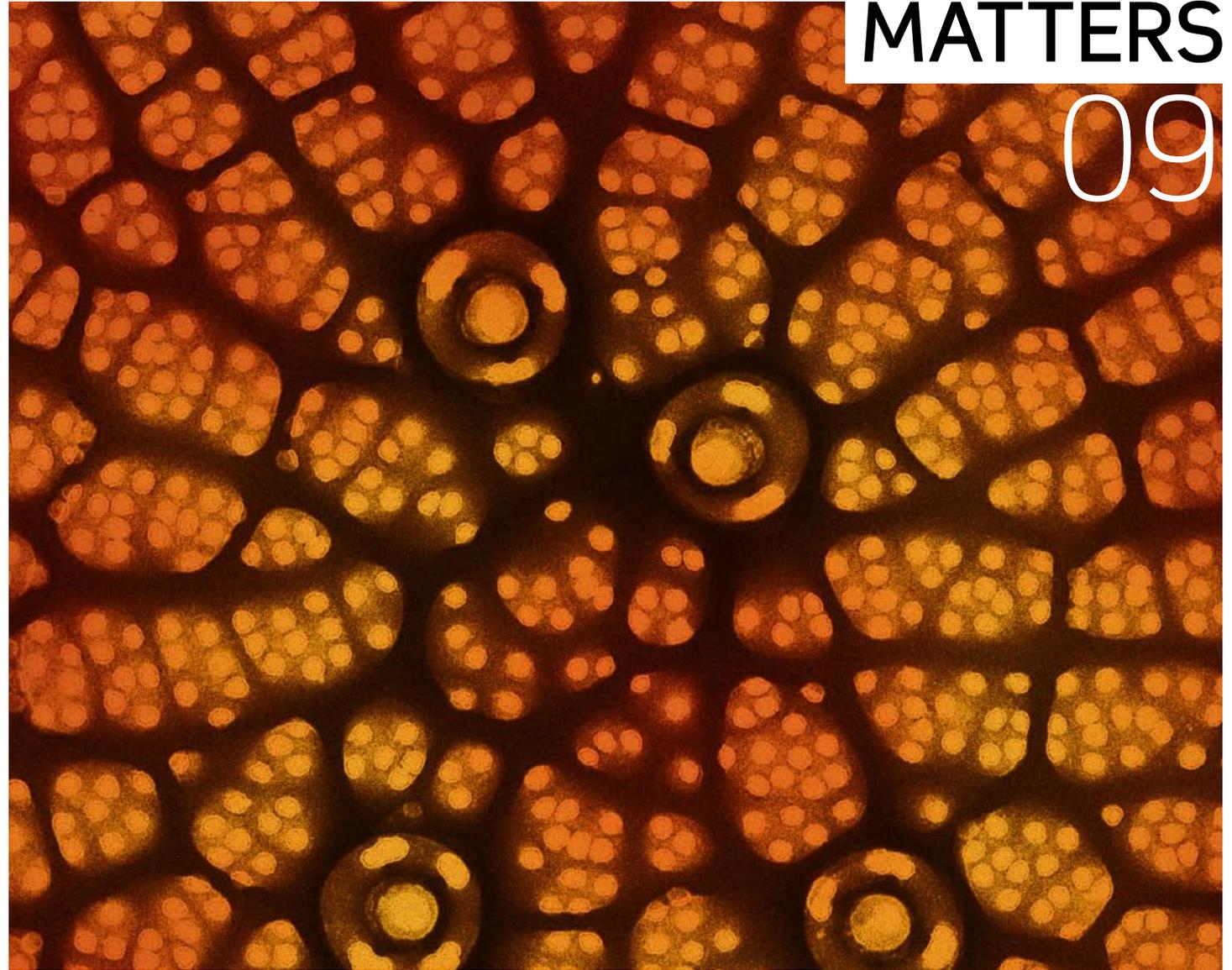




research

MATTERS

09



INTERVIEW WITH PROFESSOR PAT DOLAN

RESEARCH SHOWCASE AWARD WINNERS 2014

MOLECULAR SURFING ON THE WEST COAST

NUI GALWAY AT FOREFRONT OF
€245 MILLION RESEARCH INVESTMENT

NEW SFI CENTRE FOR NUI GALWAY

EVOLUTIONARY GENETICS OF IRISH HONEY BEES

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Welcome from the Vice President for Research



Welcome to issue nine of Research Matters. In the following pages, you will snapshots of the important research activities at NUI Galway in recent months. In July we celebrated research excellence at NUI Galway's Inaugural Research Showcase. The event was inspiring and focused not only on our current research leaders, but also on our students and early career researchers who together all form part of NUI Galway's dynamic Research Community.

Guest Letter



When we speak of the knowledge economy we often think of those in employment who are directly affected by the tides and waves of economic changes, be they austerity or prosperity based. An often forgotten component of the knowledge economy lies within retired communities.

At NUI Galway through the Retired Staff Association we work in partnership with the Research Office to provide support, advice and guidance to the research community. Retired staff engage with a wide spectrum of high level activities including publishing in internationally refereed journals, publishing prestigious academic books, editors of major

Early next year, NUI Galway will launch our Strategic Plan 2020. The plan will greatly influence the future of research at NUI Galway. We are confident that the strategic plan will build on our previous research successes and create vast new opportunities for research at NUI Galway.

Finally, from an international perspective our research is increasingly being recognised as world class; this is evident in two stories in this edition, namely our collaboration with the Mayo Clinic and NUI Galway featuring in Thomas Reuters 'World's Most Influential Scientific Minds 2014'.

Professor Lokesh Joshi
Vice President for Research

international journals and monograph series, and members of international and national journal editorial boards. Other research-related activities include organising and contributing to conferences, chairing/members of EU and other international and national research evaluation panels, and external appointments including Adjunct Professor and External Examiner for higher degrees.

As a University who understands and celebrates the value of ageing people through research centres such as the Irish Centre for Social Gerontology, our direct contributions to research at NUI Galway underpin our individual core values from both an economic and societal perspective and indeed those of the University. We look forward to contributing to future editions of Research Matters.

Professor Ger Jennings
Emeritus Professor of Physics and
Chair of the Retired Staff Association

From The Editor

Welcome to the 9th edition of Research Matters. Regular readers will know that our editorship and editorial board have recently changed. As I introduce myself as editor I will also take this opportunity to point out some changes in this edition of Research Matters. I will as those who edited before me strive to preserve all that is right about Research Matters whilst making incremental changes that, I hope, will make it even better.

The mission of Research Matters is to support the community of people with research interests in NUI Galway. We support this community by presenting stories, commentaries and briefings on researchers and research activities in addition to providing pointers to other sites and online stores sharing our research successes.

Research Matters tries to be a facilitator for readers and authors. For the most part, our stories are both societally and economically relevant reads that showcase the impact of our research nationally and internationally. Because we want our authors to write what is most compelling to them, editing of stories is light.

As readers of our publication, I invite you to let me know what you like or don't like about Research Matters, what works or what doesn't, we welcome your thoughts, comments and ideas about this and future issues.

Natalie Walsh
Editor, Research Matters

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OPINIONS & PERSPECTIVES

THE APPOINTMENT OF PROFESSOR PAT DOLAN AS THE PRESTIGIOUS UNESCO CHAIR IN CHILDREN, YOUTH AND CIVIC ENGAGEMENT AT NUI GALWAY HAS CREATED A CATALYST FOR CHANGE IN UNDERSTANDING AND ENABLING YOUNG PEOPLE'S CAPACITY FOR RESILIENCE IN SOCIETY. PROFESSOR DOLAN SHARES HIS OWN EXPERIENCES AND OPINIONS IN RELATION TO CURRENT AND FUTURE RESEARCH IN THIS CRITICAL RESEARCH AREA IN ADDITION TO INTRODUCING NUI GALWAY'S NEWEST RESEARCH INSTITUTE, THE INSTITUTE FOR LIFECOURSE AND SOCIETY (ILAS).



The connection between engagement in school and engagement in the community is a key factor in enabling

young people's capacity for resilience in society. Throughout the past decade, there have been numerous initiatives responding to the needs of youth and demonstrating their potential. These initiatives have contributed to a growing recognition of youth as key partners in development, strengthening the gradual shift from 'about youth' to a 'with and for youth' approach to planning and programming. Under the directorship of Professor Pat Dolan, the UNESCO Chair in Children, Youth and Civic Engagement, the Child and Family Research Centre has built its core strengths around demonstrating young people as positive agents for change and key actors for social transformation in building stable, peaceful and progressive societies.

Pat Dolan commented: "my research trajectory began in 2003 when I completed my PhD thesis which addressed the topic of adolescents and their perceived social supports and mental health. My postgraduate qualifications both masters and PhD were motivated and informed by experience in the policy domain where I worked for a number of years in the Youth Division

of the Irish Health Services Executive. On my entry to academia I pursued, from the outset, the development of research into children as well as youth and family issues, which were seriously underdeveloped in the Irish context. This initiative resulted in the establishment of a major research centre of which I was the first Director namely the Child and Family Research Centre at NUI Galway.

Four years later I had the honour of being appointed to the first UNESCO Chair in the Republic of Ireland. In recognition of this initiative and the growing interest in youth research, I was the beneficiary of substantial philanthropic funding from the Atlantic Philanthropies.

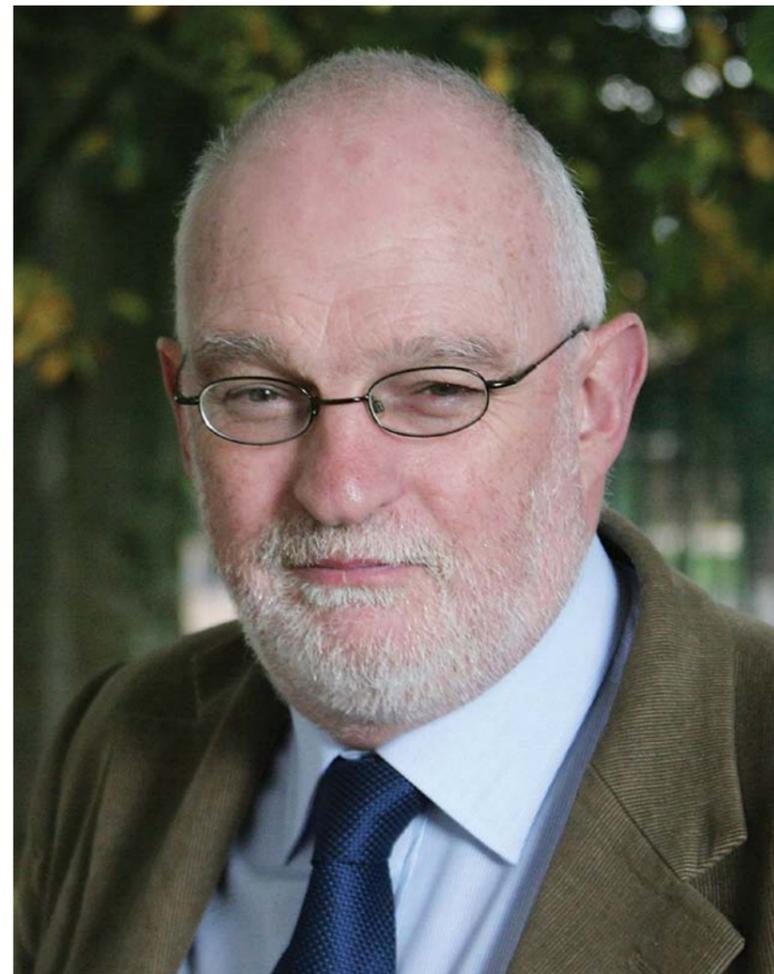
UNESCO Chairs serve to bring together the world's best experts, faculty, researchers, students, and youth, to achieve international development goals. We focus on community development, youth engagement, empathy, social support, and resilience. We recognise that, through our roles and representation of UNESCO we are determined to serve the needs of our youth, acknowledging the challenges and inequality that exists, and seek to redress these imbalances through informative and educational means that translates into a better future for our young people. As UNESCO Chairs we develop programmes, shape policy on children, young people and

communities as well as education and conflict and international development."

The Centre has grown significantly and is now recognised as a world class research Centre in youth civic engagement and leadership. Since 2006 it has been awarded in excess of 5 million euro in funding from a diverse range of funding agencies. The research projects range from qualitative to experimental design studies. Irish actor Cillian Murphy is a patron for the Centre and works with Professor Dolan and his researchers to promote research by youth researchers. The Centre has established international collaborative networks in Europe, United States, Africa and New Zealand and has hosted national and international conferences. It has successfully produced an array of commissioned research reports, books, specialised monographs, policy evaluation studies, and academic peer reviewed journal papers. The Centre runs postgraduate courses including Masters and PhD programmes which are underpinned by core values and the mission of the research centre.

Global Network of UNESCO Chairs on Children, Youth, and Communities

Professor Dolan, Professor Mark Brennan, (UNESCO Chair in Rural Community,



“ We work to create opportunities for youth and communities worldwide to improve their lives, security, and well-being. They will lead change through high quality research, evidence-based translational research; innovative educational programmes; effective policy briefing advice; state of the art outreach activities, and high-impact national and international partnerships. ”

Leadership, and Youth Development-Penn State) and Professor Alan Smith, (UNESCO Chair in Pluralism, Human Rights, and Democracy-University of Ulster) have formed the Global Network of UNESCO Chairs on Children, Youth, and Communities. Through this network, higher education and research institutions all over the globe pool their resources, both human and material, to address pressing challenges and contribute to the development of their societies, with particular interest in rights of vulnerable populations of youth. They will serve as a 'think tank' and bridge builders between academia, civil society, local communities, research and policy makers.

The network, unprecedented in size and scope, spans 6 continents, 10 geographic regions, dozens of universities and

NGO's and an extensive list of the world's best multidisciplinary academics and researchers are committed to being part of this programme.

Prof Dolan adds that "the network will focus on delivering immediate responsive on-going research, program development, and educational program delivery and outreach. With their dedicated partners we are able to conduct international comparative research, design programs, and deliver them worldwide in a matter of months - not years as is often the case. The network has a common framework of Community Capacity Building, Youth Development, and Conflict Mitigation. The framework sets the stage for effective work in a wide range of areas such as civic engagement, resilience building, health and well-being, education and literacy, social and economic development, democratisation

of family support and peace building. We work to create opportunities for youth and communities worldwide to improve their lives, security, and well-being. They will lead change through high quality research, evidence-based translational research; innovative educational programmes; effective policy briefing advice; state of the art outreach activities, and high-impact national and international partnerships."

Professor Dolan states that 'we would undertake this work through our Global Network of UNESCO Chairs on Children, Youth and Communities. We bring together hundreds of researchers, programs, and youth from all over the world dedicated to education, improving lives, and promoting peace. We seek to make an impactful difference in the lives of our youth in partnership with our youth'. >>>

OPINIONS & PERSPECTIVES



⤴ To view a short video in relation to the UNESCO Declaration on Youth Civic Engagement and Leadership visit: <http://www.youtube.com/channel/UCcbSAL1ch7KbYa215CWOb5A>

⏪

The UNESCO Croke Park Declaration on Youth Civic Engagement and Leadership Development through Sport and Recreation

Early this summer, Professor Dolan, Professor Mark Brennan, (UNESCO Chair in Rural Community, Leadership, and Youth Development-Penn State) and Professor Alan Smith (UNESCO Chair in Pluralism, Human Rights, and Democracy-University of Ulster) hosted the UNESCO Symposium in Croke Park, Ireland. 'The purpose of the event was to sign into effect the UNESCO Croke Park Declaration on Youth Civic Engagement and Leadership Development through Sport and Recreation. The core principal of the declaration was to call for all youth worldwide to receive the attention needed for them to be empowered to take ownership for their lives and development of their societies'. The declaration was signed at the Croke Park Classic, at half time during the American football clash between Penn State and University of Central Florida.

The event brought together leading international researchers, practitioners, policy makers, and stakeholders to launch a movement for fostering youth leadership



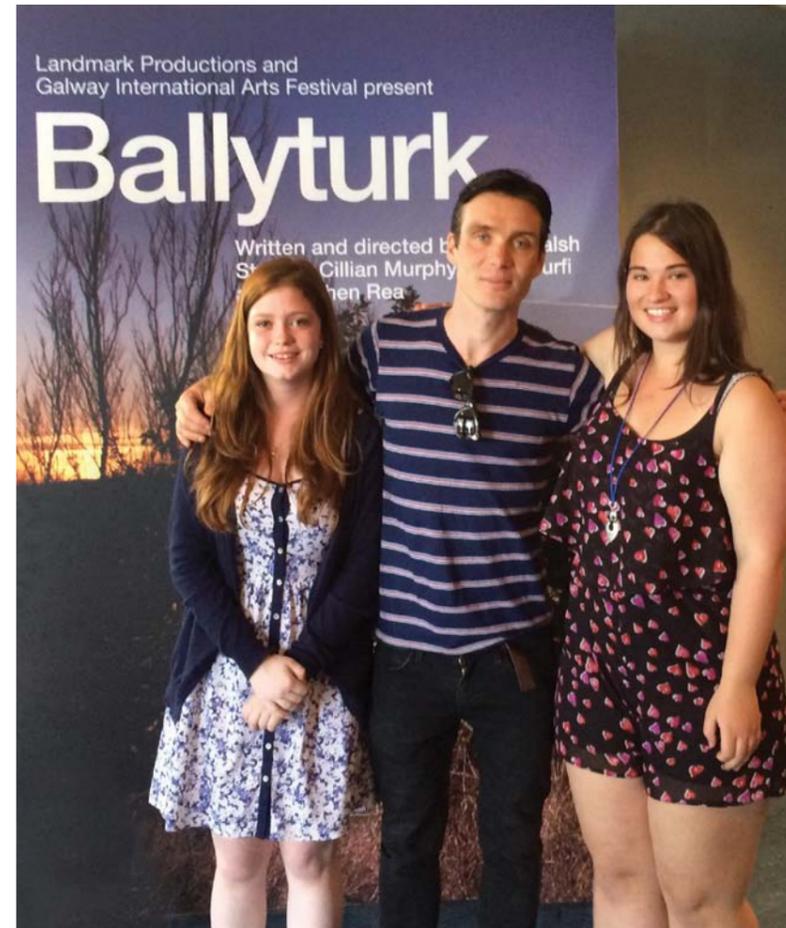
⤴ ABOVE: Prof Alan Smith, UNESCO Chair in Human Rights and Democracy, University of Ulster; Prof Mark Brennan, UNESCO Chair in Rural Community, Leadership, and Youth Development, Penn State University and Prof Pat Dolan UNESCO Chair for Children, Youth and Civic Engagement at the Croke Park symposium and again at the Croke Park Classic American Football match, 30th August 2014, between Penn State and University of Central Florida.

and development through sport and related activities. The declaration seeks to create precise, real and actionable programmatic and policy suggestions and to design and implement a UNESCO Chairs Summer School Programme on Youth Development.

Youth As Researchers

Youth research conducted by young people with young people is far more valuable and insightful than using the traditional model of research. Pat and his research team are seeking to develop a youth as researchers project. A central tenet of the proposal is that young

people respond better to other youth in terms of sharing their experiences and issues. The project will focus on four key areas; youth in care; youth in mental health; youth and children with a disability and youth directly involved with dissemination and engagement. This project will enable and empower both youth researchers and those being researched so that we have rich and open information to inform our future research policies for those truly affected by it. A key focus of the project will be ensuring that the findings are accessible and understandable by all. The program is closely linked with the work termed



⤴ ABOVE: Cillian Murphy takes time from rehearsals at the Galway Arts Festival to meet with Youth Researchers Lucy Kelly (L) and Katie Price (R).

'Project Lifecourse' of which an important component is to train youth, older people and people with disabilities to undertake research that is relevant to their lives, and disseminated in an accessible way to all populations.

The Institute for Lifecourse and Society

In addition to his role as Director of the Child and Research Centre and his UNESCO Chair appointment, Professor Dolan is interim Director of NUI Galway's newest Research Institute, the Institute for Lifecourse and Society (ILAS). This newly designated interdisciplinary

social sciences Institute will produce research which supports innovative policy reform across the life cycle to enable citizens to achieve their potential and live fulfilling and productive lives. ILAS is committed to being informed by and strongly promoting the voice of citizens in its work. It draws on the internationally recognised expertise and the track record of multiple distinguished Research Centres in NUI Galway.

For more information please visit: www.nuigalway.ie/ilas

By **NATALIE WALSH**
Editor, Research Matters



⤴ To view the interview with UNESCO Child and Family Research Centre Patron Cillian Murphy, filmed in January 2014 visit: vimeo.com/86601601



▲ ABOVE: Pictured are the NUI Galway President's Awards for Research recipients (back row, r-r): Professor Donal O'Regan (College of Science), Professor Afshin Samali (College of Science) and Dr Martin O'Halloran (College of Engineering and Informatics). Front Row (l-r): NUI Galway President, Dr Jim Browne, Dr Shane Darcy (College of Business, Public Policy and Law), Dr Marie-Louise Coolahan (College of Arts, Social Sciences and Celtic Studies), Professor Henry Curran (College of Science), and Professor Lokesh Joshi, Vice President for Research.

Research Showcase

NUI GALWAY HAS HONOURED STAFF MEMBERS FOR THEIR OUTSTANDING CONTRIBUTIONS TO RESEARCH. THE PRESIDENT'S AWARDS FOR RESEARCH WERE INTRODUCED EARLIER IN 2014 AND ARE HIGHLY COMPETITIVE. THE AWARDS ACKNOWLEDGE EXCELLENCE IN RESEARCH ACTIVITY ACROSS THREE CATEGORIES: EARLY STAGE RESEARCH, RESEARCH SUPERVISION AND ESTABLISHED RESEARCH.

Recipients were honoured recently at NUI Galway's Inaugural Research Showcase. The awards ceremony included opening remarks from NUI Galway President Jim Browne and Vice-President for Research Professor Lokesh Joshi. Professor Joshi remarked on the breadth and depth of the award recipients and thanked members of the University community for their thoughtful and moving nominations.

Speaking at the presentation ceremony, Dr Jim Browne, President of NUI Galway said: "It is a privilege to preside over the Inaugural President's Research Awards and to share our research with fellow colleagues and our broader research community. Whilst our Inaugural winners come from different Schools and Disciplines with very different research skills and objectives, they share a passion for research excellence which is internationally recognised in their cognate research areas."

By **NATALIE WALSH**
Editor, Research Matters



Dr Audrey Morley
(College of Arts, Social Sciences and Celtic Studies)
Euro Million Project Pitch



Dr Deirdre Ní Chonghaile
(College of Arts, Social Sciences and Celtic Studies)
Euro Million Project Pitch



Dr Pádraic Moran
(College of Arts, Social Sciences and Celtic Studies)
Euro Million Project Pitch

Not photographed:
Dr Eilíonóir Flynn, Euro Million Project Pitch, Dr Mark Healy, Research Supervisor Award and Linda O'Connor, Societal Impact Award Poster Presentation.



Karen Taylor
(College of Arts, Social Sciences and Celtic Studies)
Best Poster Presentations



Dilip Thomas
(College of Medicine, Nursing and Health Sciences)
Best Poster Presentations



Claire McDaniel
(College of Science)
Best Poster Presentations



Ursula Kenny
(College of Medicine, Nursing and Health Sciences)
Innovative Poster Award



Trevor Clohessy
(College of Business, Public Policy and Law)
Industry Impact Award



Leah Kidney
(College of Science)
Graphic/Imagery Award

RESEARCH SHOWCASE 2014: AWARD WINNERS

List of Awardees:

Professor Henry Curran
(Chemistry)
Established Research Award

Professor Donal O'Regan
(Mathematics)
Established Research Award

Dr Marie-Louise Coolahan
(Humanities)
Established Research Award

Dr Shane Darcy
(Law)
Early Stage Research Award

Dr Martin O'Halloran
(Engineering)
Early Stage Research Award

Professor Afshin Samali
(Biochemistry)
Research Supervisor Award

Dr Mark Healy
(Engineering)
Research Supervisor Award

Other events featured at the Research Showcase included a **Euro Million Project Pitch** with team and individuals pitching for research funding to develop a unique research idea. Seven projects were pitched to a panel of research expert with four projects awarded developmental funding.

Awards were presented to the following:

Dr Eilíonóir Flynn
(College of Business, Public Policy and Law)

Dr Deirdre Ní Chonghaile
(College of Arts, Social Sciences and Celtic Studies)

Dr Pádraic Moran
(College of Arts, Social Sciences and Celtic Studies)

Dr Audrey Morley
(College of Arts, Social Sciences and Celtic Studies)

Sixty postgraduate researchers were also selected to present posters designed to represent their work. The event gave students the opportunity to share their research with other students and staff.

The following students were acknowledged at the event for their contributions to research.

Best Poster Presentations

Karen Taylor
(College of Arts, Social Sciences and Celtic Studies)

Dilip Thomas
(College of Medicine, Nursing and Health Sciences)

Claire McDaniel
(College of Science)

Societal Impact Award

Linda Connor
(College of Science)

Industry Impact Award

Trevor Clohessy
(College of Business, Public Policy and Law)

Graphic/Imagery Award

Leah Kidney
(College of Science)

Innovative Poster Award

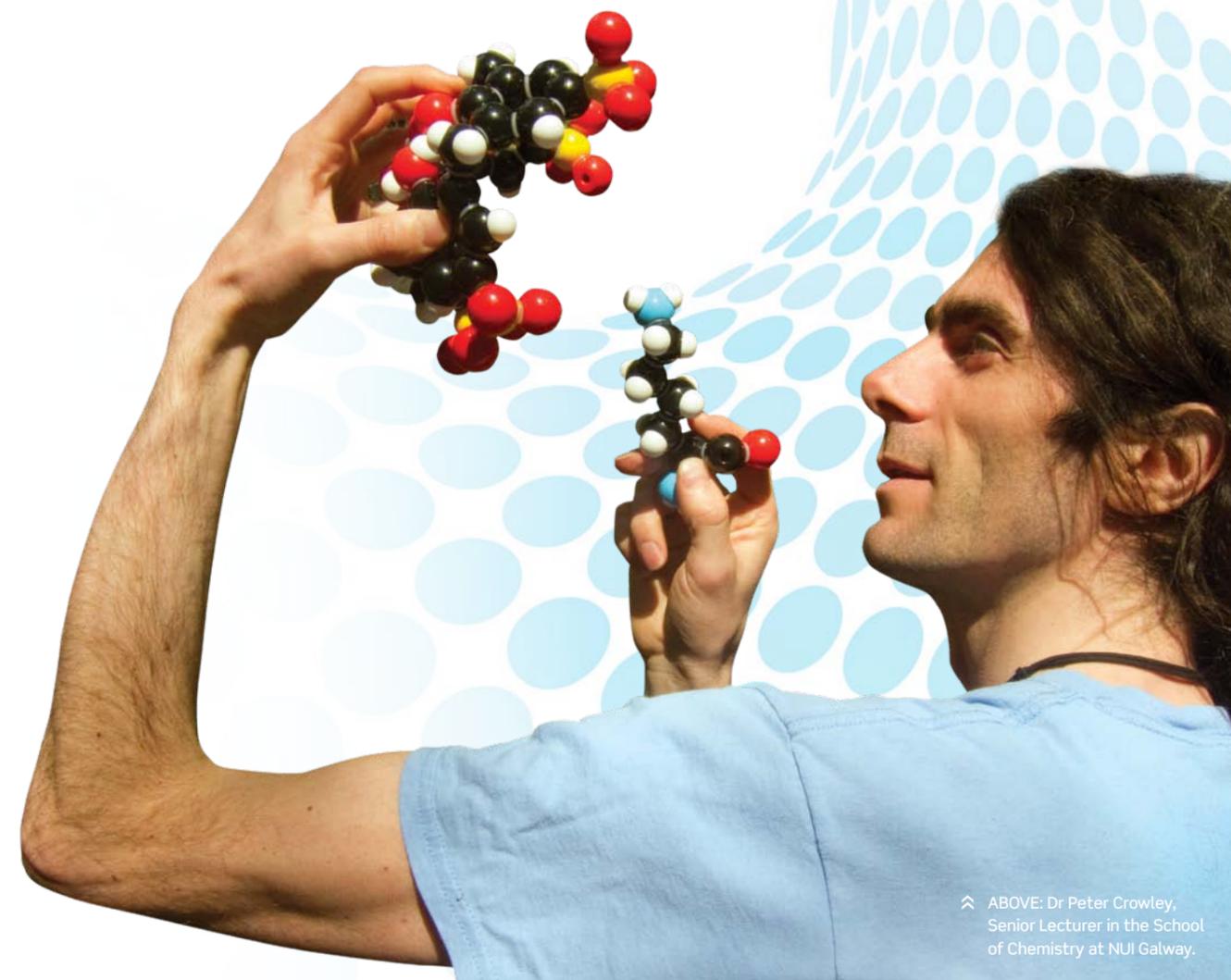
Ursula Kenny
(College of Medicine, Nursing and Health Sciences)

“ This is a unique day in the calendar of the University as Engineers, Scientists and Humanities come together to debate and present their research in a forum that is open to the broader University Community. The Research Showcase gives NUI Galway students and staff the chance to share their research with new audiences and tell the world about their work. ”

Professor Lokesh Joshi
Vice President for Research

Molecular Surfing on the West Coast

DR PETER CROWLEY, SENIOR LECTURER IN THE SCHOOL OF CHEMISTRY, WRITES ABOUT HIS RESEARCH GROUP AND THEIR DISCOVERIES IN THE FIELD OF PROTEIN INTERACTIONS. IN THIS ARTICLE HE ALSO CALLS FOR INCREASED COLLABORATION IN RESEARCH AND TEACHING BETWEEN CHEMISTRY AND THE LIFE SCIENCES.



↑ ABOVE: Dr Peter Crowley, Senior Lecturer in the School of Chemistry at NUI Galway.

MOLECULAR SURFING ON THE WEST COAST



Chemical Connexion

Chemistry is one of those subjects; love it or leave it. Like any discipline the initial encounters are crucial to determining the long-term outcome. I was fortunate to have

a great teacher who captured our imagination with the power of chemical knowledge - the ability to think abstractly about molecules and their interactions. At university the obvious choice was a BSc and after considering the options in cell biology and zoology I settled finally on chemistry. Again two inspiring teachers played pivotal roles, this time in revealing the amazing world of protein science. From then on I was hooked. After Dublin I moved to Leiden University where I worked towards a PhD in protein interactions. This was a roller-coaster experience for a young Irishman in the deep end of experimental research, learning to work in a large, international and multi-disciplinary environment, and enjoying the thrill of publishing new results. From Holland I headed southwards to join a structural biology lab in the suburbs of Lisbon. Here, with a Marie Curie fellowship I continued my research and published a seminal paper on the role of Arginine in protein interfaces. At this stage I was set on a career in research and I returned to Ireland to work initially in UCD where I spent two years as a lecturer in biochemistry.

Building a Research Team

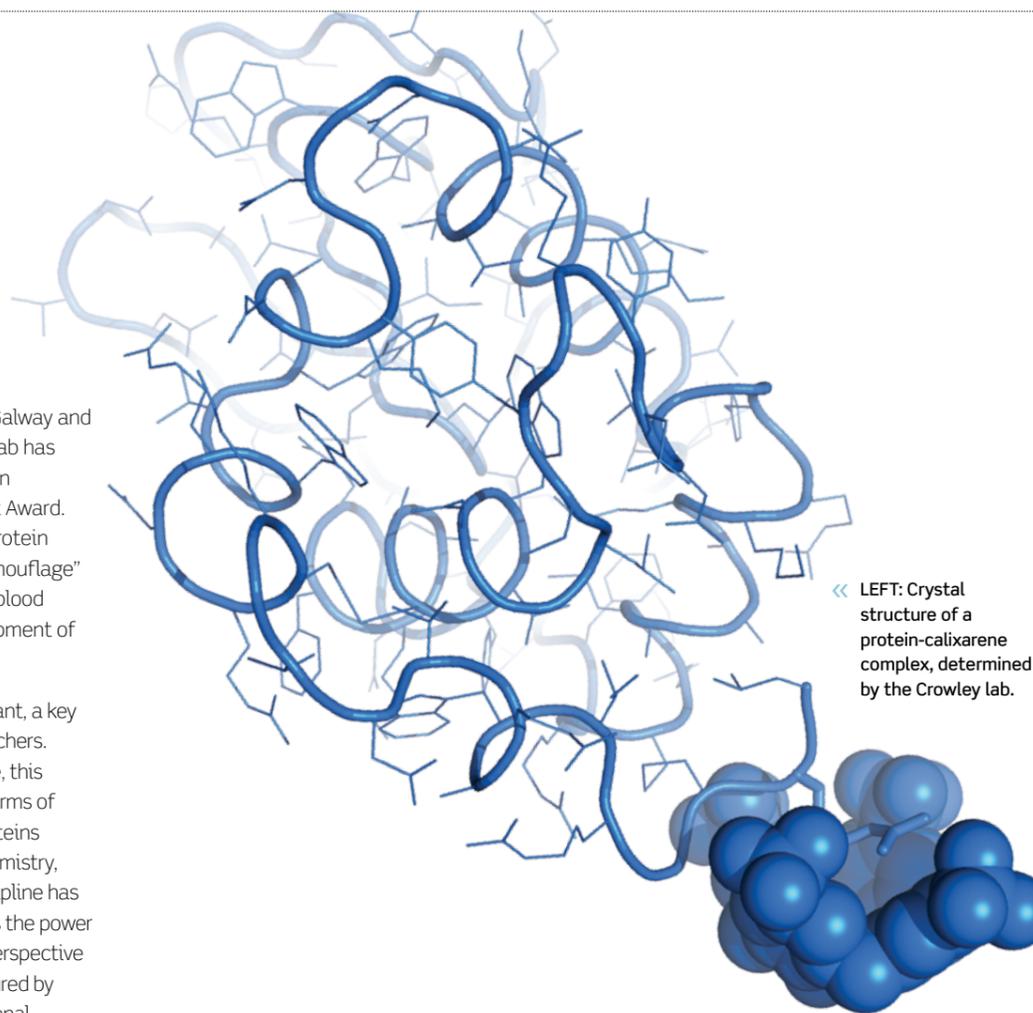
In 2008, I moved to the School of Chemistry at NUI Galway. University funding made it possible to build up my team and establish the Crowley lab. With some relatively small investments it was possible to kick-start protein chemistry at NUI Galway. In 2011 the NMR facility in the School of Chemistry was expanded to include a 600 MHz spectrometer with a cold probe. This is state of the art equipment for protein structural studies, the characterization of natural products and a wide-variety of other applications. Such infrastructure enables us to do internationally competitive research. And colleagues from across the University are encouraged to use the facility, which can provide valuable data to enhance their research.

Through both the research supports available at NUI Galway and the research achievements of our group, the Crowley lab has attracted substantial funding from Science Foundation Ireland, including most recently a Career Development Award. With this award we will develop new ways to control protein assembly. We will also investigate the concept of “camouflage” which aims to enhance the activity of proteins in the blood stream. This has potential implications for the development of protein-based therapeutics.

Whilst infrastructure and funding are incredibly important, a key ingredient of any team is talented students and researchers. With an increased focus on the value of protein science, this multi-disciplinary field requires a unique approach in terms of education and research. The untapped potential of proteins will only be realised through collaboration between chemistry, biochemistry and the life sciences. Currently, each discipline has a distinct style of teaching and research but to harness the power of proteins we must adopt the structural / analytical perspective provided by chemistry and the biological aspects captured by biochemistry and medicine. As a result of our conventional educational streams Irish graduates are often ill-equipped to work with proteins and research in the life sciences suffers. The move from the traditional to a hybrid approach in education and research may appear challenging. However, the key components are already established, it just requires a softening of the boundaries between the disciplines. And we need an open mind to the possibilities of truly, inter-disciplinary training. Currently, we are graduating large volumes of students with traditional science degrees. A new approach with different programme structures is needed to create the researchers of tomorrow.

What is life?

Biochemists have identified a myriad of processes inside the living cell. Each process can involve numerous different proteins that work together like the parts of a machine. Proteins are often referred to as “molecular machines” (or nano-machines) because of their robotic-like functions inside the cell. In the Crowley lab we want to understand how proteins stick together



« LEFT: Crystal structure of a protein-calixarene complex, determined by the Crowley lab.

and how this stickiness can be altered by small molecules like drugs. With this knowledge we can help to solve one piece in the puzzle of the molecular basis of life.

The focus of our research is on weak interactions, which are the crucial difference between living systems and inanimate materials. We want to know how molecules bind weakly to the surface of proteins. The best way to address this question is through molecular structure. The main techniques we use are NMR spectroscopy and X-ray crystallography, which provide detailed information on every atom in a protein (Even a small protein has as many as 2,000 atoms!). Knowing the structure of a molecule is essential to knowing how it works (form and function). If we know how it works we can begin to play with it and make it do new things.

Discovery

Our most important discovery to date was to show how a calixarene (a bowl-shaped molecule) can “explore” a protein surface. Using NMR and X-ray data we demonstrated how the calixarene can move around a protein surface by hopping from one lysine to another (lysine is one of the amino acids found in proteins). This work is important because it brings together two large, disparate fields of research: supramolecular chemistry and structural biology. The specific calixarene we study was developed by Seiji Shinkai (Kyushu University) in the late 1980s. Since then, there have been hundreds of papers and patents describing how calixarenes behave as hosts to pick up guest molecules and assemble into complex architectures. We were



« ABOVE: The Crowley lab at a print workshop in June 2014, from left to right; Pawel Antonik, Ciara Kyne, Giada Cattani, Madeleine Mallon, Peter Crowley and Alan Crowley (Limerick School of Art and Design).

the first to show how the calixarene sticks to a protein and induces assembly. The work featured on the cover of *Nature Chemistry* (July 2012) with follow-up papers in *Chemical Communications* and *Chemical Science*. Róise McGovern the PhD student who worked on the project recently joined Jan Steyaert's Nanobodies lab in Brussels.

Research and Society

Research in the short term may generate useful knowledge for contemporary applications. But today's research should also provide the stepping stones for future developments. The single-most important component in this chain is the researcher and teacher. Creativity with undergraduates and PhD students (apprentices) working alongside properly-trained researchers (masters) is one of the strands in a healthy, functioning University (society). But to do this properly we need time dedicated to research. Careful planning and organization of the system is required. Our current structures and approach need to be revisited. We need to grow new synergies across the disciplines rather than be fenced in by traditional boundaries that blinker discovery.

Returning then to the question, what is life? What is the University's role and how can we best address this central question? A helpful step will be to remove the barriers between the disciplines, schools and colleges, to enable students and researchers to explore all of the possibilities. We must harmonize our activities to obtain an understanding of the whole and not merely a scrutiny of its parts.

By DR PETER CROWLEY
College of Science



Creativity with undergraduates and PhD students (apprentices) working alongside properly-trained researchers (masters) is one of the strands in a healthy, functioning University (society).



DAIRYWATER - A NEW MULTI-STAKEHOLDER RESEARCH PROJECT THAT IS STRIVING TO MAKE THE IRISH DAIRY PROCESSING INDUSTRY MORE EFFICIENT.

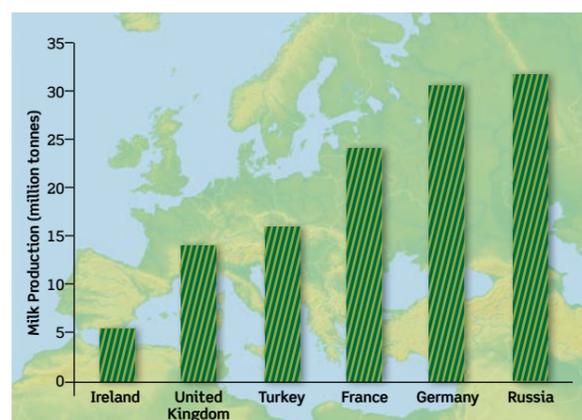
Major €1 Million Study Aimed at Increasing Resource Efficiency in the Irish Dairy Processing Sector

Ireland is one of Europe's largest producers of cow's milk with an annual production of over 5,500 million litres. Currently, dairy ingredients and products comprise almost 30% of the Irish food and drink export market and, in

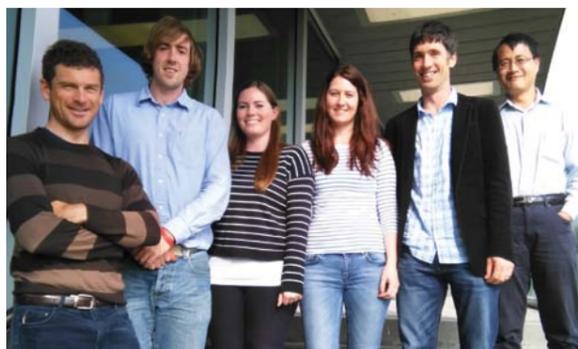
2013, dairy ingredients and products surpassed €3 billion for the first time. The abolishment of milk quotas in 2015 is expected to result in a 50% increase in milk production in Ireland by 2020. This increase in the volume of milk being processed, along with stringent measures on emissions from the industry and growing commercial drive for operational efficiencies, is driving the need for innovative technological and operational solutions within the dairy processing industry.

In this context, DairyWater - a new multi-stakeholder research project - is striving to make the Irish dairy processing industry more efficient and environmentally sustainable by reducing carbon footprints, energy and water use. This will, in turn, lead to greater potential for exports, increased international competitiveness for Irish products, and stimulate job creation.

DairyWater is led by Prof Xinmin Zhan in Civil Engineering, College of Engineering and Informatics and the Ryan Institute at NUI Galway. The project also involves leading research groups at UCC, Trinity College Dublin, Athlone IT and Teagasc. The primary goal



ABOVE: Major milk producing countries of Europe



ABOVE: NUI Galway research team of the DairyWater Project. L-R Dr Eoghan Clifford, Dr William Finnegan, Emma Tarpey, Kelly Fitzhenry, Dr Jamie Goggins, Prof Xinmin Zhan.

of the study is to efficiently and effectively treat wastewater effluent from dairy processing plants using a range of innovative biological, nanomaterial-based and disinfection technologies. In parallel, the efficient use of water (and resulting energy costs) within the plants is also being explored.

Prof Zhan explains "In Australia, 1.5 litres of fresh water is used for every litre of milk processed while, in Ireland, water consumption is approximately 66% higher than this, so there is plenty of scope for improving the efficient use of water within this sector."

The project team are working closely with leading industry stakeholders. A project advisory board includes leading members of the dairy processing industry (Arrabawn, Aurivo, Carbery, Dairygold, Glanbia and Lakeland), and government funded bodies (Enterprise Ireland, the EPA and Teagasc). The industry partners will provide data and facilitate pilot scale activities during the project; thus enabling potential commercial benefits of this research to be realised.

The four-year project has received €1 million funding from the Department of Agriculture, Food and the Marine. Further details can be found at: www.dairywater.ie

By DR WILLIAM FINNEGAN
College of Engineering & Informatics and the Ryan Institute

PROFILES

MEET THE PEOPLE
BEHIND THE RESEARCH

DR SUBHADIP BODHAK
NFB Researcher



D

Dr Subhadip Bodhak has received a Starting Investigator Research Grant (SIRG) from Science Foundation Ireland (SFI).

The award provides support for excellent postdoctoral researchers wanting a fully independent research career. He will complete his project, 'Multifunctional Nanofibrous Patch for Intervertebral Disc Regeneration,' at the Network of Excellence for Functional Biomaterials (NFB) at the National University of Ireland, Galway. Dr Bodhak and his recruited PhD student supported by the SIRG award will closely work with his mentor Prof Abhay Pandit to develop a novel regenerative strategy by combining biomaterials science and cell therapy which will underpin the next generation of medical devices for the treatment of intervertebral disc (IVD) disease.

The pathophysiology of degenerative IVD, affecting over 80% of the adult population, have a remarkable socio-economic impact and associated healthcare expenditure is estimated to

be over \$100 billion annually in USA and €5.34 billion in Ireland. However, despite the prevalence of degenerative disc disease and its enormous socioeconomic impact current treatment options are limited because while they can ease the pain, they are unable to completely restore normal functions of damaged disc. To overcome this limitation, the objective of Dr Bodhak's proposed research is to develop a multifunctional biodegradable elastomer based nanofibrous patch which will offer opportunities for functional modification to satisfy the requirement of disc regeneration by providing the appropriate mechanical support, biochemical cues, and mesenchymal stem cells. It is hypothesised that the functionalised nanofibrous patch can manipulate a disc's biology on a molecular level by correcting the biochemical imbalance, and can potentially stimulate the repair of the ruptured disc to return the disc to its pre-degenerative state.

Dr Bodhak's past and present research is primarily in the fields of functional

biomaterials for soft and hard tissue repair/replacement, stem cell based regenerative medicines, and non-viral gene therapy strategies for bone tissue engineering applications. The main focus of his research is to engineer musculoskeletal tissue and develop medical implants that will drive the engine of biomedical innovations for the next century enabling better understanding of diseases, drug discovery and therapeutics.

Dr Bodhak received his PhD in Materials Science from Washington State University, USA in July, 2010. As a PhD student, Dr Bodhak secured the prestigious Acta Student Award 2009 and a fellowship of €1,500 for the best student authored paper submitted to Acta Biomaterialia - one of only two awardees for one calendar year. This paper based on his postgraduate studies recognised that the surface properties (surface charge, wettability and surface energy) of polarised hydroxyapatite play significant role on early stage mineralisation and bone cell adhesion/growth. >>>

PROFILES

«« After finishing his PhD, Dr Bodhak secured the prestigious Japan Society for Promotion of Science (JSPS) Postdoctoral Fellowship (awarded only to the top 13% of applicants) and received a grant of €80,500 over a period of two years to conduct a collaborative project in the frontier field of non-viral gene transfer strategies at National Institute for Materials Science (NIMS), Tsukuba, Japan. As a JSPS fellow, Dr Bodhak was the first to demonstrate that hydroxyapatite/collagen nanocomposites can be successfully utilised in non-viral gene delivery facilitating next generation biomaterials for skeletal repair and reconstruction.

Dr Bodhak demonstrated his emerging independent researcher status through his securing of the prestigious National Research Council (NRC) Postdoctoral Fellowship in 2012 and received a grant of € 105,000 (awarded only to the top 19% of applicants) supported by The National Academy of Sciences, USA. As a NRC fellow, Dr Bodhak's ongoing research jointly at the National Institute of Standards & Technology (NIST), and National Institutes of Health (NIH), Maryland, USA has allowed him to develop a deep insight and understanding of the huge potential of stem cell based regenerative medicines. At NIH/NIST, Dr Bodhak successfully developed a high-throughput and systematic *in vivo* transplantation assay method that can be used for evaluating oestrogenic potential of stem cell populations and scaffold formulations in an immunodeficient mouse subcutaneous model.

To date, Dr Bodhak has published 16 peer-reviewed journal papers (11 as first author) and five referred conference proceedings which received 352 citations (Google Scholar, 31.7.2014) and his current 'h' index rating is 10. His two patent (one USA and one Japan) applications are now under review. In addition, Dr Bodhak has also delivered more than 10 invited and contributory lectures in different scientific conferences held in USA, Canada, Japan, and India.

NICOLE MÜLLER

Professor of Speech and Language Pathology, Linköping University, Sweden



Nicole Müller is a professor of Speech and Language Pathology at Linköping University, Sweden. She moved to Sweden in June of 2014, after fourteen years at the University of Louisiana at Lafayette. Nicole is a linguist and philologist by training, and has been researching and teaching in the area of clinical linguistics and phonetics since the 1990s. Her particular research interests relate to bilingualism, as well as acquired disorders of communication and cognition, such as dementia in consequence to Alzheimer's disease, aphasia following a stroke or similar brain damage, or communication and memory impairment after head injury. She also has a great love for the Irish language, and has spent time at An Cheathrú Rua, as far back as the 1980s. She also spent an academic year at what was then UCG as an undergraduate, so coming back to NUI Galway now is something of a homecoming for her. Her most recent stay at An Cheathrú Rua, in July of

2014, was made possible by a Fulbright Summer Gaeltacht Award.

At NUI Galway, Nicole is working with the discipline of Speech and Language Therapy, and the Irish Centre for Social Gerontology (ICSG). The focus of Nicole's Fulbright study is on the experiences of bilingual persons with dementia. Using qualitative methods such as ethnography and functional linguistic analyses, Nicole is investigating the significance, and the meanings attached to the different languages spoken by bilingual persons with dementia, and by the people caring for them. Dementia affects multiple aspects of cognition, including those required for explicit remembering, and laying down of new memories. Since these cognitive activities are to a large extent mediated through language, it is important that the communicative and language resources of persons with dementia are used to the best possible effect, and that their life-contexts stimulate and encourage the active use of those resources. In bilinguals, this includes the use of both languages. However, the use of language also has a strong emotional component, and in bilinguals, the different languages can have strong associations with different autobiographical memories. To date, there is comparatively little research into the skills and deficits in language, communication and cognition encountered in bilingual people with dementia. Thus, Nicole's research complements the already established research in ageing and dementia at ICSG, and the research in discourse analysis, narrative, and clinical linguistics in Speech and Language Therapy.

NUI GALWAY IS HOSTING TWO US FULBRIGHT SCHOLARS THIS ACADEMIC YEAR



THOMAS A. METZGER

Ph.D. candidate, University of Notre Dame, France

Thomas A. Metzger (University of Notre Dame) is a Ph.D. candidate and has received the U.S. Student Fulbright Award and the Whitaker International Fellowship for the 2014-15 academic year. At NUI Galway, he is a visiting researcher for the Department of Mechanical and Biomedical Engineering.

Thomas's previous Ph.D. research has aimed to understand the role of physical exercise in musculoskeletal health. Specifically, his work seeks to characterize the response of bone marrow cells to physical stimuli, a phenomenon that is not well understood but has significant potential to provide alternative treatment approaches for bone and cartilage diseases. At NUIIG, Thomas is studying under Dr Laoise McNamara, investigating the role of cell-cell interactions in the mechanotransduction of trabecular bone marrow.

Bone marrow is a soft tissue, found within the porous compartments of bone, consisting of multiple

cell types such as adipocytes (fat cells), erythrocytes (blood cells), and mesenchymal and hematopoietic stem cells (MSCs and HSCs, respectively). MSCs have been recognised clinically for their potential for bone repair and treatment of bone diseases because of their osteogenic (bone forming) differentiation capacity. In particular, recent studies have shown that MSCs respond to mechanical stimuli *in vitro* to regulate bone formation. However, although these studies are interesting, the mechanism by which MSCs sense stimuli in their natural environment remains unknown.

At NUIIG, Thomas is continuing his work on the role of exercise on musculoskeletal health by investigating the role of cell-cell interactions in MSC osteogenesis *in vivo*. Specifically, he plans to inhibit and upregulate cell-cell interactions in harvested bone marrow cells and mechanically stimulate the cells with the use of a novel, three-dimensional *ex vivo* bioreactor. This project will

integrate immunohistochemistry, immunoblotting, and polymerase chain reaction in order to monitor the role of cell-cell interactions in osteogenic protein and gene expression. Finally, computational models will be used to further elucidate the role of cell-cell interactions in the mechanotransduction of bone marrow cells.

Thomas's work at NUI Galway promotes collaboration between the US and one of Ireland's top research institutions, NUI Galway. Moreover, this is one of the first efforts to characterize the role of cell-cell interactions in MSC osteogenesis and should provide international recognition for Notre Dame and NUIIG. Most importantly, this research will have an immediate impact on the field of MSC mechanotransduction, as well as long-term implications on the development of non-pharmaceutical musculoskeletal treatments.

NUI Galway Takes Centre-Stage in €245 Million Investment in Research

A FLAGSHIP MEDICAL DEVICE RESEARCH CENTRE IS TO BE ESTABLISHED AT NUI GALWAY AS PART OF A €245 MILLION GOVERNMENT INVESTMENT IN SCIENCE AND TECHNOLOGY. IN ADDITION, NUI GALWAY WILL PLAY A KEY ROLE IN TWO OTHER RESEARCH CENTRES ANNOUNCED ON OCTOBER 2014 IN DUBLIN BY RICHARD BRUTON, T.D. MINISTER FOR JOBS, ENTERPRISE AND INNOVATION, AND DAMIEN ENGLISH, T.D. MINISTER FOR SKILLS, RESEARCH AND INNOVATION.



➤ ABOVE: Professor Abhay Pandit, Director of CÚRAM, NUI Galway's new Medical Device Research Centre.



A total of €155 million will be invested in the new world class research centres of scale. The new funding will be delivered

through Science Foundation Ireland's Research Centres Programme, coupled with more than €90 million in cash and in-kind contributions from industry partners. The funding, announced by the Minister for Jobs, Enterprise, and Innovation, Richard Bruton, and the Minister for Skills, Research, and Innovation, Damien English, will be provided over the next six years.

NUI Galway will host CÚRAM, The Centre for Research in Medical Devices, a new national research centre, based in the heart of the medical device industry. The

core objective for CÚRAM will be to develop innovative implantable medical devices to treat major unmet medical needs.

Professor Abhay Pandit, currently Director of the Network of Excellence for Functional Biomaterials at NUI Galway, will be the Director of CÚRAM. Professor Lokesh Joshi, Vice-President For Research and Stokes Professor of Glycosciences and Director of AGRC at NUI Galway; Professor Tim O'Brien, Director of the Regenerative Medicine Institute (REMEDI) and Professor of Medicine at NUI Galway; and Professor David Brayden, professor of drug delivery at UCD will bring a depth and breadth of expertise to the new research centre.

CÚRAM will design and create implantable smart medical devices, designed and manufactured to deliver therapeutic agents, such as drugs, exactly where needed, utilising cutting edge research from biomaterials, stem cells, and drug delivery. Devices will be developed with strong clinical collaborations and with industry partners and hospital groups to enable rapid translation to the clinic.

CÚRAM's outputs will benefit particular patients with chronic diseases such as heart disease, diabetes and musculoskeletal diseases. As the global population ages, with one in three people expected to be over 65 by 2050, the financial burden for healthcare is expected to rocket. CÚRAM will position

Ireland as the driver in developing medical device technologies, which will provide affordable transformative solutions for chronic diseases to meet this challenge.

Crucially, CÚRAM will also sustain and permanently strengthen Ireland's standing as a major global hub for medical device sector research and development. CÚRAM brings together researchers from NUI Galway, UCD, DCU, UL, UCC and RCSI. The centre will include almost 40 industry partners and support product development and the creation of new spin-out companies. Partners will include indigenous Irish companies and multi-nationals such as Arch Therapeutics Inc, Aerogen, Medtronic Vascular Galway Ltd.

iCrag - Centre for Research in Applied Geosciences

ICRAG- Irish Centre for Research in Applied Geosciences

NUI Galway also forms part of the new Irish Centre for Research in Applied Geosciences (iCrag). This centre is focused on unlocking Ireland's natural resources and providing solutions to resource security problems by securing supplies of energy, minerals and safe water. Part of this work will involve "de-risking" investment by exploration companies in Ireland by providing better descriptions and models of the geology to improve our understanding of the key processes influencing their formation.

Additionally iCrag will develop innovative techniques for predicting the location and nature of resources and link them to improved methods for optimising the production of resources throughout Ireland.

iCrag initial research is built around key sectors in the geosciences, notably Raw materials, Marine Geoscience, Groundwater and Hydrocarbons. Emphasis is also placed on increasing the public understanding of geoscience in Ireland and its role in the economy. NUI Galway researchers from the discipline of Earth and Ocean Sciences in the School of Natural Sciences will contribute to all aspects of iCrag research. NUI Galway's Professor of Earth and Ocean Sciences, >>>



◀ LEFT: Ministers Bruton and English, Professor Mark Ferguson, Director General of Science Foundation Ireland and Chief Scientific Adviser to the Government of Ireland pictured with Centre Directors from ADAPT, CONNECT Centre for Future Networks & Communications, CÚRAM Centre for Research in Medical Devices, iCrag Centre for Research in Applied Geosciences and LERO The Irish Software Research Centre.

◀◀ Peter Croot, is a co-PI in iCrag and will lead research in Marine Geosciences in cooperation with colleagues from UCC, Maynooth, TCD, DIAS and the iCrag host institute, UCD

Geophysics and particularly seismic data are typically very large and growing in size, driven by many factors including higher-resolution sensors, cheaper storage and global acquisition programmes. However much of the software used on a daily basis by engineers and scientists in the field was conceived and built before the era of "Big Data". The Irish Centre for High-End Computing (ICHEC), a technology centre at NUI Galway, and its industry partners will develop new methods to modernise our approach to handle large datasets in the oil and gas sector.

Lero-Irish Software Engineering Research Centre

NUI Galway is also a significant partner in Lero, the Irish Software Engineering

Research Centre. Key Irish industry sectors such as manufacturing, medical devices, financial services, cloud computing, analytics are largely underpinned by complex software systems and structures which inform business decision making and activity. LERO's research mission is to replicate the success of traditional software engineering in the context of large-scale, pervasive, physically-integrated, highly interconnected, evolving, and continuously-available software systems, in which the boundary between design-time and runtime is disappearing.

Dr Kieran Conboy, Dean of the College of Business, Public Policy and Law at NUI Galway will lead a group of 14 new researchers who will work at the cutting edge of software project management and innovation. According to Dr Conboy, whilst the software industry is strong in Ireland, accounting for €12bn in exports, there are significant challenges to overcome to ensure this sector leverages its national expertise

internationally and plays a leading role in Ireland's recovery. Together with industry LERO at NUI Galway will develop, implement and evaluate world-leading software development and management practices in two core areas:

- **Evolving software:** The ways in which software is created and managed are constantly changing. The Lero team at NUI Galway will lead research on contemporary methods for evolving software such as lean and agile approaches, project and portfolio management, decision making and lean analytics.
- **Open software:** The development and management of software crosses teams, organisations and sectors. The team will lead research in open innovation, software ecosystems, crowdsourcing, cloud technologies and design thinking.



⤴ ABOVE: Ministers Bruton and English, Professor Mark Ferguson, Director General of Science Foundation Ireland and Chief Scientific Adviser to the Government of Ireland and members of the 5 new SFI Research Centres at the Official Centre launch on 20th of October 2014.

Dr Jim Browne, President of NUI Galway, said: "This is a wonderful endorsement of NUI Galway's consistent approach to supporting selected priority areas of research, particularly in the area of biomedical science. CÚRAM will draw on the very significant pool of talented biomedical researchers on our campus, led by Professors Abhay Pandit, Tim O'Brien, Lokesh Joshi and their teams. CÚRAM holds enormous potential for the Irish economy and the Centre will work with industry partners to support innovation and development in the medical device sector – where Galway and Ireland already have a significant profile as an international hub for 'medtech'.

Speaking at the announcement, Minister for Jobs, Enterprise and Innovation, Richard Bruton TD, said: "A key part of the Government's Action Plan for Jobs is to build on the major achievements in scientific research we have built up over the past decade and turn more good ideas into good jobs. Today's announcement will lead to the establishment in Ireland of world-class centres of research excellence and scale which will be game-changers for Irish scientific research."

Professor Mark Ferguson, Director General of Science Foundation Ireland and Chief Scientific Adviser to the Government of Ireland, said, "These five new SFI Research Centres were selected following a highly competitive and rigorous international peer review process which screened for scientific excellence and assessed potential economic and societal impact. These five SFI Research Centres complement the seven we announced last year – which are already having a major positive impact: making important scientific advances, initiating and enhancing enterprise, training people with appropriate skills, winning EU projects and enhancing Ireland's international reputation. These SFI Research Centres combine scientific research with deep and significant enterprise engagement, excellence and impact. We are confident that they will make a significant contribution to Ireland's economy, employment and reputation."



⤴ ABOVE: Ministers Bruton and English, Professor Mark Ferguson, Director General of Science Foundation Ireland and Chief Scientific Adviser to the Government of Ireland pictured with members of the CÚRAM team.

Photograph Credit: Jason Clarke.

Dementia Education Programme Incorporating REminiscence for Staff (DARES)



ABOVE: Professor Eamon O'Shea presenting the Dementia education programme at NUI Galway.



ABOVE: (LtoR) Professor Bob Woods, Professor of Clinical Psychology of the Elderly, Bangor University, Dr Dympna Casey, School of Nursing & Midwifery, Professor Eamon O' Shea, Irish Centre for Social Gerontology, Professor Kathy Murphy, School of Nursing & Midwifery, President James Browne, Dr Adeline Cooney, Head of the School of Nursing & Midwifery, Andrew Hunter, School of Nursing & Midwifery, Edel Murphy, School of Nursing & Midwifery and Dr Fionnuala Jordan, School of Nursing & Midwifery.

A pioneering trial run jointly by the Irish Centre for Social Gerontology led by Professor Eamon O'Shea and the School of Nursing and Midwifery at NUI Galway headed by Professor Kathy Murphy entitled Dementia Education Programme Incorporating REminiscence for Staff (DARES) has highlighted the potential of talking and remembering earlier times as a means of therapy for people with dementia, based on a study of three hundred people with dementia carried out over a period of three years.

It is estimated that there are 50,000 people with dementia in Ireland today with an additional 4,000 new cases every year, which will increase from now on as people are living longer. Dementia is the term used to describe a group of symptoms such as memory loss, language difficulties, confusion and disorientation which affect some people, usually in older age. It is not always clear why some people get dementia and others do not, nor can it be easily predicted, although there

may be a genetic component and lifestyle is an influence on some types of dementia.

Dementia is an expensive condition for families and the State. The annual financial burden of the disease has been estimated by researchers at NUI Galway to be 1.7 billion euros, with significant burden falling on family carers, who provide most of the care.

Whilst much of the treatment of people with dementia to date has been pharmacological, studies have shown that psychosocial interventions can also be beneficial. Reminiscence is increasingly seen as important in the care and support of people with dementia, given its potential to draw on early memories, which often remain intact for people with dementia, thereby highlighting the person's preserved abilities rather than any cognitive impairment. Despite being widely used in dementia care, evidence on the effectiveness of reminiscence remains uncertain.

The DARES trial involved using

reminiscence therapy for people with dementia in long-stay care settings in the West of Ireland. The therapy involved the use of photographs, music, mementos and memorabilia to people with dementia to encourage them to talk about their earlier life. The intervention was a structured education reminiscence-based programme for care staff, who subsequently engaged in individualised reminiscence with long-stay residents under their care. The primary research question focused on the impact of reminiscence therapy on the self-reported quality of life of residents with a diagnosis of dementia. The results showed that reminiscence therapy has a positive effect on people with dementia in long term residential care. Reminiscence can also improve the quality of the care and support that people with dementia receive as new relationships and connections are formed with staff, who are now more aware of the identity and personhood of the person for whom they care.

By **DR KIERAN WALSH**
Irish Centre for Social Gerontology



LEFT: Pictured at the signing of the MOU were Professor Lokesh Joshi, Vice-President for Research, NUI Galway; Dr Jim Browne, President, NUI Galway; Professor Tony Windebank, Deputy Director for Discovery, Centre for Regenerative Medicine at Mayo Clinic; and Professor Tim O'Brien, Director of REMEDI NUI Galway.

Mayo Clinic & NUI Galway Formalise Collaboration

COLLABORATION WILL FOCUS ON STEM CELL THERAPY, GENE THERAPY, BIOMATERIALS AND BIOMEDICAL ENGINEERING

NUI Galway has signed an agreement to formalise collaborative ties with the Mayo Clinic Centre for Regenerative Medicine in the US. The agreement follows many years of close cooperation, and paves the way for joint collaborations in clinical trials using regenerative therapies.

Collaborative research projects will focus on a number of key strategic areas of importance for both institutes, including adult stem cell therapy, gene therapy, biomaterials and biomedical engineering. Furthermore, the agreement facilitates ongoing student and staff exchange between Galway and the US.

The Memorandum of Understanding (MOU) puts the emphasis on regulatory science to facilitate global translation of regenerative medicine therapies to the clinic. Both the National University Ireland Galway and the Mayo Clinic Centre for Regenerative Medicine have GMP cell manufacturing facilities, licensed for use by the respective national medical authorities.

National University of Ireland Galway's President, Dr Jim Browne, welcoming the

signing of the MOU, said: "Formalising our longstanding links paves the way for advancing our common agenda which is to realize the potential of regenerative medicine. Here in Galway we have Ireland's only facility licenced to produce stem cells for human use, while the new clinical and translational research facility for conducting clinical trials with patients will be complete in early 2015."

NUI Galway's Regenerative Medicine Institute (REMEDI) and the Network of Excellence for Functional Biomaterials (NFB), both of which are supported by Science Foundation Ireland, are working together specifically to develop joint clinical trial programmes in the area of regenerative medicine.

Professor Tony Windebank, Deputy Director for Discovery of the Centre for Regenerative Medicine at Mayo Clinic said: "Mayo Clinic and NUI Galway have an established track record and commitment to regenerative medicine over the last decade. The Mayo Clinic has prioritised the development of new regenerative medicine clinical applications as a critical strategy for meeting the needs of patients in the future, which was evidenced in the



WATCH CLIP
To watch this video featuring Professor Tony Windebank, Deputy Director for Discovery of the Centre for Regenerative Medicine at Mayo Clinic visit: <https://www.youtube.com/watch?v=B98ci3iAkNE>

formation of our Centre for Regenerative Medicine in 2012."

The signing of the MOU comes on top of the recent announcement of a new \$16 million agreement between Mayo Clinic and Enterprise Ireland where up to 20 novel medical technologies will be commercialised in Ireland over the next five years with the aim of creating several high value medical technology spin-out companies.

HARNESSING THE RESEARCH POTENTIAL BETWEEN NORTHERN AND SOUTHERN IRELAND, THE FUSION PROGRAMME IS CONTRIBUTING TO THE CREATION OF INDUSTRY READY RESEARCH GRADUATES. AS NUI GALWAY JOIN THIS HIGHLY PRESTIGIOUS PROGRAMME, DR GER HURLEY OUTLINES SOME OF THE EARLY INDICATORS OF SUCCESS FROM THIS NEW PARTNERSHIP.

NUI Galway Joins FUSION Programme

The FUSION Programme is a North-South initiative run by InterTrade Ireland. The programme is a business academic graduate partnership. The partnership involves a company, a third-level institution with specialist expertise and a high calibre science, engineering or technology graduate. The graduate is employed by the company and mentored by the academic partner and an InterTrade FUSION consultant. Participating companies in Northern Ireland have an academic partner based in the South and vice versa. The programme has been running for 10 years and this year an academic from NUI, Galway joined the programme for the first time.

Alan Little Ltd is an Electrical engineering company providing Electrical Installation, Testing and Maintenance services to both the Private and Public Sector. They are a systems integrator providing complete industrial automation, safety consultancy and maintenance to organisations across various sectors. The main objective of the FUSION project is the development of processes incorporating the upgrade of knowledge and IT skills to provide advanced electrical engineering design for export customer base in industrial automation, including the integration of process



▲ ABOVE: Jim Daly, General Manager, Little Electrical, Paul Lennon, FUSION graduate, Oonagh Monahan, InterTrade Ireland FUSION Consultant and Prof Ger Hurley, NUI, Galway.

control systems, machine design and commissioning in a one stop turnkey operation.

The Power Electronics Research Centre (PERC) was established in 1992 in a partnership between Government, Industry and the University Sector. The Centre is based in a 60 m² facility in the new Engineering Building of NUI Galway. The aim of the Centre is to foster links with industry by transferring technology from a strong research base in the University to the wider community. The Centre is now involved in a number of new areas of research activities: automotive electronics; sensor technology; battery management, power harvesting, and renewable energy systems. PERC has extensive experience of working with industry.

This current project will inform the new programme in Energy Systems Engineering, with its first graduating class in 2013. The Centre has also worked with a local start-up company in the area of battery testing. PERC has previously worked with companies on ultracapacitors for energy storage and battery testing under the Enterprise Ireland Innovation Voucher Scheme.

The University will use the practical experience gained to reinforce the industrial and commercial relevance of many current undergraduate courses through generation of new project material and new course notes. The University will also implement the know-how and knowledge gained as course material in postgraduate programmes and in short-course programmes for industrialists. The programme presents excellent research opportunities with the company to further develop and expand its business into high value added products and processes.

FUSION provides an excellent opportunity for research centres in the University to expand their range of activities while providing expertise to the wider industrial community and at the same time strengthening the knowledge base of the centre.

Further information on FUSION may be obtained by contacting Oonagh Monahan, InterTrade Ireland FUSION Consultant at: omonahan@fusionprogramme.com

By **DR GER HURLEY**
College of Engineering and Informatics

AGRICULTURAL SCIENCE IS TYPICALLY ASSOCIATED WITH THE CHALLENGES OF PRODUCING FOOD AND MANAGING EARTH'S ENVIRONMENT. HOWEVER, IN A PUBLIC LECTURE AT THE INVITE OF ASTRONOMY IRELAND, I INTRODUCED TO THE AUDIENCE ONE OF THE MORE UNUSUAL ASPECTS OF AGRI-RESEARCH: CROP PRODUCTION AND ASTRONOMY.

Crops in Space

The interaction of these diverse branches of science is not, in fact, new. Ancient societies such as the Inca depended on astronomical observations to demarcate their agricultural calendar. In modern times, high resolution imagery from satellites such as Terra and Aqua, and powerful cameras o cropsn board the International Space Station, are used by the Spatial Analysis Laboratory at Teagasc to monitor grass growth, and by institutions such as the Upper Midwest Aerospace Consortium to track erosion, glacial melt and soil moisture, respectively. While once humanity looked to the stars to guide agriculture, we can now look down, to do that same thing.

Over several decades both NASA and private enterprises such as the Mars One project have been developing novel approaches to crop production, suitable for use on the International Space Station, and with a view to supporting prolonged space missions. One of the chief challenges is in providing a suitable substrate for plant growth, a role which on Earth is conveniently filled by soil. These substrates must be capable of supplying the nutrients, support and water required by the growing plant. Zeoponics is one potential solution, in which zeolite crystals, which can absorb and release water and nutrients in response to plant demand, are used in place of a traditional soil medium. This same technology is widely used in golf courses to maintain the quality of greens year round.

One difficulty in using Zeoponics, or in designing any substrate for use in space, relates to changes in the water retention properties of soil. As part of my PhD research – which is supervised by Drs Mark Healy and Tiernan Henry (Ryan



◀ LEFT: Sara Vero, PhD Student presenting her research at the Astronomy Irelands Research Series in 2014

Institute) and Dr Owen Fenton (Teagasc) - I use high speed centrifugation to determine these properties for soils and substrates on Earth, and a numerical model that then tells me about the transport of solutes. However, research¹ has shown that under the reduced gravitational forces of the Martina and Lunar landscapes, water would not be retained in soils in the same way that it would be here on our planet. So, a fresh approach to hydrological modelling and the use of innovative crop substrates is required to face extra-terrestrial agricultural challenges!

The lecture was well received by Astronomy Ireland and is part of their on-going series which has featured past guests such as Professor Peter Watkins of CERN and Dr Brian Cox.

¹ Jones et al. (2005)

By **SARA VERO**
PhD Student, Ryan Institute & Teagasc

APPROXIMATELY ONE THIRD OF ALL THE FOOD CONSUMED BY HUMAN SOCIETY IS DEPENDENT ON BEE POLLINATION AND IN SOME PARTS OF THE WORLD DEMAND FOR POLLINATION IS OUTSTRIPPING SUPPLY. IN IRELAND AND ACROSS THE WORLD WILD HONEY BEE POPULATIONS HAVE UNDERGONE WIDESPREAD EXTINCTION LEADING TO NOT ONLY A LOSS OF BEES BUT ALSO A LOSS OF THE GENETIC DIVERSITY THAT ENSURED THE HEALTH OF BOTH WILD AND DOMESTICATED BEE COLONIES.

For the Bees

A

At NUI Galway a bee breeding programme has recently been initiated on native Irish bee colonies to improve resistance to disease while retaining important colony traits.

The programme was proposed by Mr. Dara Scott of Advance Science Limited, an on-campus company involved in the development and sale of natural colony protection supplements. Dara is an experienced beekeeper and a member of the Native Irish Honey Bee Society (NIHBS), which are strongly supporting the programme.

The programme now forms part of the research of a PhD student supervised by Dr Grace McCormack, Head of Zoology and Ryan Institute researcher. The PhD student (the author of this article) will also be investigating additional questions surrounding the evolutionary genetics of Irish honey bees *Apis mellifera mellifera* L. and the traits linked to disease resistance.

“Research in this area is of paramount importance because of the often unappreciated but crucial role that honey bees play in human society including the pollination of commercial and indigenous flora, and of the decline of *A.m. mellifera* in Europe” explains Grace. There has been extensive assisted geographical movement and selective breeding of different honey bees in Europe and the US with the aim of bringing honey production to new areas or to enhance production. One of the consequences of this process was that the Asian honey bee *Apis cerana* and its ectoparasitic mite, *Varroa destructor* came into contact with the European Western honey bee *A. m. mellifera*. Since the Western honey bee had no innate resistance to this mite, *Varroa* as it has become known, became highly prevalent and is considered the main cause behind the high colony

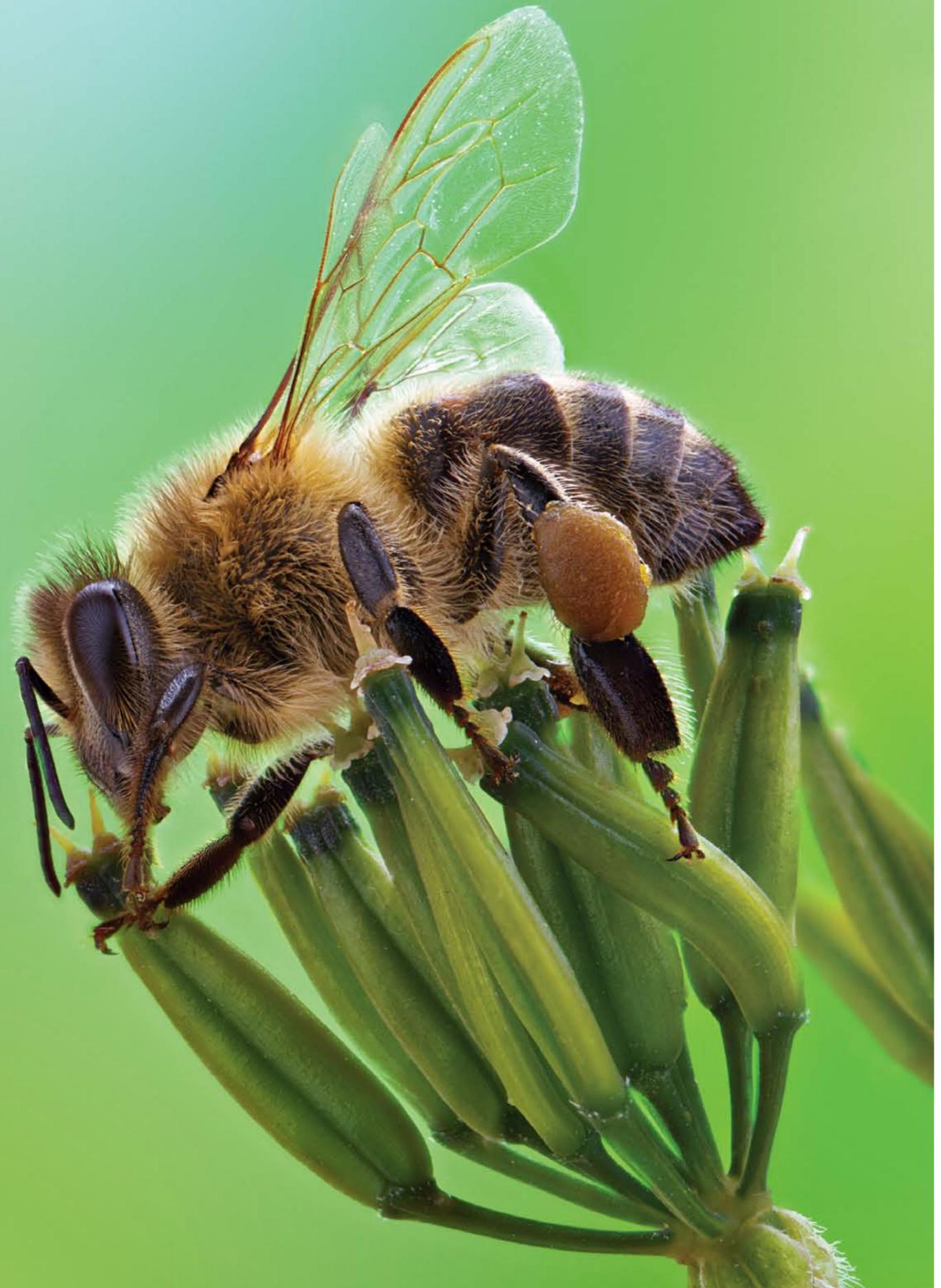
losses which currently plague commercial and amateur beekeepers in most of northern Europe. It acts directly on honey bee colonies and also weakens their defence against bacterial, fungal and viral pathogens.

Beekeepers, of necessity, have used a combination of selective breeding and chemicals for control of *Varroa* and the associated pathogens. The importation of non-indigenous honey bees considered more *Varroa* resistant is also extensively used, which further threatens the integrity of putative native strains. The chemical approach, whilst considered necessary, can introduce unwanted substances into honey products and, importantly, selects for resistant *Varroa* thus driving their evolution towards greater resistance to those chemicals. This chemical treadmill will involve a continuous escalation of costs. Selective breeding has a more insidious effect and can negatively alter the genetic diversity of the native stock.

One of the last places in Europe where the Western honey bee sub-species *A.m. mellifera* went extinct in the wild is Ireland. Here NIHBS beekeepers have resisted the practice of introducing other species. The result is one of the most minimally introgressed *A.m.mellifera* stock remaining worldwide. Optimistically, there is anecdotal evidence of *Varroa* resistance in some of this native stock.

If successful, this programme can help ensure the continued arrangement of mutual benefit that our society has with the Western honey bee which permits the best quality and quantity of our crops and crucially allows its reintroduction into the wild in Ireland and elsewhere.

By KEITH A. BROWNE
PhD Student and Dr Tony Ryan Research Fellow



Pleasures and Pains of Academic Work

A RECENT STUDY CONDUCTED BY DR VICTORIA HOGAN, SCHOOL OF HEALTH SCIENCES, INVESTIGATED WORK-LIFE INTEGRATION IN ACADEMIA AND THE PSYCHOLOGICAL WELL-BEING OF IRISH ACADEMICS.

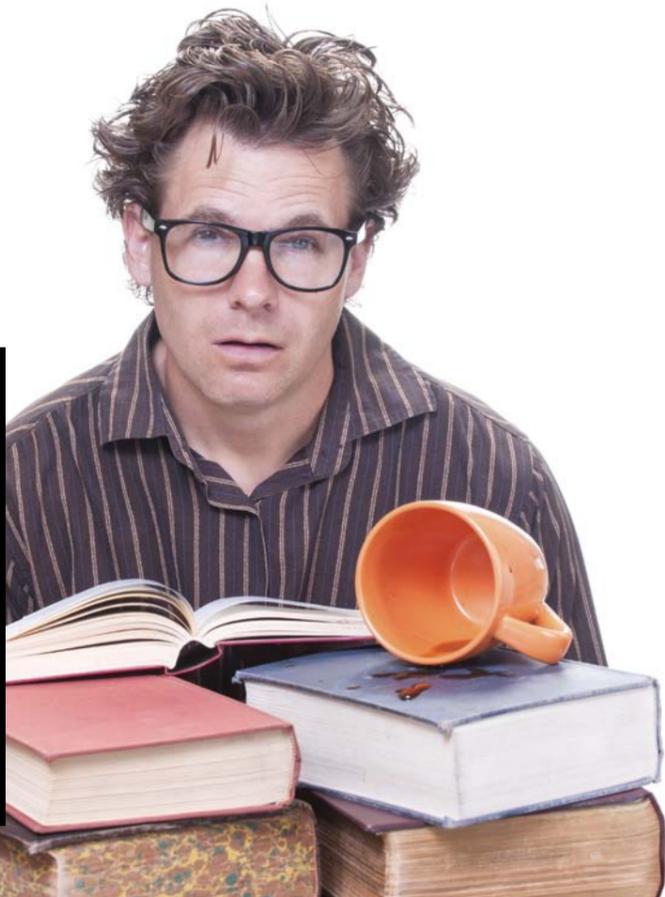
Three inter-related studies involving three universities were conducted; a large scale electronic survey, a week long diary study and a series of interviews with academics. The results revealed the demanding nature of academic

work and factors that sustain well-being. Notably, almost half of the 410 academics surveyed worked in excess of 48 hours per week, often working at home at nights and at weekends, not taking holidays and lunch breaks. The home was regarded by many academics as an extension of the workplace and academic work was viewed as potentially all consuming with few boundaries to separate work from home life. Of concern from an occupational stress perspective were the findings that 92% of academics felt unrewarded for their efforts and over half felt that their promotional prospects were poor.

When gender differences were considered in the study, a number of interesting findings were observed. For example, although male academics worked longer hours than females, female academics reported poorer psychological well-being, heavier work demands and higher levels of worry and rumination. At home female academics spent significantly more time engaged in childcare and household activities than male academics while male academics spent significantly more of their free time engaged in additional work, suggesting that the traditional male 'breadwinner' role and female 'primary carer' role still persist. Such constraints on the working time of female academics may contribute to promotional disadvantage and stress. Indeed, many female academics who adhered to a 40 hour week and maintained firm work-home boundaries believed that they were regarded as less committed workers and that this work pattern was contrary to long hours expectations. Additional analyses investigating propensity towards workaholism in academia revealed that strong inner compulsion to work predicted higher levels of work-life conflict and stress and workaholic academics had poorer functioning across a range of measures, in particular, greater difficulty in recovering and detaching from work, higher emotional exhaustion and greater fatigue.

Importantly, engagement in physical and social activities during non-work time facilitated the highest levels of post-work recovery and were identified as important restorative processes that can prevent the onset of stress and fatigue. Additional practices which facilitated well-being included: maintaining boundaries between work and home, resting at the weekend, and engaging in activities during non-working time that were very absorbing and distracting. Finding suitable ways of switching off from work is vital for highly engaged workers, particularly when the demands at work are high. Despite the intensive nature of academic work, high work enjoyment and high work involvement were also very evident. However, on balance, work enjoyment and involvement do not appear to compensate for the effect of long working hours and work-life conflict on stress and going forward both university management and academics need to take steps to protect the health and well-being of the academic workforce in a broader social and political context of decreasing resources and increasing demands.

By **DR VICTORIA HOGAN**
College of Medicine, Nursing and Health Sciences



NUI Galway and SmartBay Funding Success to examine Galway Bay Marine Environment

RESEARCHERS BASED IN NUI GALWAY HAVE RECENTLY BEEN AWARDED HIGHLY PRESTIGIOUS RESEARCH FUNDING FROM THE IRISH RESEARCH COUNCIL THROUGH THE ENTERPRISE PARTNERSHIP SCHEME. IN PARTNERSHIP WITH SMARTBAY IRELAND A SIGNIFICANT INVESTMENT HAS BEEN MADE THAT BRINGS TOGETHER AN INTERDISCIPLINARY TEAM OF RESEARCHERS FROM THE DISCIPLINE OF INFORMATION TECHNOLOGY, NUI GALWAY AND THE DEPARTMENT OF CHEMICAL SCIENCES IN DUBLIN CITY UNIVERSITY TO DEVELOP A NUMBER OF RESEARCH STREAMS THAT UTILIZE THE NATIONAL MARINE TEST & DEMONSTRATION FACILITY MANAGED BY SMARTBAY IRELAND.



ABOVE: (L to R) Dr Enda Howley (NUI Galway), Dr Eucharia Meehan (Irish Research Council), Siobhan Moran (NUI Galway), John Devlin (SmartBay Ireland), Dr Jim Duggan (NUI Galway), and Prof Fiona Regan (DCU).

The Primary Investigators from NUI Galway are Dr Enda Howley and Dr Jim Duggan while Prof Fiona Regan is leading the researchers from DCU. John Breslin and Regina McNulty lead the research team on behalf of SmartBay Ireland.

NUI Galway researchers will begin development on accurate data visualizations of Galway Bay marine environment that can leverage the existing SmartBay infrastructure and accurate weather data. The outcomes of this research will be of pivotal use to key stakeholders such as members of the public, emergency response agencies, city and marine professionals.

At the announcement of the funding Dr Enda Howley commented that "the project is a great vote of confidence by the IRC in the researchers involved in this area. This major investment shows the capacity of NUI Galway to partner on interdisciplinary research projects that have huge potential to impact on people's daily lives. This particular research project based in NUI Galway aims to develop technologies that can assist all those who are potentially impacted by the marine conditions surrounding our cities. The chilling impact of this could be seen earlier this year in Galway City where extensive damage was inflicted by flood waters at Leisureland in Salthill and businesses at the Spanish Arch. Any technology that can assist us in better understanding the potential impact of coastal marine events can have a major long-term impact"

John Breslin from SmartBay Ireland stated "we were delighted to secure 4 enterprise-academia research partnerships through the Irish Research Council's, Enterprise Partnership Scheme. SmartBay Ireland will support the successful students in a wide variety of research areas, such as: data visualisation from our sub-sea cabled observatory; flood management analytics; the development of materials to mitigate the effects of marine growth and the detection of harmful algae blooms. All projects will utilise the National marine test & demonstration facility managed by SmartBay Ireland in Galway Bay. The SmartBay team will provide data and technical support to ensure the success of these applied projects".

The announcement was made in the Royal College of Physicians of Ireland on the 18th July by Minister for Research and Innovation Seán Sherlock TD and Dr Eucharia Meehan. Awards to the sum of €5.7m were made by the IRC through the Enterprise Partnership Scheme.

By **DR JIM DUGGAN**
College of Engineering and Informatics

Two Expert Psychologists Appointed by HRB as National Research Leaders

THE HEALTH RESEARCH BOARD (HRB) HAS APPOINTED SIX NATIONAL HRB RESEARCH LEADERS AS PART OF AN €9 MILLION INVESTMENT TO ADDRESS STRATEGIC GAPS AND LEADERSHIP CAPACITY IN POPULATION HEALTH AND HEALTH SERVICES RESEARCH IN IRELAND. PSYCHOLOGISTS DR MOLLY BYRNE AND DR BRIAN MCGUIRE HAVE TOGETHER BEEN AWARDED ALMOST €3M TO LEAD TWO AMBITIOUS RESEARCH PROGRAMMES OVER THE COMING 5 YEARS.

D **DR MOLLY BYRNE**, Health Psychologist secured €1.4m to set up the Health Behaviour Change Research Group. Health behaviour is one of the primary causes of premature illness and death in the developed world. Changing health behaviour can prevent, manage and reverse disabling and life-threatening diseases. The HBCRG is a centre of excellence in evidence-based health behavioural intervention development, evaluation and implementation. The Group is linked in with other national and international interdisciplinary research groups, and is building capacity and training opportunities for those interested in behaviour change research for health.

Dr Byrne has recently recruited a dedicated team, including post-doctoral researcher Dr Jenny Mc Sharry, strategic development and project manager Ms Valerie Parker, PhD student Ms Milou Fredrix and SPHeRE PhD Scholar Ms Caragh Flannery. The Group works in partnership with the National Clinical Care Programme in Diabetes, and collaborates with international partners such as University College London's Centre for Behaviour Change and the Manchester Centre for Health Psychology.

Currently the Group is identifying the most important behaviour change targets relevant to diabetes treatment and prevention

by engaging with key stakeholders – the public, service users, service providers and policy makers – in a research prioritisation exercise. By involving key stakeholders at this early stage, the HBCRG aims to increase the relevance of the research and to maximise the potential for future translation of the research findings into practice.

Dr Byrne explains, 'In Ireland, as is the case internationally, an increasing number of the healthcare problems are linked to our behaviour. There is powerful evidence that changing people's health-related behaviour, for example, smoking, poor diet, excessive alcohol consumption, and lack of exercise, can impact positively on leading causes of mortality and morbidity, such as cardiovascular diseases and diabetes. But we all know changing behaviour is not easy! It is clear that we need to take into account the psychological and social factors which determine people's behaviour, and use psychological theories to develop effective interventions to change these behaviours'.

For further information, see our website: http://www.nuigalway.ie/psychology/health_behaviour_change_group.html

Keep up to date by joining our mailing list. Contact: healthbehaviourchange@nuigalway.ie



⤴ ABOVE: Ms. Marggie Jones, Ms. Catherine Quinn, Dr Siobhan O'Higgins, and Dr Brian McGuire, of the School of Psychology and Centre for Pain Research; Dr Molly Byrne, Dr Jenny Mc Sharry and Ms Valerie Parker, School of Psychology and Health Behaviour Change Research Group.

DR BRIAN MCGUIRE, Centre for Pain Research will research and deliver new psychological approaches to treat people living with multi-morbidities - where a number of physical symptoms or disease are present at the same time, such as arthritis, depression and chronic pain. The treatments will focus particularly at helping people to cope with chronic pain.

The first step in Dr McGuire's research is to identify the number of people in Ireland who have multi-morbidity where chronic pain is a feature and to estimate what this costs. The second step is to develop and test a range of psychological interventions for people with chronic pain in the context of their other medical conditions and evaluate the impact of these interventions. The interventions will utilise technology wherever possible – such as online therapy, phone apps and devices to monitor symptoms.

Dr McGuire explains, 'There is evidence to show that psychological interventions, such as Cognitive Behavioural Therapy (CBT), can help with physical symptoms like chronic pain. But access to these psychological treatments is scarce in Ireland. We will develop new ways to offer treatments like CBT using online, mobile phone technology and social media. We would hope that if these approaches are successful, they would have the potential to benefit large numbers of people worldwide, not just in Ireland'.

The research team has been recruited and includes Dr Brian Slattery, a post-doctoral researcher in psychology, Ms. Marggie

Jones who brings expertise in information technology, and Ms. Catherine Quinn, a qualified physiotherapist with a special interest in pain management. The activities of the Research Leaders Award will also include the establishment of a new course in eHealth which will roll out in 2016.

For more information, please visit: http://www.nuigalway.ie/centre_pain_research/index.html

The HRB Research Leaders Awards has also resulted in the creation of the HRB Research Leaders Network, which includes the six national Research Leaders: Prof Patricia Kearney, UCC; Prof Cathal Walsh, TCD; Prof John Forbes, UL; and three from NUI Galway: Prof Ciaran O'Neill, Economics; and Dr Molly Byrne and Dr Brian McGuire of the School of Psychology. The purpose of the Network is to develop collaborative and strategic alliances with a focus on:

- The development of competitive funding proposals
- Research training and professional skills development
- Strategic input into the current health research agenda
- The establishment of networking and collaborative platforms.

By **VALERIE PARKER**
HBCG and College of Arts, Social Sciences and Celtic Studies

DISSATISFACTION WITH PHYSICIAN-PATIENT COMMUNICATION IS KNOWN TO BE A LEADING FACTOR INFLUENCING PATIENTS' DECISIONS TO INITIATE MEDICINE NEGLIGENCE PROCEEDINGS.

Research in Medical Education



Physicians' communication skills have a considerable impact upon quality of health care. Good communication skills improve healthcare outcomes, such as physiological status, pain control, and emotional health. Furthermore, good communication skills significantly increase patient understanding and patient satisfaction.

Within schools of medicine, dentistry, veterinary medicine, nursing and health sciences, practical communication skills training has been shown to improve student performance in relationship building, time management and patient assessment. NUIG School of Medicine/Medical Informatics & Medicine Education (MIME), headed by Dr Thomas Kropmans, developed an Online Marking Tool (OMIS). "OMIS provides detailed analysis of the quality of clinical skills assessments, so we provide detailed insight in student's acquisition of communication skills and the way it is being assessed by faculty" according to Dr Kropmans. The most striking finding of Winny Setyonugroho's PhD research in this area is a demonstrated absence of consensus in the way communication skills are assessed Internationally. Furthermore, it is apparent that there is a clear absence of consensus in the interpretation of terminology used and the use of performance standards in the assessment of communication skills. Thus, it is likely that there is a lot of variation between different departments within a medical school as well as across different years within the medical curriculum being taught in different universities. NUI Galway is the first university engaged in medical education research as to how communication skills are being assessed using their Online Marking Tool to how clinical skills assessments can be improved.

The OSCE

The Objective Structured Clinical Examination (OSCE), is the assessment tool most commonly used for assessment of clinical skills in schools of medicine, dentistry, veterinary medicine, nursing and health sciences. Research suggests that the OSCE is appropriate for high-stakes assessments in which students go through a series of up to 30 stations and in each they demonstrate competency in critical skills (history taking, or practical skills like CPR as in figure 1). In addition to practical clinical skills, the OSCE can be used to assess complex communication skills. In our Medical School, the majority of OSCE stations combine both the assessment of domains of communication skills with assessment of a specific set of clinical skills. Interpretation of student performance in such stations can be complicated by the combination of communication and clinical skills assessment. Students could compensate between these skills to achieve a pass grade overall but their performance in communication skills is often not immediately apparent. The OSCE assessment procedure is also used for admissions interviews known as Multi Mini Interviews (MMIs).

Marking OSCEs, Exams and Standard Setting

The pass mark for NUIG medical students is 50%, in contrast to other sciences where the pass mark is only 40%. These pass marks vary between different institutions worldwide. In a simple way taking skills assessment into account in some institutions you pass with at least a 50, 60, or 65% average result.



⤴ ABOVE: Winny Setyonugroho explaining his research results to Dr Karen Doyle vice-president of Graduate Studies NUI Galway.

⤵ LEFT: The real life CPR station (student Diarmuid Donovan) being assessed online by Liam Griffin of Qpercom Ltd.

⤵⤵ FAR LEFT: Dr Louise Cambell wears 'Spy Glasses' and is instructed by medical student Ayisha Hennelly with the recorded OSCE station projected in the background.

"To avoid dissatisfaction with physician-patient communication, we therefore need to know precisely what we are training and assessing" says Winny. "Currently it is like assessing the temperature of water with the tip of your finger and guessing its temperature. The standard should be to use a thermometer to get it right". The MAAS-Global is known as the thermometer to assess communication skills but is not yet widely adopted. NUI Galway is one of the first medical schools to calibrate its communications skills according to this thermometer. After reviewing the existing literature on communication skills assessment in OSCE settings, Winny and the MIME team calibrated all 2800 checklist items of existing station form checklists according to the MAAS-Global. "Now we are able to calculate the 'true' caliber of communications skills" according to Dr Kropmans.

Dissemination of Research Results

It is extremely important in medical education research that the outcome of this research is used to improve educational decision making regarding pass or fail decisions. For his research, Winny used data being generated by an online marking tool known as OSCE Management Information System (OMIS). OMIS was developed in 2006 in MIME by David Cunningham and Dr Thomas Kropmans with local educators, examiners and researchers validating and testing this online marking tool. Benchmarking their system showed in 2006 that they developed a unique tool for these kinds of assessments. Sean Dinneen Head of the Medical School mentioned: "With the high standards set by our university, this spin off company from our medical school, continues the tradition of both collaborative

research and collaborative work with commercial and academic partners. By creating the OMIS, they have managed to make the laborious and unreliable paper trail in observational assessments and admission interviews obsolete. We also benefit from Qpercom's first class collaborative partner universities like Dundee University, the National University of Singapore, Erasmus University in Rotterdam and the Karolinska Institutet in Stockholm, who are happy to share their experiences and challenges with the Qpercom team. This type of research will eventually change the way we look at communication skills training and assessment, and the evaluation of training our examiners and students."

Currently, 4 employees in Qpercom serve 18 prestigious universities like the University of Dundee, and St Andrews University in Scotland, Karolinska Institutet in Sweden but also Erasmus University Rotterdam and the veterinary school of The University of Utrecht in the Netherlands. Last but not least also number 8 on the QS University ranking list, the National University of Singapore is on board. As one of our clients suggested: "You don't sell software, you sell expertise in observational clinical skills assessment".

Our latest summer research project with NUI Galway medical student Ayisha Hennelly is about assessor's behavior while examining students in an OSCE on paper and on a tablet. Her abstract: "Spy glasses prove paper marking OSCE stations is faster than using tablets, the truth!" has just been submitted for presentation at the International Student Congress of (bio) Medical Sciences ISCOMS 2015 in Groningen (NL).

By **DR THOMAS KROPMANS**
College of Medicine, Nursing and Health Sciences
and **MS GERALDINE WARREN**

RESEARCH IN FOCUS

A CLOSER LOOK AT RESEARCH ACTIVITY
ON AND OFF CAMPUS

Lindau Nobel Laureate Meeting Award goes to NUI Galway Researcher

The Minister for Skills, Research and Innovation, Mr Damien English T.D., and Professor Orla Feely, Chairperson of the Irish Research Council, recently presented NUI Galway researcher Dr Aileen Ryan with an award in recognition of her selection and participation in the Lindau Nobel Laureate Meetings.



⤴ ABOVE: The Minister for Skills, Research and Innovation, Mr Damien English T.D., (left) and Professor Orla Feely, Chairperson of the Irish Research Council, (right) recently presented NUI Galway researcher Dr Aileen Ryan with an award in recognition of her selection and participation in the Lindau Nobel Laureate Meetings.

⤵ LEFT: NUI Galway researcher Dr Aileen Ryan with her award in recognition of her selection and participation in the Lindau Nobel Laureate Meetings.

SIAM Modelling Workshop at NUIG

The newly formed SIAM student chapter at NUI-Galway organised a four-day undergraduate modelling workshop, in conjunction with the Stokes Cluster of the School of Mathematics, Statistics and Applied Mathematics. While the workshop followed a similar format to that of a European Study Group with Industry (ESGI), it was pitched at an undergraduate level, giving most of the students their first contact with the mathematical modelling of real-world problems. On the opening day, four

problems were presented, two of which were adapted from previous ESGIs and two developed independently with the intention of ensuring a broad range of topics. At the end of the programme each group presented their findings. A total of nineteen undergraduate students took part in the event, hailing from the University of Limerick, University College Dublin, University College Cork, Trinity College Dublin, NUI-Galway, Enseirb-Matmeca- Bordeaux and Ecole centrale de Marseilles. It is hoped that this workshop



is the first of many such productive collaborations between the SIAM student chapter and the Stokes Cluster at NUI-Galway.

NUI Galway Confers Honorary Degrees on Commissioner Máire Geoghegan-Quinn, Lt. Gen. Seán McCann and Finian O'Sullivan

NUI Galway conferred three outstanding individuals with honorary degrees on Friday, 27 June, 2014. Those conferred were: Máire Geoghegan-Quinn, EU Commissioner for Research, Innovation and Science; Lt. Gen. Sean McCann retired Chief of Staff of the Irish Defence Forces; and Finian O'Sullivan Founder of Burren Energy Plc.



Minister congratulates Dobbin Scholarship Recipient

Minister for Education Ruairi Quinn T.D. and Dr Eugene Farrell (Geography & Ryan Institute) discussing NUI Galway's new MSc programme in Coastal and Marine Environments (starting September 2014) at the Ireland Canada University Foundation (ICUF) Dobbin Award ceremony hosted on June 20th by Canadian Ambassador to Ireland, Loyola Hearn. Dr Eugene Farrell was the recipient of a Dobbin Scholarship which will support him to conduct one month of coastal research in Vancouver, Canada with his host, Dr Ian Walker, University of Victoria.



RESEARCH BYTES

A ROUND UP OF RESEARCH NEWS AT NUI GALWAY

Dedicated Geographers Offer New MSc in Coastal and Marine Environments

Ireland has many challenges to face in regards to the sustainable use of our coasts, as was highlighted last year by the extensive damage to coastal infrastructure during severe winter storms. In light of this definite socio-economic and environmental need, the timing of one of NUI Galway's newest

taught Masters course, "Coastal and Marine Environments: Physical Processes, Policy and Practice" couldn't be more appropriate.

As part of this one year programme, students will be trained to conduct socially relevant research using best

scientific practices and short field courses, and will participate in work placements aiding in their professional development giving them desirable career opportunities. Students will be mentored by staff who are active in international field science research and who will integrate them into research projects.

The EU has agreed its funding framework for the next decade (Horizon 2020) and one of the core 7 research themes is Marine and Maritime activities. This means that there are currently a series of large research projects coming to fruition requiring PhD candidates with strong foundations in the coastal and marine sciences. This programme aims to make NUI Galway students competitive in this market.

Dr Aaron Potito, Head of the School of Geography and Archaeology says "Staff in Geography recognise that there is a need for this type of programme. National policies that control how the Irish coastal

and marine environments are managed and achieve Good Environmental Status (GES) by 2020 require personnel trained in both science and policy. Most new coastal and marine policies at national and European levels - like Harnessing our Ocean Wealth and the Marine Strategy Framework Directive - include commitments to consider the natural environment and the implications of climate change in our decisions, yet scientific training is rarely offered in conjunction with these new policies. The new MSc programme is designed to fill some of these gaps."

Prof Colin Brown, Director of the Ryan Institute says "The level of commitment of so many environment, marine and energy researchers to generate real, positive sustainable change in our society continually astounds me. Staff members in Geography have agreed to offer this course on top of existing workloads, in spite of current constraints on funding and resources. NUI Galway, located on Europe's Atlantic seaboard, has the capacity to develop a leading role in marine and maritime activities in Ireland and can



➤ ABOVE: New postgraduate students and NUI Galway School of Geography staff at the launch party of the new MSc programme on the RV Celtic Explorer. [Acknowledgement: Vessel access provided by Irish Marine Institute].

make a unique contribution to some of the major trends in marine education and training in the EU. The MSc will be greatly enhanced through partnership with the Ryan Institute and this will improve student opportunities, research

collaborations within NUIG and promotion of coastal and marine research in Ireland."

By **DR EUGENE FARRELL**
School of Geography & Archaeology
and the Ryan Institute



➤ ABOVE: Caption: Dr Eugene Farrell (Codirector), Mayor of Galway, Mr. Donal Lyons, Dr Kevin Lynch (Codirector) and Prof Colin Brown, Director the Ryan Institute NUI Galway on the bridge of the RV Celtic Explorer at the launch party of the new MSc programme. [Acknowledgement: Vessel access provided by Irish Marine Institute].

IRC International Career Development Fellowship awarded to NFB PhD Student

Shane Browne, a final year PhD student at the Network of Excellence for Functional Biomaterials (NFB) at NUI Galway, has been awarded an Irish Research Council International Career Development Fellowship under the ELEVATE scheme. The award will cover his postdoctoral research at the University of California, Berkeley,

USA to collaborate with Professor Kevin Healy for two years.

The aim of this initiative, co-funded by Marie Curie Actions, is to allow Irish-based experienced researchers who have gained most of their research experience in Ireland to carry out research at an International Host Organisation. The

scheme requires researchers to spend a mandatory one year return phase at a returning Host Organisation of their choice in Ireland. Shane will spend a third year at the NFB at NUI Galway to complete his fellowship.

The project involves novel methods of treating limb ischemia which occurs

when the blood supply is lost to a limb. Delayed treatment of the condition leads to morbidity, amputation and even death. Shane's research will involve promoting new blood vessel growth to the limb using biomaterials in Professor Healy's Laboratory.

Professor Healy's work focuses on the interface between biology and materials science to develop engineered systems to explore both fundamental biological phenomena and new applications in translational medicine. The research group at Berkeley is highly interdisciplinary,

incorporating researchers from the fields of bioengineering, materials engineering, medicine, and molecular biology.

Shane is completing his PhD which is funded by Science Foundation Ireland (SFI), under the supervision of Professor Abhay Pandit studying treatment of myocardial infarction (MI). He has received multiple rewards for his postgraduate research including a German Academic Exchange Service (DAAD) fellowship and European Molecular Biology Organization (EMBO) travel fellowship.





We Cannot Negotiate With Nature

AFTER 2020, DEVELOPING COUNTRY EMISSIONS WILL OVERTAKE THOSE OF THE DEVELOPED WORLD. IN THE MEANTIME, THE RATE OF GROWTH OF OVERALL DEVELOPED COUNTRY EMISSIONS SHOULD START TO FALL, FOLLOWED BY AN OVERALL ABSOLUTE REDUCTION FROM 2020 ONWARDS.



European Commission, Communication on Limiting Global Climate Change to 2° Celsius, January 2007

It is well documented and understood that the built environment accounts for more than 40% of the overall energy consumption and 36% of the overall CO₂ emissions. Yearly statistics show that construction and the upkeep of our buildings and infrastructure is the largest industry worldwide accounting for approximately 10% of global GDP.

Modern construction processes are lacking in mechanisms to support the decision-making, execution and commissioning phases. This can result in defects that degrade the intended energy and comfort performance of new structures and retrofits. The EU has taken a leadership role by announcing its own ambitious unilateral measures through the Horizon 2020 framework.

To address this concern, Ryan Institute Built Environment & Smart Cities Researchers have just signed the contracts for a new Horizon 2020 Public-Private Partnerships project called Built2Spec. This research brings together experienced partners to develop breakthrough technological advances

with a specific focus on the development, use, integration and delivery of portable and robust systems that can be easily handled in the construction site.

Involving 20 partners, PI's Dr Marcus Keane, Dr Jamie Goggins & Dr Magda Hajdukiewicz (College of Engineering and Informatics/Ryan Institute) will lead the NUI Galway involvement in Build2Spec. Dr Keane said "Built2Spec will use real-time, on-site data to maximize build effectiveness, thus ensuring the best-case scenarios for the resultant building in terms of energy efficiency and robustness. By providing the on-site workforce with the capacity to do this type of self-inspection and quality checking, a feedback mechanism that allows for continual checks and improvements in all areas of the actual build can be built into the construction process. There are additional savings in terms of time, money and a potential reduction in waste, as the construction process is optimised."

With the expertise of Built Environment & Smart Cities researchers here at NUI Galway, Dr Keane, Dr Jamie Goggins & Dr Magda Hajdukiewicz will be focused on developing and incorporating Smart Materials and methodologies for

self-inspection and quality checks. By embedding sensors in building elements, contractors and engineers can collect environmental and structural information from the sensors, enabling performance checking. Embedded sensors would also allow for building performance to be analysed throughout its operation, rather than only in the handover phase. Working with local industrial partner Oran PreCast, NUI Galway researchers will also be looking specifically at modelling, prototyping and testing sensors embedded in precast concrete construction elements. Monitoring heat transfer and storage, and structural elements such as stress, will be a key focus.

There is a consensus in the international community that climate change must be addressed and that the requisite institutional architecture be put in place. The market can be badly organised, inefficient, and administratively time consuming. Build2Spec propose to deliver many innovative technologies that aim to address these inefficiencies. There is great potential to make long-standing, sustainable changes in behaviour at EU construction worksites and provide much needed employment to the European SME sector.

Voice and Agency: Empowering Women and Girls for Shared Prosperity



The World Bank launched its ground-breaking report 'Voice and Agency: Empowering Women and Girls for Shared Prosperity', with Former U.S. Secretary of State Hillary Clinton, World Bank Group President Jim Yong Kim, and UN Women Executive Director Phumzile Mlambo-Ngcuka on May 14th.

Dr Duvvury led a team including Dr Srinivas Raghavendran, Dr Aoife Callan and Trish Carney to produce one of the key background papers on the costs of violence that provided new evidence for advocacy on the issue with governments globally. Former US Secretary Hillary Clinton specifically highlighted the significance of this evidence of the economic impact of violence against women and girls to ensure commitment for action and concrete resources to address this global epidemic of violence.



WATCH CLIP
 View the video of the launch of the report here: <http://live.worldbank.org/voice-and-agency-empowering-women-hillary-rodham-clinton>

Background papers can be downloaded from here: <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTGENER/0,,contentMDK:23353755~pagePK:210058~piPK:210062~theSitePK:336868,00.html>

TERMIS-EU 2014 Conference Round Up

Eleven researchers from the Network of Excellence for Functional Biomaterials (NFB) gave podium presentations at the prestigious TERMIS-EU 2014 conference in Genova, Italy on the 17th June 2014. Abhigyan Satyam, a postdoctoral researcher at the NFB, was awarded the Young Investigator Award for Best Oral Presentation. The NFB, a research centre at NUI Galway, also had three researchers presenting posters at the conference.

TERMIS is one of the most prominent organisations in the field of tissue engineering and regenerative medicine globally and attracts interest from the highest levels of the scientific community in biomedical research. The sessions this year focused on biomaterials and intelligent scaffolds, stem cells, growth factors, activation of developmental and regenerative



pathways, and translation of research to the clinic and industry. The NFB, a Strategic Research Cluster funded by Science Foundation Ireland (SFI), had the most researchers presenting out of any of the research groups that attended the conference.

Satyam's winning lecture was about using macromolecular crowding to increase cellular activities to create extracellular matrix-rich tissue equivalents faster. When cells are in the body they are in a crowded space which makes them synthesise collagen quickly. When cells are placed in a

less dense population area, such as culture conditions in a lab, collagen production is very slow. Satyam's research, supervised by NFB's Dr Dimitrios Zeugolis, involves adding inert polydispersed macromolecules into cell cultures to increase the density of the growth area which will, in turn, increase extracellular matrix production. Their research was recently published in *Advanced Materials*, the top among all materials science journals for 2012.

Professor Abhay Pandit, the Director at NFB, stated: "Our strong presence at TERMIS-EU 2014 is further indication of the relevance of NFB's research within Europe. We will continue to initiate collaborative research, with partners from outside of Ireland and look towards funding opportunities within Horizon 2020."



NUI Galway Hosts 2nd Irish Geomorphology Workshop

NUIG is hosting the 2nd Irish Geomorphology Workshop on November 6 and 7, 2014. It's goal is to bring together geomorphologists in Ireland with a view to sharing research and fostering interdisciplinary communication and collaboration.

As well as a strong emphasis on presenting research, the workshop will include dedicated sessions on career guidance and opportunities for early career researchers; a discussion of geomorphological teaching in Ireland and identifying future funding and research opportunities. We are inviting proposals for paper presentations, workshops/ interactive sessions, and posters addressing geomorphology themes. Formed in Spring 2013 this group is building inertia and has already been a platform for numerous new research collaborations.

The first Irish Geomorphology Scientific Workshop was held on 8 February at Trinity College Dublin with a fantastic and diverse itinerary: <http://irishgeomorphology.wix.com/home#liggyworkshop2014/cyxr>

Oliver Daniels Appointed as CEO of the Insight Centre for Data Analytics



The Insight Centre for Data Analytics announced the appointment of Oliver Daniels as CEO on Tuesday 30th of September 2014. Oliver Daniels will lead the €75 million SFI Research Centre as it firmly positions Ireland at the heart of global data analytics research. He joins Insight from Avaya, where he has served as R&D Leader of Research & Development for Contact Center Applications at Avaya for the last five years.

Oliver Daniels was responsible for leading the software engineering teams as they developed innovative applications for both cloud and on premise solutions. At Avaya, he has leveraged his 27 years of enterprise software experience with Avaya, and Nortel, to create industry-leading contact centre solutions and drive innovation in customer experience technology.

Prior to Avaya, Oliver Daniels served as R&D Leader for Nortel, and has also served as CEO of Accendo Technologies, an Irish start-up. Oliver has held a wide variety of senior roles in technology and management, serving Nortel, ADC, and Saville Systems, based in Ireland, the UK, and France. Oliver Daniels is credited as

a co-inventor in several contact centre patent applications, he holds a B. Comm from NUI Galway.

Insight is a joint initiative between researchers at DCU, NUI Galway, UCC and UCD, and other partner institutions. Established in July 2013, it has brought together a critical mass of more than 200 researchers to develop a new generation of data analytics technologies in a number of key application areas.

Data analytics - the study of 'Big Data' - is a global challenge that involves turning vast quantities of ubiquitous raw data into knowledge that will inform people and improve society, business, and health. The sector is growing by an estimated 30% annually and Insight is playing a key role in developing the research strengths and specialised skills needed for Ireland to remain globally competitive.

Insight undertakes high-impact research in data analytics that has significant impact on industry and society by enabling better decision making.

www.insight-centre.org

Chartered Accountants Ireland/NUI Galway Debate Integrated Reporting

On Thursday 5th June, Chartered Accountants Ireland, in conjunction with the Whitaker Institute hosted a seminar on Integrated Reporting (IR). Integrated Reporting is a process based on integrated thinking which aims to result in a concise corporate report about how an organisations strategy, governance, performance and prospects lead to the creation of value in the short, medium and longer term. Over 60 delegates heard contributions from Dr Ian Ball, Board member of the IIRC, Professor Cristiano Busco, of the Whitaker Institute, and Rafaella Bordogna of ENI Corporation, a major Italian energy conglomerate and early adopter of the



ABOVE: (L to R) Maeve Carton (Finance Director of CRH plc), Rafaella Bordogna (ENI Corporation), Cristiano Busco (Whitaker Institute), Ronan Nolan (President of Chartered Accountants Ireland), Ian Ball (Board member of the IIRC), and Emer Curtis (Whitaker Institute)

IR Framework. A lively panel discussion followed, chaired by Dr Emer Curtis of the Performance Management research cluster at the Whitaker Institute with contributions from CAI members including Maeve Carton, Finance Director of CRH plc, Joe Carr, Mazars, and Frank O'Dwyer, CEO of the Irish Association of Investment Managers.

The presentations from the event can be viewed here: <http://www.charteredaccountants.ie/PageFiles/351/Integrated%20Reporting%20Full%20presentation%2005.06.14.pdf>

Open Innovation Expert Speaks at NUI Galway

Professor Wim VanHaverbeke, Professor of Strategy and Innovation at the University of Hasselt, Belgium, delivered the InterTrade Ireland Innovation Lecture on the 8th of May at NUI Galway as part of the All-Island Innovation Programme

Professor VanHaverbeke's lecture Open Innovation Fails Because Companies Are

Not Prepared to Open Up! focused on the most common management problems firms with a strong reputation in closed innovation experience when they embark on open innovation. Professor VanHaverbeke also delivered three materclasses on open innovation while he was at the Whitaker.



View the video of his lecture here: <https://www.youtube.com/watch?v=nwTxVTv1IHQ>

InterTradeIreland
All-Island Innovation Programme



RESEARCH BYTES



News In Brief

Biomedical Engineering PhD Student Wins Major International Award

Biomedical engineering PhD student Noel Reynolds was awarded second prize in the Cellular Biomechanics PhD paper competition at the World Congress of Biomechanics (WCB) in Boston in July. The WCB takes place every four years and is the largest and most prestigious international biomedical engineering conference in the world, attended by over 4000 delegates, with over 750 submissions for the PhD paper competition.

Under the supervision of Dr Patrick McGarry, Noel has developed a novel experimental system to mechanically deform cells. Experimental data was then used to develop next-generation computational models, providing a new understanding of cell response to physical stimuli. The complete work entitled, "On the role of the actin cytoskeleton and nucleus in the biomechanical response of spread cells", was recently published in *Biomaterials*, the leading journal in the field.

The work is supported by Science Foundation Ireland's Research Frontiers Programme (SFI-RFP) and the Irish Centre for High-End Computing (ICHEC). This is the fourth major international prize awarded to a member of Dr McGarry's research group in the past three years.

Duanaire: a Treasury of Digital Data for Irish Economic History



The Duanaire project, led by Aidan Kane in Economics, borrows the Irish word for song-book or anthology (loosely, a 'treasury'), to

convey the sense of a rich, varied corpus handed down and explored anew. The project will open up a wealth of Irish economic history data, and in particular, Irish fiscal history data, by making accessible online a range of datasets in flexible forms. The project will construct a unique infrastructure for the imaginative curation, exploration, and sharing of significant tranches of Irish economic history data. Duanaire is supported by the technical, academic, and management resources of the Whitaker Institute and is partnering closely with the James Hardiman Library at NUI Galway to provide sustainable and high-quality data curation infrastructures.

The Duanaire project aims:

- To open up, for diverse audiences, a wealth of important Irish economic history data, centred on Irish fiscal history, over three centuries.

- To deliver a substantive and impactful research programme drawing upon these unique data resources.
- To thereby build capacity to contribute to a research agenda in other data-intensive fields of Irish economic history.
- To provide a sustainable platform for the long-term curation, management, exploration, and open sharing of Irish economic history data.

18th Century Irish Fiscal Data

Duanaire's first release is a fine-grained dataset of the public finances of Ireland in the 18th century. The core sources are the detailed accounts of revenues and expenditures printed in the journals of the House of Commons of the Kingdom of Ireland throughout the 1700s. These sophisticated accounts give unique insights into the evolution of the Irish economy and the press of political and military events in this fascinating period. They are presented on www.duanaire.ie in a variety of ways: one can browse the accounts year-by-year, use interactive graphs to explore the data, and download the full dataset, which comprises about 24,000 data items, to enable further research.

www.duanaire.ie

EUROBIC 12th (European Biological Inorganic Chemistry Conference) 2014



Dr Diego Montagner, Marie Curie Fellow, in the School of Chemistry was awarded the "Young Researcher Presentation Prize" for his scientific contribution "A fluorescent probe for investigating the activation of anticancer platinum (IV) prodrugs based on cisplatin scaffold" at the EUROBIC 12th (European Biological Inorganic Chemistry Conference) held in Zurich, Switzerland, 24-28 August 2014.



NUI Galway is Top Irish University for World's Most Influential Scientific Minds

Three outstanding researchers at NUI Galway have been ranked among the 'World's Most Influential Scientific Minds: 2014'. Professor Henry Curran, Professor Colin O'Dowd and Professor Donal O'Regan have been ranked among the world's top 3,000 scientific minds by the multinational media body Thompson Reuters.

Those named on the list have earned their distinction by publishing the highest number of articles that rank among those most frequently cited by fellow researchers. More individuals were listed from NUI Galway than from any other Irish university.

According to NUI Galway's President, Dr Jim Browne: "The report describes those listed as being 'on the cutting edge of their fields' and 'among the most influential scientific minds of our time'.

This is certainly true of the NUI Galway individuals who excel and out-perform in their fields of chemistry, climate change and mathematics".

Professor Henry Curran is Director of the Combustion Chemistry Centre at NUI Galway. His research interest lies in the study of the chemistry of how fuels burn in combustors in order to increase efficiency and reduce emissions for a cleaner world.

- Professor Colin O'Dowd is the Director of the Centre for Climate and Air Pollution Studies, at the Ryan Institute, NUI Galway. Through his pioneering work in the field of atmospheric physics, has become internationally renowned as one of the leading scientists in the field of climate change.

- Professor Donal O'Regan is a Personal Professor of Mathematics at NUI Galway and an internationally recognised expert in the field of Nonlinear Analysis, Differential Equations, and Fixed Point Theory. He has written over 1,000 peer-reviewed mathematical articles, making him one of the most prolific authors in the history of mathematics in the world.

Thomson Reuters analysts assessed papers indexed between 2002 and 2012 in 21 broad fields of study. They tracked authors who published numerous articles that ranked among the top one percent of the most cited in their respective fields in the given year of publication. These documents represent research that the scientific community has judged to be the most significant and useful.

Biomaterials Researcher Wins Prestigious Young Investigator Prize

Dr Manus Biggs, a Science Foundation Ireland (SFI) Investigator at the Network of Excellence for Functional Biomaterials (NFB) at NUI Galway has won the Larry Hench Young Investigator Award. The award was presented at the United Kingdom Society for Biomaterials (UKSB) division of the 26th Annual Conference for the European Society for Biomaterials, held in Liverpool, from 31 August-3 September 2014.

The prize is awarded to a promising young research scientist in recognition of outstanding and innovative contributions in a selected field of biomaterials research. The judging criteria includes evidence of peer reviewed publications, outstanding contribution and demonstrable research in the field

of biomaterials. The researcher must be at an early stage of his career having no more than seven years of experience after his PhD was awarded.

Dr Biggs's research focuses on developing electrically active polymers for musculoskeletal and neural applications. His research group creates nanoscale fibres from piezoelectric polymers and incorporates them into a mesh-like scaffold that mimics the natural bone matrix. The scaffold materials can be utilised for the regeneration of large bone defects, which do not undergo spontaneous regeneration normally. Also, his group is improving long-term function of implanted microelectrodes being used for the treatment of neurodegenerative disorders by using conducting polymers to

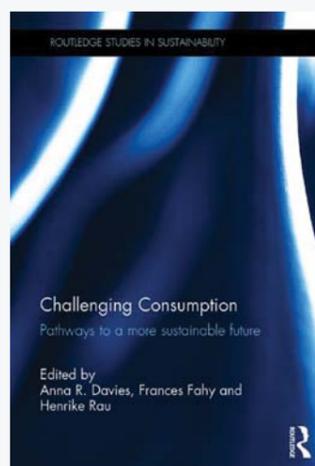
coat the implanted electrodes. The aim of the coating is to reduce the inflammatory response around the electrode interface to prevent neural loss and instability of the electrodes at the implantation site.

Seven researchers from the NFB presented at the European Society for Biomaterials conference. The conference brought together experts and scientists from academia and industry, and also those involved in funding regulatory and commercial enterprises related to biomaterials science, tissue engineering and regenerative medicine.

Professor Abhay Pandit, Director of the NFB at NUI Galway, commented: "The award is further indication of the competitiveness of the NFB's research at an international level."

RESEARCH PUBLICATIONS

REVIEW OF BOOKS, ARTICLES
AND ALL OTHER PUBLICATIONS



Challenging Consumption: Pathways towards a more sustainable future

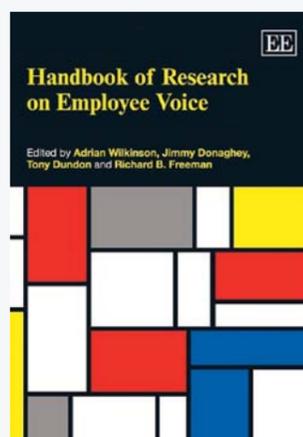
F. Fahy, H. Rau and A. Davies
Routledge London, 2014

Over the summer Dr Frances Fahy, Geography and Dr Henrike Rau in the School of Political Science and Sociology (with colleague Prof Anna Davies in Trinity College Dublin) launched their co-edited book 'Challenging Consumption: Pathways towards a more sustainable future', published by Routledge London.

Sustainable consumption is a central research topic in academic discourses of sustainable development and global environmental change. Informed by a number of disciplinary perspectives, this book is structured around four key themes in sustainable consumption research: Living, Moving, Dwelling and Futures. The collection successfully balances theoretical insights with grounded case studies, on mobility, heating, washing and eating practices, and concludes by exploring future sustainable consumption research

pathways and policy recommendations. Theoretical frameworks are advanced throughout the volume, especially in relation to social practice theory, theories of behavioural change and innovative visioning and backcasting methodologies.

This groundbreaking book draws on some conceptual approaches which move beyond the responsibility of the individual consumer to take into account wider social, economic and political structures and processes in order to highlight both possibilities for and challenges to sustainable consumption. This approach enables students and policy-makers alike to easily recognise the applicability of social science theories.



Handbook of Research on Employee Voice

A. Wilkinson, J. Donaghey,
T. Dundon and R. B. Freeman
Edward Elgar Publishing Ltd, 2014

Professor Tony Dundon Professor of HRM and Employment Relations and member of the Work, Society and Governance research cluster at the Whitaker Institute has co-edited this book with Adrian Wilkinson, Professor of Employment Relations, Griffith University, Australia; Jimmy Donaghey, Reader of Industrial

Relations and Personnel Management, University of Warwick, UK; and Richard B. Freeman, Professor of Economics, Harvard University and National Bureau of Economic Research, US

This book examines the theory and history of employee voice and what voice means to various actors, including employers, middle managers, employees, unions and policy-makers. The authors observe how these actors engage in various voice processes, such as collective bargaining, grievance procedures, task-based voice, partnership and mutual gains.

Rescuing cells from inevitable death

Adrienne Gorman
Apoptosis Research Centre, Sept 2014

Scientists in the Apoptosis Research Centre (ARC) recently demonstrated a novel mechanism by which cells can be rescued from inevitable death. Dr Adrienne Gorman's research group, publishing in one of the leading cell death journals, Cell Death and Disease, showed how death-inducing caspase enzymes can be sent to the cellular trash

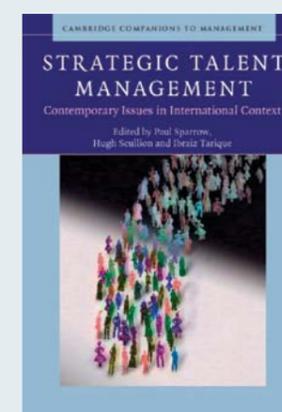
can, allowing cells to recover function and exhibit long term survival and growth. This rescue of the cells from otherwise certain death is due to the action of a pro-survival growth factor called nerve growth factor (NGF). The study builds on earlier work from the group regarding the biochemical mechanisms of neuronal protection by NGF.

The current findings have important implications for development of new therapeutic treatments for neurodegenerative diseases, such as ischemia, where a major therapeutic goal is to rescue neurons which have already initiated death programmes and

are on the brink of cell death. Since there is almost no replacement of neurons once they die, any rescue of neurons can have beneficial effects.

This study was largely carried out by two recent graduates from the Gorman group, Dr Katarzyna Mnich and Dr Laura Carleton, and also involved collaboration with other NUI Galway researchers. This work was supported by funding from Science Foundation Ireland, and the Irish Research Council.

The paper is available through open access at the following link: <http://dx.doi.org/10.1038/cddis.2014.173>



Strategic Talent Management: Contemporary Issues in International Context

P. Sparrow, H. Scullion and I. Tarique
Cambridge University Press, 2014

Described as the definitive work in the field by leading scholars in the area (John Slocum Editor of Journal of World Business).

With contributions from leading scholars and practitioners, this Cambridge Companion examines the topical issue of talent management from a strategic perspective, mapping out insights from a number of related fields including strategy, organisational learning, marketing and supply chain management. The authors examine the challenges faced when viewing talent management in a global context, showing how both comparative and international HRM thinking have become increasingly important when, for example, managing talent in emerging markets or trying to globalise the

talent management function. The book concludes with a valuable summary of key learning points about talent management for both practitioners and researchers, as well as a discussion of the most fruitful areas for future research. This Companion will be an essential resource for academic researchers, graduate students and practitioners of global strategic talent management

Hugh Scullion, Professor of International Management in NUI Galway has recently been ranked one of the world leading researchers in his field and he is Chair of the European Institute for the Advanced Study of Management (EIASM) Workshop on Talent Management in Berlin 13 and 14 October 2014.

RESEARCH INTERSECTION

BRIAN SEXTON

Early Career Researcher

Education background and why you decided to pursue area of Research. Why NUI Galway?

I graduated with a BE in Civil Engineering from NUI Galway in October 2010. In the third year of my degree programme, we began to study Soil Mechanics/Geotechnical Engineering, and while the subject matter was new and challenging, I really enjoyed the lectures and felt that this would be the branch of civil engineering that would suit me best.

Since then, I have worked on my PhD in Geotechnical Engineering under the supervision of Dr Bryan McCabe and I successfully defended my thesis in October. Bryan's enthusiasm for geotechnical engineering and the growing reputation of NUI Galway internationally were the main reasons why I wanted to pursue my postgraduate studies here.

Career Highlights and Achievements

- Awarded the RPS Prize for 1st place in 3rd year Civil Engineering, 2009.
- Awarded the Tobin Consulting Engineers Gold Medal and Research Scholarship in Civil Engineering (NUI Galway) for the highest overall mark in the BE Degree Examinations in Civil Engineering, 2010.
- Awarded an IRCSET 'EMBARK Initiative' Postgraduate Scholarship, 2010.
- Presented my research at the PLAXIS Users Group Meeting in Karlsruhe in 2012, the national BCRI Symposium in Dublin in 2012 and the International Conference on Installation Effects in Geotechnical Engineering in Rotterdam in 2013.
- Published two journal papers on my PhD research and two further papers are under review.

What Next?

I am keen to remain in geotechnical engineering, and my experience in numerical modelling would stand me in good stead if looking for employment in this area. However, I am currently undecided as to whether to pursue a career in academia or in industry. The Geotechnical Research Group at NUI Galway has been at the forefront of the European research carried out in my area of ground improvement to date and Bryan and I are planning a funding proposal with a view to pursuing postdoctoral research at NUI Galway.

DR BRYAN McCABE

Research Leader

Education background and why you decided to pursue area of Research. Why NUI Galway?

I graduated with a BA BAI in Civil, Structural and Environmental Engineering from TCD in 1997 and with a PhD in Foundation Engineering from the same institution in 2002. I was fascinated by soil as a material; not only is it naturally variable and has properties that are difficult to measure, its mechanics are challenging. I was delighted to join NUI Galway in 2001 as academic vacancies are limited in this area; I am the only geotechnical academic at NUI Galway today and have only a handful of counterparts nationally. A brief secondment to Keller Ground Engineering (UK) in 2004-05 helped me identify and develop research projects with real practical benefit to the profession and I now have a research group that peaked at seven research students this year.

Career Highlights and Achievements

- Senior Geotechnical Design Engineer and acting Chief Engineer at Keller Ground Engineering, UK, 2004-05.
- Awarded Geotechnical Society of Ireland prizes in 1999 and 2007
- Awarded Crampton Prize for journal paper in the Institution of Civil Engineers (ICE) Geotechnical Engineering (UK), 2010
- Chair of the international conference Shaking the Foundations of Geo-engineering Education (SFGE 2012) hosted at NUI Galway in 2012
- Recipient of NUI Galway President's Award for Teaching Excellence 2012
- Awarded Telford Prize for journal paper in ICE Ground Improvement (UK), 2013
- Head of Civil Engineering since July 2014

What Next?

I enjoy research and working with postgraduate students, supporting their growth into experts in their chosen areas. At this stage of my career, I would like to diversify to new areas within mainstream Geotechnical Engineering (tunnelling is a particular interest) and to consider more cross-disciplinary projects with colleagues within the College of Engineering and Informatics and beyond.

IN THIS SECTION WE LOOK AT HOW DIFFERENT RESEARCHERS AT VARYING STAGES IN THEIR CAREERS ARE DRAWN TOGETHER AT NUI GALWAY. THIS ISSUE WE TALK TO PHD STUDENT **BRIAN SEXTON** AND **DR BRYAN McCABE**.



Our Research

Loading on the ground, generated through building foundations or road/rail embankments for example, will cause the underlying soil to compress. If the amount of soil compression is excessive, the building or embankment may experience serviceability issues or damage. The Leaning Tower of Pisa is a classic illustration of clay compression in geotechnical engineering.

If excessive compression is anticipated, ground can be pre-treated by various methods, one of which is the vibro-replacement stone column technique. There are two main components to soil compression: short-term (due to a process called primary compression) and long-term (due to a process called creep compression). The effect of stone columns on reducing primary compression is reasonably well established, whereas their effect on creep compression has largely been overlooked to date. However, as cities and towns continue to expand, there is increasing pressure to develop marginal sites that were previously

considered unsuitable. Since such sites are often underlain by soft organic soils where are susceptible to creep compression, the response of creep compression to ground treatment is an emerging issue for the profession.

Field and laboratory studies of creep compression are usually impractical due to the amount of time (several years) needed to gather reliable data. So finite element (FE) modelling was used in this research to determine why and by how much stone columns reduce creep compression. PLAXIS is the most commonly used FE software in geotechnical engineering, and various time-dependent models for soft soil were used, starting out with simple models before progressing to more advanced models.

The research has provided important guidance to practitioners for the first time on how to design stone column schemes in soft organic soils.

If you would like to have your own research featured in future issues of Research Matters, or suggest other themes for the publication, please email us at: researchmatters@nuigalway.ie

09

research
MATTERS

National University of Ireland, Galway,
University Road, Galway,
Republic of Ireland

T: +353 9149 5312
E: researchmatters@nuigalway.ie

www.nuigalway.ie



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