THE **DNA** OF INNOVATION: VOLUME III

CREATIVE CONNECTIONS

Queen's University Belfast

WE ARE QUEEN'S UNIVERSITY BELFAST
We are exceptional

CONTENTS

Note: The content features are listed in alphabetical order by the surname of the researchers

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FOREWORD

Professor James C McElnay

The profiles on these pages provide a vivid portrait of gifted academics confident in what they are doing, in what they can achieve and in how their work can influence the world around them.

Their collective story is increasingly the story of Queen's University itself. It is a story of self-belief.

This is a world-leading institution, the heartbeat of Northern Ireland, making an impact on society at home and abroad, sharing its knowledge and its talent through a diverse range of activity.

In this third volume of our *DNA of Innovation* series, there are economic and industrial partnerships, cultural collaborations and scientific links. We help deliver change in education, in the understanding of history, in social policy – and through all of this pioneering work we enhance the reputation of our University as a centre of innovation and of Northern Ireland as a place of progress.

Making a selection for this publication was not an easy task. The people who have been chosen are individually remarkable, but they represent the University as a whole, its commitment to excellence and to providing the space where academic enterprise can flourish for the benefit of us all.

They and their colleagues throughout Queen's are a success story and I wish them well.

Professor James C McElnay
Acting President and Vice-Chancellor
Queen's University Belfast

"This is a world-leading institution, the heartbeat of Northern Ireland, making an impact on society at home and abroad."

CREATIVE CONNECTIONS

Mr Scott Rutherford

> “On these pages you will see evidence of a growing scale of connectivity and collaboration and how we are rising to meet global challenges through local and international partnerships.”

This is the third volume in our successful series *The DNA of Innovation* in which we highlight the outstanding and continuing achievements of academic colleagues at Queen’s.

The first volume turned the spotlight on those making an impact in engineering and the physical sciences, men and women carrying out ground-breaking scientific investigation. Volume two delivered a picture of a broader research base and how it benefits society in terms of policy, culture and business, as well as health and life sciences.

This new volume tells the story of how our researchers make *Creative Connections.* It reveals how they exchange knowledge between industry and academia through secondments and placements, how they maintain close collaborative links with major commercial companies, with hospital trusts, with government agencies, and how their work is influencing major societal change.

It provides a picture of a university playing an increasingly active role in community and society in Northern Ireland and globally, engaged in research which is delivering life-changing impact.

In the profiles on these pages you will see evidence of a growing scale of connectivity and collaboration and how we are rising to meet global challenges through local and international partnerships.

We live in a demanding economic environment. Our funders of research want to see evidence of collaboration, how academia is open and accessible, how ideas and people can flow across boundaries. At Queen’s it is the natural way of doing things. In this new volume there is a strong spine of activity with an international outlook and impact, which has been supported by the strategic ambition of our former Vice-Chancellor, Professor Sir Peter Gregson. We provide research leadership for business and industry, helping major companies solve difficult problems. There are long-lasting research partnerships with Petronas, Almac, InfoSys, Seagate and others. Our researchers also help smaller, local companies to innovate and grow, through schemes like Knowledge Transfer Partnerships, for example.

But at the heart of this new publication are our people: poets and pharmacists, engineers and educators, clinicians and chemists, historians and health scientists. The impact they make on our world is exciting and inspiring.

Scott Rutherford
Director of Research and Enterprise

SECRETS IN SOIL CHANGING THE INDUSTRIAL ENVIRONMENT

Dr Chris Allen
School of Biological Sciences

Dr Chris Allen has a very precise view of what his work is achieving. 'We're using enzymes from nature to do useful things for industry.'

His research focus at Queen's School of Biological Sciences is in biocatalysis. 'It's about looking at the bacteria in the environment and harnessing their potential.'

His innovative work has led to several industrial relationships, in particular with the Almac Group, the Northern Ireland-based global contract research organisation, through the development of Knowledge Transfer Partnerships (KTPs).

'The link with Almac came about because they have a very successful research group led by Dr Tom Moody and they're using biocatalysis to develop their business. Originally they were simply interested in the research we were doing and then they realised we had the facilities and expertise that could benefit them and that we could develop a research partnership.'

The result: two KTPs in succession. The first was completed in 2012 and the current partnership runs until 2015. 'We help to supervise the project, provide technical input and facilities, and in return we benefit from stronger links with industry to keep our research current and tuned to industrial need.'

In January 2013, the completed KTP was named 'Outstanding' by the KTP evaluation panel, the highest grade that can be awarded. For Almac, it means the development and improvement of bioprocesses which will facilitate the delivery of novel products for its biocatalysis business.

Chris says, 'One of the things about working in a university like Queen's is that you can ask bigger questions. If you're working in an industrial setting, you're very much focused on profit return and that's understandable. Here you can do applied research and you can also take certain academic risks that you wouldn't want to take in a company.'

He describes 'some of the most exciting work we're doing at the moment. You may think the soil in your garden has no value. But we're looking at alpine paleosols with powerful environmental biology techniques that use an approach called metagenomics, and you can actually find that in a single gramme of soil there are potentially millions of useful enzyme genes that have never been studied before. These can be used in biofuels, pharmaceuticals and so on.

'It's about taking very pure fundamental environmental science and demonstrating potential for new technology that then creates something of value to a company like Almac.'

Chris has high praise for the Research Centres at Queen's – for example, the Centre for the Theory and Application of Catalysis and the Queen's University Ionic Liquids Laboratory. 'Not only do they help fund our research but they help to strengthen the links with industry. Within the Centre that funded me when I first came here, there are companies like Shell, BP and Northern Ireland Water. We're able to direct our research towards what they need and they will fund us. This culture is one of the great things about Queen's.'

There are strong international links. Nigerian PhD students come to learn the latest techniques in environmental microbiology which can then be used back in their country's oil industry.

At home, links with the Belfast company Whiteford Geo Services, with part funding through Invest NI, has led to a new technology platform to assess contamination in soil. 'Shell and BP are also interested in this. We're able to look at the microorganisms that are present and estimate how they're actually doing their job. There's a lot of innovative research involved.'

The link with Almac has additional benefits. 'They're one of the biggest employers in this area in Northern Ireland, and they're eager that Queen's produces the graduates with the skills they need. We want to go a step further – to train students from this University within Almac so that they're exposed to the industrial environment before they graduate. That's an aspiration.'

“We help to supervise the project, provide technical input and facilities, and in return we benefit from stronger links with industry to keep our research current and tuned to industrial need.”

Professor Cecil Armstrong and Dr Trevor Robinson (left)
School of Mechanical and Aerospace Engineering

> “There’s a little triangle: the industrial end user has the problem, we are the source of research ideas and concepts, then the commercial people take that and deliver to the end user something they can support.”

PROBLEM-SOLVING FOR THE GIANTS OF INDUSTRY

Professor Cecil Armstrong has no doubt about the benefits of academics working in collaboration with industry. 'They can supply us with problems we never thought of, problems with a complexity we could never dream up in the lab, and that helps us to keep our focus on the real issues.'

Cecil, from Queen's School of Mechanical and Aerospace Engineering, explains his research aims: 'With very complex systems like gas turbine engines, companies are trying to predict or simulate how the engine will behave in all possible situations it might get into during service.

'Typically, that involves taking complex geometry and making analysis models which can predict that behaviour. Getting the analysis models ready to run so that designers can use them to make intelligent decisions about changing things for the better is where our focus is.'

Cecil works closely with colleague Dr Trevor Robinson in the Finite Element Modelling Group. Trevor graduated at Queen's in 2003 then embarked on a PhD on Vivace, a European Framework programme on the process of making the analysis models of gas turbine engines more efficient.

Among the many industrial partners on the project was Rolls-Royce with whom Queen's has a lasting relationship, shown most recently in the completion of a Knowledge Transfer Secondment. It involved a placement for a postdoctoral researcher, Dr Jonathan Makem, allowing the company to have exposure to the University's technology and allowing him to identify new research opportunities.

Trevor explains, 'The preparation of these analysis models involves breaking pieces of geometry down into a mesh which is what the analysis is run on. For complex components this can take three to six months so we do our best to make that process more efficient, to speed up the design and make it less costly.

'Jonny was able to take work that we'd developed here to see how it would perform in real-world components, to see what time savings were available, what the issues were and what we hadn't thought about.'

Jonathan, who now works in advanced simulation development at Siemens, says, 'It was invaluable to get this kind of exposure. At the end of my secondment I was given the opportunity to present the results of my work to the senior management team within Mechanical Methods and this raised their interest in future research on similar topics.'

Cecil says, 'There's an order of magnitude between a proof of concept – where you have an idea and do some minimal research – and translating that into an industrial tool. That requires major investment and development. Companies are willing to explore these options because they don't want to miss anything. They call it their de-risking strategy.

'There's a little triangle: the industrial end user has the problem, we are the source of research ideas and concepts, then the commercial people will take that and deliver to the end user something they can support and will be part of their process. We can't ever be in a situation where a company like Rolls-Royce is dependent on a bit of University software. They just wouldn't entertain that.'

Trevor emphasises benefits for teaching. 'I take the introductory design courses. I was able to ask some of the Rolls-Royce engineers what the main shortfalls are with graduates coming into their company. So then I'm able to go back to my students and tell them – these are the things we're going to focus on and this is why they're important. The students see real benefit in direct feedback from the company.'

Cecil says, 'The work is tremendously exciting. The job of an academic has evolved hugely over the years.'

Trevor adds, 'It takes time. Ten years ago we had an idea which we floated to Rolls-Royce but they didn't respond. Then recently they brought it back to us as something they might like to look at. It's about trust. Companies build their faith in you when they see over a number of years that you can deliver.'

WORLDWIDE COLLABORATIONS TO COMBAT EYE DISEASE

Professor Usha Chakravarthy
Centre for Vision and Vascular Science,
School of Medicine, Dentistry and
Biomedical Sciences

When academics at Queen's talk about making a global impact, they may well have people like Usha Chakravarthy in mind.

In addition to her role as Professor of Ophthalmology and Vision Sciences for the University and the Royal Victoria Hospital, she is also Chair of the Ophthalmology Group for the UK Clinical Research Network; a member of the Royal College of Ophthalmologists Academic Group; a member of the scientific advisory panel for AMD Alliance International; a member of the steering committee for a Lasker Foundation/International Retina Research Foundation Initiative; an international member of the Macula Society; external examiner and advisor to the University of Malaya; and a scientific panel member for the German Medical Research Council and the Australian Health Foundation.

She is also a leading figure in the Association for Research and Vision in Ophthalmology (ARVO). And at its meeting in Seattle in May 2013, she was made a Gold Fellow in recognition of her work and her contribution to the association. She has stepped down as programme chair for ARVO's retina section, but continues in an executive role on one of its international committees.

At the Seattle meeting she also introduced a discussion on her most recent major project: the IVAN trial. This was the NHS-funded clinical trial which she conducted over four years into treatment for wet AMD – age-related macular degeneration – involving more than 600 patients in 23 UK hospitals. The research concluded that use of the drug Avastin was as effective a treatment as the more expensive option Lucentis, paving the way for an estimated saving to the NHS of £84m a year.

Of her research she says, 'Since 1982 there has been a sea change. For the first few years there was a trickle of people in this field at Queen's, but success breeds success. We were lucky to get some very large grants from the Medical Research Council and the Wellcome Trust and so we were able to build up a body of people working in vision research.

'Through the '90s we continued to consolidate that programme. We had people like Alan Stitt joining the group and we've since appointed something like 15 senior academics. We also have a number of postdoc fellows and a building which is now almost entirely occupied by the Centre for Vision and Vascular Science.'

She is committed to her many contacts away from Belfast. 'I've always been very active in attending international meetings. You network when you're there and if you have a particular reputation people want to engage with you.

'In my case, this has led to a lot of collaborations and joint publications. I was part of an international consortium of retina specialists who were successful in obtaining a major European Commission grant. That helped to cement relationships in this area between the UK and Europe. I also have many contacts in the USA – I did a sabbatical there in 2005 – and I also received a big grant from the Wellcome Trust to work in India, which meant I established collaborations there – and so the international aspect of my work has flourished.'

A further example of Usha's collaborative links is her work on two major projects, the EUREYE and INDEYE studies, with Professor Astrid Fletcher and her team at the London School of Hygiene and Tropical Medicine. Their joint research has secured in excess of £1m in grant income and has produced around 40 publications.

And she sees exciting work ahead at the Centre. 'We've got some major studies on the genetics of AMD. We're taking on new projects, particularly in the field of diabetes.

'We also have so many gifted researchers coming through now and I'd like to see some of the younger people taking on more of a leadership role. They're energetic and enthusiastic and I see a great future for them.'

Usha has come a long way since she arrived in Belfast in 1982. Her achievements have steadily increased her professional prestige, in the process enhancing the reputation of Queen's and Northern Ireland in medical innovation.


“There’s exciting work ahead – major studies on the genetics of age-related macular degeneration.”

DRIVING FORWARD LONDON'S TRANSPORT FUTURE

Professor Roy Douglas
School of Mechanical and Aerospace Engineering

Passengers stepping on to one of London's new hybrid buses as they come into regular service will be embarking on the latest stage of a journey of success for a Ballymena company and Queen's University.

The collaboration between Wrightbus Ltd and the research team led by Professor Roy Douglas from the School of Mechanical and Aerospace Engineering that helped to secure the 'New Bus for London' contract has brought international recognition for innovation and enterprise to the company, to the University and to Northern Ireland. But as Roy explains, it didn't happen overnight.

'In my research I'd been doing quite a lot of work on catalytic after-treatment, catalytic converters, and at the end of the '90s I was having a chat with William Wright whom I'd known for a long time and he was telling me about his new hybrid bus project.

'He mentioned some of the issues they were having and I suggested they should have gone for a diesel engine instead of a gas turbine. After that, I said, they should study the system and model it and try to understand it fully.

'Nothing happened until we met again three years later. He said he wasn't a fan of this modelling malarkey – his exact words – but they were still struggling and any help I could give would be invaluable.'

That was the beginning of the relationship. 'I did a little bit of consulting with a few simple models, but they decided they needed something more sophisticated so we started a PhD programme, with funding from Wrightbus and Invest NI, which was very successful and became a Knowledge Transfer Partnership to take the software we were developing and embed it in the company.' The original PhD student, Andrew Simpson, is now an engineering analyst with Wrightbus, developing the model further.

When the 'New Bus for London' project came along there was general agreement that it was the ideal application for the model. 'In the tender process, more than 70 per cent of the points' allocation was on technical specification. Wrights decided to go for a very high spec which gave us a lot of pressure because it was based on our modelling and so it was essential to get it right. In the end we got it almost bang on, so that was very pleasing.'

The modelling approach had allowed Wrightbus to optimise the system performance and to specify the individual components in detail. And they were 'best in class' for fuel economy and exhaust emissions. It led to a contract worth more than £230m.

Roy says, 'William Wright is very forward-looking when it comes to technology. Now they won't go into any development without doing modelling first, which is the way the whole auto industry has gone. They're totally convinced.'

Roy himself is sure of the benefits of researchers working closely with companies to see how they operate. He went on a year's sabbatical with General Motors in Detroit, and out of that came a new project and a Queen's spin-out company called Catagen, focused on catalyst ageing technology.

All of this experience has provided benefits for students. 'When I'm lecturing I can quote real-life examples. I can talk about Wrightbus, the aircon system, for instance, how in London in summer the fuel economy is about half what it is in the winter. It's about enthusing the students and getting them interested in real-life engineering.'

William Wright comments, 'We're very happy to continue this fruitful relationship with Queen's. There's a lot of knowledge there. Roy has the benefit of great experience but, just as important, he's a great communicator.'

Roy adds, 'The marvellous thing about this University is that it lets you do what you like and enjoy. I'm a great believer that if you're allowed to do that, then you'll do things better.'

> “Wrightbus won’t go into development without modelling first. They’re totally convinced.”

THE CEMENT PROVIDING NEW SUPPORT IN ORTHOPAEDICS

On a shelf in Dr Nicholas Dunne's office is an ancient copy of Gray's Anatomy. It may seem a strange volume to find in the School of Mechanical and Aerospace Engineering, but he finds it invaluable.

Nicholas is Director of the Polymer Processing Research Centre and of the Advanced Materials and Processes Cluster. His research focus is on injectable orthopaedic bone cement, used in total hip and knee replacement surgery to support the metallic implant and in spinal surgery to repair damaged or diseased vertebrae.

He first came to Queen's in 1993 to pursue a PhD project, in association with Musgrave Park Hospital (a Global Centre for Excellence in Joint Replacement Surgery), developing strategies for optimising the quality of bone cement and introducing consistency and reliability to the end product.

'The powder and liquid constituents are mixed by a theatre scrub nurse using a rudimentary manual mixing device. But consistency can depend on variables, such as the temperature of the theatre or the speed of the mixing action. My project was primarily to look at how the material is mixed and delivered within the surgical environment.'

His work brought him into contact with Depuy International, the multinational orthopaedic equipment company based in Leeds, leading to a job as a biomaterials engineer. He would later join Dublin City University, becoming one of the first lecturers working on their Medical Mechanical Engineering degree, before returning to Queen's in 2003, building a career in developing biomaterials or ancillary devices associated with orthopaedic applications.

'Since 1993 there had been some improvements in technology relating to bone cement and its delivery, but there was still a gap in terms of managing the cement within the operating theatre, considering the surgery that's involved and the impact on people's lives.

'Over the past eight years, we've received significant funding from Invest NI which has allowed us to develop technology and know-how that we've since licensed to a leading medical device manufacturer specialising in bone cement mixing and delivery systems. Additionally, we've provided training courses for theatre staff and orthopaedic surgeons across Europe, to broaden their fundamental knowledge of the actual use of the bone cement within a theatre environment and the impact which preparation has on its final performance.'

But there are other problems. 'It's not an active biomaterial. It doesn't do anything once it's implanted. It's largely dormant. But there are other materials – ceramic-based cements with the potential to stimulate bone activity. However, one disadvantage is that they're quite brittle and fail easily under load-bearing applications.'

A collaboration with the University of Leeds secured EPSRC funding to study different biomimetic strategies with the potential to improve the mechanical and biological properties of these cements. Collagen fibres derived from natural sources were one of the most attractive candidate adjuvants studied and showed good signs of offering mechanical reinforcement.

'We looked at a number of different reinforcement materials but there were potential issues with them. Then I began to build up a relationship with NHSBT – Blood and Transplant – in Liverpool, one of the world's biggest providers of human recovered materials, with the technology and know-how to extract collagen from human bone and tissue.

'We recruited a postdoctoral research fellow via the EPSRC Knowledge Transfer Secondment scheme to spend time in Liverpool working on extraction and purification techniques for collagen with a view to incorporating it into our ceramic-based cements.'

The relationship with NHSBT has been successful. Now mechanisms are being explored to take the technology further with a view to it being developed and packaged as an off-the-shelf product.

The relationship with Musgrave Park and Depuy International continues with both involved in a new PhD programme in the area of measurement and control during total hip replacement surgery. A former PhD student in Nanotechnology now works in the Hospital's Orthopaedic Outcomes Unit, looking at the long-term impact of joint replacements and how successfully patients return to normal functionality after surgery.

'This shows the success that comes from real interdisciplinary collaboration. It's a spider's web of skillsets.'

Dr Nicholas Dunne
Polymer Processing Research Centre,
School of Mechanical and
Aerospace Engineering

“The success comes from real interdisciplinary collaboration. It’s a spider’s web of skillsets.”

PROFESSOR ALAN FITZSIMMONS

SEARCHING THE SKIES TO SECURE THE SAFETY OF THE PLANET

"We're working on the best way to move an asteroid if we find one that's likely to hit us."

Professor Alan Fitzsimmons
Astrophysics Research Centre,
School of Mathematics and Physics

Alan Fitzsimmons's work takes him across the world to study what lies beyond it. The focus of his research is on finding and studying asteroids and comets which pass close to the earth, helping to develop strategies to deal with one if it is thought to present a possible danger.

This involves close collaboration with major global institutions and organisations, including the University of Hawaii, Harvard University, the Observatoire de Paris, NASA, the Russian Space Agency, the University of Pisa, the Institute of Space Studies in Berlin and more.

Alan, Professor at Queen's Astrophysics Research Centre, spoke after returning from six months research in Hawaii: 'I'm currently involved with two major collaborations and teams. One is the Pan-STARRS project, the largest astronomical camera in the world, which is in Hawaii. I've been using data and working with the team there to assist in finding objects that orbit the sun, that pass close to the earth and which could one day hit us.

'While I was there, a small asteroid hit the earth near the Russian city of Chelyabinsk. That focused a lot of attention on the work we're doing.'

In the first four months of 2013, with the Pan-STARRS telescope, over 100 previously unknown asteroids passing close to the earth were identified. 'We're finding hundreds of these things every year. While I was away in the USA I also helped organise an international meeting on planetary defence. We have these meetings every two years – scientists, engineers, mission planners, administrators from space agencies – discussing how we go about finding these things and what to do if we come across one that's on a collision course.'

A second major collaboration is European-focused, 'although it also involves people from the USA and Russia. It's called NEOShield – a title taken from Near-Earth Objects – a three-and-a-half-year study funded by €4m from the European Union to find out the best way to move an asteroid if we ever do find one that's likely to hit us.

'Several different technologies have been suggested, but we've never actually tried it in real life, never tried to change the path of an asteroid in its orbit. So we are now working on both space mission designs and choosing potential test targets. We have to pick an asteroid carefully, one that's fairly representative, and at the same time we have to make sure that we can't actually change the orbit so that it does hit the earth.'

The study will finish in 2016 and it is hoped that a test mission will happen in the early years of the next decade.

Near-Earth Objects have been around as long as the history of the solar system. 'Every time we find a potentially dangerous asteroid or comet, astronomers immediately predict where it's going to be in the next 100 years in order to know if we need to make more observations, if we need to continue to study precisely where it's going, or if we can just forget about it because it's not going to come anywhere near the earth at any time in the near future.'

He emphasises the importance of openness in this field of research. 'Unlike some areas of science, when a new Near-Earth Object is found it's immediately announced. There's no keeping anything secret. We need as many observations as possible to track an object and one single telescope can't do that.

'We work across political boundaries, but the main discovery programmes are based in the USA. That's one reason we at Queen's are members of the Pan-STARRS consortium which has the best telescope at the moment for discovering these potentially dangerous objects.

'We have a worldwide reputation in this field and that's why you get invited into collaborations like this. Queen's is seen as a natural partner for many of these studies and in fact we get many more invitations than we can accept. There are only 24 hours in a day and there are many more Near-Earth Objects out there to discover and track.'

RESEARCH THAT HELPS TO CLOSE THE GAP IN DIVIDED SOCIETIES

Professor Joanne Hughes
School of Education

Professor Joanne Hughes's life-changing moment came when she was a postgraduate student at Queen's working towards a PhD.

'I'd chosen to look at issues relating to conservation in West and South Belfast, but this was at the height of the conflict and I soon saw that it was patronising to talk to people about conservation when there were other very different issues impacting on their lives.

'I grew up in East Belfast where I'd had practically no opportunity to meet people who weren't of the same religion as myself, so one of the things that fascinated me was the experience of people in West Belfast, somewhere I hadn't been before.

'And so I started to look at children who attended separate schools, the social attitudes they had, compared to those who'd gone to the first integrated school. That became the focus of my PhD and that interest has sustained me ever since.'

Her first academic post was at the University of Ulster. She would spend 15 years at the School of Policy Studies there before coming to Queen's once more. She was appointed to a Chair in the School of Education in 2007 and is now Director of the Centre for Shared Education. It is a subject on which she is recognised internationally. In May 2013 she was the keynote speaker in Cyprus at the conference of the European Trade Union Committee for Education, which represents 11 million teachers throughout Europe.

'My interest is in community relations policy but education has always been a big element in my work and when I came back to Queen's I was invited by the Minister for Education at the time, Caitríona Ruane, to sit on the Community Relations Policy Review Committee. I've been involved in a number of studies of relationships between Protestants and Catholics in Northern Ireland, exploring issues around identity and the value of inter-group contact, which is one of my premier areas.'

She has contributed to the work of the Ministerial Advisory Group, appointed in 2012 by Education Minister John O'Dowd and led by Professor Paul Connolly, Head of Queen's School of Education. In April it published its report recommending changes to the education system to advance shared education.

'I see my role as someone who can bring research evidence to the table. Decisions on core social and public policy issues which will impact on the lives of children should be evidence-based.

'In Northern Ireland, 93 per cent of children still attend separate schools. We've had integrated education for 30 years. It's had some impact, certainly, but it's not a panacea. In a pluralist society parental choice remains important, no more so than in Northern Ireland where schools are often cherished representations of community and faith-based identities.

'Within that context, what can we do that offers children sustained contact with the kind of outcomes that we know are likely to happen if you give them that opportunity? And shared education seems to me to be the obvious way forward.'

She emphasises that there is still a considerable way to go on building relationships. 'A little while ago we did some research with children born post-ceasefire and I was shocked by some of the negative attitudes each had about the other. Some of them had no opportunity to meet with people of another religious tradition and there were even notions that there was some sort of physical difference.

'There's something very wrong with a society that allows children to grow up in that kind of negative space. The reason I came into academia was because I believe you can make a change. But to do that you've got to connect, to talk to people, try to understand where they're coming from and how any intervention is going to impact on them.'

And Queen's has a major role to play. 'It's hugely important that universities like ours help to open minds, to make a positive difference.'


“It’s hugely important that universities like ours help to open minds, to make a positive difference.”

TURNING THE PAGES ON A CENTURY OF MI6 SECRETS

> "It was a brilliant project... and I wanted it to be academically respectable."

Keith Jeffery likes the work of John Le Carré. He enjoys Ian Fleming too. 'In fact,' he says, 'in the book there's a reference to someone Fleming is thought to have used as the model for James Bond.'

The book is his engrossing volume ***MI6: The History of the Secret Intelligence Service 1909–1949***. On its publication, BBC journalist John Simpson said it was 'a delight to read'; the distinguished historian Peter (Lord) Hennessy said it was 'marvellously crafted'; and the former head of MI5, Dame Stella Rimington, who knows a thing or two about secrets, said it was 'measured and scholarly but there is life in it too and characters'.

One of those characters is that roguish old friend of Ian Fleming's. But it is unlikely that the author would have had so much success if he had used the man's real identity. 'The name's Dunderdale, Biffy Dunderdale' doesn't have quite the same ring to it.

So just how did Keith Jeffery, Professor of British History and Head of Postgraduate Studies at Queen's School of History and Anthropology, become involved in this enterprise?

'Both MI5 and MI6 were founded in 1909. Coming up to the centenary they began thinking about how to mark this. They decided they would each commission an official history and recruit professional historians from the university sector. I had done some intelligence history and was in the frame.'

And so a recruitment process started. 'It began in a very informal way. I was asked if I'd be interested. Certainly there was an air of mystery about the whole thing. Then it turned into a more formal exercise and I was selected.' It was the beginning of four years' work and a period of relocation, living in London and commuting to and from Belfast.

There were other complications. For a start, the archives were highly classified. 'My business is researching the past by using documents and then writing history. The unique difference with this process was that not only did I have to do that, but the text I produced had to be reviewed on national security grounds. So I had to both write it and then negotiate it into the open air.'

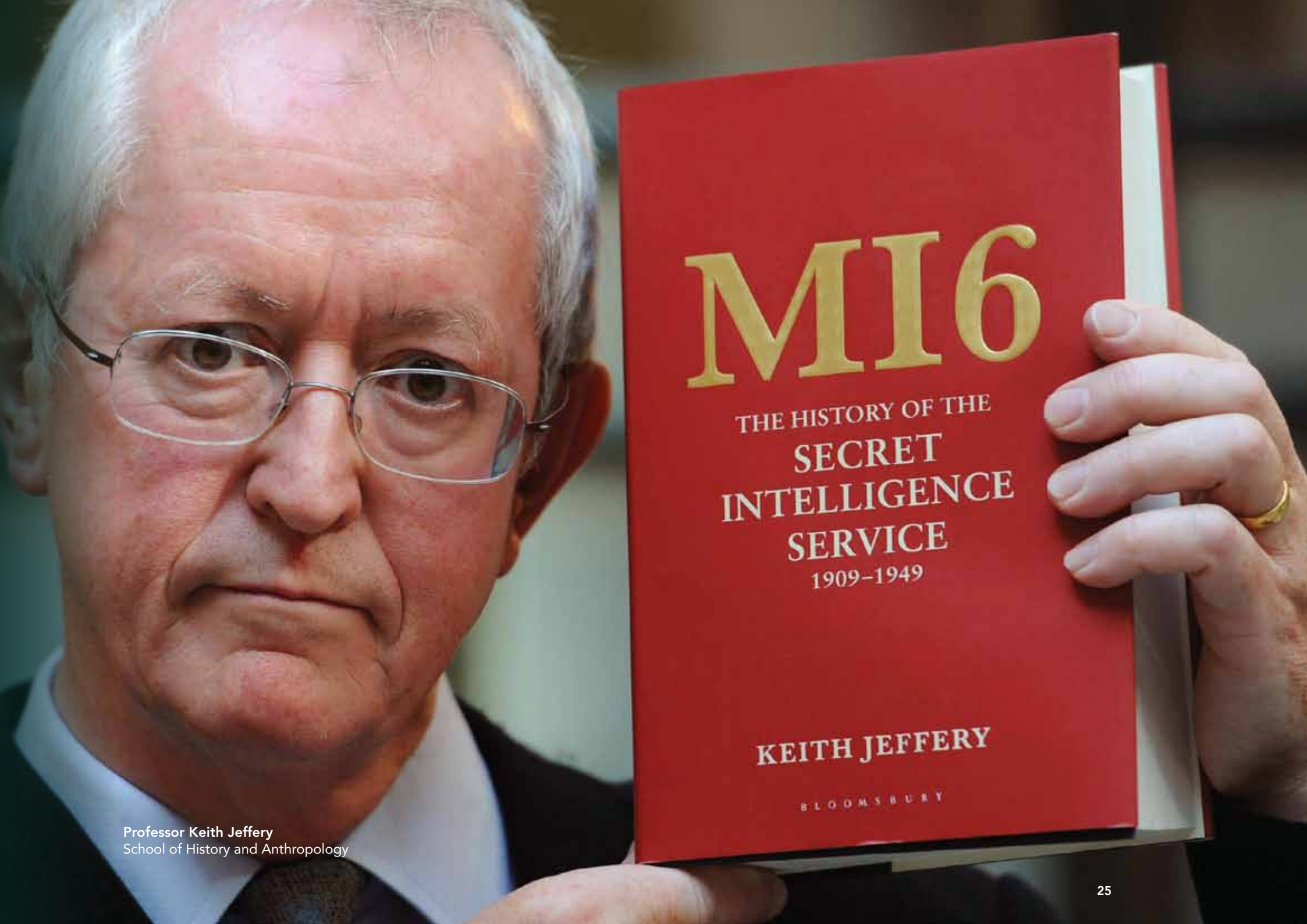
There was a prohibition on naming agents. 'They are the people, usually foreign nationals, who work for British Intelligence. If you're in Germany in the 1930s working for MI6 and they tell you – "your secret is safe with us, we're never going to let you down" – that's an absolute. But it only lasts as long as the agent wants it to.

'Many people who worked for MI6 during the war were very keen to tell their stories afterwards and if they outed themselves, then that's fine. But there were people who hadn't. However, you can still tell their stories. That's what cover names are for.'

It was complex work but exciting. 'I knew there was only one bite at the cherry and there was an awful lot to get in – the organisation, the kind of structural stuff that's important but not necessarily the most fascinating, as well as the sharp end, the James Bond kind of stories.

'I wanted it to be academically respectable. Universities like Queen's exist at public expense to do public good. As university historians we do not depend on what we write to live. We're given the time and space and the resources to research and reflect and synthesise a narrative as best we can. That's the difference between a university historian and a freelance one. The professional requirements, the methodology, the process are all subsidised at public expense to get it right.'

And the official view, now that the story is written? In his foreword to the book, the Head of MI6, Sir John Sawers, praises what it tells of the men and women of the service, their dedication, character and courage, but he emphasises too that it is a work built on Keith Jeffery's independent judgments as an experienced academic and scholar. As a history, he says, it is a landmark.



Professor Keith Jeffery
School of History and Anthropology

NEW HOPE IN THE STRUGGLE AGAINST HIV

Professor Karl Malcolm
School of Pharmacy

Professor Karl Malcolm has a vivid memory of how he knew his bright idea to help combat HIV infection was going to take off. It was when he submitted a paper to an HIV conference in Antwerp in 2002.

'It described the release of antiretroviral drugs from polymeric vaginal ring devices. The response was amazing. There was interest from academic groups and companies who had access to old and new antiretroviral compounds but had given little thought to how best to deliver them. It's one thing to have a potent drug compound, but you need to get to the next level. There were clinicians working on HIV microbicides in gels and who realised the advantage of a ring device. Everyone understood the significance and the potential.'

Karl is a Professor in Drug Delivery. His work on vaginal ring technology began when he joined the School of Pharmacy as a lecturer in 1997 and applied his knowledge of polymer science, gained during his PhD, to drug delivery research for the first time.

'At that time, I was working on a number of vaginal ring products aimed at more conventional women's healthcare issues. However, it dawned on me that there had to be other clinical indications within sexual and reproductive health for which a vaginal ring would be the viable and practical drug delivery system.'

It was then that he began to think about HIV prevention. 'The HIV field had been very focused on trying to develop a vaccine. Despite high hopes, most vaccines failed miserably in clinical studies. It was a seemingly intractable problem. The virus mutates too quickly for our current vaccine strategies to cope and our understanding of the immune system is still incomplete.

'Fortunately the HIV field was also considering other strategies. Given that HIV is largely transmitted by unprotected sex, vaginally administered antiretrovirals were a priority and simple, inexpensive gel-based products were particularly attractive. The difficulty here is the issue of user adherence. To be effective, the gel has to be applied a short time before sex and that isn't always practical for women.

'I realised that a controlled release device which slowly trickled the drug out over a long period would potentially solve those adherence issues. And that's what my research has pursued ever since.'

Establishing the concept was just the beginning. 'These ring devices are limited in the types of drugs they can release and there had to be a certain matching of the drug to the polymer to dial in the appropriate drug release rate. I spent most of the early 2000s getting to grips with the fundamentals of these ring delivery systems.'

The work has now led to a long-term relationship with the International Partnership for Microbicides, a not-for-profit organisation funded by many governments to spearhead development of HIV prevention products for women worldwide. Ten years after those first tentative steps towards bringing the concept to reality, the first product – a dapivirine-releasing vaginal ring – entered the final stages of clinical testing in 2012.

The trials will involve 3,500 women in southern Africa and will last until 2015. Karl says, 'Hopefully, most of the impact from this work is yet to come. In 2014 we'll get the first indication as to whether the ring is providing protection against HIV transmission. There's so much interest and so much goodwill about a ring device that a woman could use long term to provide herself with 24-7 HIV prevention.'

Karl's work was recently honoured at Queen's when he became one of the winners of the first Vice-Chancellor's Impact Awards. He and his multidisciplinary team are now working on new ring devices which, in addition to HIV prevention, combine hormonal contraception and protection against other sexually-transmitted diseases.

'I expect that the struggles and difficulties we had in developing a ring for HIV prevention are likely to be multiplied many times over for these more complex, multi-purpose rings. But we're ready for the challenge ahead.'

> There's so much interest and so much goodwill about a ring device that a woman could use long term to provide herself with 24-7 HIV prevention.

THE CALIFORNIA DREAM DRIVING HEALTH SCIENCE INNOVATION

Professor Danny McAuley
Centre for Infection and Immunity,
School of Medicine, Dentistry and
Biomedical Sciences

When Professor Danny McAuley returned to Belfast from a seven-month sabbatical in San Francisco he brought back more than a love of the California way of life. He also brought back the determination to establish a new clinical trial model to help research in his specialist field – acute lung injury.

When people become critically ill, their lungs can fail. Around 40 per cent of people to whom this happens die. Danny says, 'Despite many years of research there is still no drug therapy to improve the outcome for patients, and that's where my research is focused.'

He has been involved in respiratory and intensive care medicine from early in his academic career. 'Part of my initial interest was the spectrum of disease. I thought respiratory disease was an area which we all needed to know more about. It also involved a lot of general medicine and I like the broad approach of being able to know a little about many areas of medicine.'

A Queen's graduate, Danny came back to the University in 2005 as a senior lecturer in intensive care medicine. But some time before that he had spent a year as a postdoctoral researcher at the University of California in San Francisco – his first spell there – working with a world leader on lung injury, Professor Michael Matthay.

Danny is now Professor and Consultant at the Centre for Infection and Immunity, working for both Queen's and the Royal Victoria Hospital, focused on experimental medicine, finding new treatments for patients.

He says, 'One of the big drivers in my research has been to try to develop human models that allow us to test new therapies in a safe way. We get healthy volunteers to inhale very low doses of an irritant to model lung injury and you can test drugs to see if they might be effective. It's very safe, very controlled.

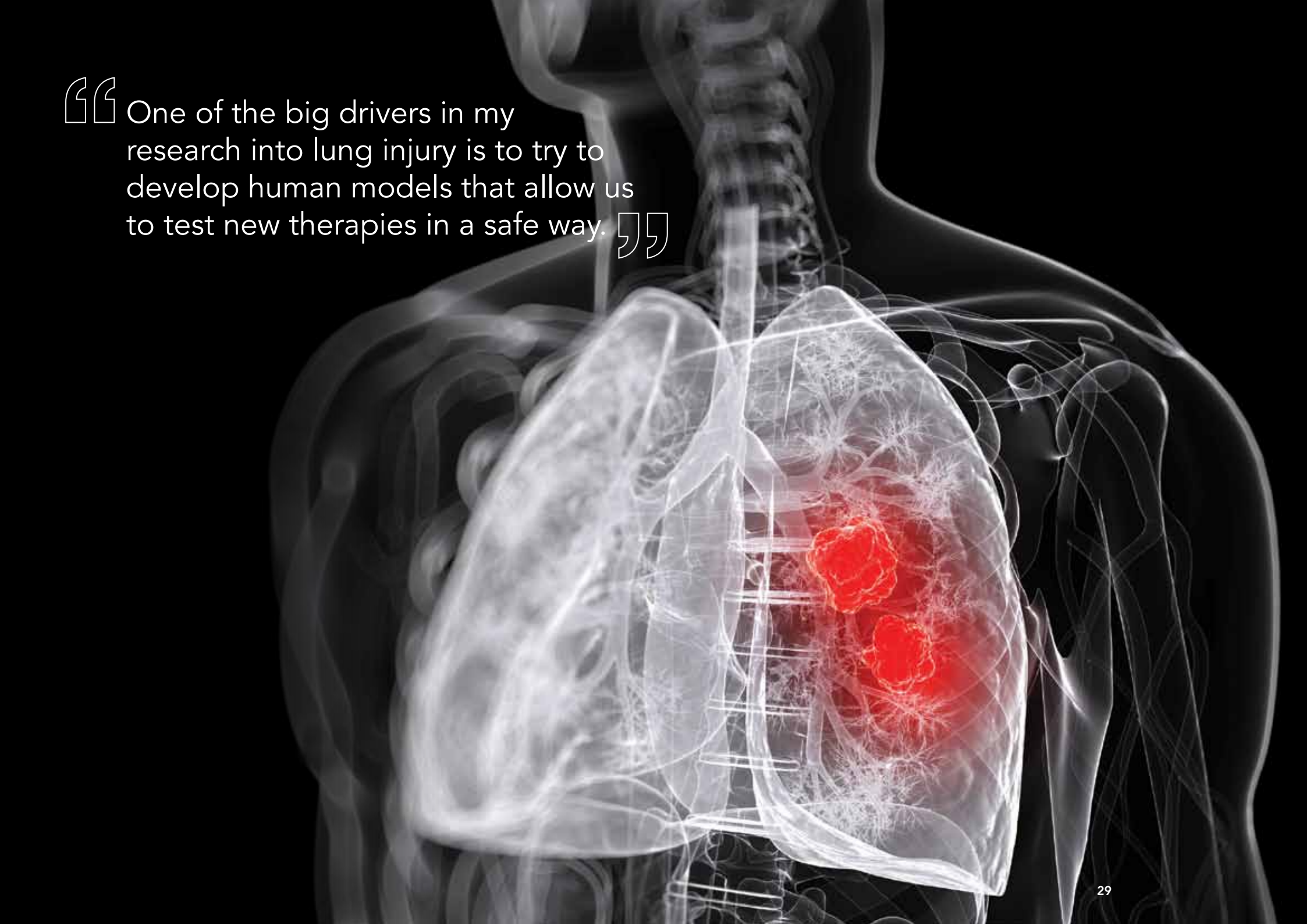
'But there is another model – taking human lungs which have for a variety of reasons been rejected for transplantation, giving them lung injury to try to model what happens in the body, and using that to develop new therapies.'

This human *ex vivo* model had been established by Michael Matthay in his lab, and it was why Danny decided to go back to California. 'It was clear to me that this was one of the most important models which had been developed recently. That triggered the desire to go back and learn.'

He also learned how adult stem cells could be used as a treatment for lung injury – 'a paradigm shift in new therapies.' The *ex vivo* lung clinical trial model is now established in Belfast, but he is also pursuing a trial using adult stem cells through a series of grants. Danny sees several major benefits which have resulted from his time in California. The human *ex vivo* lung model has been set up, with Belfast one of two UK centres working on it; he has gained the experience he needed to establish a new programme of research around stem cells; Queen's has benefited from new grants and publications; and there are the personal benefits.

'I was there with my wife and our new baby. Having seven months to pause, to think about research, but also to enjoy the quality of life – the sabbatical was without doubt one of the best decisions I ever made.'

There is a further benefit. One of the scientists with whom he worked in California has now been recruited by Queen's as a lecturer. 'That would never have happened otherwise.'



“One of the big drivers in my research into lung injury is to try to develop human models that allow us to test new therapies in a safe way.”

Professor Donal McKillop
Queen's University Management School

> "This is a root and branch shake-up of the credit unions in Ireland."

HELPING TO SAFEGUARD A FINANCIAL INSTITUTION

Across Ireland the singer Imelda May has become known as the public face of those unique institutions, the credit unions. In advertisements she presents a stylish and confident image for the movement but behind the scenes much hard work is going on to safeguard its future.

Among the people influencing this campaign is Donal McKillop, Professor of Financial Services at Queen's University. His expertise is renowned internationally and he has been a key contributor to major government research in the Republic of Ireland.

He says, 'My work encompasses all aspects of credit union behaviour. I was asked by Brian Lenihan, when he was Minister of Finance, to be a member of a committee to advise on legislation. Then, later, Michael Noonan asked me to chair the Commission on Credit Unions which has been looking at a future new regulatory environment.'

His Commission's report, published in April 2013, has recommended restructuring of the sector, a new legislative framework and new governance requirements. The proposals are now being implemented.

Donal says, 'The credit union concept developed first in Europe, with the model transferring to Canada in the late 18th century and then to the USA at the beginning of the 19th. It was a financial service for people of modest means. Then the movement spread to Canada, to the UK and to Ireland where there are now close to 2.7 million people who are credit union investors, covering the whole range of the population.'

He reflects on the notion that credit unions may sometimes be seen as an old-fashioned concept in the modern financial age. 'This can be good and bad. The good thing is that they haven't been hit as hard in the financial crisis. Part of the reason is the fact that they've been ring-fenced in terms of the financial products they provide so they haven't got into high-risk products.

'Set against that – this is an ever-changing financial world. Increasingly, people want technology-based products, they want to be able to transact on the phone. And while some sophisticated credit union movements such as in Canada and the USA have been able to provide this kind of service, in the UK and Ireland they've been a little bit behind and are just starting to significantly embrace technology.'

The new regulatory environment, he says, will mean a root and branch shake-up. 'We're focusing on prudential control, on governance, on creating a mechanism which will allow credit unions to enter into a new phase of restructuring over the next four or five years. And as part of this we've established a Restructuring Board which will have €250,000 in funding which can be used by credit unions to amalgamate, primarily based on the stronger credit unions driving the process.'

He has been to Toronto to give presentations on governance and he believes it's important for an academic with his kind of experience and knowledge to make a contribution beyond the campus.

'But it's a two-way process. Over the past year I've gone to individual credit unions, I've met their boards, presented my research. But I probably get back far more than I give. I'm constantly being brought up to date with issues and challenges – and they're challenging my research. You learn from what other people have to contribute.'

At Queen's this work feeds directly into what he teaches, including a Masters in Financial Regulation. He has been focusing on credit unions since 1996. Since then, five significant research grants have been obtained and five students have completed PhDs on aspects of credit union behaviour. He also collaborates with University College Cork where he oversees a suite of related programmes.

He says, 'The movement continues to work. It's a model that's alive and well but it needs to be changed continually and fine-tuned because the financial environment is continually changing. If you don't change, then you get left behind and something else will come and take your place.'

DEVELOPING CHEMICAL TOOLS TO INVESTIGATE THE BIOLOGY OF CELLS

Phosphorus is an essential part of our being. Without it we would not be alive – which makes Dr Marie Migaud's research in phosphorus chemistry all the more vital.

As she explains, 'In the biology of cells, you have building blocks: sugars, peptides, lipids, nucleic acids and so on, all of them either containing phosphorus or being modified by it. Without it, many of those building blocks can't stick together, and this is particularly true for DNA. But phosphorus-containing molecules are difficult to make and difficult to modify. This means that developing chemical tools that help investigate the biology of cells and drugs based on these structures is not easy and that's why a lot of chemists shy away.'

Marie, Reader in Molecular Therapeutics at Queen's School of Pharmacy, has never been one of them. Graduating in her native France with a degree in chemical engineering, she decided to pursue a PhD in the USA in organic synthesis – 'my first foray into phosphorus chemistry.'

After the USA came postdoctoral research at Bath University and then Oxford, where she became involved in a project funded by GlaxoSmithKline (GSK). This was the beginning of a long and fruitful relationship with the company in which a key influential figure is Dr Simon MacDonald, now GSK's Director of Medicinal Chemistry at Stevenage.

Almac Discovery is another company with which she is closely linked. 'We do not have any contractual arrangement, but they may call and say – 'We're doing some phosphorus chemistry and we're stuck'. Coming up with reasonable solutions may require some thinking time on my part, but it is always exciting science. Also, there's longer-term value and the possibility that in the next few months something bigger may come along.'

There are other companies with which Marie is associated. Warner Chilcott, a leading UK-based international pharmaceutical firm, is funding research in her lab. There is also ChromaDex, a fine chemicals and food supplement manufacturing company, and Sigma-Aldrich, the leading life science and high technology materials company.

'A lot of our drive is about helping to understand disease and so to better develop effective drugs. It's about providing the chemical probes or tools that help the biologists understand at what stage a disease is created and what makes the cells behave the way they do; cancer for example. If we can understand what chemical events trigger it in the cell, then we can target it with the appropriate drug.'

Marie has also built up important international academic links. She has become the 'house' chemist for a network of leading biology colleagues working in labs in the USA, Germany, Norway and Italy. She develops chemicals that are used by the network to probe specific biological events at cellular levels as well as generating new phosphorus-based molecules capable of preventing cell proliferations and, therefore, possible lead compounds for drug-discovery programmes.

She says, 'We are running out of phosphorus. It is not renewable. Carbon can be renewed through plants. Plant production can be increased with fertiliser supplementation and fertiliser is made up of nitrogen and phosphorus, so much of which is wasted, ending in rivers, for example. Countries like the USA and China are now hoarding phosphorus supplies and around the world the price of phosphorus as a commodity is increasing.

'We need to be clever in how we use phosphorus. If we don't have enough high quality raw material for the production of chemicals which contain phosphorus, be it a chemical component in a power cell, a chemical probe or a drug, such as those which treat osteoporosis, then we won't be able to deal with this problem in an ageing population which is so dependent on advanced technology.

'Being efficient, not wasting anything, is critical in what we do. It's about making the molecule in the most efficient way possible. This is ingrained here. This makes our students attractive to industry and makes our approach attractive to the companies with which we wish to work.'


“Coming up with solutions for companies is always exciting science.”
Dr Marie Migaud
School of Pharmacy

SMART INKS: SHINING A LIGHT ON PACKAGING SECURITY

Professor Andrew Mills has a working philosophy that is to the point. 'Whenever I'm looking at the research I'm doing, I'm wondering how I could use it and how it could benefit society.'

Chair of Materials Chemistry at Queen's, Andrew's focus is on novel, innovative chemical systems that are of commercial worth. His work involves collaborations with major international firms such as Unilever, Johnston Matthey and Pilkington Glass.

At the heart of his research is semiconductor photocatalysis. 'In simple terms, we're talking about materials, usually inorganic materials, which carry out useful chemical reactions on the surface when you shine light on them. This leads to the development of a wide range of commercial products, including self-cleaning glass, as well as tiles and paints.'

Andrew is a graduate of the University of London but obtained a PhD in solar energy conversion at the Royal Institution of Great Britain, the oldest independent research body in the world. 'Solar energy conversion is about using sunshine to drive useful chemical reactions forward and I'm still pursuing that interest.'

A Chair at Swansea University in 1994 was followed by another at the University of Strathclyde in 1999, then he moved to Queen's in 2011. An EPSRC Bright Ideas Award, followed by Scottish Enterprise funding, led to the founding of Insignia Technologies, based in Scotland, a business which has developed a range of sensing techniques and to which Andrew is a scientific consultant.

One of Insignia's main areas of impact is in the food packaging industry. 'This is a big research interest for me. A lot of food is packaged in an atmosphere that is other than air. Mainly the package is flushed with another gas, such as carbon dioxide or nitrogen, in order to restrict the growth of food spoilage micro-organisms.

'This modified atmosphere packaging is very common and it's accountable worldwide for around 60 billion food packages a year and growing. It's a way to keep food fresher for longer without resorting to chemical preservatives.

'But it's very difficult to identify whether the package is intact. In response to this, we have developed inexpensive colour-based indicators, derived from smart inks, that tell you if the package is broken, whether it's been tampered with or whether air has got in and the food has gone off. Such indicators are not only invaluable to food packaging, but also the packaging of any material which needs to be stored in a controlled atmosphere, such as electronics, pharmaceuticals and medical instruments.

The Insignia connection has led to two successful Knowledge Transfer Secondments from Queen's. The company says these have supported the development of enhanced products and made a significant contribution to research strategy. As a result, many of its future projects will be coming to Queen's.

Andrew has other irons in the fire. One is the creation of a highly specialised service company. 'There are a number of international standards now in photocatalysis because there is such a wide range of commercial products. These standards are quite expensive to run and a lot of companies, big and small, find it difficult to implement them routinely.'

So a centre has been created which will run photocatalyst standards and service the considerable and growing industry, as well as educational establishments and research centres. It is a commercial enterprise created at Queen's via the EPSRC – Bridging the Gaps' funding initiative. [The Queen's International Photocatalyst Standards Test Centre: http://www.queensips.com/]

And his PhD of many years ago has not been forgotten. 'There's a renaissance of interest in solar energy to chemical energy conversion. Part of my group is looking at that in a project which involves big industry, global leaders like Tata Steel, Teer Coatings and The Welding Institute, as well as other universities.

'We're a little way off from creating something that will impact on humankind in the next five years. Although we work on many different aspects of chemistry, some purely academic, many applied, all projects have a common, clear potential to change things for the better.'

Professor Andrew Mills
School of Chemistry and Chemical Engineering

NEW VOICE TECHNOLOGY MAKING ITSELF HEARD

Ji Ming sits at his computer and clicks on the mouse. Suddenly there is loud noise – like stones rumbling round a washing machine on full cycle. But in the midst of the confusion there is the hint of a human voice.

This is the raw material Professor Ming works with. Somehow he will eliminate that noise so that the voice can be heard clearly. This skill – recovering speech from degradation – is leading to productive collaborations between his research team and major companies working in voice technology.

Ji is based at Queen's Institute of Electronics, Communications and Information Technology (ECIT). He has been with ECIT from the start. 'I even participated in the design of the building, helping to work out how much space the various groups should have.'

He came to Queen's in 1993 as a research fellow, then became a lecturer, reader and finally professor. He has led the research programme in Speech and Language Processing since 2000.

The example he has just played on his computer has been supplied by the Home Office – one of the outside organisations which seek his expertise.

'I didn't ask them what kind of noise this was. It might be a car travelling at speed with the window open. They wanted to know what the person in the background was saying.

'No automatic speech recognition system is good at coping with something like this. Normally, if you speak in a very quiet environment, systems will give you reasonable accuracy, but if the background is noisy, all systems will fail to some degree.' And that is where Ji's research comes in.

The research was funded by the EPSRC and the techniques developed at Queen's were named best paper in speech enhancement at Interspeech 2010, the top international conference in speech and language processing. Later the Japanese company NTT adopted the techniques as their entry in the International Chime Challenge for speech recognition and separation and took first place.

Ji has strong links with Cambridge Silicon Radio (CSR), the pioneering designer and developer of software for the consumer electronics market – motorists, photographers, people listening to music, using mobile phones.

'One of CSR's former staff now works here at ECIT. He told them about the work we're doing and they became interested. We applied jointly to EPSRC and as a result we were able to fund a Knowledge Transfer Secondment.'

Its prime objective was to investigate and understand how the Queen's speech-processing group's research into noise elimination could be applied in the commercial market. It involved Research Fellow Dr Ramji Srinivasan being seconded to CSR for a year. He is now employed full time by the company as a Research Engineer.

Ji says, 'The collaborative project provided an opportunity to demonstrate the impact of the Queen's research work outside academia. It led us to steer our research to leading-edge, industry-oriented problems, which in turn led us to new discoveries – including new algorithms for audio bandwidth expansion.

'The experience exceeded our expectations. We were given very difficult real-world noisy data involving different forms of distortion. That was something beyond our capability at the time. We had to invent new algorithms to deal with it and we succeeded.'

CSR says the relationship between the company and Queen's has been strengthened and there will be further collaborative research programmes as a result.

Ji says, 'There has been a group at Queen's researching speech and language since the 1980s. Over a long number of years, many talented staff have worked in this area, but many talented PhD students too. They come with some background knowledge in the field, but after three or four years they emerge as experts who are sought by some of the world's biggest companies in voice technology.'

“We’re steering our research towards leading-edge industry problems.”

Professor Ji Ming
Institute of Electronics, Communications and Information Technology (ECIT), School of Electronics, Electrical Engineering and Computer Science

Dr Sinéad Morrissey
School of English

> “I feel hugely honoured to have become Belfast’s first Poet Laureate.”

THE STORY OF A CITY THROUGH A POET'S EYES

Whatever accolades and achievements come Sinéad Morrissey's way, one will always stand out. In the summer of 2013 she became the city of Belfast's first Poet Laureate.

It was a fitting tribute to someone who is acclaimed as one of the most gifted of the new generation of Northern Ireland poets and has made enormous contributions to Belfast's cultural life.

One of the most significant of these was the part she played in the success of Land of Giants, the spectacular event staged at the Titanic slipway as part of the celebrations to mark London 2012.

Sinéad, Reader in Creative Writing at The Seamus Heaney Centre for Poetry in Queen's School of English, explains how she became involved: 'The creator and director of the show, Mark Murphy, contacted me and said he wanted a poet to do the writing in order to honour our literary tradition. For me it was a wonderful opportunity to tell the story of Belfast through history – I'm drawn to historical subjects anyway – and to write about the people of the city. That's where my focus is.

'It was the first time I had written anything to be performed essentially as a theatre piece. Part of it was in my voice, part of it was sung, part was in the voices of actors. To hear what I'd written being broadcast to that kind of audience in that kind of setting was spectacular.'

It was an event which drew on the wider community and many local organisations for its success. Five choirs took part, one of them with a particularly rich heritage – the Harlandic Male Voice – and the response from all of them to her work was enthusiastic.

This was echoed in the reaction of the man behind the show, Mark Murphy: 'She produced the most elegant, tender material, touching in an intuitive way. It was perfect.'

While Land of Giants was a new association for Sinéad, it was not the first time she has been involved in artistic collaboration. In 2002, the Ulster Museum commissioned a major anthology, *A Conversation Piece: Poetry and Art*, in which the poem 'Eileen, Her First Communion' was her response to the Lavery painting of the same name. She would later use the image as the cover for her collection *Between Here and There*.

And in 2012, also as part of the Cultural Olympiad, she was one of a number of outstanding poets, among them the late Seamus Heaney, Wendy Cope and Carol Ann Duffy, chosen to write poems inspired by the works of Titian and which were exhibited during the major Titian exhibition at the National Gallery.

Sinéad has been an important voice in contemporary poetry for 15 years, winning many prestigious awards. At the time of writing, her most recent collection, *Parallax*, is on the shortlist for the 2013 Forward Prize for Poetry.

Her new role as Belfast's Poet Laureate is giving her the opportunity to develop her relationship with the city in a series of artistic duties and activities during the term of office of the current Lord Mayor, Councillor Máirtín Ó Muilleoir. There will be new poems, outreach work to focus on the 'hidden' Belfast, engagement with ethnic groups, the young, the vulnerable.

Sinéad believes that her students at Queen's will also benefit from this and from her varied collaborative experiences. 'Some of them are astonishing, so talented, much more accomplished than I was at their age. I teach them a variety of approaches, taking on different kinds of poems, trying your hand at all kinds of voices and subject matter. All this is part of a branching-out.'

She says, 'I feel hugely honoured to be Belfast's first Poet Laureate. It's a city with an extraordinary literary tradition, especially in relation to poetry, and I'm excited about being able to celebrate and explore the city and poetry further.'

PROFESSOR RUTH MORROW

TECHNOLOGY WITH A NEW FEELING FOR THE BUILT ENVIRONMENT

> “I’ve always encouraged students to think about getting involved in product design.”

Professor Ruth Morrow
School of Planning, Architecture and Civil Engineering

Weavers Court is a neat business park just off Sandy Row in South Belfast. Its name reveals its heritage: the linen industry for which the city was renowned. But now it is the setting for the growth of new concepts in the use of textiles that could never have been envisaged in that 19th-century heyday.

Among the Weavers Court enterprises is Tactility Factory, created and run by Ruth Morrow, Professor of Architecture at Queen's, and her co-director Trish Belford, a Senior Research Fellow in Textiles at the University of Ulster (UU). The company sits within the QUBIS portfolio (the vehicle for spin-out companies at Queen's).

Ruth says, 'We're bringing textile thinking to materials in the built environment – using ground-breaking technology that allows us to permanently embed fabrics onto the surface of concrete.'

In her office at Queen's, she shows striking examples: tiles with veins of red velvet running through them, others with a subtle sheen of linen.

She says, 'I love the cleverness of this technology. It has taken seven years to develop and manufacture textiles that are robust enough to survive in the heavily alkali environment of concrete and are porous enough to let concrete seep through to permanently co-form the surface.'

These textile/concrete surfaces are not just beautiful: they also expand the potential of concrete. As Ruth explains, 'For example, Sustainable Design uses an increase in the thermal mass of buildings to reduce energy consumption. Concrete is the easiest, most direct means of increasing the mass of a building, but exposed concrete surfaces are acoustically harsh, grey and ugly. Tactility Factory's surfaces combine the soft, colourful designs of textiles with the strength and mass of concrete. Thus you get surfaces that meet the technical needs of thermal mass while providing a quality internal finish.'

Ruth looks around her office and points to the ducts that run along the walls. 'The dominant feature of this room is something that brings in the electricity. Very few of the components have been designed with human performance in mind. They're designed for technical performance, technical need, rather than any involvement from the people who sit here.

'Architects have drifted away from the point of fabrication. But from my early days as an academic, I've always encouraged students to think about the possibility of not just becoming architects but becoming involved in product design for the built environment.'

Ruth came to Queen's in 2009 after six years at UU where she established a new School of Architecture. She says, 'Architecture is a transformative subject. It's not just about making buildings; it's understanding the link between people and space. In fact, this is really a key part of the peace-building process, opening things up. We have to get our students to think beyond bricks and mortar, to think about the impact that space and the quality of material finish have on people's lives.'

With Tactility Factory there is a new business plan, a new round of seeking investment. The company is having impact near and far: a frieze at the Playhouse in Derry, fabrics on the walls of the James Street South restaurant in Belfast. But there are also projects in Cairo, Dubai and in London, at the headquarters of an oil company where Tactility Factory will create inserts across six floors of the building.

Ruth says, 'As a profession we're realising that finding a wealthy liberal-arts client who will allow us to make wonderful architecture is a rare thing and makes us very vulnerable to economic conditions. We have to take a wider view. Architecture isn't just the building, it's the whole spectrum. That spectrum is getting broader and the academic curriculum will have to get broader too.'

She is devising a new masters' programme. 'It will involve thinking about architecture through the material, about new economic models and about entrepreneurial activity. That will be the beginning of bringing some of the things we've learned through Tactility Factory into the teaching environment.'

WORKING TO TURN THE CLOCK BACK ON DEMENTIA

Dr Eugene O'Hare
School of Psychology

Dr Eugene O'Hare hopes his research may help provide a treatment for a disease which touches the lives of millions of people throughout the world – Alzheimer's. He is collaborating with Senexis Ltd, a Cambridge-based drug-development company that is focused on discovering new compounds for the treatment of dementia.

Eugene is a Senior Lecturer at Queen's School of Psychology, which he joined after many years working in the United States. 'I was officially associated with the University of Minnesota, but most of my work was federal government research, based at the Minneapolis VA Hospital. It's one of two showpiece veterans' hospitals in the USA. They have some of the most up-to-date facilities in the world. You get to perform procedures and use equipment of a type that a university would only dream about.

'Most of the research in which I was involved was clinically oriented – how to relieve various diseases. As you can imagine, in a veterans' hospital there are high proportions of people suffering from dementia, smoking-related illnesses, heart disease and post-traumatic stress disorder.

'Minnesota was a great place in which to work, but I felt that I wanted to contribute something to the community I came from and it was a good feeling to come back and bring skills that I probably couldn't have acquired here.'

Eugene says of his research work, 'One of the difficulties with dementia, especially with a disease like Alzheimer's, is that by the time people are diagnosed they're perhaps in their 60s, so it's extremely difficult to carry out any kind of epidemiological studies to see if there are factors in the environment or genetic factors which are influencing the onset of the disease.

'One of the problems with it, and probably the reason why there's no cure for it yet, is the fact that we don't know what causes it. So a way to address that is to model the disease.'

At Queen's, Eugene developed models using the experience he had gained at Minnesota. 'As a result I produced a couple of papers on the development of neuropathology and Senexis became interested. That resulted in a long relationship with them where they could test a particular drug using a specific model, see where it was weak, try to modify the chemical, play with the molecular structure and so on. That relationship has been going on for 10 years and it's been very fruitful for the company and for Queen's.

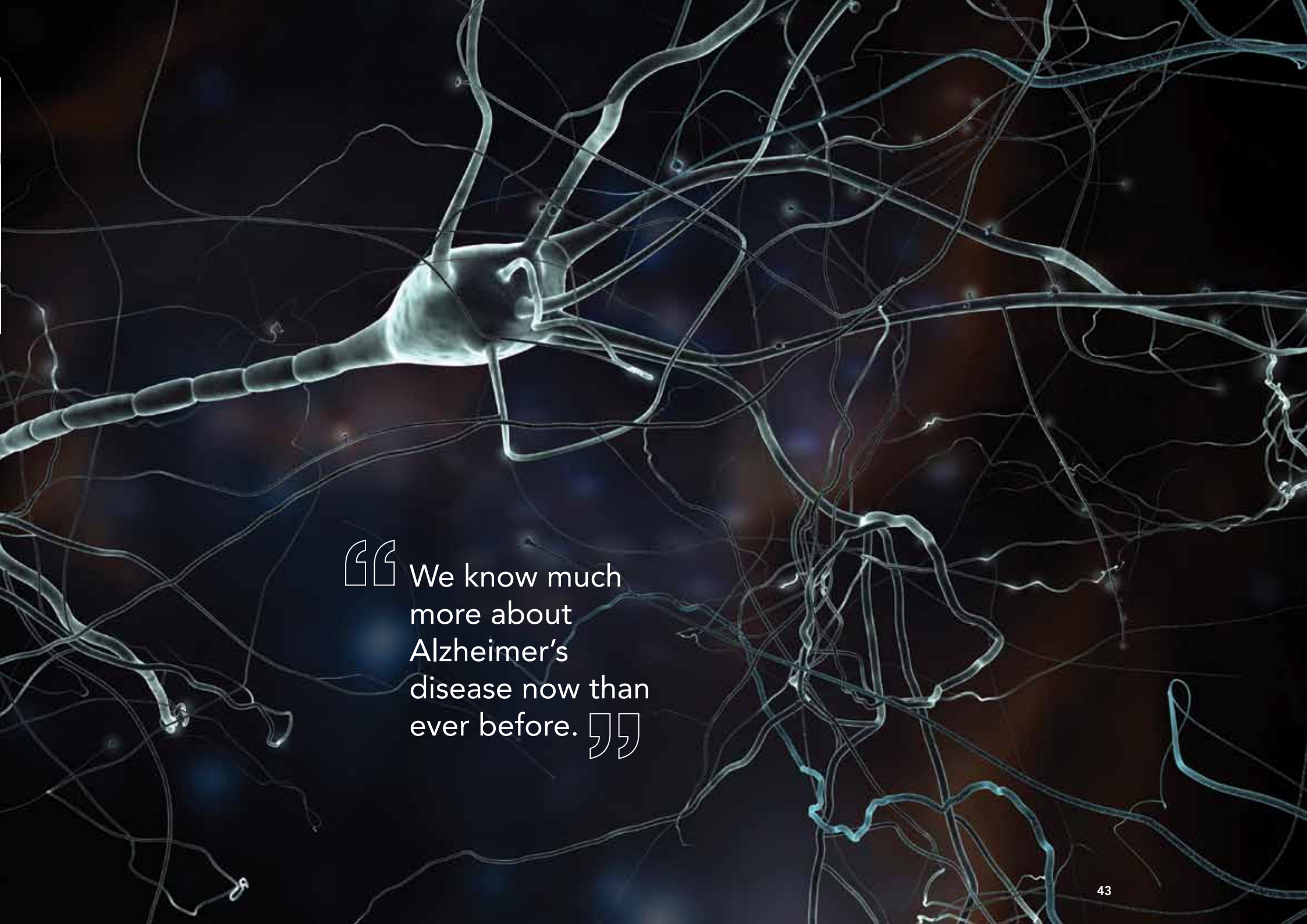
'At the moment they have a compound which they've developed and they're looking for investors – but to take a drug to clinical trials costs millions. Five drugs are currently approved for use in Alzheimer's. They work for a short time in some people to alleviate some of the symptoms, but that's it. They don't halt the disease, they don't reverse it.

'What Senexis is aiming towards is a drug that will halt the process from advancing and maybe even turn the clock back a little. This would mean being able to reduce the level of clinical management.'

There is an additional collaboration with NeuroSolutions Ltd, a specialised electrophysiology company which provides services to the pharmaceutical and biotechnology industries. 'Once they saw the applicability of the models and the way we could determine pharmacological effects on behaviour, they became really interested in offering analysis to various companies on the actual physiological effects of a drug in the whole organism, rather than just tissue sections.'

Through a Knowledge Transfer Partnership, NeuroSolutions has now been able to supply support for Eugene's lab with their highly-developed technical capabilities and commercial expertise.

Eugene says, 'We know much more about the disease now than ever before. With our research we're constantly pushing the field forward and I would predict that within the next 10 to 15 years there'll be a drug that really does something for the sufferer.'


“We know much more about Alzheimer’s disease now than ever before.”

“I’ve seen the work at Queen’s evolve. It’s at a very important juncture.”

Professor Joe O’Sullivan
Centre for Cancer Research and Cell Biology,
School Of Medicine, Dentistry and Biomedical Sciences

CRUSADER FOR CLINICAL RESEARCH IN PROSTATE CANCER

Like many clinical academics working for Queen's, Professor Joe O'Sullivan serves two institutions. In his case he has responsibility to the University and to the Belfast Trust through his work at the Cancer Centre at the City Hospital.

Above all he has responsibility to patients – and he is fulfilling that through clinical research in his specialist field, prostate cancer.

'It is fundamental,' he says. 'As a clinical academic doctor, I see patients, most of whom are in clinical trials of some kind. To give treatment properly, it must include research and if we're not doing clinical research either in new drugs or testing new ways of doing things we're not doing our job as oncologists properly.'

A graduate of UCD Medical School, Joe's focus on prostate cancer developed during time spent working at the Royal Marsden Hospital in London. 'That's where I saw the value of clinical research. The model at the Royal Marsden was the model by which I try to practise now. It was a mark of quality.'

His journey to Belfast began when he met Professor Patrick Johnston at an oncology conference in Chicago in 2003. 'I was very impressed by Paddy's vision for a comprehensive cancer centre in Belfast and I accepted his challenge to take on the development of radiotherapy and prostate clinical cancer research. I took up post as a senior lecturer in Clinical Oncology at Queen's in January 2004 and I haven't looked back since'.

He believes that both research and the clinical service are now at a very high level and he says Queen's and the Belfast Trust both gain. 'The Trust sees the benefit of me bringing research into the clinic and Queen's sees the benefits of me being involved in clinical trials.

'I've seen the work at Queen's evolve over the last nine years. It's at a very important juncture. In particular, Peter Gregson was very visionary when it comes to medical and biomedical research and development and I think I've been very lucky to have worked here during his time as Vice-Chancellor. He was extremely supportive.'

He points to a number of successes, including modernising prostate cancer radiotherapy, bringing in advances such as 3D and image-guided radiotherapy and IMRT, while on the clinical side there is the systemic management of advanced or incurable cancer 'not just in terms of the clinical trials we've brought through, but in raising the profile and raising the ambition.'

He adds, 'I'm also proud of the collaboration with Professor David Waugh and Professor Kevin Prise and their groups. We've brought some of their research discoveries into the clinic. We're building the infrastructure of research and we've grown to such an extent that prostate cancer is one of the cancers where we have particular expertise.'

For the future? 'There are two key areas. One is how better to use radio isotopes with chemotherapy and particularly the drug Radium-223, also known as Alpharadin. We've been funded to do a Belfast-based trial looking at this drug, trying to cure men with advanced prostate cancer. Nobody's been looking at that.

'I'm trying to use drugs like Alpharadin, along with complicated and sophisticated radiotherapy treatment of the prostate gland, to actually cure these men and let them get on with their lives. But that will also involve molecular profiling to better understand the kind of cancer we're dealing with.

'I'm also interested in using high-tech external radiotherapy which is extremely precise – high dose in a very small volume. It's a way of patients avoiding surgery and not just in prostate cancer.'

He says, 'My research is very current. I can see benefits right in front of my eyes. Our work is grounded in real time. Patients come in and the type of research I'm talking to them about is right here, right now. I tell them – you're starting this drug tomorrow. Let's hope it helps you.'

> Policy decisions, although certainly not made on the hoof, are often made far quicker than people imagine.

AN ACADEMIC IN WHITEHALL

Professor David Phinnemore
School of Politics, International Studies and Philosophy

Decorating David Phinnemore's office are framed front pages telling the story of a momentous event in history – the fall of the Berlin Wall in November 1989. They are images which are a constant reminder of how quickly the political landscape can be transformed.

'When it happened, I was in my final year at the University of Kent, doing courses in European integration and contemporary European politics, and here we had the whole of postwar Europe changing overnight. It was fascinating.'

He graduated in 1990, then started on a PhD looking into the European Union's relations with the countries in central and eastern Europe, taking him into the area of European Union enlargement. At the same time Maastricht was being negotiated and he became interested in treaty reform.

'I have followed these two avenues throughout my academic career. It's a journey that still goes on as the EU has continued to enlarge and has continued to reform and adopt new treaties.'

In 2000, David joined the staff of Queen's, where he is Professor of European Politics. He was appointed Head of School in 2012. He says, 'When you're dealing with international relations and European integration you're dealing with something that's fluid and you have to adapt. That's one of the most interesting and challenging things in this field – it's constantly changing. Students appreciate it when their courses reflect on and engage with the most recent developments.'

David's academic focus has given him an international reputation as an expert on key elements of the EU and led to an inward loan to the Foreign and Commonwealth Office (FCO) as a senior research analyst.

'When the coalition government was formed there was a commitment to tighten up the way Parliament was involved in decisions about the transfer of powers and sovereignty from the UK to the EU. It became clear that there would be a bill on increasing control over this.

'The FCO is not traditionally a department which regularly takes major bills through Parliament, so there was a desire to bolster available expertise on past treaty reform processes. They were also looking for someone with expertise in EU enlargement. I fitted the bill.'

His inward loan was for an initial six months, working in London, but when the EU Bill had to go back to the Commons after being held up in the Lords, the inward loan was extended for three months during which he was able to work from Belfast.

The whole experience taught him a lot about the inner workings of Whitehall. 'You were very conscious that it was a coalition government. There were sometimes tensions but you also realised how quickly events moved. In academia you can generally take your time, reflecting on things and gradually crafting a paper. In the FCO, if someone wanted some analysis by three o'clock, they meant it. A quarter past was often too late.

'Policy decisions, although certainly not made on the hoof, are often made far quicker than people imagine. It was also interesting to see how a lot of policy officers are very much focused on their particular brief. They don't always immediately see the broader context and that's something which research analysts can bring to discussions – a longer-term perspective, how an issue has been approached before, why certain positions were adopted. This means you can enhance the solid basis on which decisions can be taken.

'I'm like a lot of colleagues who work on European politics. We pride ourselves on being able to look at the issues from a variety of different perspectives. We don't operate wearing a set of national blinkers.'

He sees benefits for Queen's in inward loans of this kind. 'The University's profile is raised, its expertise demonstrated. We are a university which can contribute to a whole range of different policies and debates because of the expertise we have here.'

He adds, 'The reputation of academics is improved, their value to policy-making recognised. But another lesson I learned is that what policy-makers want isn't necessarily what academics normally offer. You don't sit down and write 8,000 words on something. You've got to be able to write concisely and distil down a whole set of complex arguments into a single side of A4 or – even better – a single paragraph.'

NEW DISCOVERIES IN DRUGS TO HELP CANCER PATIENTS

Tracy Robson's research collaboration with Northern Ireland pharmaceutical company Almac Discovery is leading to new and exciting developments to help cancer patients. It is also providing a unique learning experience for Queen's students and creating job opportunities for gifted graduates.

In 2011, Tracy, Professor in Experimental Therapeutics at Queen's School of Pharmacy, announced a breakthrough in treatment for cancer. She and researchers at Almac have developed a novel drug which, rather than attacking tumours directly, will prevent angiogenesis – the growth of new blood vessels – starving them of oxygen and nutrients.

It is hoped clinical trials will start early in 2014. In the meantime, Tracy has learned more about the protein from which it is developed.

'We've been able to demonstrate that if patients have tumours with high levels of this protein they'll do very well but, if they have tumours with low levels they'll do badly. We're trying to develop a biomarker, based on this protein, that can stratify patients to particular treatment groups.

'We're hoping to screen patients who are going to be on this trial, to assess the levels of this protein. When we give patients the drug we're basically giving them back the protein. The patients who have high levels of it already are probably not likely to respond, but those who are deficient in it are very likely to. So our aim is that in future trials, perhaps phase II or III, we will select only those patients with low levels of the protein for treatment.

'If you really want your drug to show efficacy you've got to choose the right patient population. If you don't, you could end up exposing patients to a drug which has no therapeutic benefit and the drug trial may fail as a consequence.'

Tracy believes she was lucky to be in the right place at the right time when Almac were expanding their discovery arm – although she admits that at first she found it difficult to adjust. 'Working with people who are commercially driven is very different. There are different timescales and objectives. They concentrate on what needs to be done to get a drug to patients.'

She sees huge advantages for an academic working with industrial partners. 'You become much more focused. In the past it would have been a case of doing really nice research and writing nice papers and looking forward to the next big grant coming in, but working with a company like Almac makes you ask different questions. Where am I going with this? What's going to be the outcome? My experience with them has forced me to think about the impact of my research and how to make it more translational.'

But the story of the new drug does not end there. It will deliver even more. 'We've also demonstrated that it inhibits cancer stem cells – the cell population within a tumour that's resistant to the standard treatments of chemo and radiotherapy. We hope now that this drug has two mechanisms of action which is probably how Almac will market it. And of course all this came from Queen's through my interaction with them.

'I give lectures on angiogenesis and anti-angiogenic drugs. I tell students about what we're doing here at Queen's and they're always amazed. They say – my goodness, is that what's going on in the labs upstairs?

'The students who are really interested will knock on my door and want to come and do a summer studentship or even come back to do a PhD. They may want to have careers as academic researchers or they may see commercial opportunities in the pharma world.

'In fact, four of my former PhD students are now with Almac and they're continuing to work on related research. So they've got permanent jobs with a local pharma company and Almac is gaining key skills from academia. That shows you the direct benefit that can result from this kind of relationship.'

“Working with people who are commercially driven makes you become more focused.”

Professor Tracy Robson
School of Pharmacy

REBORN ON MICROSOFT: AN 18th-CENTURY TYPEFACE

Dr Gabriel Sánchez Espinosa
School of Modern Languages

Gabriel Sánchez Espinosa has a love of the Spanish 18th-century that grew out of necessity and has blossomed to define his career.

He says, 'I studied Spanish literature and linguistics in Madrid, then when I graduated I went off to Germany to do a PhD. But one of the conditions of getting grant funding was that I had to do some research on that 18th-century period – and I hadn't a clue about it.'

That situation would soon change. Starting from scratch, he found himself studying a period that he found hugely absorbing and relevant – and still does.

'This was 1986, the year Spain joined the European Community, and I could see that the 18th-century was a similar period, a period of transition in which the isolated, inward-looking Spain started to gaze towards Europe, wanted to modernise its economy, society and culture. It was a period of an enlightened monarchy. Spanish people started to travel to London, Frankfurt, Rome, Amsterdam.'

But, as he points out, in the conservative society of the 19th-century, study and knowledge of this period would be suppressed, as they also were during the Franco years.

After finishing his PhD, Gabriel went back to Spain and got a job in a newspaper where he was in charge of its database. His return to academic life came in 1995 when he was appointed to a post at Queen's where he is a Reader in Spanish Studies.

'My focus is still on those parallels that excited me in the first place and I try to communicate that to students – that studying the 18th-century isn't archaeological, it's not a dead period, it's the period when Spain recovered itself.'

He has helped that study come to life with a unique project – restoring a distinctive Spanish typeface of the 18th-century for use in the contemporary print and digital media. It is Ibarra Real, created by Joaquín Ibarra in 1780, and it is now one of Microsoft's suite of fonts.

Gabriel explains, 'One of my specialisms is the book. I discuss society of the period through books, how they work, what their function was, how they were received and understood. The 18th-century was the golden age of Spanish publishing. Printing was state-sponsored, which resulted in works which are still extremely attractive today.

'This specialism led to me being invited to join a group who wanted to re-fashion and update this classical typeface. They were people involved in graphic art, in museums and exhibitions in Spain.'

It was a project supported by the Spanish Ministry of Industry, the Spanish International Cooperation and Development Agency, the Royal Academy of Fine Arts of San Fernando and by Microsoft.

Ibarra Real can now be downloaded free from the Microsoft website. 'The idea was to revive this font because of what it represents. So now we have something which is technologically modern but symbolises Spanish identity and a period of Spanish enlightenment.'

Gabriel's role in the project was not to design the type but to provide support through his expertise, ensuring that the new Ibarra preserved all the distinctive qualities of the original and that its essential character remained the same.

As part of promoting the enterprise, an exhibition was staged in Madrid. Books produced in the 18th-century were on display and there were computer images showing the modern Ibarra font and its application. The exhibition was later taken to Santiago in Chile and to Guadalajara in Mexico. In total it attracted 45,000 visitors.

Gabriel says, 'Becoming involved with this team has given me the impulse and the will to work more in this area of book history. I try to communicate my fascination to my students – not always easy in the world of iPads and so on – but they're learning that sometimes you can draw on the past to create something new.

'This is a living link with the period they're studying. It connects the present day to the history of Hispanic culture across the world and across the centuries.'

“Our students are learning that sometimes you can draw on the past to create something new.”


“Working with both clinicians and industry is key to our success.”

FINDING NEW THERAPIES USING NANOTECHNOLOGY

Professor Chris Scott
School of Pharmacy

Professor Chris Scott is driven by innovation. 'We're always trying to work out what the next big thing's likely to be.'

He's having success in finding it – most recently in the form of a microscopic medicine, developed through research led by Chris and his team, which has been widely hailed in the media as the 'magic bullet' which he hopes will help treat acute lung injury.

Chris is Director of Research for the Molecular Therapeutic Cluster at the School of Pharmacy. 'Our cluster has a track record in coming up with new ways of developing therapeutics, for instance in the field of antibodies and peptides. We try to look for a new angle that we can bring our expertise to. It's so we can be competitive in a niche where a big pharmaceutical or biotech isn't already investing money.

'Central to the type of work we do, whether it's in medicine or pharmacy, is that we address a clinical need or question. That's at the heart of our research and working with both clinicians and industry is key to our success to date.'

Chris has an understanding of business and what drives it. After a PhD in Biochemistry at Queen's and then a postdoctoral position at the School of Pharmacy, he became one of the first members of staff of Fusion Antibodies Ltd, a Queen's spin-out company.

'The concept behind Fusion was that it would be a contract research company, trying to help people make proteins and antibodies as a service. But while I was there I realised how much more productive we could be if there was more time. So when I came back to Queen's I took that idea further. I was able to get a Knowledge Transfer Partnership (KTP) grant with Fusion to examine the speed by which we could deliver protein and antibody orders.'

Research knowhow from this work has now been marketed by Fusion as part of Fusion Expression Technology.

A follow-on, three-year project was designed to bring together the research capabilities of Chris's team and Fusion to identify and characterise new biomarkers in cancers. Biomarkers, specifically cell-surface proteins, are ideal therapeutic targets for antibodies. This work led to the development of a novel antibody-based inhibitor Fsn0503.

'That was a paradigm shift. Normally antibodies are developed as binding to cell surface receptors but to actually inhibit an enzyme was quite new.'

Chris adds, 'KTPs have been one of the most powerful mechanisms for the creation of innovation and impact. Fusion is now able to market the results of our collaborative work around the world. In a project like that, which you and the company have bought into and support each other, where the person employed on the ground is in control, is the perfect arrangement. Everybody gets something out of it.'

He is now heavily involved in nanomedicine, the therapeutic application of nanotechnology, with successful impact which has been publicly acclaimed.

'Most of my energy is now dedicated to nanomedicine – in cancer and in respiratory medicine. Why the interest? It all comes back to the clinical questions. We've developed a really exciting nanoparticle and been awarded £500,000 from the Medical Research Council for pre-clinical evaluation of acute lung injury.'

In addition to this lead molecule, his team are pursuing other nanomedicine strategies. He says, 'Drug biodistribution is crucial to efficacy. If a drug isn't present long enough at the site of the disease it's not going to work. I now have strong relationships with companies like GSK and AstraZeneca and so my nanotechnological approaches may take drugs that previously have failed and turn them into winners. This is going to be one of the really big growth areas in the pharmaceutical industry.'

RECOVERING TRUTH, INFORMING JUSTICE

> "It's about being a chronicler. It's about bearing witness."

On 15 April 1989 at an FA Cup Semi-Final at Hillsborough Stadium, Sheffield, thousands of Liverpool fans were trapped in a fatal crush as the match began. Ninety-six men, women and children died, hundreds were injured and many more traumatised.

A judicial inquiry concluded that the cause was severe overcrowding in two central pens on the terraces due to the failure by police and stewards to manage a capacity crowd in a venue unfit for purpose. Yet the inquest verdicts were 'accidental death'. There were no criminal prosecutions and no authority held responsible.

The bereaved families campaigned for two decades for disclosure of the investigations' documents, the quashing of the inquest verdicts and full accountability. In 2010 the Home Secretary appointed the Hillsborough Independent Panel, chaired by the Bishop of Liverpool, to research and report on documentary disclosure from over 80 agencies and individuals involved. The research team was based at Queen's, led by Panel member Professor Phil Scraton. On 12 September 2012, as primary author of the 395 page Report, Phil presented its 153 findings to over 300 bereaved family members in Liverpool's Anglican Cathedral. 'At that moment' he states 'I realised the significance for families of what we had achieved'. Overwhelmed by the Report's detailed, unequivocal criticism of all key organisations involved and its exoneration of the fans, the families applauded the Panel for several minutes.

Immediately, from a packed House of Commons, the Prime Minister offered the families a double apology – for their loss and the 'injustices' endured since the disaster.

Phil, from Merseyside, was appointed in 2003 to a Chair in Criminology in the Institute of Criminology and Criminal Justice within the School of Law. Over 30 years Phil has conducted in depth research into official inquiries, criminal investigations and coroners' inquests into controversial deaths. Commissioned in 1989 to research into all aspects of the Hillsborough disaster, three critical reports were published – in 1990, 1996 and 1997. He is also author of the acclaimed book *Hillsborough: The Truth* and has published a range of influential academic articles, receiving research funding from the Home Office, Nuffield and the Economic and Social Research Council.

He says, 'Throughout the decade of investigations and inquiries that followed the disaster, the reputations of those who died and survived were vilified, as police levelled unsubstantiated allegations of drunkenness, violence, criminal and abusive behaviour.

'The Panel's Report details how those allegations were fed to the media, influencing public opinion. It also reveals in depth the full extent of institutional culpability before, during and after the disaster. The report exonerated the dead and survivors. Its impact was immediate and profound.'

The Prime Minister's public apology was endorsed by all official public and corporate agencies concerned. New inquests will follow the quashing of the accidental death verdicts by the High Court. The Director of Public Prosecutions established a full criminal investigation, the Independent Police Complaints Commission has embarked on its most extensive ever inquiry. The research has broken new ground in the disclosure and analysis of documents in cases of national and public interest, providing a process and a method for transparency in contested and controversial cases. It provides a model for independent, comprehensive 'truth recovery' and has particular relevance in Northern Ireland.

Following the Report's launch, Phil gave talks at the Ulster Bank Belfast Festival at Queen's and Liverpool's WOW Festival, attended by many bereaved families and survivors. At Queen's, he was awarded the Vice-Chancellor's inaugural Impact Prize for Research. In April 2013 he returned from a research sabbatical at Amherst, Massachusetts to speak at the annual Hillsborough Memorial Service and to deliver a Queen's public lecture on research impact. The project has also been short-listed for the 2013 Times Higher Education Research Project of the Year Award.

He stated that the Hillsborough work is part of a broader commitment to critical research: 'It's about being a chronicler. It's about bearing witness to the testimonies of others. It's about gathering otherwise hidden information, contextualising it, making it accessible and challenging official discourse. It's about recovering truth.'

Professor Phil Scraton
School of Law

Picture courtesy of the Liverpool Echo

MAKING LIFE ON THE LAND A SOCIAL PRIORITY

Professor Sally Shortall
School of Sociology, Social Policy and Social Work

When Sally Shortall's father died, her mother took on the running of the family farm. 'I remember later how she would answer the door and people would ask – is the boss in? And I thought – but she *is* the boss.'

Perhaps this is what started Sally thinking about the role of women in agriculture and about the land and all the issues that surround it. It was to become a lifelong research interest for Sally, now a Professor in the School of Sociology, Social Policy and Social Work.

In her career to date she has worked at the Economic and Social Research Institute and the National Economic and Social Research Council in Dublin; she is an expert adviser to the UK Food Standards Agency, the European Parliament and the European Commission; and she has most recently been an Economic and Social Research Council Knowledge Transfer Fellow seconded to the Northern Ireland Department of Agriculture and Rural Development (DARD).

'I'd just been on sabbatical when my Head of School drew my attention to this. It was for someone to work within DARD, to examine the existing rural evidence base of economic and social studies which were being used to underpin rural policymaking, as well as to identify evidence and research gaps. It was about identifying priority themes for future research and developing models for the most efficient and effective methods of collecting and disseminating rural evidence and research.'

The secondment was for 12 months, but eight months into it, she fell at home and broke her shoulder. The remaining four months were completed part time. Her work helped to inform the Rural White Paper Action Plan, published in 2012, outlining policy priorities for the NI Executive for a further 10 years.

The Plan acknowledges these priorities as those which Sally identified in her report for DARD. They relate to urban/rural linkages, access to services, rural communities, rural economies, and the countryside.

In addition to this work, she has contributed to the development of a £1.5m Rural Childcare Programme for Northern Ireland to benefit policymakers, childcare training providers and rural dwellers, particularly women. She has also provided information about the needs of women in rural development in order to help NGOs in their future strategy and she has provided information for the European Parliament and Commission to assist the development of EU rural policy.

'I also carried out some work for the Organisation for Economic Co-operation and Development, four case studies in Poland, Portugal, Spain and the Netherlands, looking at relationships between urban and rural areas. This is an important thing – the level of social trust. Do people trust each other enough to co-operate around rural development?

'In Northern Ireland the rural development programme, which has brought community groups together, has really improved trust and communication.'

A current academic pursuit relates to how evidence or knowledge is used to inform or make policy. 'How does it actually happen? How do we use different types of knowledge – academic knowledge, stakeholder knowledge, the knowledge of interest groups?'

With a colleague in the Northern Ireland Assembly Research and Information Service, Sally developed the Knowledge Exchange Seminar Series. These seminars are held at Stormont, and are now run by Queen's, the University of Ulster, the Open University and the Assembly's Research and Information Service. The series' objective – to promote evidence-led policy and law-making within Northern Ireland.

'This has proved to be a very valuable forum. Sometimes there's a big gap in the relationship between academics and the people who make policy and we can do something about that. In the end, it's not our job to dictate public policy, but we can help those who do and we can inform their decisions through the evidence and the knowledge we've gathered in our research work.'

"It's not our job to dictate public policy but we can help those who do and we can inform their decisions through the evidence and the knowledge we've gathered in our research work."

CREATING A CAUSEWAY TO ENGINEERING INNOVATION

Professor Su Taylor
Environmental Engineering Research Centre,
School of Planning, Architecture and Civil Engineering

Su Taylor is helping to build bridges – sometimes literally – that will provide long-standing links between Queen's and industrial partners beyond the campus.

In particular, she embraces Knowledge Transfer Partnerships (KTPs) as the most significant method of establishing those relationships and has done so almost from the moment she arrived at Queen's in 1995 as a Research Assistant. Now a Professor in the Environmental Engineering Research Centre at the School of Planning, Architecture and Civil Engineering, to date she has chalked up more than 11 successful KTPs, supervising projects in companies such as Macrete Ireland Ltd, Bullivant Taranto Ltd, EDM Spanwall Ltd, CUBIS Industries, Hughes Precast Products Ltd and McFarland Associates Ltd.

'We like to work with companies which are forward-looking,' she says, citing a recent KTP with Bullivant as an example. This is a company which has more than 18 years' experience in the design and manufacture of a range of reinforced and pre-stressed concrete products to the construction, water, marine and agricultural markets. In particular, they are at the forefront of the precast concrete piling market.

'Bullivant has had a high dependency on concrete from outside sources. To improve efficiency and lower costs, it needed to design and manufacture lower energy and consistent concrete.

'The major aim of this KTP was to refine the material properties of the concrete in order to reduce the carbon footprint, encapsulating waste material such as fly ash, and along with that to develop more structurally-efficient concrete systems such as the new vaulted floor and the pile joint which they're now patenting.

'They had a major cost saving. We as academics are trying to promote sustainable development, using our research in concrete materials and structures to reduce the carbon footprint. Obviously companies are looking at the profit margins as well so if they improve those and reduce labour by using self-compacting concrete then it's a win-win.'

The associate on the project was Richard Morton who now works full-time with Bullivant as Technical Manager. As Su says, 'There are great benefits for the associates who become involved. KTPs open a door, give them tremendous opportunities to progress.'

Relationships with companies such as Bullivant provide additional benefits. 'We run concrete competitions with the fourth year students.' There are National Student Design Awards on the wall of her office, evidence of success. 'I don't think I'd have been confident enough to get involved with those without the experience of KTP so that's a direct benefit for the teaching.'

There is also research. 'If you walk past the heavy structures laboratory now, you will find beams being used for research there and they have been provided by Bullivant. So that's evidence of the knowledge transfer. Our research goes out into industry, which in turn supports new research at this University.'

Another of Su's KTP successes has been the Flexi-Arch bridge, developed through a partnership with Macrete Ireland Ltd. It is based on the use of modern precast concrete, as well as an innovative method of construction, simplified transportation and rapid deployment. It has given Macrete international exposure and generated new and lucrative contracts.

Su is also pursuing a European collaboration with Polytecnico di Milano, the Italian company Azichem and Banagher Concrete Ltd in County Offaly. 'This is about precast concrete for future sustainable infrastructure, on a parallel with the Bullivant work, taking the low-energy concrete and trying to combine it with corrosion-resistant material – basalt fibres as opposed to steel – for bridge building.

'The results will initially be seen in Europe, but why not the rest of the world? This work has a global application. Look at the Flexi-Arch system – it's now licensed in Australia. You're not going to transport precast concrete around the world, but you can certainly spread the impact of the research.'


“Knowledge we supply to industry
leads to support for new research.”

CAN STONE STRUCTURES COPE WITH CLIMATE CHANGE?

Dr Patricia Warke's life changed direction radically when she turned from a career in nursing to pursue a love of geography and geology. But she did not forget all the things she had learned in the medical world.

Patricia is a geomorphologist at Queen's – interpreting landscapes and the processes which shape them – and lectures in physical geography.

'As a nurse I worked with cancer patients whose conditions are assessed by a globally-recognised system that uses common terminology to provide a measure of the disease stage which a person has reached. One of the issues in my professional world now – dealing with historic stone – is how to assess which buildings are more in need of care than others and how best to target ever-diminishing funds.

'So when we were given the task of setting up an historic stone database, assessing nearly 2,000 stone structures across Northern Ireland, there was a bit of a problem. That's when I came up with the idea of using the system I was familiar with in medicine.

'We've adapted and applied it as a successful condition assessment tool which is now being used elsewhere. My late colleague Professor Bernie Smith and I even travelled to Petra in Jordan, where they have 800 tombs, and we were able to prioritise those which were in most urgent need.'

Patricia – who outside Queen's is a member of the Historic Buildings Council – is a key figure in the University's Weathering Research Group, one of the main centres for this work in the UK and Ireland. There is a close collaboration with the Northern Ireland firm Consarc Design Group and through them the stone specialists S McConnell & Sons Ltd, based in Kilkeel. This has led to a Knowledge Transfer Secondment (KTS) involving one of Patricia's PhD students, Catherine Adamson.

'Catherine has been looking at the greening of buildings. As our weather gets wetter and warmer, showing the first effects of climate change, we're beginning to see green algae growing. In trials which we carried out all over Northern Ireland there was evidence that this is very rapid.'

With Patricia supervising, Catherine agreed to step down from her PhD for six months and went to work with McConnell's to give them the benefits of her knowledge about stone. Patricia says, 'We set up exposure trials at our field site at Derrygonnelly in Fermanagh. McConnell's provided stone that had been treated with various biocides, to see how effective the treatments were. We found that some worked and some didn't.'

The final report on the KTS shows the benefits of the project. Catherine emphasises that it gave her the opportunity to work with a prestigious industry partner and that it gave her a different perspective to her work.

In turn, McConnell's are now changing the way their treatments are used, adding that 'the KTS has reinforced the importance of collaborative research links between industry and academia which we will hopefully be able to sustain into the future.'

Patricia says, 'Getting this kind of feedback from industry helps me understand the complexity of what people have to deal with and it's invaluable for students too.

Dr Patricia Warke
School of Geography, Archaeology and Palaeoecology

They see the evidence of what they're being asked to study, and it gives them a clear picture of what best practice means.'

Outside Northern Ireland, there are other collaborations, including links with Historic Scotland that is currently funding a PhD. 'They want to know how surface coatings applied to stone will affect their long-term weathering. This involves water repellents which were once a no-no, but now we're having to rethink our approach.

'As we get these more extreme weather conditions, our buildings are becoming wetter and staying wetter for longer. This has adverse effects on the integrity of stone, so we're examining the impact which water-repellent coatings might have.'

She says, 'People want answers to specific questions, and that's how we direct our research. The projects in which we're involved remove the temptation to drift away in a research bubble. They keep our feet firmly on the ground.'

> "People want answers to specific questions, and that's how we direct our research."

A RELATIONSHIP OF TRUST IN CANCER CARE

Professor David Waugh
Centre for Cancer Research and Cell Biology,
School of Medicine, Dentistry
and Biomedical Sciences

Professor David Waugh, Director of the Centre for Cancer Research and Cell Biology (CCRCB) at Queen's, is a firm believer in what can be achieved in cancer care through collaboration. 'CCRCB is a very dynamic environment, but even with that it can't stand on its own. It must work in key partnerships to deliver its goal of research innovation to improve cancer patient outcomes.'

Locally, those partnerships involve the Belfast Health and Social Care Trust and the Research and Development Office of the Public Health Authority to facilitate how research discovery can be implemented to make sure patients in Belfast are being provided with state-of-the-art care.

'Our relationship to major national organisations such as Cancer Research UK and the Medical Research Council ensures that our high-quality programmes are sustained, while interaction with local biotech companies PathXL, Fusion Antibodies, Randox Laboratories Ltd and the Almac Group provide opportunities to develop products that will shape the future of cancer diagnosis and treatment.'

David, a Queen's graduate, spent almost a decade working in leading US healthcare organisations including the Cleveland Clinic before taking up a post at the University in 2000 in oncology. 'I have always been interested in research that has a direct application to patient outcomes. When I came to interview at Queen's and met Paddy Johnston, his vision of linking scientific discovery and clinical research was extremely appealing. To see that ambition at Queen's was something I had to try to be part of. I became hooked.'

He decided to focus on prostate cancer because 'we already had strong programmes in colon and breast cancer in Belfast. I felt there were opportunities to develop something significant in prostate cancer.'

He cites the close collaboration with clinical oncologist Professor Joe O'Sullivan as a major factor in the growth of the prostate cancer research programme. 'My role is to define the science, to understand the basic biology and to identify new opportunities to try to treat the disease. Having someone of Joe's expertise engaged with the scientific programme ensures that my team is concentrating on discoveries that are clinically relevant. Over the last couple of years, we have also been able to encourage other investigators to become actively involved so our research capabilities and activity have broadened significantly.

'We've developed multidisciplinary teams, involving oncologists, pathologists, biologists, and medicinal chemists, to encompass the full breadth of research expertise that's needed to fundamentally understand the disease and then develop the translational outputs that we can apply to patient outcomes.

'These teams allow our clinicians to set the important questions, the answers to which will have the greatest impact on patient care. Our investigators then define the clinical and scientific research programmes that will address these questions in the laboratory.'

> Research funding is helping us build a momentum of understanding.

He says, 'What we're constantly learning about cancer is that it's not "one size fits all". One prostate cancer is very different from another. There is a massive biological heterogeneity and also very different journeys for cancer patients. So we're starting to strip the disease right back to basics – starting to do molecular and genetic annotation of tumours to gain a comprehensive understanding of how many different types of prostate cancer there are and which genetic backgrounds have the most significant clinical consequence.

'For each tumour type there will be key elements of biology that are unique or very important to its progression. When we start to understand the biology of the clinically-significant disease, then this provides us with the knowledge defining the best opportunity to tailor the next generation of therapeutic interventions.'

The work is underpinned by investment. CRUK and MRC, and many local organisations like Cancer Focus NI, Friends of the Cancer Centre and Men Against Cancer, have funded the research over the past decade in various ways.

'These relationships with national and local stakeholders are important to build in order to sustain all the cancer research programmes undertaken in CCRCB. We can now show the evidence of innovative trials that are being led by Queen's investigators, born out of scientific research conducted at CCRCB, and significantly now being rolled out and financially supported at UK-wide and pan-European levels.'

64

ACTING TO HELP THE LIVES OF STROKE SURVIVORS

Dr Brenda Winter-Palmer
School of Creative Arts

Throughout her professional life, Dr Brenda Winter-Palmer has been reaching out to people.

An actress, writer and director, she was a founder member of Charabanc, the women's theatre collective which made its mark in the 1980s. Later there was Replay, Northern Ireland's longest-established educational theatre company, which she also founded, and then the Mixed Peppers theatre arts training programme for young people with motor disabilities. She was creative director from 2000–2004, engaging in an area in which she has a particular personal interest because her son has a disability.

More recently, she has brought her talents to Queen's. She studied for an MA in drama, then a PhD and she is now a lecturer, teaching a course in applied theatre. As she explains, 'This is any kind of theatre that happens outside the usual mainstream venue. Therefore, Replay and Mixed Peppers would fit that description.'

In 2012, she asked her students to create a notional project, to research it and write it up. One of them approached NI Chest Heart & Stroke as part of the exercise, then came back and said – 'They want to do this for real.' Brenda's reaction? 'Excitement certainly – but this is an area which requires particular skills and sensitivity and I said there was no way I could let them undertake this without proper training and supervision. So I agreed that we would provide both.

'When you become involved in this area there are things you need to be aware of. I brought in a drama facilitator to work with me. The training was in basic drama facilitation skills, but there was also instruction about how stroke actually affects people. It's not just the physical problems, although those can be pretty devastating, there are cognitive problems as well. People forget things, some lose their hearing. There are psychological and emotional difficulties and what the drama does is take people out of their own concerns, to take them beyond.'

The initial week-long encounter took place in the Brian Friel Theatre at Queen's, 'an ideal space. There were eight stroke survivors, aged between 53 and 75. They were very nervous, we were nervous, but the whole thing took off within an afternoon.'

There was improvisation, stories were shared, creative abilities started to emerge. One observer, Catherine Lowry, is a speech and language therapist and specialist drama tutor. Her mother, who is a wheelchair user, was one of those taking part: Catherine says she watched how the participants were able to develop their confidence and self-esteem. 'What was emerging naturally was a trust and familiarity and with that a new-found freedom that there was no such thing as doing something badly or getting something wrong.'

This is endorsed by the stroke patients themselves. Some of them commented:

– 'It gave me a real sense of freedom to be someone who isn't me for a while…'
– 'A week ago I wouldn't have believed anyone who said I could get up in front of an audience...'
– 'I can just see a really positive thing here, not feeling that you're just sitting in a corner as a stroke person.'

And there is the effect on the students. Brenda says, 'Some of them decide – "This is the kind of work I want to do for the rest of my life".

There is an employability aspect to the experience they get. Some of our students want to go into teaching, some want to get involved with community ventures. One has gone on to work with a group of men in Tiger's Bay in Belfast on a health project.'

Andrew Dougal, the Chief Executive of NI Chest Heart & Stroke, has commented: 'We're always trying to be innovative when helping people recover from the devastation of stroke. This project was the first of its kind in Northern Ireland and was made possible only by working in partnership with Queen's University.'

Brenda says, 'I hope the research I'm doing will show other organisations that drama is a way in which you can improve emotional and cognitive health. I know this works, but what I have to do now is show why it works.'

THE SEARCH FOR 3,000 PEOPLE MOST AT RISK OF HEART ATTACK

Professor Ian Young
Centre for Public Health,
School of Medicine, Dentistry
and Biomedical Sciences

Professor Ian Young is a man who likes a good detective novel. There are shelves of them in his office at the Centre for Public Health (CPH).

But now he has become something of a sleuth himself. He and his team are working to trace people in Northern Ireland who suffer from abnormally high cholesterol.

It is a major risk factor in heart disease but, he says, 'the idea that there are some people who have very high levels and that they cluster in families – we are studying that in a lot of detail.

'We began to identify genetic abnormalities in individuals and to understand the mechanism by which these would give rise to high cholesterol. As a result, we've led the UK in developing genetic tests and we can now identify people with such abnormalities right from birth.'

From the beginning of his career, Ian has been interested in the prevention of disease. The two areas he is focused on are lipids – of which cholesterol is one – and the nutrients and vitamins in fruits and vegetables and how they protect against ill health.

He is Professor of Medicine at Queen's, Director of the CPH, which is sited at the Royal Victoria Hospital, and also has responsibilities to the Belfast Health and Social Care Trust. 'Like many physicians working for Queen's, I bridge the two organisations. I see patients for the Belfast Trust and I work with colleagues in Belfast Trust laboratories to carry out research in an effort to develop new test treatments.'

The genetic testing is now being used by other hospitals throughout the UK and Ireland which send them samples. And a team of nurses is being established from the five Northern Ireland Health Trusts with the job of going out into the population to try to identify all the patients with this inherited cholesterol problem.

Ian says, 'This affects about one in 500 people in Northern Ireland, just under 4,000 individuals. At the moment we know about 1,000 of them, so there are 3,000 missing. We think that if they're not treated, the men among them will have a one in two chance of a heart attack or stroke before they're 50. For women, it's a one in two chance before they're 60. In both cases, it's a substantial risk.'

The CPH has 33 academics, 29 researchers, 70 postgraduate students and a large team of professional support and technical staff.

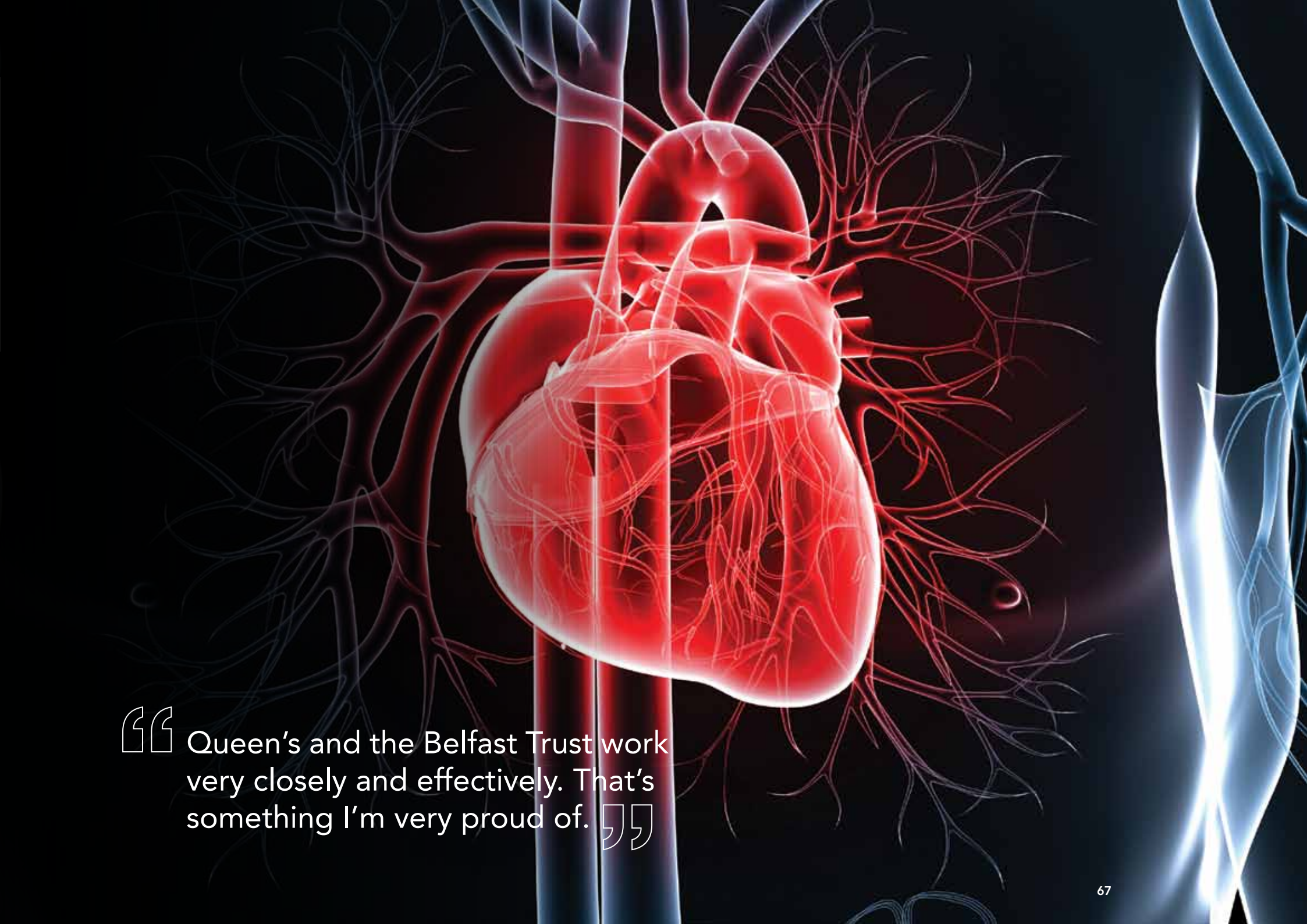
Ian says, 'As well as my role in the University, I'm Associate Medical Director for the Belfast Health and Social Care Trust and I'm responsible for research and development across its hospitals and in the community. Queen's and the Belfast Trust work very closely and effectively. That's something I'm very proud of and which is very important to both organisations.

'Ultimately, we both have the same objectives – to provide better care for patients in terms of diagnostic tests and treatments and also to support the development of the Northern Ireland economy.'

Unlike many academic researchers, he is closely in touch with the 'end user' – working directly with patients. 'You can give an explanation quickly, offer treatment or investigation when appropriate and, more importantly, test their children, sometimes being able to reassure them that they aren't going to have problems with cholesterol as they get older.

'In some cases our postgraduate students have the opportunity to interact with patients too. We have a fantastic bunch. They are bright, vibrant and passionate about what they're doing.

'Public health attracts a different kind of student – those who have a great interest in policy and the broader public good. Working to influence policy is one of the most important things we can do. And if you can get large segments of the population to make even small changes in their behaviour – that can have a big impact.'



“Queen’s and the Belfast Trust work very closely and effectively. That’s something I’m very proud of.”

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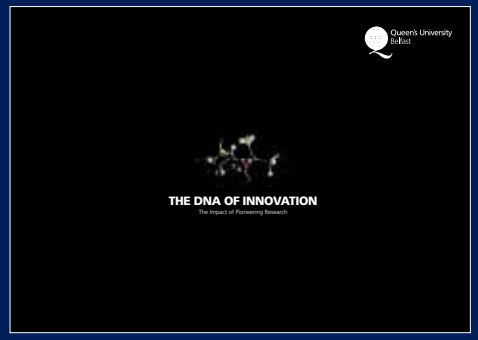

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