation rates and long-term health outcomes.

L: Laura Tenison

R: Professor Martin Kitchener

Putting public value at the heart of research

In 2015, Cardiff Business School committed to becoming the world's first public value business school. This model sees the School pool its research expertise and build stronger links with other disciplines, such as medicine and engineering, to develop ground-breaking solutions to the most pressing issues facing industry and society.

Ethical innovator and founder of JoJo Maman Bébé, Laura Tenison (LT), spoke to Cardiff Business School Dean, Professor Martin Kitchener (MK), about what a public value approach to research and teaching means in practice and how it will influence and impact on business and society.

LT: In 2015 Cardiff Business School publicly committed to putting public value at its heart. What does this mean?

MK: In contrast to most of the other 25,000 business schools in the world, we have set a clear, bold and progressive values-based strategy, which informs our full range of activities.

I am acutely aware that business schools have been criticised on at least two fronts. First, it has been argued that the relevance of our work is limited because academics tend to research in narrow disciplinary areas that don't reflect the complexity of real-world issues. Some people believe this explains why so few economists predicted the most recent financial crisis. Second, because leading business schools are known to have trained

many of those involved in high profile corporate scandals, some people question the ethics of business and management education.

In response to these challenges, our public value strategy directs the School towards promoting economic and social improvement through interdisciplinary scholarship that addresses the grand challenges of our time, while operating a progressive approach to our own governance. When we use the term "challenge-led scholarship," we are referring specifically to research and teaching focused squarely on addressing the major economic and social problems of our time, such as innovation and inequality.

LT: Your own research is in healthcare and public sector management, what impact did this have on the idea of the public value business school?

MK: Throughout my own research career in Europe and North America, it became clear to me that the major challenges facing all organisations, like innovation and sustainability, are complex, and cannot be

understood from the perspective of any single discipline. This belief led me to study issues of innovation and change in public services collaborating with colleagues from disciplines including medicine, public administration, nursing, economics and sociology.

In one example from my time at the University of California, I worked closely with nurses and public policy experts on studies of the costs and quality of care in residential (social care) homes. Although our basic research demonstrated that the number and grading of nurses was strongly related with the quality of care provided, it was only by working collaboratively with colleagues from other disciplines that we were able to translate our research into public policy. This led to an increase in the federal (Medicaid) nursing pay rates.

LT: How does this public value approach set you apart from other business schools? Why is it a distinct remit and should we be doing more of it in our universities?

MK: When I became Dean in 2012, I had a clear mission to build on and further develop

the School's excellent research reputation while distinguishing it from its competitors.

The starting point is a clear recognition of our responsibility - to our University and wider economy. Alongside the strong economic contribution of our public value model, we changed our approach to the governance of our own organisation to incorporate a series of innovative and progressive structures and processes.

We created a Shadow Management Board (SMB) to invite more diverse participation in the School's decision-making process. Members represent a diverse mix of personnel from across the School who are at various stages of their careers. The 15 members (five men and 10 women) represent the five academic sections, professional services, as well as teaching and research. Senior colleagues from across the School and the College of Arts Humanities and Social Sciences are regularly invited to SMB meetings to discuss strategic and operational matters.

Our second major change in internal governance was to include a commitment to interdisciplinary and challenge-led scholarship as essential in our hiring criteria for all academic appointments. So far, we have hired 10 full professors and 17 other academics on that basis.

Our public value mission is increasingly influencing our external engagement activity. We have publicly committed ourselves to external initiatives that align with it. These include 50-50 by 2020 (5050by2020.org.uk), a Welsh campaign to encourage organisations to increase women's representation in decision-making positions to 50% by the year 2020. We received the Athena SWAN Bronze Award for gender equality from the Equality Challenge Unit, which promotes diversity initiatives in higher education institutions in the UK. Currently, we are one of only two business schools in the UK to hold this distinction.

We have developed new relationships with other external organisations and initiatives that are committed to social improvement.

We are partnering with Business in the Community (BITC), a charity that enables businesses to work together to tackle key social issues. The BITC is part of The Prince's Charities, a group of not-for-profit organisations led by HRH The Prince of Wales.

We are developing a partnership with Enactus, a global community of student, academic, and business leaders "committed to using the power of entrepreneurial action to transform lives and shape a better, more sustainable world."

In January 2016 Cardiff Business School became a signatory of the United Nations Principles for Responsible Management Education (PRME) initiative. As a PRME signatory, Cardiff must submit and post Sharing Information on Progress reports at

least once every two years. These reports outline our activities related to sustainability in our teaching and research. The reference to sustainability is more than just environmental sustainability. The first principle (of the six) is that: "We will develop the capabilities of students to be future generators of sustainable value for business and society at large and to work for an inclusive and sustainable global economy".

In addition, principle two asks us to incorporate the values of global social responsibility into our curriculum which includes the Sustainable Development Goals.

LT: What does research in a public value-led business school involve?

MK: Many of the School's researchers are tackling intractable social issues such as poverty, access to decent work and inequality. The School is actively supporting research interests that address social and economic challenges, directing School funds to these activities.

Professor Tim Edwards, through the Responsible Innovation Network is working with a charity in Eritrea. They are building a research programme with a local college to assess the community impact of climate resilient agriculture systems. These efforts will support women-run microbusinesses in agriculture.

Professor Victoria Wass, Professor Melanie Jones and Dr Deborah Foster are focused on disability at work and addressing the inequalities faced by disabled people.

Our economists also contributed to a project led by Professor Jonathan Shepherd in the School of Dentistry to tackle alcohol-related violence. The project resulted in a halving in the number of violence victims treated in Cardiff emergency departments between 2002 and 2013 and has delivered £5m annual savings to Cardiff's health, social and criminal justice systems.

A major University innovation which will enable us to further develop our public value research ambitions, is the development of the world's first Social Science Research Park (SPARK). It will allow us to engage the public, and practitioners and policymakers from disciplines, sectors, regions, and nations, in our research activity.

LT: Would you consider introducing a teaching module to teach, research and analyse the benefit to society of business run as a force for good?

MK: We already offer a number of modules which research and analyse the benefit to society of public value-run business. They emphasise the impact our graduates can make in the future.

The modules Ethics and Morality in Business, and Marketing and Society focus on the ethical and moral choices for business.

The core objective is to raise undergraduate and postgraduate awareness of the social consequences of business decision making and the power they hold for generating positive outcomes.

The ethics module explores many different moral dilemmas including:

Philosophical - do the ends justify the means; can you engage in unethical action to achieve good? Is it more important to secure the happiness and interests of the many at the expense of the interests of the minority?

Environmental - how much should we limit economic growth and prosperity to take care of future generations as yet unborn?

Financial - should we invest ethically or avoid investing in tobacco or arms companies even though they may bring a healthy return to investors which could be a pension fund?

Utopian - should we be cynical about idealism and not trust anyone that has an agenda to make things better?

Real life - is crime good for the economy and for the world's global poor?

LT: Will this type of research and teaching encourage a more public value approach to business?

MK: Our ambition is to encourage our students and graduates not to accept the status quo, to think differently and feel empowered to provoke change in business for the good of society. We nurture within our students a sympathetic imagination to consider the social impact, as well as the economic benefit, of their contributions and interventions in the corporate world. This begins during their induction week when they complete a questionnaire assessing their orientation towards social improvement. By the time they reach the final year of their studies and re-take the survey, we hope to be able to demonstrate that Cardiff Business School has had a positive effect in nurturing their commitment to promoting social and economic improvement through their work; whether that is as a hedge fund manager or leader of a social enterprise in Africa.

This is a step change for business and management education and we are delighted with the support we have received from other organisations, such as the Chartered Association of Business Schools. We recognise that it will take time to fully embed the principles of the public value strategy in all that we do.

We are fully invested in achieving real social improvement and change, and hope to inspire others to similarly take a public value, socially minded, approach. The collective impact that could be generated, should others adopt comparable principles, is significant, and we welcome the opportunity to work with our global partners to that end.



Employer experience of the Living Wage

Employer commitment to the voluntary Living Wage is strong, and the experience of most Living Wage employers has been positive, according to a recent Cardiff Business School study.

Evidence collected in the study demonstrates to businesses that going above and beyond statutory minimums can bring tangible benefits to an organisation.

Researchers looked at why and how employers lent their support to the Living Wage, including the reasons for paying and the positive effects for low-wage workers. The study found that the desire to act responsibly is one of the driving forces behind becoming an accredited Living Wage employer.

Gains noted by employers include enhanced brands, differentiation from competitors, and improved corporate reputation.

No evidence of employers recovering the cost of the Living Wage by cutting other employment provisions was found by the research team, and there was little to suggest the Living Wage had a negative impact on investment, employment or prices.

The research was carried out in partnership with the Living Wage Foundation, the charity that promotes the Living Wage and accredits employers who agree to pay it. All accredited employers were sent the survey and more than 840 (30%) responded, representing the full range of accredited organisations. The researchers also conducted more than 40 recorded interviews with Living Wage campaigners, employers and trade union representatives about their experiences of campaigning for and implementing the Living Wage.

Since created in 2011 more than 3,000 employers have signed up to the Living Wage. It is estimated that about 150,000 employees have received a substantial pay increase as a result. The Living Wage is a voluntary wage standard, currently set at £8.45 per hour for the UK and £9.75 per hour in London.

Full speed ahead for research and innovation in the Great West

The GW4 Alliance leads regional taskforce and launches new collaborative projects.

From supercomputing to creative collaboration: our new projects

The GW4 Alliance has launched two major projects this year, funded by Research Councils, in partnership with major organisations and SMEs in the region.

The first is Isambard, a supercomputer which has been hailed as a 'global first' in its use of semiconductor technology. Isambard is being developed by GW4 academics and partners Cray Inc and the Met Office. Funded by the Engineering and Physical Sciences Research Council (EPSRC), the high performance computing (HPC) service will enable scientists across the UK to compare hardware platforms quickly and cost-effectively. The project was unveiled at a national exhibition at the Thinktank science museum in Birmingham. The Met Office will be home to Isambard, enabling climate scientists to gain first-hand insights into how their weather models need to be adapted to emerging computational architectures.

Professor Simon McIntosh-Smith, leader of the project and Professor of High Performance Computing at the University of Bristol, said: "Isambard could be the first of a new generation of ARM-based supercomputers, ushering in an era of wider architectural choice, and greater opportunity for differentiation between vendors."

"Isambard will enable scientists to choose the best computing solution for their problem, saving time and money and hopefully leading to a higher rate of scientific breakthroughs."

The second project is Bridging the Gap, which is developing new mechanisms of collaboration between academia and industry across the South West and Wales, funded by the Arts and Humanities Research Council (AHRC). Researchers will work with organisations including the BBC, British Museum, National Trust, English Heritage and Cadw (the Welsh Government's heritage conservation and tourism organisation), as well as SMEs and local authorities to refine innovative methods of co-production and test new technologies to benefit creative industries across the UK.

Academic lead Professor Tim Cole, Professor of Social History and Director of Brigstow Institute at the University of Bristol, said: "Many academics work closely with partners outside the university but rarely get the chance to stop and reflect on what they've all learnt in the process. This project provides an opportunity to do just that, as well as a chance to push things a little further by experimenting together with new mechanisms of working across the arts and humanities, heritage and the creative economy sectors, which are so important to our regional economy and identity."



Senior representatives of the GW4 Alliance and Great West Taskforce joined by Ben Bradshaw MP at Westminster event

#GreatThinking from GW4 Opinion

The GW4 Alliance has launched GW4 Opinion which brings together senior academics with prominent figures in industry and government to consider policy developments, opportunities and aspirations for the region.

The series showcases #GreatThinking from the Great West, and features in-depth articles from experts in our region's world-leading sectors, from creative economy to new energy to engineering.

Find out more and read the latest articles at gw4.ac.uk/opinion

If you are interested in contributing to this series, please email GW4 Communications Officer Hannah Scarbrough at scarbroughh1@cardiff.ac.uk.



Making our voice heard in Westminster

At the start of this year senior representatives from the GW4 Alliance (the universities of Bath, Bristol, Cardiff and Exeter), Local Enterprise Partnerships and major organisations met with politicians to discuss how they can work together to ensure that the South West England and South East Wales region is recognised as an economic powerhouse in its own right, alongside the Northern Powerhouse and Midlands Engine.

At the Westminster event, sponsored by Rt Hon Ben Bradshaw MP, politicians heard that the 'Great West' can recapture the ambitious vision of Isambard Kingdom Brunel as a hyper-connected, smart and specialist region.

Following this event, the Great West taskforce was established to take forward the recommendations of the South West England and South East Wales Science and Innovation Audit and to respond to major policy developments such as the UK Government's Industrial Strategy.

The taskforce, led by the GW4 Alliance, brings together university and industry partners such as Oracle, Airbus, the Met Office and the Compound Semiconductor Centre (a partnership between Cardiff University and IQE plc) to develop step-change investment opportunities and champion science and innovation for the region.

"We are proud to realise the scale of this region's ambition and will work hard to ensure that the voice of the Great West is heard loud and clear at Westminster."

**Dr Sarah Perkins,
GW4 Director**



Memory Palace

The drawing *Memory Palace* represents an ancient procedure that turned memory into an imaginary space in which 'images' could be retained, based on an architectural metaphor.

The drawing was created by Dr Rhys Bevan Jones, psychiatrist and clinical research fellow, at the Division of Psychological Medicine and Clinical Neurosciences.

Dr Bevan Jones is interested in visual metaphors related to the mind and mental states, and their use in psychoeducation, medical education and public engagement work, to engage, inform, educate, and promote discussion. He recently completed a National Institute for Health Research/Health and Care Research Wales Doctoral Research Fellowship to develop an online multimedia programme for adolescent depression.

Visual metaphors were illustrated and animated to engage young people and to communicate aspects of mood and depression, and its management. The programme was developed through a person-centred collaborative approach, following consultations with young people, families/carers and professionals from a range of services/charities.

It was in line with guidelines that stress the need to engage with individuals and families/carers and deliver accurate information about their difficulties (NICE, 2005), and builds on the work of others at the Division who have developed online mental health packages.

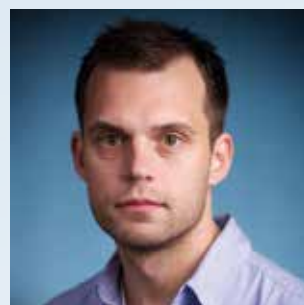
For more information:

MRC blog: www.insight.mrc.ac.uk/2017/03/03/behind-picture-metaphors-mind/

Bevan Jones, R; Thomas, J; Lewis, J; Read, S; Jones, I. (2017)

Translation: from *Bench to Brain - Using the Visual Arts and Metaphors to Engage and Educate*. *Research for All*. 1(2), 265-283.

What made me curious?



▲ Professor René Lindstädt

Professor René Lindstädt joined the University in September 2016, as Head of the School of Law and Politics. An expert in American politics with a particular interest in Congress, he spoke to Dr Stephen Cushion, Reader and Director of MA Political Communication in the University's School of Journalism, Media and Cultural Studies about what sparked his curiosity in the subject.

SC: What sparked your curiosity in American politics?

RL: I spent a year in the United States, in a small town in Alabama, when I was in high school. It was in 1993-1994, right at the beginning of the Clinton administration. I was absolutely fascinated by the political climate and political dynamics, and started really getting into studying American politics and history. I never looked back, and ended up making a career out of it.

SC: Did you ever contemplate a career in politics?

RL: Despite all of my interest in politics as a subject, I never even came close to contemplating a political career. I'm interested in understanding political processes and their implications, and particularly enjoy drawing on quantitative data sources to shed new light on longstanding questions. Real-life politics is too messy for me to want to be a part of it.

SC: Why the particular interest in Congress?

RL: The big three institutions in American politics are Congress, the Presidency and the Supreme Court. So when I started graduate school, I had a choice to make about how to specialise. I was very fortunate to work with one of the pre-eminent US Supreme Court scholars, Professor Lee Epstein, at my alma mater, Washington University in St. Louis, which is why my early work was on the Supreme Court. Eventually, I started to develop an interest in legislative processes and in particular the rules that govern legislative politics. Yet I have kept a keen interest in the US Supreme Court, and I'm in slowly getting back to working on studying courts now that I'm working at the School of Law and Politics.

SC: How much influence did your time in the US at the State University of New York Stony Brook have on the direction of your research?

RL: My graduate training at Washington University in St. Louis had by far the strongest influence on my research. My research agenda

was already set, at least in broad terms, once I arrived at Stony Brook University in 2006. Having said that, I greatly benefited from Stony Brook's strength in research on political psychology. My excellent colleagues at Stony Brook frequently challenged my conceptual views of political behaviour, which are rooted more in the rational choice tradition. My research greatly benefitted from those interactions.

SC: What do you see as the current challenges in your field?

RL: There has been a long-standing challenge to make the research we do in political science relevant to real-life politics. I think the discipline as a whole has got a lot better at this in recent years, but there is still a lot of work to be done.

SC: How do you think Trump has changed US politics? Do you think he will be re-elected?

RL: No, I don't think he will be re-elected. In fact, and I will probably regret later having made a prediction, I don't think he will finish the four-year term he was elected to last year.

SC: What were the main reasons for Trump's election, and what role did the media play?

RL: I believe that the research community is only just starting to come to grips with this question. In some respects, the election of Trump is part of a larger phenomenon that can, to a large extent, be traced back to the fact that globalisation has not generated benefits for all parts of society. As a result, we have seen more protest voting and elections that have produced winners that are not part of the mainstream.

As to the specific case of Trump, there are many different reasons that conspired to produce this outcome: a large field of Republican primary candidates; a divided Democratic Party; the alleged Russian meddling in the electoral process; ideological polarisation in the electorate; and many more. I also believe that the media has found it difficult to adjust to the unconventional and erratic style of Trump the Candidate and Trump the President.

SC: What can journalism do to hold politicians like Trump more accountable?

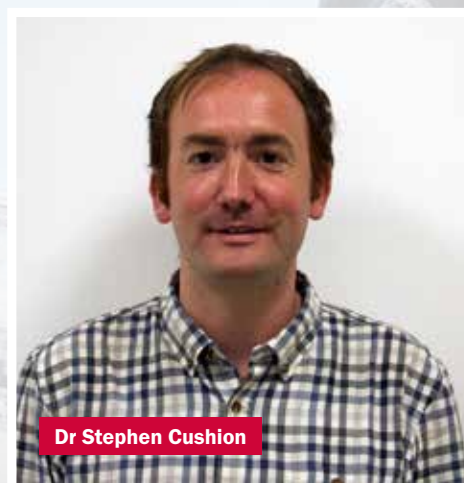
RL: A lot. I think that in many ways the election of Trump has reenergised the media and brought a resurgence of investigate journalism designed to hold political elites accountable. *The Washington Post*, which played a big role in bringing down the Nixon administration, is once again playing a leading role in the investigation of Russian meddling in the 2016 presidential election.

SC: Do you think we live in an era of post-truth politics? Do you see similarities between Brexit and Trump's election victory?

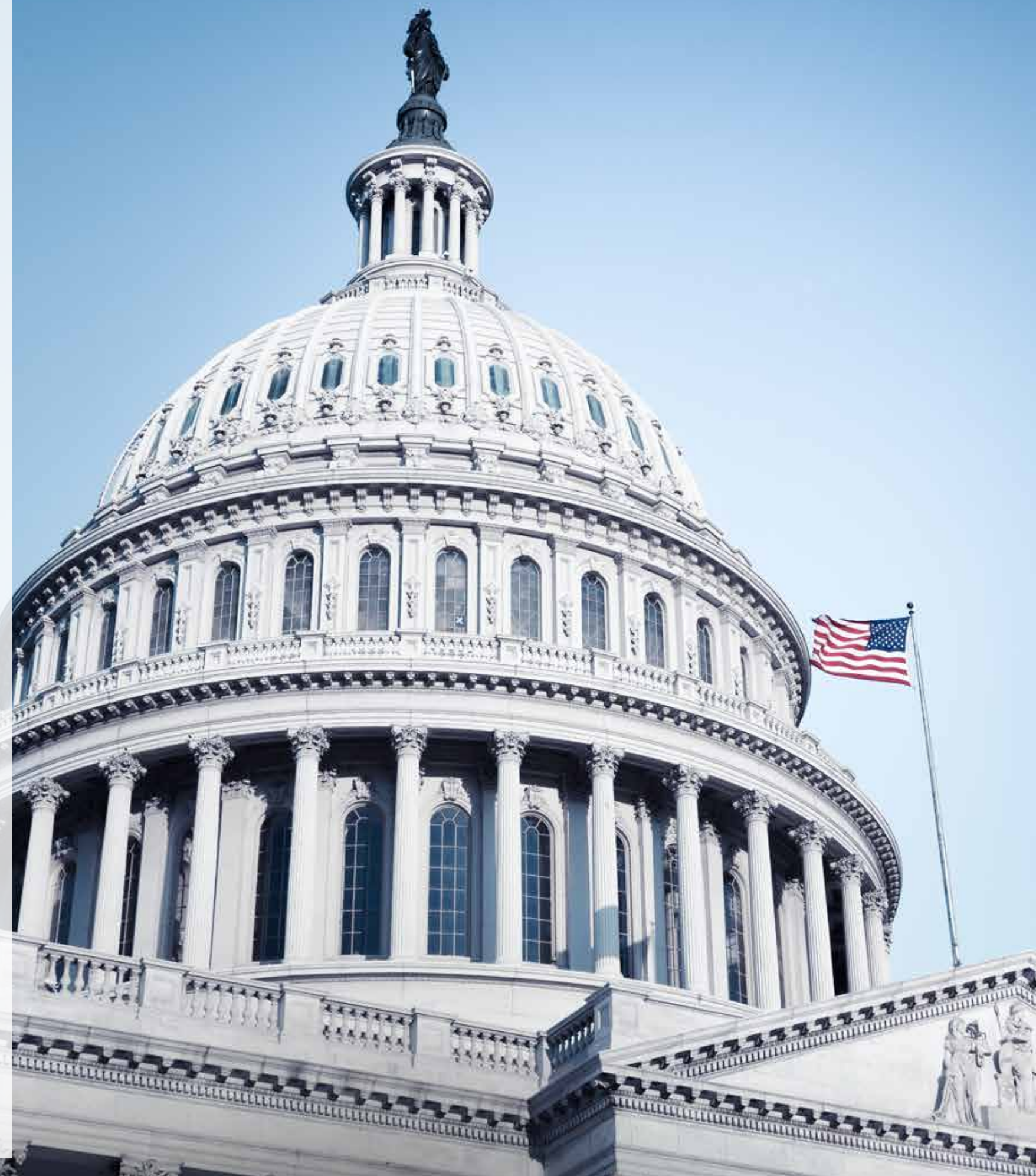
RL: We are at risk of sliding into an era of post-truth politics, which is why it is so important to have a strong, independent media. I do believe that there are some similarities between what brought about Brexit and the election of Trump, i.e. what I said earlier about globalisation, but I believe that there are also many more differences.

SC: What are your future research plans?

RL: For obvious reasons, I'm trying to combine my interests in law and politics to explore research questions at the intersection of the two fields.



Dr Stephen Cushion



Crime and Security Research Institute

The Crime and Security Research Institute was established in 2015. It combines the expertise of three world-leading research groups, the Universities' Police Science Institute, Data and Knowledge Engineering, and the Violence Research Group, as well as a growing community of innovative, multi-disciplinary academic partners to develop new insights, evidence and knowledge about local, national and international crime and security problems.

Professor Martin Innes, Director of the Crime and Security Research Institute, said: "Crime and security challenges are transforming, and how we research these issues needs to change also. We need new concepts, methodologies and approaches. Cardiff has established an international reputation for pioneering work in this area, and with the investment in the Crime and Security Institute we continue to identify new ways in which societies can respond to these challenges."

Since its inception, the Research Institute has secured in excess of £1.5m external funding. It works with a range of external partners including the Home Office, Welsh Government, IBM, Metropolitan Police Service, Her Majesty's Inspectorate of Constabulary, and the College of Policing.

Open source communications and big data analytics

One of the early achievements of the Institute is the establishment of the Open Source Communications Analytics Research (OSCAR) Development Centre, led by Professor Martin Innes. This examines how big data and social media are transforming policing and investigative, intelligence and engagement work, from neighbourhood policing to national security. These issues are being investigated through a strategic relationship between the University, the police National Counter Terrorism Functions Command, and five police forces across the country.

Open source communications have created greater public demands for police accountabilities and transparency. Funded by the Home Office, the Higher Education Funding Council for England (HEFCE), and the College of Policing, the Centre is helping to develop open source methodologies, technologies and insights that will shape the future of policing.

OSCAR is already delivering significant impacts. The national policing lead for open source intelligence in counter-terrorism has said of the programme:

"One of the most important pieces of work was reviewing the ways of working with open source practitioners. This insight has allowed us to improve training programmes and change our thinking about how we hire staff... OSCAR has saved the tax payer significant money assisting us in these areas."

Utilising OSCAR's innovative data analytics software SENTINEL, researchers at the Research Institute are working to develop new evidence and insight into how the circulation of 'soft facts', in the form of fake news, rumours, and conspiracy theories, alter public perceptions and understandings.

A particular focus on this issue has been facilitated by an Economic and Social Research Council (ESRC)-funded project on the social and security implications of Brexit. The Soft Facts, Social Media, Security and Brexit project seeks to examine the causes and consequences of the rise and spread of soft facts based on three different types of events and across four different categories, which can have important ramifications for community tensions and social cohesion.

The question of whether Brexit will make the UK a safer place is difficult to answer. The picture is complex, and the security implications are as yet relatively unknown. In order to address these questions and the immediate challenges for the future of policing, the Research Institute convened a recent conference titled Open Sources, Closing Borders: Policing, Counter-terrorism and Organised Crime in Europe After Brexit.

The event created a forum for senior academics, police and intelligence practitioners to engage in thought-leadership work around the potential consequences of Brexit. Participants included

the former Chief Inspector of Constabulary, Sir Denis O'Connor, the National Crime Agency, the National Prevent Co-ordinator, South Wales Police, Metropolitan Police Service, the National Police Chiefs' Council, and the College of Policing. A report setting out key issues and insights was due to be published in June.

The OSCAR work links with another project the Research Institute is involved with. The UK and US Governments have formed the Distributed Analytics and Information Science International Technology Alliance (DAIS ITA) with funding of up to \$80m. Focused on understanding how the Internet of Things and other sources of big data will transform intelligence work, the partnership comprises a consortium of leading UK and US academic and industry organisations led by IBM, alongside a number of academic and industry partners including Airbus Group, BAE Systems, Imperial College London, Raytheon/BBN Technologies, Stanford University, University of California at Los Angeles, University of Massachusetts at Amherst and Yale University.

Technology developed as part of the ITA and OSCAR projects is being used to analyse open source social media data to monitor community reaction to large scale events, and was pioneered during the NATO summit in South Wales in 2014.

Professor Alun Preece, one of the Research Institute's co-directors and director of the Data and Knowledge Engineering Research Group, is the UK academic lead on the project. He said: "The research will generate the enabling technology and insights to enhance future multinational responses to major crises."

Reducing violent crime

Research carried out by the Research Institute's co-director Professor Jonathan Shepherd and the Violence Research Group led to the development of the Cardiff Model. This is an entirely new way of preventing violence, in which data from hospitals is shared with the police and

local authorities. Receptionists at emergency departments record information, including the location and weapon used, from people injured in violence, and this information is anonymised and combined with police data to inform violence prevention strategy and tactics. This public health approach is credited with reducing violence through research and has led to new use of data and original collaborations between medicine and criminal justice. It is being replicated in several other countries including the US, Australia and the Netherlands.

"Anonymised details from hospitals such as the precise violence location, time, days and weapons are shared with police, helping them to build a monthly 'hotspot map' of the timing and characteristics of violence, showing where their presence is most effective in deterring violence and allowing for early intervention if it does break out," said Professor Shepherd.

The recent spate of police shootings in the US highlighted the need for reform and sees Professor Shepherd working with Dr Steve Sumner from the US National Center for Injury

Prevention and Control in Atlanta, who says violence in the US can be tackled if police and health agencies work together.

Evaluations show that policing and violence prevention can be much more effective if agencies work together to identify and tackle violence hotspots, which could cut the death toll on America's streets. The Cardiff Model has already been adopted in Milwaukee, where Professor Stephen Hargarten, Medical College of Wisconsin, works with the US National Institute of Justice.

The award-winning model has this year won a £740,000 (\$1.4m Australian dollar) grant to work on cutting violent crime using data from accident and emergency departments in several Australian cities including Melbourne, Sydney and Canberra.

The Evaluating the Diversion of Alcohol-Related Attendances (EDARA) project led by the Violence Research Group's Professor Simon Moore is evaluating the effectiveness, cost-effectiveness, efficiency and acceptability of the Alcohol Intoxication Management Services (AIMS)

in managing alcohol-related attendances at emergency departments. AIMS are designed to receive, treat and monitor intoxicated patients who would normally attend emergency departments and to lessen the burden that alcohol-misuse places on unscheduled care. They offer the potential to mitigate some of the pressures on emergency departments as well as ambulance services and the police at times when there is a sustained increase in demand.

Professor Moore also leads the Alcohol Misuse: Electronic Longitudinal Alcohol Study in Communities (ELAStic) project, which works to determine pathways into alcohol use and misuse and the life-course effects of alcohol misuse on health and well-being. This three-year study uses statistical methods and modelling techniques to analyse and interpret existing longitudinal data, linked with routine health and administrative data. The project is funded by ESRC, Medical Research Council (MRC) and Alcohol Research (ARUK).



From L to R: Professor Alun Preece, Professor Martin Innes and Professor Jonathan Shepherd



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