

THE DNA OF INNOVATION: VOLUME IV

OUR GLOBAL IMPACT ON SOCIETY



WE ARE QUEEN'S UNIVERSITY BELFAST
We are exceptional!

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

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www.qub.ac.uk/home/ResearchandEnterprise
Tel. +44 (0)28 9097 2568

FOREWORD



Professor Patrick G Johnston

The men and women profiled in this publication have fascinating stories to tell – stories which show individual success and collective commitment and paint a picture of a University where the pursuit of innovation and discovery and the advancement of knowledge are in full flow.

In this new edition in our *DNA of Innovation* series you will learn about our international impact. You will read about the work of world-leading academics now firmly established on our campus, engaged in research with relevance and global importance.

You will also discover how researchers are opening windows of understanding and how Queen's plays a leading role in the continuing growth of Northern Ireland, advancing its reputation on the international stage.

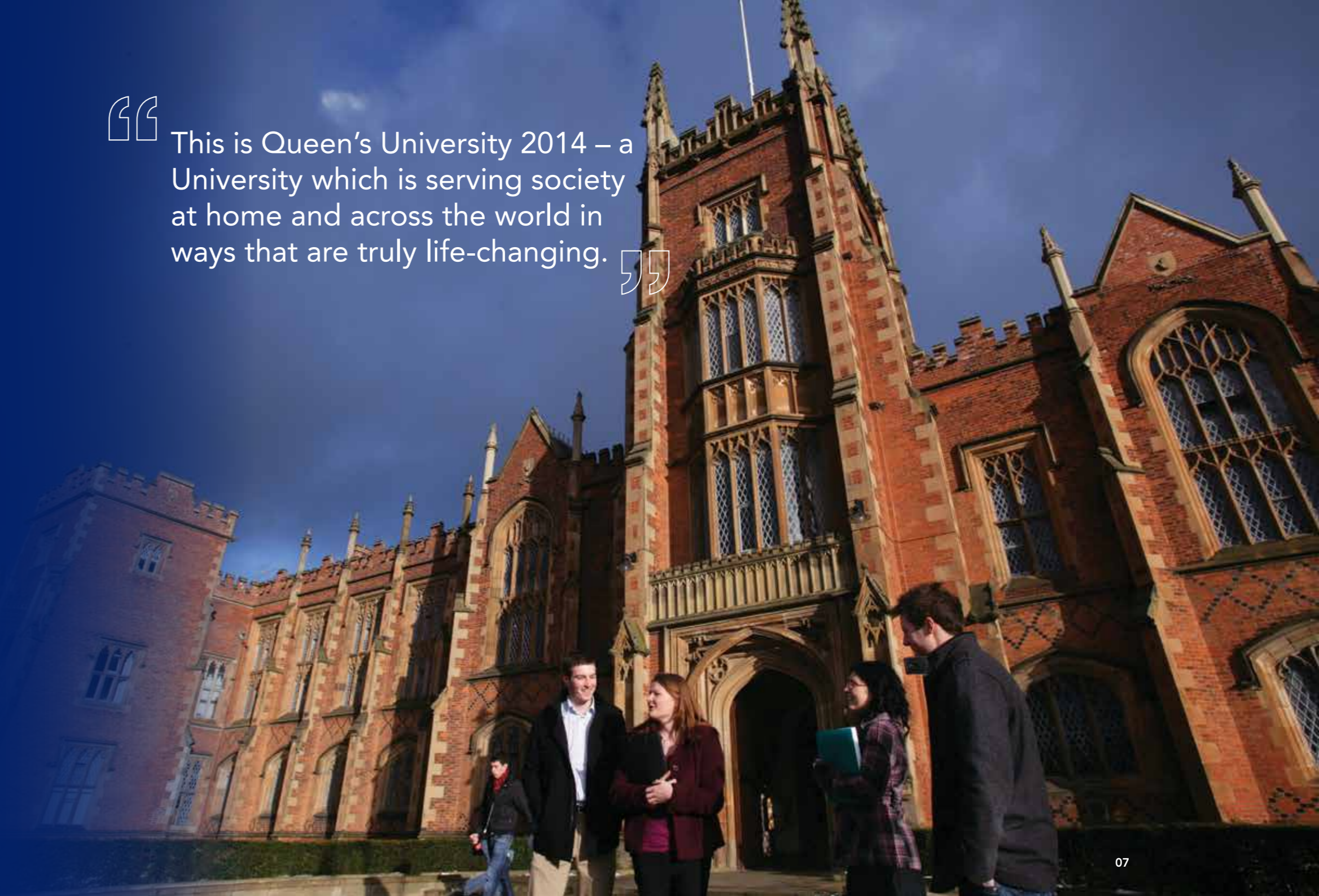
This is Queen's University 2014 – a University which is serving society at home and across the world in ways that are truly life-changing.

At Queen's, ideas are being translated into action. As a researcher myself, I know how vital but complex that process can be and so I want to thank the Research and Enterprise Directorate for its outstanding expertise and support offered right across our University.

Let me offer my congratulations to all those whose work is highlighted in this new publication. Through their ambition, conviction and achievement they represent this world-class University at its finest.

Professor Patrick G Johnston
President and Vice-Chancellor
Queen's University Belfast

“ This is Queen's University 2014 – a University which is serving society at home and across the world in ways that are truly life-changing. ”



OUR GLOBAL IMPACT ON SOCIETY

“ In this new edition, we introduce you to outstanding researchers from many parts of the world... Together they are enhancing our reputation on the international stage through research which is having a global impact on society. ”

Coming up with the selection for a new edition of *The DNA of Innovation* series is never an easy task but it is always a rewarding one. The decisions we make give us the opportunity once again to focus the spotlight on a few of the remarkable researchers at Queen's and their extraordinary portfolio of achievement.

The 32 academics featured in this publication represent research activity right across our University. The work of these men and women is diverse – advances in cancer treatment and drug delivery, the study of prehistory and the 'smart cities' of the future, social issues such as domestic violence and children's rights, and a range of scientific innovation.

Their work also gives us a new vantage point from which to view the island of Ireland, to understand more about the culture and history that have shaped our present and how we can influence our future.

In this new edition we introduce you to outstanding researchers from many parts of Ireland and the UK, from across Europe and from Canada, Australia, China and the USA, as well as Sri Lanka. Together they are enhancing our reputation on the international stage through research which is having a global impact on society.

They are advancing and expanding knowledge, helping to define attitudes to some of the great social issues of our time – such as modern slavery, human embryology, gender and democracy, and ethnic diversity.

Success in an internationally-competitive research environment requires world-class academic leadership and research that is

distinctive and of high quality, ambitious in scale and scope, and which is underpinned by a professional support service.

Many of the case studies featured in this publication have formed a significant part of our submission for REF – the Research Excellence Framework, through which the quality of research in UK higher education institutions is being assessed.

This is the fourth volume in the *DNA of Innovation* series. Here is a picture of our University – playing a dynamic role nationally and globally, a University with conviction and with commitment to research that changes lives.

Mr Scott Rutherford
Director of Research and Enterprise



Mr Scott Rutherford



A DEFINING MOMENT IN THE HISTORY OF MODERN SLAVERY



Professor Jean Allain
School of Law

“Queen’s is supportive of blue-sky thinking. It allows me and others the space to carry out research which has fundamental impact on people’s daily lives.”

From the moment he gained his first degree at university in his native Canada, Jean Allain knew that he wanted to teach international law. ‘But I knew I couldn’t do that successfully unless I saw the world, so I set out to do so through my studies.’

And so the journey began – a year in Central America doing a Masters in human rights, a Doctorate in Geneva, and a job at The American University in Cairo – then later Belfast and Queen’s University School of Law.

Jean is Director of the Human Rights Centre at Queen’s. He says, ‘Queen’s was a good choice for me. I am very much a researcher. Here research is weighted very heavily and in the UK there are great funding opportunities.’

His research has made him internationally acclaimed through his work on the definition of slavery. This has transformed the concept of slavery from being seen primarily as a phenomenon from history to being of direct relevance in dealing with modern-day slavery.

Jean joined Queen’s in 2004. ‘But while conducting my PhD studies in Geneva, I clerked for the President of the International Criminal Tribunal for the former Yugoslavia. A case came up with regard to slavery but it wasn’t clear what constituted slavery as a crime.

‘That’s when I started to become interested in issues of slavery. I quickly realised I had walked into one of the most vivid and intellectually stimulating areas of study of the past 30 years, and yet the relationship between slavery and the law was something no-one had ever before considered in depth.’

In 2010, he secured funding from the Arts and Humanities Research Council and the

Rockefeller Foundation. This allowed him to lead a group of 20 academics and practitioners, experts in contemporary and historical slavery and in property law, in developing what became in 2012 the Bellagio-Harvard Guidelines. These have now been established as a benchmark for anti-slavery work around the world.

The key words are property and control. ‘We showed that contemporary slavery is about controlling somebody to the extent that your control means they no longer have the ability to make fundamental decisions about their life course. In essence, they lose agency or autonomy.

‘As a result, any discussion about contemporary slavery has to start with the basis I helped develop through the Guidelines. For example, a Bill on modern slavery is in the early stages of going through Parliament and it uses the Bellagio Guidelines. Likewise, the Global Slavery Index uses them as its basis for measuring the prevalence of slavery worldwide.

‘I don’t regard myself as an anti-slavery campaigner. I’m an academic and a legal scholar first and foremost. What I’ve done is put my mind to an issue and this is the outcome. My research provides a sound basis both in law and in fact in determining what are true cases of slavery versus what are simply instances where the rhetoric of slavery is used.’

Jean’s current research looks beyond slavery to issues of equal global importance: food security, food safety and the right to food. ‘Queen’s is supportive of blue-sky thinking. It allows me and others the space to carry out research which has fundamental impact on people’s daily lives. That’s what a top rank university should be doing and at Queen’s we are doing it.’

INFLUENCING THE LIVES OF FUTURE GENERATIONS

The Human Fertilisation and Embryology Authority (HFEA) is dedicated to licensing and monitoring UK fertility clinics and all UK research involving human embryos. For the past nine years, one of its key members has been Professor David Archard, Chair of Philosophy at Queen's since 2012.

He is also Chair of the HFEA's Statutory Approvals Committee. As he says, 'It's an enormous responsibility. The Committee is charged to look at licensing something very particular: PGD, pre-implantation genetic diagnosis. This allows prospective parents who worry that they might pass on a very serious condition to their child to obtain fertility treatment.'

'By various processes, you can screen the embryos that are created through IVF and make sure that an embryo is put back that doesn't have the condition they're worrying about. However, Parliament has always been concerned that there might be a slippery slope towards designer babies. So they will allow PGD only in conditions which are agreed to be serious, where there is a significant risk that a child will inherit a serious condition and they left it to us to determine that.'

David's appointment to the HFEA in 2005 as the only moral philosopher on the Authority and his re-appointment in 2012, is recognition of his internationally distinguished research in social, political, legal and applied moral philosophy.

He says, 'The HFEA was created to regulate fertility treatment. One in five couples experience problems having a child. We know this can create enormous difficulties in a relationship. People can become

desperate and want fertility treatment but the Government devised very clear rules and we are charged with administering them.'

In his research at Queen's, David's focus is on applied ethics – 'the general theoretical questions of what's right and wrong, but using moral theory to understand urgent contemporary practical problems. For example, is there anything wrong with designer babies and genetic enhancement, is it ok to use drugs in sport, what's wrong with capital punishment, is anything in business fair game?'

'My view is that moral philosophers have a huge obligation to try to change the world. If they're concerned with right and wrong they ought to be concerned also with making things better – yet they haven't spent a lot of time thinking about how to do that. So being on the HFEA, working with people who have no background in philosophy, has been wonderfully eye-opening.'

In his teaching, he brings these considerations to the forefront. 'Queen's serves the community in particular ways. My students are future MLAs, future lawyers, civil servants, policy-makers. I hope my lectures will cause them to think harder about the issues they have to deal with.'

David is also a member of the Advisory Board of the Arts and Humanities Research Council. He says, 'Funding councils very much want to see research addressing practical issues which have an outcome and an added value. I'm sympathetic to that.'

'I don't see the point of a purely abstract, idealised consideration of what's right and wrong. We need to address practical issues. Philosophy will be seen in a poorer light by the general public if it doesn't have something to say about important issues.'

“ Moral philosophers have a huge obligation to try to change the world. ”

Professor David Archard
School of Politics, International
Studies and Philosophy

“It’s the fastest development ever recorded in the oil and gas industry and we’re proud to be associated with it.”

THE INNOVATOR WITH ENERGY FOR A NEW ROLE

When Martin Atkins retired from BP in 2009 a new world of opportunity opened up. He joined Petronas – the State-owned Malaysian oil and gas company – as Chief Technologist, and now he is at Queen’s where his lifetime of achievement in the energy industry is adding value in one of the University’s key research areas.

Martin holds the Chair of Chemical Innovation and Sustainability at the School of Chemistry and Chemical Engineering. He is also Commercial Director of the Queen’s University Ionic Liquid Laboratories Research Centre (QUILL) and is a mentor for a diverse base of commercial development at the Research and Enterprise Directorate.

He retired after 29 years with BP, during which time he commercialised and developed several new technology platforms and amassed over 70 patents. He steered the world’s

largest gas to methanol project and headed up several major international technology alliances. His last post before retirement was BP’s Chief Scientist in China. ‘We were also working on a project with Petronas, so when I retired they asked me to join them, to focus on clean energy and to help develop their interests in ionic liquid technologies.’

Martin had already established a relationship with Queen’s through BP, but with Petronas the pace would grow rapidly, leading to the commercialisation of a world first in supported ionic liquid catalysts for the removal of mercury from hydrocarbon process streams.

‘The team at QUILL did a fantastic job of getting some early recipes together which showed their efficacy. My job was to take that from being a laboratory invention to a commercial reality. Back in 2004 Ken Seddon, Jim Swindall and I, along with QUILL Industrial Board members, had created a road map for fast-tracking ionic liquid development. We used every protocol in it to develop the Petronas commercial activity.’

‘It took just three years from the first 300mgs of solid in these labs at Queen’s to running

the first commercial plant. It’s the fastest development that’s ever been recorded in the oil and gas industry and we’re proud to be associated with it. Now we’ve got four plants in operation – the largest ionic liquid process anywhere in the world at present.’

The influence of the research group is spreading rapidly. ‘We are viewed increasingly as a university group well integrated into industrial problem-solving and we stay focused on the project to ensure commercial goals are achieved. An example of this is developments in the palm oil sector where technology from the oil and gas industry was utilised to great effect further enhancing the synergistic relationship in the two industries.’

‘Palm oil is a crop used worldwide in about 80 per cent of products in the food chain. It’s worth about \$20bn a year, but free fatty acids - a contaminant that’s rife across Malaysia and Indonesia - affects the quality and price of the final product.’

‘The industry saw how we could fast-track in the energy sector and wondered if we could do the same thing in palm

oil. We’ve looked at their problem and we’ve demonstrated we can solve it.’

He sees many new opportunities for collaboration – ‘with Bombardier, for example. They have made huge strides in sustainable energy development and we hope to further enrich this by showing them how to convert all their waste gases so that they no longer become greenhouse gases. In another example, Queen’s and its special relationship with the Chinese Academy of Sciences Research Institute in Dalian (DICP) have identified partnership options within NI to enhance grid stability and reduce energy costs by integrating wind, wave, biomass and waste to power concepts.’

‘There are many potential linkages, all helping the growth of the university and its impact in Northern Ireland, exporting these innovative technologies across the world. We punch way above our weight in the league of UK universities, but the challenges are made easier by the quality of the people and their unrivalled energy and commitment.’

Professor Martin Atkins
QUILL, School of Chemistry
and Chemical Engineering

GLAUCOMA: PUTTING TREATMENTS TO THE TEST

Professor Augusto Azuara-Blanco is on a mission to improve the lives of patients with glaucoma – the second most common cause of blindness in the western world and the leading cause of irreversible blindness worldwide.

He has brought a new area of expertise to Queen's University's Centre for Experimental Medicine where there is already internationally-recognised excellence in research into other diseases of the eye, such as macular degeneration and diabetic retinopathy.

Augusto joined the staff of Queen's in 2013 from the University of Aberdeen where he had been Professor and Chair at the Health Services Research Unit. Previously he had been an NHS Consultant Ophthalmologist.

He says, 'Coming to Queen's was very exciting. Here we have a top unit with a great track record of quality research in

ophthalmology over many years. There are very few universities which have such a strong vision research department. We also have a superb clinical research facility and experienced researchers at the Northern Ireland Clinical Trials Unit, which has developed expertise in ophthalmological studies.

'It was a very positive opportunity for me. My research is very close to patients. I'm not heavily involved in the development of new treatments. My focus is on patient care – evaluating new treatments, diagnostic technologies and models of care, finding out whether they're effective and efficient.

'Sometimes something can work well in the lab, it may work well in the context of a trial, but does it work just as well in real life with NHS patients? That's my academic interest and I knew that when I came to Queen's I would be able to pursue those questions that are relevant to clinical practice.'

Funding for most of Augusto's academic work – over £5m, with half of this raised by

him as Principal Applicant – comes through the National Institute for Health Research. He says, 'Continued research is needed to find the best and most efficient treatment options for glaucoma patients, to halt the progression of the disease and to save sight. The prevalence and incidence of glaucoma increases with age and the ageing population is growing at a rapid rate.

'But glaucoma is up against many other healthcare needs. We're competing among different areas of health. However if you try to address an important research question and you have a strong application with a good team, then you have a very good chance of getting support.'

Augusto believes strongly in the dynamic that can be created by researchers working together. He collaborates with Professor Usha Chakravarthy on age-related macular degeneration and with Professor Noemi Lois – his wife – on diabetic retinopathy. 'The unit has a strong record in these areas but glaucoma is something new and we're

expanding. It's a very important area of research for patients and for the NHS.'

As Augusto points out, while many glaucoma patients lead normal lives, some cannot drive or administer their eye drops. Some have trouble finding jobs or remaining independent. All of this means that the high burden of cost of glaucoma blindness can be measured not just to healthcare and society but in diminished quality of life.

'Better treatments, more efficient health delivery or ways to diagnose early – those will have a knock-on effect. The message to take home is that providing eye care is very expensive. The burden of blindness for society is several billion pounds a year, so the potential impact on society of our research is substantial.'



“Continued research is needed to find the best and most efficient treatment, to halt the progression of the disease and to save sight.”

Professor Augusto Azuara-Blanco
Centre for Experimental Medicine, School of
Medicine, Dentistry and Biomedical Sciences

“ This was an unusual way of thinking about cancer. People hadn't paid enough attention to occupation. ”

Professor Matthias Beck
Queen's University Management School

WOMEN'S HEALTH: EXPOSING THE RISKS IN THE WORKPLACE

Professor Matthias Beck's fascination with the subject of risk began when he collaborated on the book *Paying For The Piper*, a major study of the offshore oil industry written in the wake of the Piper Alpha disaster.

At the time the book was published he was a lecturer at St Andrew's but in the year 2000 he became Professor of Risk Management at Glasgow Caledonian University. From there he moved to a Chair in Public Sector Management at York before joining Queen's University Management School in 2011.

He recalls, 'That book became quite a well-known history. It focused on risk and accidents and it got me into the idea of researching risk, which I've done in different guises ever since.' He has also continued to edit and write books on the subject. The most recent,

written with a former colleague, is *Risk: a Study of its Origins, History and Politics*.

His internationally-recognised expertise led to his becoming a key member of a multidisciplinary team carrying out important new research into one particular area of risk – the relationship between the working lives of some women and their exposure to breast cancer.

'I came to this through an interest in occupational health and safety and the more complex forms of accidents. Then I became interested in chemical and environmental risks. That's partly what took me in the direction of breast cancer.' He also acknowledges a personal link – the loss of his wife to the disease.

His connection to the project began when he was asked to be an external examiner for a Canadian PhD student, Jim Brophy, who ran an occupational health clinic in southern Ontario where he had observed a significant excess of breast cancer.

A pilot exercise was undertaken and led to a major study funded by the Canadian Breast Cancer Foundation involving management researchers, public health experts, oncologists and statisticians in Canada and the UK with Matthias reviewing the accuracy of the literature and data interpretation.

Their research established that there was an elevated risk among women in Ontario who were working in food canning, automotive plastics manufacturing, agriculture, bars and gambling environments.

Matthias says, 'When we published in 2012, there was a lot of media attention because for many people, this was an unusual way of thinking about cancer. People hadn't paid enough attention to occupation and occupational exposures.'

The research led to thinking about other forms of cancer. 'There are issues about solvent use in manufacturing and I think a lot of work needs to

be done in this particular field. Large amounts of chemicals come on stream every year and there is a relatively small amount of long-term research available in terms of the potential hazards.'

The study has led to demands by trade unions, politicians and charities in the UK and Canada for more research and for changes in health and safety regulations.

Matthias says, 'Part of our impact has been the raising of awareness. It means that if someone else comes up with a similar study, they won't be ridiculed or overlooked. I'm not an activist but I want to be a management professor who looks beyond management and who understands the workplace. Workplace health and safety is an important dimension and has been so since Victorian times.'

THE POWER OF POETRY AND THE WOUNDS OF WAR

Fran Brearton, Professor of Modern Poetry at Queen's and Assistant Director of The Seamus Heaney Centre for Poetry, is one of the foremost poetry critics in the UK.

Her research focus is on British and Irish poetry of the 20th and 21st centuries but she has a particular interest – the impact of the First World War on Irish and British literature and culture. She says, 'This interest is an abiding one. It never goes away. It haunted me when I first started work on it and it still does.'

It has led to her being invited to act as an Irish Adviser to the BBC for special programmes to mark the centenary of The Great War. 'They're building what will become a huge online archive. My role through the year has been to ensure the veracity of what they're doing and to make suggestions about stories which might not be well-known but will give a new take on a particular area.'

Fran's is a familiar voice to radio listeners through her contribution to programmes such as *In Our Time*, presented by Melvyn Bragg on BBC Radio Four. This kind of platform, she believes, can have real impact.

'Poetry is never going to have a wide readership but you can reach a wide public by talking about it. *In Our Time* has a huge audience and it's a way of bringing awareness and understanding of poetry into the public sphere.'

Of her own writing and criticism she says, 'If you're making a specialised argument, to some extent the immediate world you're talking to is an academic one. But I like to think that in certain books, essays or articles, one might be talking to a wider readership.'

'I wrote a book about Michael Longley – *Reading Michael Longley*. Here you have a much-loved poet – he's on the Leaving Cert in the Republic, for example – but there was no book about him. So, as well as becoming involved in critical debate, I was trying to help

people who like his poetry to understand a little better why they like it or suggest different ways they might think about and read him.'

Longley's work also provides a link to the First World War. 'If one were to write about the English poetry of the war, the most famous figures would be the soldier poets. The landscape is different in Ireland because the political circumstances were different.'

'On the one hand, the War has been seen as part of unionist culture; on the other, memories have been repressed by a nationalist community uncomfortable with the idea that committed Irish nationalists served in the British Army at the time the leaders of the Easter Rising were being executed.'

'Michael's work shows the memory of war being passed down through the generations and it is bound up with politics here. For example, in *Wounds*, he's looking at his father's experiences on the Somme but he's also looking at some of the worst atrocities

in the early years of the Troubles. He informs our understanding of both histories.'

'Through poetry you can uncover aspects of cultural history that people didn't know. Through poetry criticism you can make poetry less intimidating. The more you know about poetry, the greater your appreciation is likely to be.'

“ The First World War haunted me when I first started work on it and it still does. ”



Professor Fran Brearton
The Seamus Heaney Centre for Poetry,
School of English



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16th (Irish) Division ambulance, Mametz Wood
Battle of the Somme, 1916



From the Media Initiative for Children television message.
© Image copyright of Peace Initiatives Institute

“ We’re a beacon internationally and the results of our work show how much Queen’s impacts and serves people locally and globally. ”



Professor Paul Connolly
School of Education

AWARENESS OF DIVERSITY THROUGH CHILDREN’S EYES

Every day, the impact of research carried out by Professor Paul Connolly is having an influence for good on the lives of children throughout Northern Ireland. His work on promoting respect for ethnic diversity has led to an educational programme which has been adopted and embedded in over 1,200 preschool settings, involving more than 40,000 children.

Paul, Head of Queen’s School of Education, has specialised throughout his career on issues of diversity and inequality in early childhood. He says, ‘When we started this research we found that in Northern Ireland, children as young as three were capable of holding sectarian and racist attitudes.

‘But we also realised that here was a window of opportunity, the chance to give children a much more inclusive sense of others and a much more positive respect for difference, while at the same time not stopping them developing a strong sense of their own identity.’

Collaboration was key. From the beginning, he worked closely with the Northern Ireland Preschool Play Association, now known as Early Years. ‘They’d spent many years trying to keep sectarianism and division outside the preschool but they’d come to the view that they needed to become more proactively anti-sectarian. Then our research came along and it all linked together perfectly.’

Among the initiatives has been a partnership with the US-based Sesame Workshop and the BBC which led to the children’s television series *Sesame Tree*. In addition, Early Years and the American Peace Initiatives Institute have developed a major preschool education programme – the Media Initiative For Children

– dealing with issues such as bullying, racial discrimination and cultural difference.

Paul says, ‘The Initiative includes short media messages on TV on each of these themes. There’s also one about travellers and about rural issues. Marketing research suggests that every child here is likely to have seen at least one of these now.’

The initial study of 350 children has led to a much bigger one with Early Years – a trial of the Media Initiative involving over 1,000 children in 74 preschool settings. Funding is from Atlantic Philanthropies. ‘There’s never been a trial of that size looking at something like this. We’re extending and reinforcing our original findings, picking up things which we weren’t able to pick up in our first study.’

And there is a major impact beyond these shores. Early childhood programmes based on Paul’s work with Early Years are being developed in Colombia, Indonesia, Kenya and Serbia.

‘It’s been a launch pad. It’s had a huge impact in Northern Ireland, changing how diversity issues are dealt with in preschool. It’s made a big difference to life here and it’s had measurable impact on children’s attitudes.’

It has also led to the funding through Atlantic Philanthropies of an international initiative led by Paul and Professor Tony Gallagher – *Una*, a global network of leading researchers, policy-makers and practitioners, established to reduce racial and ethnic divisions and conflicts and to build socially inclusive communities through effective early childhood programmes. More than 80 experts from 33 different countries are taking part.

Paul says, ‘What we’re seeing is a whole cultural change. We’re a beacon internationally and the results of our work in partnership with Early Years show how much Queen’s impacts and serves people locally and globally.’

SUPERMOLECULES FROM THE LAND OF SERENDIPITY

A P de Silva is a man with a rich imagination. When he talks about his early brainwave – ‘while sitting under a coconut tree’ – of designing a supermolecule to scan the blood, he describes it as ‘just like a James Bond person sent by M to go and spy on things and gather secret information.’

But even A P’s imagination could not have envisaged how successful his ideas would become. He is a world-leading pioneer of research into fluorescent PET sensors to target protons, sodium and calcium which are crucial in many biological and medical contexts. His work has led to a relationship with the healthcare giant Roche which has seen these sensors being sold around the world, earning the company \$110m (US) so far, at a rate of \$10m a year.

A native of Sri Lanka, A P came to Queen’s in 1976 to do a PhD in Organic Photochemistry. Professor Ron Grigg was then Chair of Organic Chemistry, the post that A P now holds. Professor Grigg would become an important influence.

In 1980 he had to return to Sri Lanka for family reasons – the illness of his grandmother – but at the University of Colombo he was able to carry on work begun at Queen’s. ‘I had a notion in my head that I hadn’t framed properly. All I knew was that I’d been working with light and molecules, the mixture that’s basically responsible for life, and I wanted to do something in that.

‘I started to work less with chemistry and more with physics. I talked to my grandmother’s doctor about health issues, about sodium levels in the blood, and I was able to talk to physicist friends at the university and they taught me things.’

The result was a couple of papers published by the Royal Society of Chemistry and a phone call from Professor Grigg, who had read them. In 1986 he returned to a lectureship at Queen’s.

‘After that, the project flowered. There was funding from EPSRC who were interested in the concept of sensitive molecules, while I continued to write the occasional paper, one of which appeared in a German publication, and that’s where Roche came across it. They realised we were sitting on something that looked like a useful design but we were like architects who’d drawn plans for houses we weren’t building.’

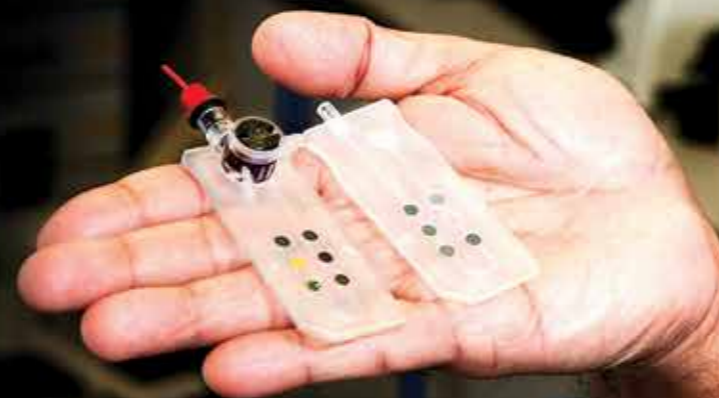
The eventual outcome was a blood analyser which has been the market leader ever since. The fluorescent sensors, inside small plastic cassettes, respond to various blood gases and electrolytes and have widespread health benefits through their use in hospital critical care units, ambulances, GP surgeries and even in the veterinary world.

And there are benefits for the new generation of researchers. ‘Some of my students are now working in diagnostic companies, like Randox and Abbott, and some have become professors. They’re all pushing the boundaries to new places.’

A P still goes back to Sri Lanka where he often ponders on how it all began and the sequence of circumstances which led to success. ‘People may not be aware that an ancient name for Sri Lanka is Serendip, which is where we get serendipity. I worship that word.’

His former mentor, Ron Grigg, comments: ‘A P is an outstanding individual. He rapidly became a major research leader and I’m privileged to have played a part in the development of his career.’

“ We were like architects who’d drawn plans for houses we weren’t building. The eventual outcome was a blood analyser which has been the market leader ever since. ”



Professor Amilra Prasanna de Silva
School of Chemistry and
Chemical Engineering

“ Impact’s coming through in terms of reduced economic cost and we see legislation, policy and attitudes changing. ”

BATTLING THE ALIEN INVADERS IN OUR WATERS

Beneath the rippling surface of the world’s lakes and rivers, a struggle is going on and Professor Jaimie Dick is fighting to influence its outcome.

Jaimie, from the Institute for Global Food Security, School of Biological Sciences, says, ‘When I was doing my PhD in the behavioural ecology of local shrimps I discovered we had species that were invasive or alien and I realised the impact they could have – wiping out native species, affecting the entire ecology of the lakes and rivers.

‘Now we can test species’ behavioural syndromes to see how damaging invasive species would be if introduced beyond their natural range. We not only understand the impact of invaders, we’re moving towards being able to predict from their characteristics which species will be nasty and damaging.’

Killer shrimp, largemouth bass, topmouth gudgeon, the Asian clam – these are among the aliens and predators that Jaimie is trying to keep out of Ireland and other parts of the globe. He is working in parallel with Professor Christine Maggs, whose focus is on marine aliens, with others in the School and with national and international partners.

‘The topmouth gudgeon from Asia is now in England and the Environment Agency are trying to eradicate it. If it were to arrive in Ireland, it might eat all the food available for trout and roach and commercially-important species.

‘We’re setting up a project to examine the impact this fish would have and working with Inland Fisheries Ireland to make sure EU legislation is enforceable. Lorryloads of fish from England are coming across and being tipped into ponds. The problem might not lie with the species being deliberately introduced but with something hitchhiking with them.

‘With many of these invaders it takes a long time before they’re noticed. And at that point it’s too late. We’ve been studying the killer shrimp in Europe for years. We warned in 1999 that it should be on the radar in England in respect of legislation but unfortunately it has now arrived.’

Jaimie’s research is not only focused on influencing policy, it’s finding practical solutions. ‘We have PhD students funded by DEL, Inland Fisheries Ireland and Waterways Ireland. They’ve been examining how common disinfectants used to clean fishing gear can stop a secondary spread of invaders, such as the Asian clam.

‘If fishermen simply dip their nets for a few minutes into Virkon Aquatic, made by Dupont who are interested in our research, before they go on to the next lake, that’s enough to kill 99 per cent. We’ve been able to persuade the fishermen to do this because they’ve seen the evidence that it works.’

Jaimie’s work is also having a global impact. ‘We’re now working in lakes and rivers across the world. We’re setting up networks of researchers doing simultaneous experiments in different locations, such as Canada, South Africa and China.

‘I would be very much in favour of task forces coordinated within European member states who have the ability to respond rapidly, to manage invasive species outbreaks in the same way as an outbreak of rabies, for example.

‘But we’re making a difference. Impact is coming through in terms of reduced economic cost; we see legislation, policy and attitudes changing. We have fantastic support from Queen’s. We have a range of funded studentships to support our research, grants from the NERC and Leverhulme Trust, significant local funding from NIEA through Quercus. We’re making the science happen and it’s very visible.’

Professor Jaimie Dick
Institute for Global Food Security,
School of Biological Sciences

RENEWABLE ENERGY: SEEKING COMMUNITY ACCEPTANCE

Geraint Ellis believes that when it comes to the development of renewable energy the voice of the public should be heard – and he’s spreading that message.

Chair of Environmental Planning at Queen’s, Geraint says that in the drive to increase onshore wind power, governments and developers have neglected the views of communities. ‘The key issue is community engagement. I really believe that the ultimate capacity of the wind industry is going to be determined by how much people are prepared to put up with, not by trying to work out the amount of wind we can exploit.’

Geraint’s research, which has evolved from an Economic and Social Research Council (ESRC) project, is having a direct influence on renewable energy policy and practice in Northern Ireland, the Republic and

internationally. He is the Irish national expert on the International Energy Agency working group on social acceptance which meets throughout the world, advising governments.

He says, ‘As Ireland emerged from the economic downturn it saw wind as a big economic lever. Mega-projects were started in order to export this energy but they have been dogged by social acceptance issues because they were handled so poorly.’

‘This experience seems to have had a wider toxic effect on wind schemes across the Irish Republic – temporarily or permanently, we don’t know, but it’s estimated that now an anti-wind group is being formed in Ireland every seven days. That’s no way to build a major plank in your economy.’

The problem, as Geraint sees it, is that the technology has always come first. The expansion of wind energy projects has been

dominated by the notion that it is largely a matter of rolling out a programme of hard infrastructure but the social dimension has been neglected.

‘We’re seeing a backlash because people feel they’re being railroaded into something. It’s become increasingly clear that the social aspects of wind energy haven’t been particularly well handled.’

‘We’ve had an energy system where you just switch the light on and there’s an unseen power station that provides the power. Now we’re moving towards a system where there’s a more direct relationship with energy generation. We need to develop a decentralised system that’s not based on carbon. That involves a very complex shift of user perception, cultural values, market mechanisms and so on.’

‘The Industrial Revolution was based on a shift to fossil fuels. This brought with it fundamental

shifts in the economy, social relations and the political system. As oil runs out and with the threat of climate change we’re now seeing the final outplay of that system. This could bring changes as profound as were witnessed then.’

Geraint sees that the benefits of renewable energy need to be developed by ‘getting communities and governments to think about their relationship to energy. If you can get them to shift their positions, then it becomes a different ball game.’

‘If we can get people thinking – should we host a wind farm, is this the best place, what do we get in return – while at the same time governments aren’t just trying to impose something on them, then we might work our way out of this energy crisis. But we’re certainly not going to get anywhere by shouting at each other.’

“

It’s about getting communities and governments to think about their relationship to energy. ”



Professor Geraint Ellis
Institute of Spatial and Environmental Planning,
School of Planning, Architecture and Civil Engineering



...we have an established track record of engaging with industry and developing research collaborations which facilitate innovation.



Professor Brian Falzon
School of Mechanical and
Aerospace Engineering

THE STRUCTURAL RESEARCH THAT'S TAKING WING

Professor Brian Falzon plays a pivotal role in engineering at Queen's. As the Royal Academy of Engineering/Bombardier Chair in Aerospace Composites he unites the skills of the commercial aerospace community with those of the University.

The result – research that will have a major impact on future aircraft design. Brian says, 'My research has to do with advanced composites, mainly geared towards lightweight aircraft structures. How do we make them lighter and how do we reduce the cost of development?'

The answer is carbon fibre. The latest generation of passenger aircraft, the Boeing 787 and the Airbus A350, are predominantly made of it and Bombardier have taken the decision to make the wings of their C series out of carbon fibre.

'Even though we've been using bits of carbon fibre on passenger aircraft for about 40 years, this is a huge leap forward. And of course what that brings is a lot of extensive experimental testing. A large part of my research is about actually trying to reduce physical testing by replacing it with simulation – virtual testing and design.'

What is leading the drive to make structures lighter is an energy issue – reducing our environmental footprint. It is an objective that aligns perfectly with the manufacturers' desire to lower operating costs.

Brian joined Queen's in January 2013 from Monash University in Melbourne. Previously he had been at Imperial College London for 12 years and before that he studied at the University of Sydney. His appointment has been hailed by Bombardier as the pinnacle of their involvement with academia in the UK.

'The opportunity came at a time when, looking at Europe from Australia and

despite the financial woes Europe was going through, I felt there was still a commitment from the UK Government to manufacturing, especially the aircraft industry.

'What appealed to me was an environment of industry-driven research. That's what excites me – plus the fact that Queen's has a fantastic reputation for engineering and for being entrepreneurial.'

Of the modelling approach, Brian says, 'We want to be able to predict with a good deal of confidence how the structure is going to behave under loading. When will it fail and how? So there are questions such as – do you start at the micro scale or at a slightly larger one? And of course the other thing about carbon fibre composites is that there are various forms from which you can create your structure. You're almost designing the material while you're designing the structure.'

Brian is also using nanotechnology, developing carbon nanotube-enhanced composite

structures 'that will give us real multi-functionality – a new material which will give you increased toughness, increased lightning strike protection and perhaps even a self-monitoring structure so that it will tell you if there's a problem developing. This is really exciting.

'As academics involved in composites research at Queen's, we have an established track record of engaging with industry and developing research collaborations which facilitate innovation.'

With this demand will come the need for new knowledge and skills. 'I think the composites expertise we have here is unparalleled. One of the distinguishing features of Queen's is that the academic staff have a lot of substantial links with industry. A lot of them have worked for Bombardier and other companies as professional engineers. They're people who really understand industry and its needs.'

GENDER AND DEMOCRACY: THE VOICE FOR CHANGE

In her 20s, Professor Yvonne Galligan had ideas about a career in Irish politics – but she quickly saw that it was a path that was not going to go very far. That was because she was a woman.

And so she went back to university, to Trinity College Dublin where she did a PhD on the subject of gender inequality. 'Researching this particular area of gender inequality helped me to understand that the things which prevented me from progressing were universal. Academia gave me the opportunity to reflect on those issues and I began to convert that into insights for friends and colleagues who were still politically active and were also trying to push the barriers.'

Since then, she has become one of the most respected and influential voices on the relationship between gender and democracy. Her sustained research on reforming political processes in Ireland to address the under-

representation of women has changed the attitudes of politicians, political parties and government. It has also had a direct influence on a Bill passed in 2012, providing gender quotas for candidates in Irish General Elections. Yvonne has subsequently been appointed Chairperson of the Fianna Fail Markievicz Commission, established to ensure the party meets the gender quota at the next Irish General Election.

Yvonne is Director of the Queen's Centre for the Advancement of Women in Politics. She is also Director of the University's Gender Initiative (QGI).

'Queen's set the Centre up in 2000 with support from Atlantic Philanthropies. The Peace Process was happening, there were moves towards elections to a new Assembly and the representation of women became part of the dialogue. I saw the job advertised and went for it.'

Within a few years, the impact of her work would grow. 'There was a little bit of movement but it was below the radar. But in 2009 the

mood began to change. Partly because of the crash, there was the sense of a need to reform institutions – that government and democratic politics weren't fit for purpose.

'When the Irish General Election was called in 2011, the parties then in opposition, Fine Gael and Labour, wanted to distance themselves from the old politics and introduce a gender quota Bill as part of a reform agenda. They used my research and my experience to inform their work and help shape the Bill.'

In Northern Ireland, there were also signs of changing attitudes. General Secretaries of the political parties were invited to a conference at Queen's where they came face-to-face with the anger and frustration of women at being excluded.

'This wasn't anything we had generated at the Centre. We knew there was dissatisfaction but we didn't realise how deeply felt it was. Since then the issue has been slowly building and it's now very much part and parcel of how parties are thinking.'

In the summer of 2014, Yvonne gave evidence to a committee of the Assembly and Executive which is looking at the topic of women in politics and what support the Assembly can provide. 'This is important because it's the Assembly itself saying that perhaps it needs to rebalance its representation.

'Established research constantly giving the evidence, independent of any position, carries a huge amount of weight in society. Without articulated arguments for change, without having exposed how unequal we are in decision-making, it would be much more difficult for politicians to introduce policies and change practices on the matter.'

'I'll continue to work with those seeking gender equality but my research thinking is always moving on. There needs to be a much greater holistic cultural change in order to sustain the momentum that's been built.'



Professor Yvonne Galligan
Centre for the Advancement of Women in Politics,
School of Politics, International Studies and Philosophy

“ Established research constantly giving the evidence, independent of any position, carries a huge amount of weight in society. ”

'Women Emerging from the Shadows', a painting by Michelle Rogers. Commissioned by QGI and hanging in the University's Council Chamber.



If we're going to have conversations about moving forward then we need to look back. ”



Professor Audrey Horning
School of Geography,
Archaeology and Palaeoecology

SEARCHING THE PAST WITH HOPE FOR THE FUTURE

Professor Audrey Horning is bringing archaeology out into the open. She says, 'Once upon a time, archaeologists used to do their work behind hoardings and then they would present their findings at the end. That's not what we're about now. We're making it much more inclusive.'

Her research centres on comparative colonialism and the relationship between archaeology and contemporary identity. Educated at the College of William and Mary and the University of Pennsylvania, her work has taken her back and forth across the Atlantic. Major projects have included directing excavations at Jamestown, Virginia, the site of the first permanent English New World settlement, but also Plantation period sites in Northern Ireland.

It is this research focus which is having significant impact. 'Over the years many archaeologists avoided this period because there's a reluctance to dig up the past, literally. But the past is still with us. It's referenced every day. It forms part of people's understanding of who they are now and how they got to be where they are.'

'So it seems to me that in a land where what happened in the 16th and 17th centuries is still far from resolved, if we're going to have conversations about moving forward then we need to look back and understand what did happen on the ground.'

Audrey first demonstrated the potential in 1999 with an excavation of the Londonderry Plantation village of Movanager near Kilrea. Subsequent Queen's-based Plantation-period projects have attracted significant grant funding from the Northern Ireland Environment Agency, the Arts and Humanities Research Council, the

Heritage Lottery Fund, as well as Foyle Civic Trust and Belfast City Council.

She says, 'There are different narratives. One is that the Gaelic Irish were moved off the land or that through disease and warfare the land was de-populated, so that when the Planters came in a new society was created. But the actual archaeology doesn't say that.'

'It shows that the Gaelic Irish were not displaced everywhere. It reveals the way in which Planters are engaging with the Irish on the land. You see it through shared material culture – like Irish-style pottery and houses in Plantation settlements – then you look at the records and you see hints that people are living together, however uneasily, in the same settlements.'

Combining what the evidence is saying with the ability to take people to sites to see for themselves is making a difference. 'People are confronting the past in a way that's very different

from being told something on TV or in a book. There's more of a willingness on the part of the general public and the funding bodies to deal with this period and to have conversations.'

'I've got a responsibility to share what I've been privileged to find out and to try to engage people more with what is all around us. There are some spectacular sites here. This heritage needs to be made open and available.'

There is evidence that Audrey's approach is working. 'We have these feedback forms and we've had some really astonishing responses. There's a great level of honesty – people realising how much they didn't know, saying how this has changed their understanding, how they'll tell people that archaeology actually does make a difference.'

'That's the sort of thing that keeps you getting up in the morning.'

NURSING HOME CARE: FROM OBSERVATION TO INTERVENTION

It was while working in a community pharmacy after her PhD at Queen's that Carmel Hughes began to focus on something that would become the core of her future research and would institute a new approach in a key area of health policy in Northern Ireland.

'During the year I worked in that pharmacy we got a lot of prescriptions for nursing homes and it was apparent to me that there were some very strange things going on. Every single resident seemed to be on lots of different medications but the vast majority also seemed to be on certain types – sedatives, anti-psychotics, tranquilisers. The suggestion was that they were all psychotic but that didn't make sense to me.'

Her concern did not go away and when she returned to Queen's as a lecturer and started her own research programme it was still very much on her mind. But it was after she went to the United States for a year – the first pharmacist to be awarded a Harkness Fellowship in health

care policy by the Commonwealth Fund of New York – that the work really began.

Since then, her research has led to major changes in how medicines are prescribed in nursing homes in Northern Ireland. Through what is known as the Fleetwood Model, an intervention service devised in collaboration with the American Society of Consultant Pharmacists, there has been both a reduction in the use of inappropriate medicines and the delivery of substantial financial savings.

Carmel, Professor of Primary Care Pharmacy at Queen's, says, 'When I'd first read up on the subject I'd realised that these medicines had a history of being abused and misused within the nursing home environment, basically to sedate and subdue older people as a way of controlling them and also to counter a lack of staffing. The Americans had recognised similar abuse and it became such a public scandal that Congress was forced to pass legislation to do something about it.'

'What I learned in the States really laid the foundation for my research but when I came

back home I found that, whereas in the USA they were drowning in data, here there was no information. You couldn't get your toes wet.

'We couldn't find reasons for patients to be on these drugs. They'd been on them for years and nobody could tell us why. You couldn't find why the medicines had been started and they were seldom stopped and reviewed. So we needed to do something about that.'

The Fleetwood Project began as a joint trial with the USA. The Northern Ireland part involved 22 nursing homes. In some, normal care continued but in others, doctors, pharmacists and nursing staff began working closely together, looking at what was being prescribed.

'Pharmacists were central to the project. They understand medicines within the context of diseases and medical conditions and they have particular skills to assess whether something is appropriate or not for a particular patient.'

'But they are not the main prescribers of medicine – the GPs are. However, the two professions work really well together when

there is an active discussion about what's best for the patient and that's why I think the project in the nursing homes worked so well.

'I think GPs struggle a bit when it comes to nursing home residents who are becoming increasingly more complex in terms of clinical need. They're much older than they used to be, they have many more medical conditions. GPs are enthusiastic about someone – ie pharmacists – helping and advising because at the end of the day, medication is the single most important and most frequent intervention that anybody will ever receive.'

'These drugs were being used inappropriately but now these patients are no longer getting medicines they don't need. All of us involved in the project, both here and in the USA, believe that's an outcome and an impact in itself.'

“ Pharmacists and GPs work really well together when there is an active discussion about what's best for the patient. ”

Professor Carmel Hughes
School of Pharmacy

“ We’re helping people to see the benefits for their health and mental wellbeing. ”

THE PARC STUDY MESSAGE: LET'S GET PHYSICAL

Dr Ruth Hunter is passionate about exercise and physical activity. She spent seven years as physiotherapist to Glentoran Football Club, as well as working with the Northern Ireland football and netball squads. Then, in 2012, she was invited to be part of the team of experts on hand at the athletes' village during the London Olympics – 'which was brilliant.'

She has also brought her enthusiasm to another role. She is Project Manager of the PARC Study – Physical Activity and Regeneration of Connswater – helping to promote physical activity and lifestyle changes for people living within a major Belfast regeneration project. The study has been developed through the Centre for Public Health and the UKCRC Centre of Excellence for Public Health, where Ruth is a Research Fellow, working with Professor Frank Kee.

She says, 'My undergraduate degree was in physiotherapy and my PhD was in physical

activity for people with chronic low back pain. But I'd always had an interest in moving beyond clinical populations, looking at whole populations, to see how we can prevent people getting these conditions in the first place.'

Ruth manages the £1.2m grant which is funded by the National Prevention Research Initiative to evaluate the public health impact of the Connswater Community Greenway. Being developed at a cost of £35m, the Greenway will connect 379 acres of public open space, improving the lives of 40,000 people and giving them enhanced opportunities for a healthier lifestyle.

Ruth's success in engaging with the community led to her winning the Vice-Chancellor's Early Career Researcher Impact Prize in 2013.

This has been followed by further success – a major award which will give her exciting international research opportunities. As a winner of a National Institute for Health Research Career Development Fellowship, she is embarking on a three-year study of the impact of social networks in changing people's physical activity behaviour, involving placements at

Harvard, the Universities of Southern California and Cambridge.

She says, 'There are two aspects to my job. One is getting people interested in the research and the other is getting them to see this huge investment in East Belfast as a resource for them – to get people out and become more active so that they can see the benefits for their health, for their mental wellbeing and in terms of social support.'

The first phase of the project was opened in April 2014 – a bridge linking Victoria Park to the Harbour Estate. 'That was very exciting. Spending time with the local people, you do get caught up in it all and the potential it has.

'The study has a strong community ethos. We put reports on the Greenway website, we write in local news sheets, we speak at the Greenway stakeholders' forum and at politicians' breakfasts.

'We're half way through the study. It began with an evaluation of local residents and their physical activity levels, their health, what they thought of the local environment, and we'll repeat that when the Greenway's finished in

order to see what actual public health impact it's had.'

Ruth acknowledges the benefits for her as an academic. 'I'm working with a wide range of people – sociologists, psychologists, planners, computer scientists, mathematicians, economists. That doesn't always happen.

'For us, the message of the Greenway is about public health and physical activity. Other people see it as a chance to increase tourism in the area, some see the biodiversity and ecology aspect. It's about a great many things.

'We have a number of exciting projects that we're working on, including the development of a novel physical activity loyalty scheme. I really enjoy what I'm doing. It's a model for all public health interventions. It's great to see people buying into it and you can actually see the difference you're making.'

Dr Ruth Hunter
UKCRC Centre of Excellence for Public Health Northern Ireland,
School of Medicine, Dentistry and Biomedical Sciences

STARTING A NEW REVOLUTION IN DRUG DELIVERY

Dr Adrien Kissenpfennig is a key member of a talented triumvirate collaborating on new research which could revolutionise the delivery of drugs to patients.

Adrien is a senior lecturer at the Centre for Infection and Immunity. He came to Queen's in 2006 as a lecturer in molecular and cellular biology with a particular focus. While doing postdoctoral study at the Centre of Immunology in Marseille he became interested in Langerhans cells (LCs), a specialised network of immune cells that reside in the epidermis.

He says, 'We've known about these cells for about 100 years but we don't have a full appreciation of what they do, apart from the fact that they're ideally placed to act as the front line defence of the immune system.'

Pioneering research by the late Nobel Laureate Professor Ralph Steinman demonstrated that

LCs have potent immunostimulatory properties and are capable of activating T lymphocytes of the immune system, which are important cells for immune memory responses.

Adrien explains, 'When the skin barrier is ruptured they're one of the first cells to become activated and instruct the immune system. We're trying to understand how they work, how we can stimulate them, and to understand how we can harness the power of what they're capable of doing in order to improve vaccine delivery and potency.'

In this research, Adrien is working alongside Professor Ryan Donnelly and Professor Chris Scott, both from the School of Pharmacy. Ryan is recognised for his work on microneedles, tiny projections applied as a patch to penetrate the outer layer of the skin painlessly. Chris is focused on new possibilities in the therapeutic application of nanotechnology.

Adrien says, 'Langerhans cells are a subset of specialised antigen-presenting cells called

dendritic cells. My research is focused on understanding which dendritic cell subsets are the major players and which play supporting roles in immune system activation.'

The research is being carried out using *in vivo* modelling. 'Vaccine delivery through a needle stick injection goes deep into the skin and bypasses a lot of these cells. But with Ryan's microneedles, we can target just the thin layer of skin rich in LCs and target vaccines to these antigen-presenting cells more efficiently.'

'Working with Chris, we've seen that if you put a vaccine in a nanoparticle it's more actively taken up by these cells and leads to more efficient activation of the immune system. This novel approach leads to improved vaccine responses in our model.'

In addition, he says that 'encapsulating a vaccine in a nanoparticle may improve the stability of vaccines and may reduce the need to have them refrigerated, thus improving their shelf life. A major challenge

for health organisations is the delivery of temperature-sensitive vaccines in parts of the world where refrigeration is difficult, so the potential global impact is substantial.'

Adrien emphasises that the work is in the early stages of development. 'However, there is great interest from industry and together we're focusing on trying to translate this technological platform into the clinical arena. If we can get this technology into the clinic, I think it will have significant impact – painless delivery of drugs, painless delivery of vaccines to children, no sharp disposal, no needles, no risk of cross-contamination.'

“ Needle-free delivery of vaccines – the potential global impact is huge. ”

Dr Adrien Kissenpfennig
Centre for Infection and Immunity, School of
Medicine, Dentistry and Biomedical Sciences

SHINING A NEW SPOTLIGHT ON DOMESTIC VIOLENCE

Image courtesy of the National Centre for Domestic Violence



“ Child abuse and domestic violence weren't highlighted during the Troubles but now we're bringing them to the public agenda. ”



Dr Anne Lazenbatt
Institute of Child Care Research, School of Sociology, Social Policy and Social Work

Researchers and educators at Queen's are making the University a hub for international gatherings where issues of global importance are debated, among them two of the most pressing social themes – child abuse and domestic violence.

The latest Congress of the prestigious British Association for the Study and Prevention of Child Abuse and Neglect, held at Queen's in 2012, attracted 700 delegates from around the world. And in 2015 the University is hosting the first European Conference on Domestic Violence.

One of its organisers is Dr Anne Lazenbatt, health psychologist and Reader in Childhood Studies at Queen's Institute of Child Care Research, working along with her colleague Dr John Devaney, Senior Lecturer in the School of Sociology, Social Policy and Social Work.

Anne says, 'This shows the influence which the University has and the importance of our work. These are enormously significant events, for academics and for society as a whole, and we are key players.'

Anne's post at Queen's is a partnership with the NSPCC. 'It's one of only three academic posts in the UK affiliated to a voluntary organisation. The NSPCC's research interest is safeguarding children, so most of my work is in that area.'

That work led to an important research project commissioned by the Northern Ireland Department of Health, Social Services and Public Safety to evaluate their case management review process on non-accidental child deaths and serious child abuse. It involved interviews with senior policymakers from a range of government departments and senior managers from public services.

As a result of the project by Anne and her colleagues, the review process has been

revised and strengthened. In addition, in March 2013, the Children's Commissioner presented to the Northern Ireland Assembly a report entitled *Still Vulnerable* from research conducted by Anne and the team.

'Child abuse and domestic violence – these are things that weren't highlighted during the years of the Troubles but now we're bringing them on to the public agenda. I remember, 10 or 15 years ago, people would say child abuse doesn't exist here in Northern Ireland. It wasn't the focus of research at all. But a lot of these issues were buried very deeply and there was the old principle – whatever you say, say absolutely nothing.'

Anne and John Devaney work closely with a Domestic Violence Research Special Interest Group which has around 200 members from 41 different organisations across Ireland. 'We send information to our colleagues virtually every day. They're policymakers, practitioners, researchers, academics, individuals working

with adult and child victims of violence and abuse. It's important that we transfer evidence-based knowledge to where it is most needed.'

Anne also collaborates extensively with Professor Julie Taylor, University of Edinburgh. 'Julie heads the NSPCC Centre for Child Protection, which provides a forum for joint, national, collaborative research bids, thus enabling us to build on our affiliations and strong interdisciplinary collaboration. The network also promotes the dissemination of knowledge about child protection and domestic violence.'

'The core outcome of my work is to identify protective factors that can be enhanced by multi-professional interaction and practice. We're seeing impact every day in terms of keeping these problems on the radar. We're writing books, writing publications, disseminating as widely as we can, and we do see differences. But it's a continuous process and social change takes a long time.'

RESEARCH HELPING TO MAKE THIS A SMARTER WORLD

A monitor on Professor Weiru Liu's desk shows an image of Spiri, a programmable, autonomous flying robot equipped with sensors, GPS, cameras, Wi-Fi and cloud support.

Director of Research at the Knowledge and Data Engineering (KDE) Cluster within the School of Electronics, Electrical Engineering and Computer Science, Weiru joined Queen's in 2004 and was offered a Chair in 2010. She obtained her PhD from the Department of Artificial Intelligence in 1995, one of the world-leading departments in AI, at the University of Edinburgh.

Her research is focused on the next generation of autonomous systems which could be deployed in hospitals, in manufacturing, schools, care homes and elsewhere.

She points to Spiri. 'An autonomous system such as Spiri must possess intelligent capabilities including being able to

constantly perceive its environment, correlate heterogeneous information that's often uncertain and inconsistent, reason in real-time, make decisions and take actions if necessary.'

She gives an example. 'Imagine a situation where multiple sensors are used to retrieve signals from an underwater target, its location to be determined. Uncertain sensor data fusion is to locate the target precisely and eliminate noise and error from sensors or other sources.'

'Let's further imagine a large, intelligent autonomous system with many clusters of sensors, each cluster monitoring one aspect of the actual world. Correctly managing and correlating such dispersed information from all these sources is crucial for determining what is actually happening and what are the right decisions to be made.'

'Now if we extend the concept of sensors beyond normal physical devices and consider other digital media forms, such as emails and tweets, then autonomous systems can be developed for all kinds of real-world scenarios.'

At KDE, one research theme is to develop an intelligent system to detect fraudulent insurance claims. There is a proposed £1m Invest NI project in collaboration with the insurance giant Allstate, with which a Knowledge Transfer Partnership has been formed. 'If we can catch an extra ten per cent of fraud by utilising information from all sources, that will mean savings of tens of millions of pounds.'

Since 2001, KDE research has informed more than 20 projects involving major UK and EU funding bodies including EPSRC, TSB, The Royal Society, the Royal Academy of Engineering, EU FP7 and Invest NI. Current projects include being part of the ESRC-funded Northern Ireland Administrative Data Research Centre and an EPSRC-funded project under the programme of autonomous intelligence systems. Partners include BAE Systems, Sellafield, the National Nuclear Laboratory and the UK Space Agency.

'We are world leading in several key areas. The first is Knowledge and Information Fusion under Uncertainty. The second is Data Extraction and

Integration. We're doing a tremendous amount of work on extracting data from deep web, from social media and unstructured texts, making sense of big, dispersed, unstructured data.'

And she is enthusiastic about the development of what is known as the Smart City. 'This is about trying to improve the quality of life of citizens, improving the services they get – integrating transport, energy, water and so on – and providing a better-connected future. Data Science and Autonomous Systems are the key research areas KDE has been strengthening and they're the underpinning technologies for Smart Cities.'

'Big cities like Dublin, London and Manchester have started experimenting in certain areas, such as public transport and tourist information. People are using mobiles and apps to get information quickly. In five or ten years' time, this will be a household concept. The impact will be huge.'

“Autonomous systems can be developed for all kinds of real-world scenarios.”

Professor Weiru Liu
Knowledge and Data Engineering Cluster,
School of Electronics, Electrical
Engineering and Computer Science

“What is being achieved by the group here in diabetic retinopathy is world-leading.”

FROM SPAIN VIA SCOTLAND WITH AN EXCITING NEW VISION

Professor Noemi Lois is one of the increasing number of top international researchers helping to make Queen's a university of truly global importance.

Clinical Professor of Ophthalmology in the Centre for Experimental Medicine, she was educated at the University of Santiago de Compostela in Spain. She developed her career in the USA, then at Moorfields Eye Hospital in London with a Fellowship in medical retina, followed by a Fellowship in surgical retina at the Royal Liverpool University Hospital. Before joining the staff of Queen's she spent 13 years as a consultant in Aberdeen.

She came to Belfast in the spring of 2013. 'When I was in Aberdeen I had been trying to get more research time but that was not possible. When an opportunity at Queen's arose, I came to Belfast, saw

the city and loved it, loved the people and I knew the research being carried out at this University was top quality.

'I knew that one major area was diabetic retinopathy, led by the work of Professor Alan Stitt. That had been the subject of my PhD thesis and as a consultant I was always involved in the care of patients with this disease. It was a fantastic opportunity for me to be able to interconnect the clinic and the laboratory, to advance the translational research taking place at Queen's and to contribute to what is being achieved by the group here which is world-leading.'

She has already made a considerable impact. With Professor Heping Xu, she is working on a project funded by the type 1 diabetes charity JDRF. It focuses on STATs – signal transducers and activators of transcription. In diabetic retinopathy, STAT3 is one of the key signalling molecules of the receptors related to inflammation and angiogenesis.

The research project will verify whether STAT3 activation is involved in the development of diabetic retinopathy and this may lead to a new approach to its management.

In another project, funded by the Medical Research Council, she is working with Professor Stitt and Dr Andriana Margariti to find effective new treatments for diabetic macular oedema (DMO), an important complication of diabetic retinopathy and a leading cause of blindness. This research involves the use of particular stem cell technology to model patient-specific DMO responsiveness. It will investigate whether we could predict who will respond to current treatments for DMO and the mechanisms involved.

Noemi says, 'This is an exciting new approach. We can generate stem cells from individuals and then derive tissue-specific cells that are unique to any given patient. The cells can then be examined in a laboratory. It's something that's been summarised as "the patient in a dish".'

In addition, she is working on a proposal for clinical trials, involving 15 centres, into how best to follow up patients with stable DMO and stable proliferative diabetic retinopathy.

'When you treat these patients you then have to follow them for life but at the moment we don't know how best to do that. Do they always have to see an ophthalmologist or can the follow-up be done through photographs, for example? This might be a way of releasing doctors to look after the patients who need them most.'

Noemi's full-on approach to her work is driven by a clear objective. 'We're trying to ensure the best possible outcomes for patients. I came here with the hope that I would be able to potentiate translational research in the field of diabetic retinopathy. That's what's happening and it is really stimulating.'

Professor Noemi Lois
Centre for Experimental Medicine, School of
Medicine, Dentistry and Biomedical Sciences

GIVING CHILDREN INFLUENCE OVER THEIR OWN LIVES

Talk to Professor Laura Lundy about her work and she may give you her favourite GK Chesterton quote: 'The function of the imagination is not to make strange things settled, so much as to make settled things strange.'

She says, 'I tell my students – when you see something with which you're not comfortable, that's where the learning is.'

In her case, that feeling arose in a research project that began after she moved from Queen's School of Law to the School of Education. 'My move coincided with the establishment of the Northern Ireland Commissioner for Children and Young People. There was a tender for a major piece of research on childhood in Northern Ireland from a children's rights perspective and I became Principal Investigator.

'I kept coming across this settled notion about children's rights, the term – the voice of the child. I was very unsettled about its use. We interviewed 350 professionals who work with children and talked to them about the right of the child to be heard. They kept saying – we do the voice of the child – but what they were saying didn't match up to my understanding of what that meant in law.'

This issue would become an important element in her research and lead to the development of a new model for understanding and implementing Article 12 of the UN Convention on the Rights of the Child, ensuring that children's views are given due weight in decision-making in every area that affects them – in education, in family court decisions, social security, healthcare and more.

Her model is based on four concepts – not just voice, but space, audience and influence too. 'The voice of the child doesn't mean giving

children a space to say something and then walking away from them. That was potentially undermining children's rights even more.'

The model has been adopted by the Children's Commissioner, NGOs, other higher education institutions, government departments and teachers in Northern Ireland and abroad.

Laura says, 'At the beginning I was a bit skeptical about Article 12. But when we began the Children's Commissioner project we talked to more than 1,000 children and the data just kept giving us the same message. That was an epiphany – hearing children talking freely about their frustration at not being taken seriously.'

Her work has international reach. During the past year she trained the UN Committee on the Rights of the Child, at their annual retreat in Geneva, on their approach to child participation. She was also invited to provide training on the approach

to the European Network of International Children's Rights Coalitions in Sofia.

Laura says, 'If we include children's perspectives in the decisions that affect them, then we will have better-informed decisions for children. That should ultimately lead to better outcomes for them.'

And there is a personal impact. 'I moved to the School of Education to engage in more interdisciplinary research and that's what I've done. A colleague said the move wouldn't make me a better lawyer but I said it would make me a better scholar. We were both right.'

“ If we include children's perspectives in the decisions that affect them, that should lead to better outcomes. ”



Professor Laura Lundy
School of Education



“ The decisions that need to be taken are not only medical but political, social and educational. ”

THE TRANSATLANTIC WARRIOR FIGHTING DIABETES

The prospect of new professional opportunities in the battle against diabetes brought Professor Timothy Lyons back to Belfast.

A Queen's graduate and former Senior Registrar at the Royal Victoria Hospital, he had spent 23 years in the USA where he had built a global reputation for his research work, first in Charleston at the Medical University of South Carolina and then at the University of Oklahoma.

It was there that he established a diabetes centre, supported by \$200m brought in over ten years through peer-reviewed grant funding, state support, and philanthropic donations from Oklahoma's Native American tribes and other donors. 'But,' Tim says, 'I felt that I'd accomplished what I'd gone there to do.'

The idea of coming back to Queen's was attractive for several reasons. 'The most important was that there was a remarkable

research opportunity here, given the new vision in the institution, as well as many of the components which I thought were essential for me to contribute something.

'There's a world-class diabetic ophthalmology group led by Professor Alan Stitt and a very strong public health component led by Professor Ian Young. Their work is highly relevant to what we do.'

For the past 15 years, Tim has been interested in diabetic complications in pregnancy, a focus he developed after he went to the USA. He acknowledges the long-standing work being carried on by Professor David McCance, Consultant Physician to the Metabolic Unit of the RVH, and of Consultant Obstetrician Dr Alyson Hunter. 'So I think there's a big opportunity for diabetic pregnancy work and that has been the thrust of our grant-writing since I came back.'

Diabetes – the silent epidemic – is the subject of a major fundraising campaign by the Queen's Foundation, helping

Tim and his colleagues at the Centre for Experimental Medicine, of which he is now Deputy Director, to drive forward research that is critical to save and improve lives.

He says, 'We're working as hard as we can on securing peer-reviewed external funds. We've made almost £5m worth of grant applications in six months and our goal next year is to submit an application every month. That reflects the realities of life for researchers these days.'

'Diabetes is almost unique in terms of its capacity to bring together investigators, clinicians, educators. It affects every part of the body and every medical specialism. It affects every part of society too.'

'It involves disciplines which extend way beyond medicine to social sciences and behavioural issues. The decisions that need to be taken are not only medical but political, social and educational.'

'It really creates a forum that can knit together lots of different collaborations. My primary

goal is to promote those collaborations and connectivity, not only within our Centre, where we've got a group of people with a lot of commonality, but between the Centres, across the School and across society.

He adds, 'This is a very challenging environment. Everybody wants answers to difficult questions and they want them now. We're in a world which is increasingly impatient. But we're dealing with things which are immensely complex.'

'We have to take a measured view of what's realistic. We have to fund basic research that doesn't necessarily promise a cure this year or next year but that is really addressing fundamental disease mechanisms. That's the only way we will get answers in the end.'

Professor Timothy Lyons
Centre for Experimental Medicine, School of
Medicine, Dentistry and Biomedical Sciences

SKILLS OF THE PRESENT UNCOVERING THE PAST

On the islands of Malta, an international team of researchers is unlocking the secrets of an ancient civilisation.

The remarkable project – FRAGSUS, which stands for Fragility and Sustainability in Restricted Island Environments – will take five years and is funded by a €2.5m ERC grant. It is also being led by Queen's with Professor Caroline Malone as Principal Investigator.

In all there are six senior academics from Queen's, as well as researchers from Cambridge, Plymouth, the University of Malta, the Superintendence of Cultural Heritage, Malta, and its National Museum of Archaeology. Seven postdoctoral researchers are also included in the team.

Caroline's distinguished career has been divided between academia and national museums and heritage, including responsibility

for Avebury and Stonehenge. She joined Queen's in 2007 because 'I wanted to return to research and teaching more fully.'

Her fascination with Malta goes back to the 1980s. It is more than 25 years since she and fellow archaeologists, including her husband, set up a new phase of fieldwork and training there.

'It was essentially capacity-building for Malta. Our work went on for nine years and we excavated a major burial hypogeum, dating back to 4,000BC, filled with human remains and wonderful artworks.

'This set the scene for what we're doing now. We established a collaborative programme with the University of Malta and trained a new generation of archaeologists. Twenty years later they are now in positions of authority and are very much part of the current team.'

The FRAGSUS project focuses on chronology, on environmental change, how the human

population responded to the island environment and it examines the effect on the landscape.

Caroline says, 'The heritage of Malta is an exceptional moment of early European civilisation. It has an extraordinary fluorescence and then more or less disappears. My interest is – why do small island cultures manage to survive in the way they do and what brings them to an end?'

'Can we on a small test bed like Malta understand how an island population sustained viable civilised life for thousands of years in the face of catastrophic environmental change? We should be trying to learn from the strategies of our ancestors – how they managed and harnessed their limited resources. It is an extraordinarily individual European story.'

Telling that story will be assisted by high-quality facilities for palaeoecological-archaeological research at Queen's, including the specialist 14CHRONO laboratory. 'What it enables the archaeologist to do is pinpoint the

moment of change. How can you understand change if you can't work out how fast it takes for something to happen? Queen's has led the world in this area for about 40 years, making an enormous impact.'

The work also provides huge benefits for students. 'This spring we brought out our Masters students to do part of their placement training with us. We've also had students from Cambridge and the University of Malta.

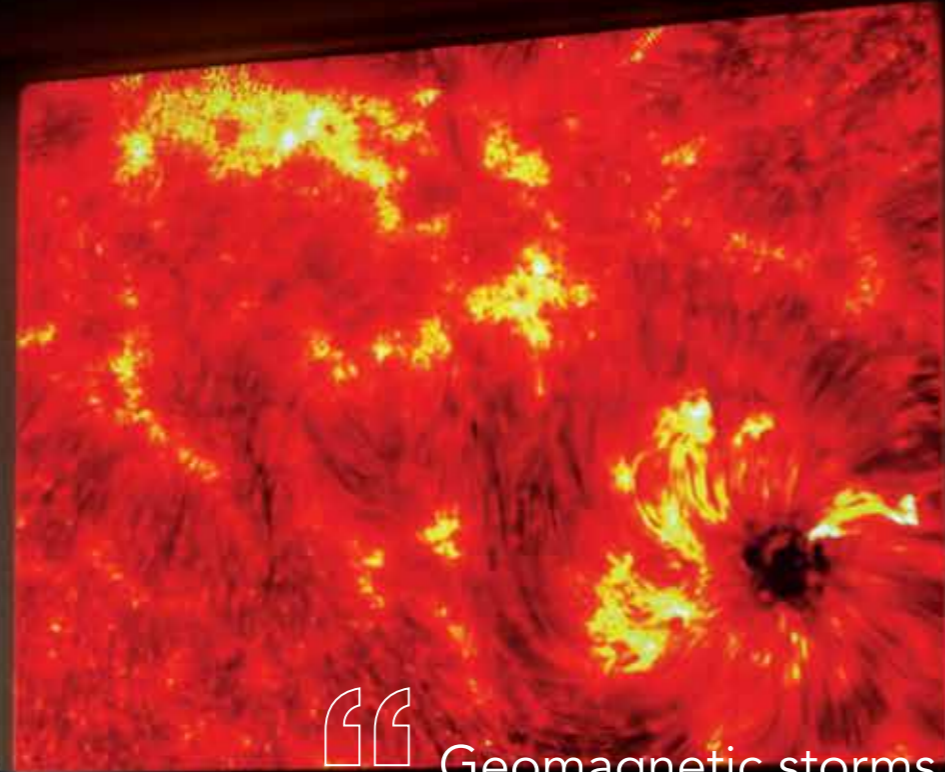
'You can't sit in a laboratory or a classroom in Northern Ireland and solve these problems. You've got to get out there and do it. This is about confidence-building.

'It's important to get students out into the wider world where they can engage with a senior research team and learn professional-level techniques. Our students are the envy of my academic colleagues. They're demonstrating that they can go anywhere and do anything. They're some of the best.'

“ We should be trying to learn from the strategies of our ancestors. ”

Professor Caroline Malone
School of Geography,
Archaeology and Palaeoecology

THE PICTURES THAT TELL THE DRAMATIC STORY OF THE SUN



“Geomagnetic storms... the aim is to see ahead to when they're going to occur so that we can give a warning.”

Professor Mihalis Mathioudakis
Astrophysics Research Centre,
School of Mathematics and Physics

Like all keen photographers, Professor Mihalis Mathioudakis likes to capture a good action shot. But unlike the others, his camera takes pictures through some of the world's most advanced telescopes and the action he shoots is happening on the sun.

Mihalis leads the Solar Physics Group at Queen's. It is 15 years since he and a PhD student, David Williams, now a faculty member of University College London, began to look at what they could get out of solar eclipses in terms of science. 'We put together a simple experiment – just off-the-shelf components, a fast PC and some cheap cameras – and we would take them to wherever solar eclipses were taking place.'

This work was done in collaboration with Professor Francis Keenan at Queen's and Professor Ken Phillips of Rutherford Appleton Laboratory. 'Each eclipse takes about three minutes and the aim was

to collect imaging of the corona of the sun at very high time resolution.

'From David's experiment, we realised that to achieve our science objectives we had to work with technology that involved very fast cameras. There was a need for many more, different wavelengths and we wanted to have more prolonged periods of observation in a bigger facility with a fast camera system.'

The result was a collaboration with Andor Technology [now an Oxford Instruments company] to develop new imaging products. It has given the company revenue of £1.7m a year and helped Andor to maintain a leading global position in the scientific camera market.

Key to this success is the camera system known as ROSA – Rapid Oscillations in the Solar Atmosphere. It is now one of the top instruments in use at the Dunn solar telescope in New Mexico, the prime US facility for solar ground-based observations.

Mihalis says, 'This is science and technology working hand in hand. We're also teamed up with Andor on a £3m proposal to fund

the next generation of cameras which will go into a much bigger telescope by 2019. It's so powerful that if you were using it in Belfast you'd be able to see a 50p piece in Dublin. This will dominate the field for the next 30 years.'

Solar physics research at Queen's is funded by the Science & Technology Facilities Council, the Leverhulme Trust and the European Community's 7th Framework Programme.

'Studying the sun is very important. It will often have outbursts, solar flares, and some of the biggest of those can influence the terrestrial environment.

'With geomagnetic storms the particles from the sun can hit the earth's magnetic field, and that can have an impact on satellite communications, power grids, global position systems, polar flights which might have to be diverted. The aim is to try to see ahead to when those events are going to occur so that we can give a warning.'

New cameras with more advanced technology will help. 'The reason we need to observe the sun at such high speed is

because of one of the biggest problems – the earth's atmospheric scene, turbulence, which blurs some of the images. With high speed imaging we can beat that.'

Mihalis adds, 'I've always been able to attract very competent students and I owe a lot of my success to them. In addition, collaboration with high technology companies, such as with Andor, is the way forward. Advances in technology will deliver the new and exciting science which will make the highest economic and societal impact.'

BACK TO THE MAZE TO CREATE A UNIQUE ARCHIVE

Cahal McLaughlin has provided the stimulus for a rich fund of story-telling that is helping to develop a deeper understanding of Northern Ireland's troubled past.

His Prisons Memory Archive (PMA) project, available online (www.prisonmemoryarchive.com), brought people back to the Maze/Long Kesh Prison and Armagh Gaol – places 'both touchstone and tinderbox' – where his team recorded more than 170 video interviews. Some, featuring the voices and experiences of women, have been compiled in a documentary, *We Were There*, co-directed with Laura Aguiar, shown to acclaim at the Belfast Film Festival in March 2014.

Cahal, a Professor in the School of Creative Arts, was a freelance film-maker before he began teaching and became an academic. The archive project developed equally organically.

'I made a film with a Maze/Long Kesh ex-prisoners group. It was fulfilling as far as it went but there was something missing – the prison itself. The stories and the visuals didn't match because we couldn't get access.

'Then I realised there was a way I could get in – by approaching elected representatives, some of whom are ex-occupants.' The film he subsequently made became a prototype which he took to the Heritage Lottery Fund as an oral history project. He succeeded in gaining a grant from the HLF and later the Community Relations Council.

'It was obvious even in that prototype how much people were having their memories stimulated by going back to an empty site that was nevertheless so full of richness. For a film-maker, when you find somewhere like that, it's a godsend but I also knew that by telling the prisons' story we were telling one of the most important stories of the Troubles.'

He acknowledges strong support from Queen's. 'They understood the value of the material, not just for my academic research but in terms of wider society.'

Starting work on the archive proper wasn't easy. 'It took about 18 months negotiating with the owners of the site and the various constituencies. I knew they would have to have co-ownership of what we did. People wouldn't give their stories unless they had some sense of how the material was going to be used.

'There was also the issue of inclusivity. We wanted the prisoners, loyalist and republican, but we also wanted the prison officer, the chaplain, the teacher, the maintenance worker and so on.'

Cahal emphasises the enabling role he and his colleagues played. There was no pattern of questions steering responses in a particular direction. It was about letting people speak as

they wanted to. 'We wanted the participants to be the owners and authors of their own stories.' As part of that shared ownership, the PMA has a management group made up of the constituencies represented.

Screenings of the film have been held in venues across Northern Ireland. 'One of our motivations has been to encourage people to hear the other story, the other side. People find themselves exposed to an experience they're not used to. That validates the purpose of the project.

'We hope this is an inspiration for people. The most valuable thing is to help the discussion that's already taking place about the past.'

“ We're telling one of the most important stories of the Troubles and we hope it's an inspiration to people. ”

Professor Cahal McLaughlin
School of Creative Arts



Taking the population-based approach has allowed us to develop large-scale studies which are of benefit to patients and the NHS.



Professor Liam Murray
Centre for Public Health, School of
Medicine, Dentistry and Biomedical Sciences

CANCER RISK: LOOKING AT THE BIG PICTURE

Research carried out by Professor Liam Murray and colleagues has led to a major rethink by clinicians and health service professionals about how to manage a commonly diagnosed premalignant condition.

The condition, known as Barrett's oesophagus, is the precursor of a lethal form of cancer called oesophageal adenocarcinoma, of which there has been a rapid increase in the past 30 years. The team's research has demonstrated that the cancer risk from Barrett's is lower than previously thought.

Liam, cancer epidemiologist at the Centre for Public Health, says, 'For the past 12 years we've been building up research resources linked with the Northern Ireland Cancer Registry which allow us to look at premalignant conditions, including Barrett's, from a population

perspective. We are most interested in how frequently people with premalignant conditions develop cancer, and why some people with the conditions go on to get cancer and some don't.'

It had been widely believed that the cancer risk in all Barrett's patients was high but Liam says, 'It is in the nature of science publications in this field that results which indicate high risk are more likely to be published than those that don't.'

'We needed to clarify the true risk because so much depended on it, both for individual patients and for use of healthcare resources, for example in endoscopic surveillance, so we undertook a systematic review of the literature, looking at every study that had been done.'

The result was an influential paper which established that no unbiased, population-based study of cancer incidence in Barrett's had ever been performed and that the case for regular

endoscopic surveillance in Barrett's may be based on flawed evidence. As a result, Liam and his University and NHS colleagues established a register which included every case of Barrett's diagnosed in Northern Ireland since 1993.

'By studying this large number of unbiased cases we found that the cancer risk in Barrett's is higher than the general population but not as high as previously thought.'

'It's now accepted that our study shows the true risk of progression. Other studies are now taking a similar approach but the Northern Ireland Barrett's Register is the only true population-based register of Barrett's oesophagus in the world.'

The Medical Research Council has funded biomarkers studies within the Northern Ireland Barrett's Register, as part of collaborations with University College London and the University of Cambridge. Some biomarkers

for progression were identified but more work is needed to identify high risk patients.

'We now have the Northern Ireland Biobank, which is a great asset for undertaking biomarker studies. With advances in technology, we also now have the opportunity to look at predictors of progression to cancer in a much more detailed manner.'

'Taking the population-based approach has allowed us to develop large-scale studies which are of benefit to patients and the NHS. But we couldn't have succeeded without the support of the Health and Social Care Trusts and the Northern Ireland Cancer Registry, which is funded by the Public Health Agency for Northern Ireland.'

THE PLACE NAMES THAT REVEAL OUR SHARED CULTURAL HERITAGE

In 1987, Mícheál Ó Mainnín came to Queen's to work on a new research programme – the Northern Ireland Place-Name Project (NIPNP). Twenty-seven years on, the project is still running and Mícheál, Professor of Irish in the School of Modern Languages, is its Director.

He says, 'We always appreciated the potential. This was something in which the whole community could be interested – language playing a more positive role in society. Irrespective of political leaning or cultural background, people want to know about the place they come from, the origin of its name, its meaning and its development over the centuries.'

For most of the 27 years, the NIPNP has been fully funded by a range of government

bodies and research councils – most recently the Arts and Humanities Research Council and Land and Property Services, as well as funding from Foras na Gaeilge, preparing the way for a future large grant.

While the methodology of the research has remained the same, the means have changed with advances in digital technology, and in 2013 a website was launched – www.placenamesni.org – creating a database with more than 130,000 references to local names.

Mícheál says, 'Since its launch we've had an average of 30,000 hits a month. For a linguistic/history project in this part of the world, that's no mean feat.'

The work of the NIPNP represents the first systematic attempt to document and analyse the place names of Northern Ireland in a modern, scientific way. An independent report has called it 'a research unit which is truly unique and to which others will look with admiration and envy.'

It is the oldest centre for the study of Gaelic place names in the UK. There are strong links with colleagues in the University of Glasgow, the Institute for Name-Studies at the University of Nottingham and the Archif Melville Richards Place-name Database at the University of Bangor in North Wales.

There is also a close relationship with government departments in the Republic of Ireland. 'People of Irish or Scots-Irish origin in America, for example, aren't aware of the subtleties of the Irish Border and couldn't be expected to be. They look to Dublin first, because it's better-known, before looking in the direction of Belfast. We're seeking to link our respective websites so that someone exploring roots in Ireland is able to source information through one portal.'

Students benefit from work experience on the project – 'and there is an impact on some of the courses we teach, drawing on some of the materials we are providing, in particular at postgraduate level.'

Mícheál adds, 'Our project is purely to provide information about our shared cultural heritage in Northern Ireland for the benefit of the broader public. This is about helping us to learn more about who we are. We all have links here and there's no point in splitting hairs about how long and in what context.'

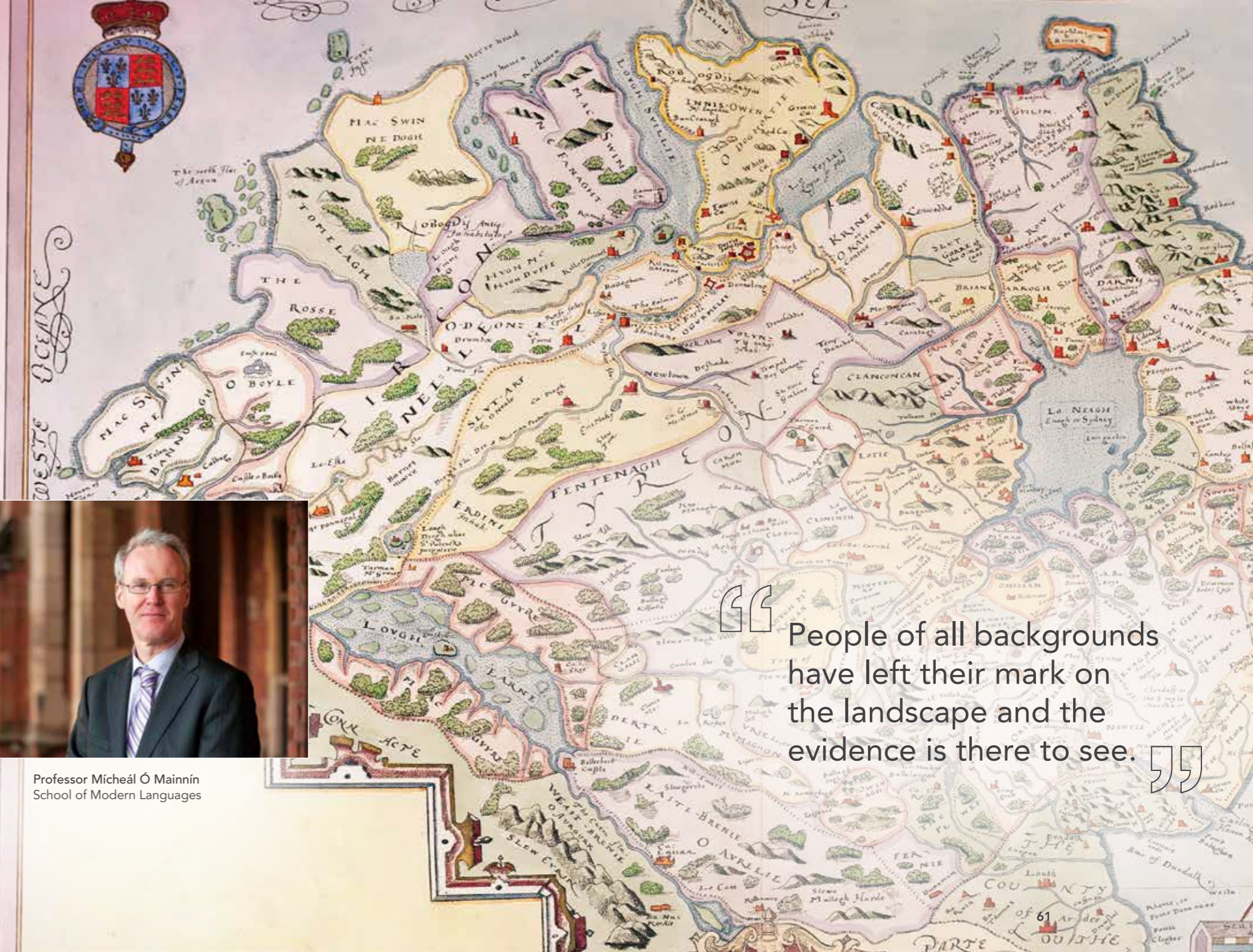
'People of all backgrounds have left their mark on the landscape and the evidence is there for all to see. There's a human footprint which is more diverse than people might have thought and once they appreciate that, linguistic diversity becomes less threatening.'

'There's a variety of colour on the map – different linguistic contexts, with different peoples, all mixed through. When we see that, we start to feel that perhaps division isn't always as extensive as we thought.'



Professor Mícheál Ó Mainnín
School of Modern Languages

The image of Richard Bartlett's Map of Ulster, 1603, is reproduced with the permission of Special Collections and Archives, McClay Library, Queen's University Belfast.



“ People of all backgrounds have left their mark on the landscape and the evidence is there to see. ”

“ Seagate and the ANSIN laboratory have made us capable of being a proper industrial prototype facility. ”

NANOTECHNOLOGY: SPINNING OUT INNOVATION

Dr Robert Pollard
Centre for Nanostructured Media,
School of Mathematics and Physics

Dr Bob Pollard is in the detection business. He says, 'We've developed novel nanostructured surfaces, composed of nanorods or nanotubes, which can be used in a variety of sensing applications and tailored to different markets – to detect proteins, for example, or hazardous gases.'

His research has led to the creation of a Queen's spin-out company, Causeway Sensors Ltd, of which he is CEO and Director, and which stems from the establishment of the ANSIN laboratory at Queen's in 2010. The ANSIN development was made possible through a £9.5m investment by Seagate, the world-leading manufacturer and supplier of data-storage technology, which employs 53,000 people worldwide, including around 1,400 at its factory in Derry.

Seagate's investment at Queen's was a response to the relentless demand for increased storage density and the need to explore new materials, ideas and fabrication methodologies.

Bob, Senior Lecturer in the Centre for Nanostructured Media, says, 'I had been doing basic research funded by an EPSRC Programme Grant on Active Plasmonics but the ANSIN laboratory and the Seagate input changed everything. It's made us capable of becoming a proper industrial prototype facility.'

Bob and his young family moved to Queen's and Belfast from Manchester in 1995. 'I came for a lectureship in physics but I had always been interested in materials science. I'd been running projects, industrial interactions, working in magnetic materials, and so I eventually moved into nanotechnology.'

He is co-founder of Causeway Sensors along with Professor Robert Bowman, who has led the ANSIN laboratory since its inception, and

Dr John Nelson, a Reader in Biochemistry. Other directors are the entrepreneur Dr Hugh Cormican, co-founder of Andor Technology and now CEO of Cirdan Imaging, and Professor Chris Elliott, Director of the Institute for Global Food Security at Queen's.

And what will Causeway Sensors deliver? 'Our first product will look just like a box. Let's say you're a biochemical researcher or somebody working in a hospital and you want to detect something – a cancer gene or perhaps food contamination. You take a chip and put it into the top of the box, press a button and you'll find whether there are antigens present, whatever it is you're looking for. That's the beginning, but now we need to develop that further in a variety of applications.'

Bob emphasises the importance of a cross-disciplinary approach. 'For example, in the lab we have a student with a background in chemistry, another is a physics graduate and he's now working in biochemical sciences.

We have biology people working here. Crossing disciplines is absolutely crucial.

'What we've been able to do is develop a vision and a strategy, using a common set of equipment and engaging actively with industry and with other academic partners.'

There is a new Centre for Doctoral Training based in the ANSIN laboratory that will bring another 50 or so multidisciplinary PhD students through Queen's in the next eight years in collaboration with the University of Glasgow.

Bob says, 'This is training for the next generation. What we do is important for Seagate but it's important for other businesses as well. Our students have gone to Radox, Andor, Cirdan. It's a good time for this sort of industry and it's an area where we can create a lot of jobs.'

CARE AND UNDERSTANDING AT JOURNEY'S END

Sam Porter's research deals with one of the most difficult and sensitive areas of human experience – caring for people who are reaching the end of their lives.

There is a particular focus on the issues created by cancer cachexia – wasting and weight loss caused by cancer. Sam says, 'Most people will have known someone with advanced cancer where the weight just drops off and there's nothing you can do about it. Towards the last stages, no active treatment can turn it back and what we need to ensure is that people are comfortable, both mentally and physically, and have dignity.'

Sam has been Chair of Nursing Research at the School of Nursing and Midwifery since 1999, the first person to hold the post. Previously he was a clinical nurse, then gained a doctorate in sociology at Queen's and became a Reader in Sociology.

'Initially we worked largely on methodological issues, then in 2007 the School decided that, given our areas of expertise, we should develop a cancer nursing and palliative care research group. We have been developing that over the past five years.'

The current research project on cachexia has been supported by funding from the All-Ireland Institute of Hospice and Palliative Care. 'It started off when Dr Joanne Reid joined our team. She had just finished her PhD, looking at the experience of patients and informal carers of people with this condition.'

'She discovered that there were lots of problems through lack of understanding, one of the most important being that it caused tension in the family, largely because the person involved didn't want to eat, whereas the family members expressed their love through trying to get them to do so.'

This led to the idea of matching research looking at the attitudes of the professionals.

'We discovered a big gap. They weren't very knowledgeable about it, didn't get any education on it and didn't feel prepared enough to deal with the issue effectively with patients.'

The result is a DVD – Understanding Cachexia – to provide guidance for patients and informal carers. 'Our impact thus far has been to alert the professional community to the problem and to the fact that not attending to this issue can lead to patients and families becoming very distressed.'

'This is an example of why nursing research is so important. The vast majority of nurses who will be practising in Northern Ireland come through this School. That's why we need research activity. Research feeds into education and training, purely and simply. We have to ensure that our students graduate and take up their careers with the view to using research evidence in all aspects of their practice.'

Sam, Joanne and colleagues have established that the cachexia awareness

project is pertinent locally – but what about others parts of the globe?

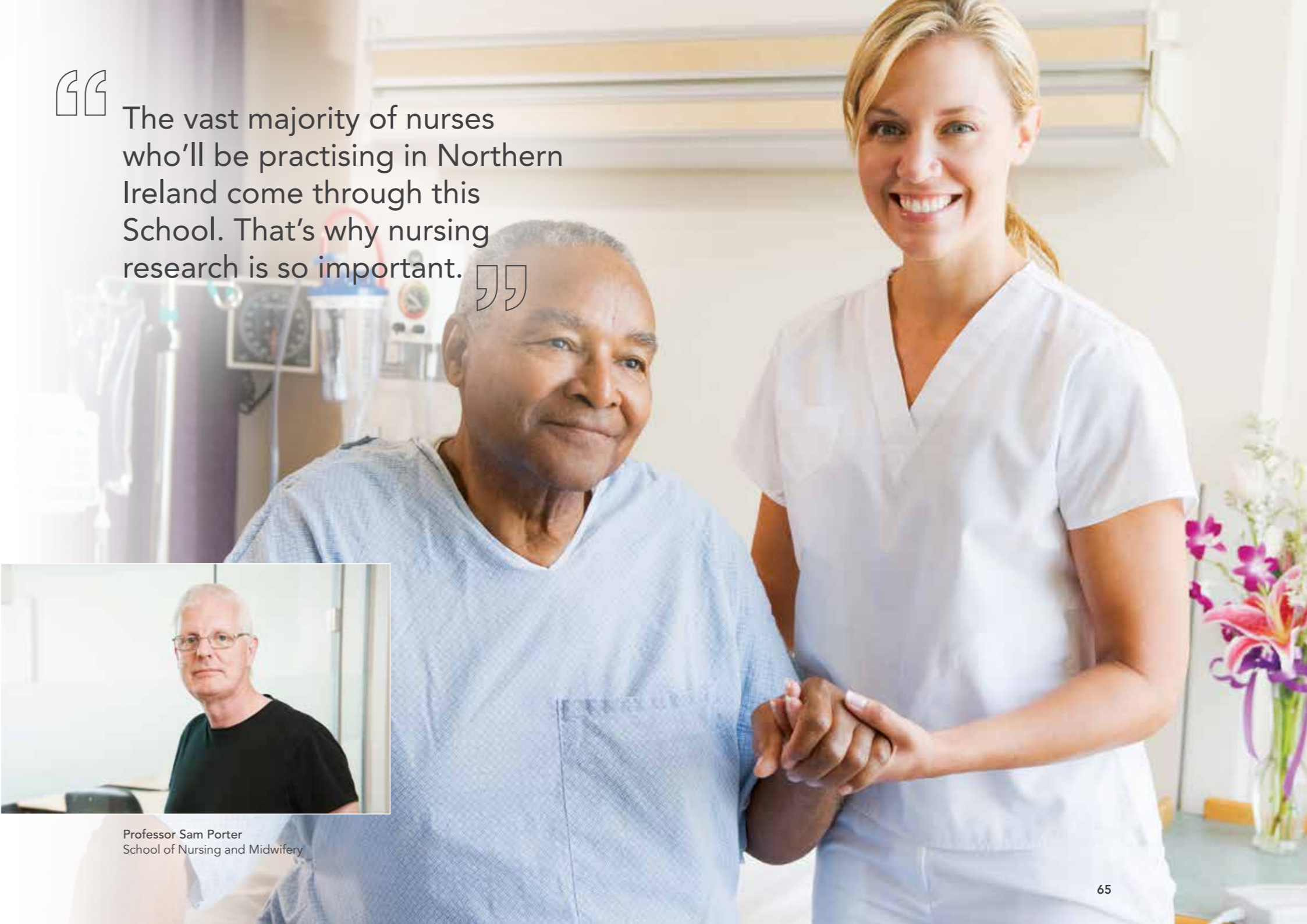
Sam says, 'The next stage is to expand, to see if the work we've done is applicable across the English-speaking world. To that end, we have developed joint research projects with the University of Melbourne and the Mayo Clinic in Minnesota to see if the kind of intervention represented by the DVD is appropriate for them.'

'We all have the right to end our lives as comfortably and as lacking in distress as possible, so it's imperative that those charged with our care have the knowledge and skills, and the attitudes to promote that right, to the greatest degree that they possibly can.'

“ The vast majority of nurses who'll be practising in Northern Ireland come through this School. That's why nursing research is so important. ”



Professor Sam Porter
School of Nursing and Midwifery



MOLECULAR PATHOLOGY: AT THE FOREFRONT OF CANCER CARE

“ Through diagnostic activity we’re helping patients today and through research we’re helping the patients of tomorrow. ”



Professor Manuel Salto-Tellez
Centre for Cancer Research and Cell Biology,
School of Medicine, Dentistry and Biomedical Sciences

For Professor Manuel Salto-Tellez, the official opening of NI-MPL – the Northern Ireland Molecular Pathology Laboratory – at Queen’s in 2013 was more than an occasion to take pride in achievement. It was a moment to take stock.

He says, ‘What that day highlighted was a recognition that genomic medicine – an aspirational concept ten years ago – was going to be one of the main pillars in the development of medicine in the future. We were ready to take up the challenge and what we’ve been doing since that official opening is exactly that.

‘If you look at the level and the number of publications since then, supported by NI-MPL, the amount of competitive grant funding with NI-MPL as a key supporter, the number of patients we’ve been able to help

by direct molecular testing, you’ll see that the opportunity has been embraced significantly.’

The facility is a partnership between Queen’s Centre for Cancer Research and Cell Biology and the Belfast Health and Social Care Trust. Manuel, who came to Queen’s four years ago, is Chair of Molecular Pathology and one of the Deputy Directors of the Centre, as well as consultant with the Belfast Trust.

He says, ‘I was attracted to Queen’s because of strong direction, a very clear vision of where the institution wanted to go. There was a clear understanding of what the key areas were in which we could show leadership, in this case cancer research and cancer treatment.

‘And there was the possibility to innovate. I came with a vision of how molecular pathology should be done that in other places had been considered too risky – but Queen’s and the Belfast Trust accepted the challenge and we’re now seeing the rewards.’

Manuel believes that it is essential to integrate morphological and molecular research to gain the best outcome for patients. ‘I came to pathology because I was curious not only about diagnosis of disease but also the reasons why disease occurs. Molecular pathology was a natural fit.’

The programme he leads is at the forefront of collaboration between academia and healthcare and one of the keys to its success is concentration of resources.

‘It’s cost effective. If we’re doing several things at the same time in the laboratory we’re maximising the technology. There’s also a concentration of talent. If you put three or four good brains together, working all the time, the result is synergistic, not additive.’

There is a portfolio of work with industry but there are also discussions about whether the laboratory itself could provide a business opportunity.

Manuel says, ‘Because of our diagnostic activity we’re helping cancer patients today and through our research activity we’re helping the cancer patients of tomorrow. Every year there are approximately 1,000 patients with cancer who get diagnosed from a molecular point of view in our laboratory.

‘That is a tangible deliverable that is happening today. We’re helping and fostering the science that comes from the Centre in a way that’s very clinical, very applied, so that every time we have a discovery our scientists understand what the relevance is, both clinically and practically.

‘This is an influence that spreads outwards. I think Northern Ireland is well positioned to be a knowledge economy. What we’re doing will help to deliver that. This isn’t science *per se* – it’s science with a purpose, and that will have an economic translation.’

AN ALTERNATIVE HARVEST OF NEW ENERGY

Dr Beatrice Smyth remembers being at a wedding in a lovely Irish village. 'Everything was perfect – except for one thing. Somewhere a farmer was spreading slurry. Wedding or no wedding, he had his work to do.'

For Beatrice, that smell, overpowering though it was that day, contains the scent of opportunity. 'When we look for energy solutions, people think of importing palm oil biodiesel from the tropics or sugar cane ethanol from Brazil – but all you have to do is look out the window.'

'We have a huge resource. We have about the same number of cattle as people and they produce a lot of manure and slurry. As well as that we grow grass better than anywhere else in Europe. And so we have an energy crop with the added advantage that

we can do this on our doorstep, benefiting local employment and the local economy.'

Beatrice, Lecturer in the School of Mechanical and Aerospace Engineering, is a member of the Clean Energies Research Group, one of 12 research clusters at Queen's with a focus on sustainability issues.

One of her most recently completed projects is Developing Opportunities in Bio-Energy – an action plan for anaerobic digestion and biogas – funded by Invest NI and coordinated by Queen's. This involved stakeholders such as the Agri-Food and Biosciences Institute, South West College and specialist industrial partners across Northern Ireland, including Agri AD and B9 Energy.

She says, 'We've been looking at the potential for biogas here, analysing what could come from different sources, such as grass, slurry and household and garden waste. We've been looking at the economics of on-farm anaerobic digestion, potential

markets and different uses, such as electricity, transport and the different sub-sectors.'

Their conclusion – the potential is a major one but a cohesive policy framework is needed.

Beatrice says, 'The biggest environmental challenge I think the world faces is the growing consumption of natural resources and a lack of planning for the future. This is why energy-related research is so important.'

'Take natural gas – about 17 per cent of households in Northern Ireland have mains gas heating and gas-fired power plants produce nearly 50 per cent of electricity in the all-island grid. Around 95 per cent of gas in the all-island grid is imported so if something were to happen to those supplies tomorrow we might need to dig out the candles and the woolly jumpers pretty quickly.'

She adds, 'If you're producing energy from waste, then you're also managing the waste effectively. We need to realise that not only

are you decreasing greenhouse gas emissions by displacing fossil fuels but you're decreasing emissions because you're managing the waste.'

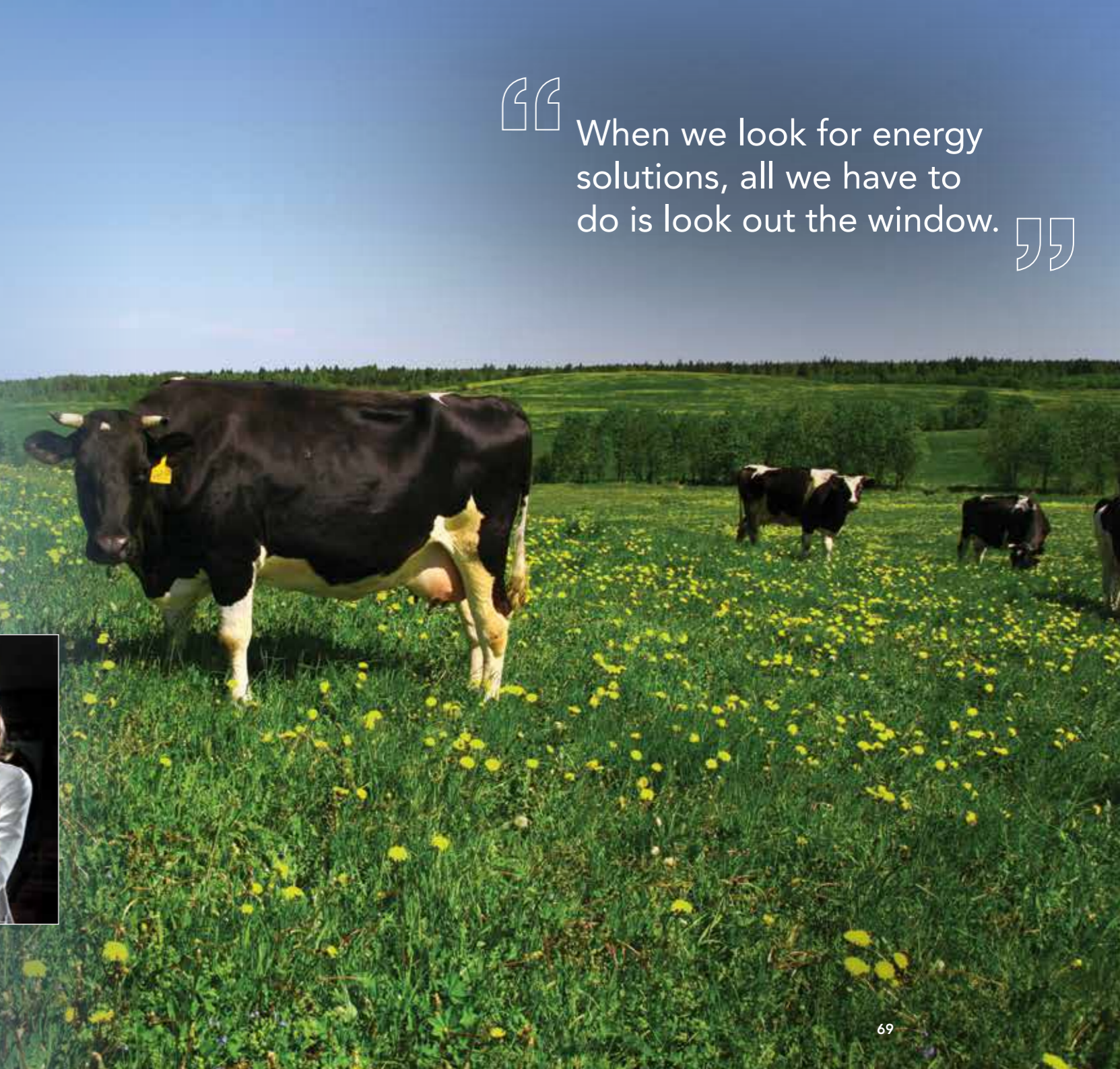
'There are further benefits. You improve health outcomes because the water is better. Pollutants from sewage and slurry won't get into the water supply. In transport, if you use gas instead of diesel, you improve air quality in the urban environment. There's a big knock-on effect.'

Beatrice has given presentations at community development events and believes it is an effective method of getting the message across. 'This is about management of our resources, which includes our waste. You can even call it harvesting. We have to get society to think differently, to think about what we can get from other sources. We all have to become a bit more involved in appreciating the difficulties we're creating for ourselves.'

“ When we look for energy solutions, all we have to do is look out the window. ”



Dr Beatrice Smyth
School of Mechanical and
Aerospace Engineering



NEW DISCOVERY IN THE BATTLE AGAINST BOWEL CANCER

“ We’re targeting the biology of the disease. This is a unique opportunity to understand more about resistance. ”



Dr Sandra Van Schaeysbroeck
Centre for Cancer Research and Cell Biology,
School of Medicine, Dentistry and Biomedical Sciences

Dr Sandra Van Schaeysbroeck’s fascination with drug resistance and how to overcome it has led to a major study into treatments for colorectal cancer, funded by €6m from the European Union.

Sandra, from Queen’s Centre for Cancer Research and Cell Biology (CCRCB), was trained initially as a gastroenterologist at the University Hospital Leuven in Belgium. ‘The final two years of that part of my education were in gastrointestinal – GI – oncology. That led me to my main interest. I wanted to do a PhD in resistance to therapies, in particular drugs used for the treatment of colorectal cancer.’

She got in touch with a number of principal investigators in Europe and eventually made contact with Queen’s and Professor Patrick Johnston, now Vice-Chancellor but then Director of CCRCB. The result was

her PhD, a collaboration between Leuven and Belfast, on epidermal growth factor receptor (EGFR) activity as a deterrent of response to EGFR-targeted therapy.

‘I truly enjoyed my PhD. There were major questions about the potential implication on therapies and how this could change current treatment decisions and survival outcomes. I wanted to do more.’ She applied successfully for a CRUK Clinician Scientist position and moved permanently to Belfast in January 2007.

‘The study we have embarked on now is based on work that evolved here at Queen’s. About two and a half years ago we were trying to identify mechanisms of resistance to therapies in poor prognostic groups, based on their molecular background. We came up with two genes which are going to be important to the survival of those particular subgroups.’

The interactivity of the two genes – MEK and MET – was uncovered when the researchers looked at all the different pathways and

interactions taking place in bowel cancer cells. The research has been published in the prestigious international journal *Cell Reports*.

Colorectal cancer – bowel cancer – is the second biggest cause of cancer mortality. It is the third most common cause of cancer in Europe, with more than 200,000 deaths a year.

In the project there are 13 partners from across Europe, bringing together world-leading researchers from the UK, Ireland, Spain, France, Italy and the Czech Republic. The research takes place under a European Consortium (MErCuRIC) funded by the European Commission’s Framework VII Programme and building on recent studies which have increased the understanding of what goes wrong in the colorectal cancer cell. Clinical trials will involve 550 patients and will be completed by 2020.

Sandra says, ‘We have not only clinical partners but we have partners who can help us with novel technologies. NGS – next generation sequencing – will help us understand

resistance better and liquid biopsies can track DNA released by tumours into the blood stream and give us an indication of secondary mutations. These experts are going to help us answer important questions.

‘We’re targeting the biology of the disease. Up to now, patients with colorectal cancer have all been treated the same way but we know there are multiple genetic aberrations, which means that some tumours will benefit more from novel treatments.

‘We’re giving novel treatments but we want to learn at the same time. This is a unique opportunity to understand more about resistance. It’s an example of how we should perform future clinical/translational trials.

‘This shows how research at Queen’s is taking important strides in the battle against cancer and it shows the value of researchers and clinicians working together with the patient at the centre of the process.’

CLASSICALLY CANINE THROUGH QUEEN'S RESEARCH

It was on the shelves of a US veterinary facility that music producer Joshua Leeds found what he was looking for. It was a study entitled 'The influence of auditory stimulation on the behaviour of dogs housed in a rescue shelter.'

Leeds writes and lectures on the effects of music and sound on the human nervous system. A pianist, Lisa Spector, had come to him with the idea of translating this interest into the animal world – producing a music CD for dogs. He was intrigued but he needed evidence that it might work.

The study, by Dr Deborah Wells of Queen's, gave it to him. The result was a CD called *Through A Dog's Ear* with Mozart, Debussy and Haydn pieces played by Spector. There is now a whole series of recordings that have sold

around the world. There is a version for pups and one for elderly dogs. There is even an app.

Deborah says, 'It's used in about 150,000 rescue kennels and all on the back of our research. That's a massive impact.'

Deborah graduated top of her year at Queen's in 1992 with a first class Honours degree in Psychology. She followed this with a PhD on the welfare of dogs in rescue shelters. She is now a reader in the School of Psychology and Director of Queen's Animal Behaviour Centre.

'It began as the Canine Behaviour Centre. As well as carrying out research, vets referred people to us if they were having problems with their dogs. Unfortunately we had to stop that service some years ago because of time constraints. There simply wasn't enough time in the typical academic day. However, we're hoping to restart our clinic following new appointments in animal behaviour and further support.

The research into sound began with funding from the National Canine Defence League, now the Dogs Trust. 'We secured a grant to explore environmental enrichment, trying to find ways of improving the welfare of dogs in shelters. These can be very noisy and have a negative effect. With this in mind, we examined the effects of different types of music on the animals' behaviour and we found that classical music had the best effect on their wellbeing.

'We then looked at other animals and found classical music to have the same effect with cats, gorillas and elephants. We came to the conclusion that there was something fundamentally enriching about classical music. It wasn't specific to one species.'

Deborah's research also looked at the welfare of gorillas at Belfast Zoo. She discovered that they seemed less agitated when they could not see their human audience and that their welfare was improved if visitors

watched them from behind a screen such as a camouflage net. This research won awards and the practice has now been adopted in zoos in London, Edinburgh and Dublin.

In general, the psychological welfare of animals in the home, in zoos and in rescue shelters has improved significantly as a result of research conducted at the Queen's Animal Behaviour Centre. Its work has also influenced new international guidelines on the issue of stressful environments, such as kennels.

In addition, there are now links with industries, notably pet food companies. A Knowledge Transfer Partnership with Devenish Nutrition, a Northern Ireland agri-technology company, has resulted in a product soon to appear on the market – DeviQ – a complementary foodstuff to help dogs with the digestive process.

“

This music is used in about 150,000 rescue kennels and all on the back of our research. It's a massive impact. ”

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Dr Deborah Wells
School of Psychology





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