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**TRINITY  
COLLEGE  
DUBLIN**

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DR PATRICK PRENDERGAST  
PROVOST & PRESIDENT

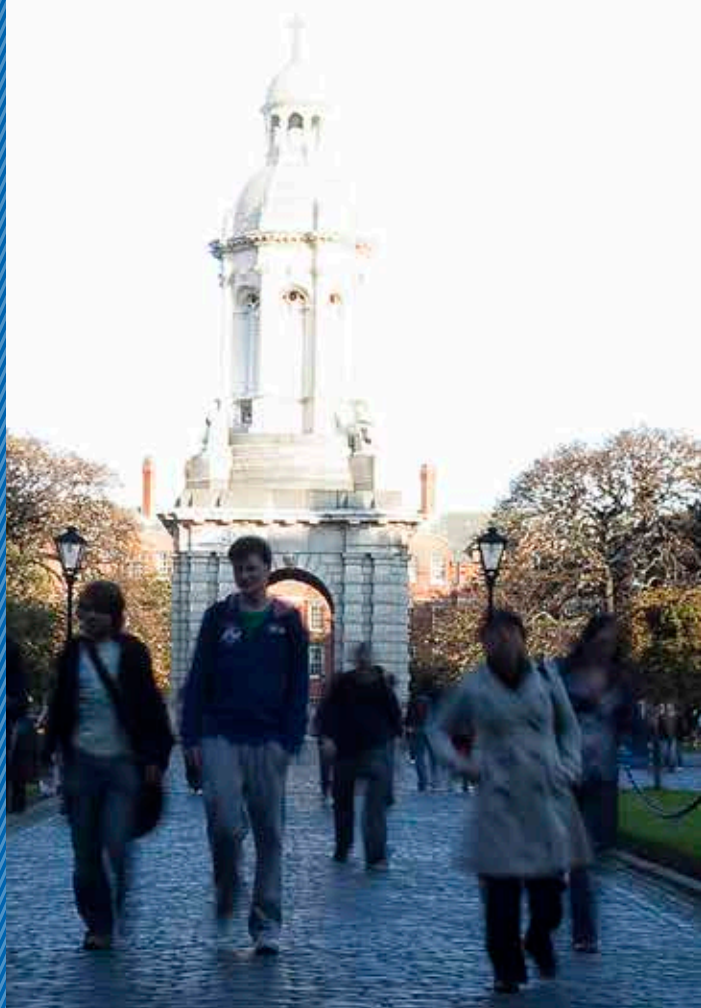
ANNUAL  
REVIEW

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**2012–2013**



TRINITY  
COLLEGE  
DUBLIN



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## 01

# INTRODUCTION FROM THE PROVOST

Earlier this year I was asked to contribute my undergraduate reminiscences to a volume of essays, *Trinity Tales – Trinity College Dublin in the Eighties*. Looking back on that, for me, magic decade, I observed that “Trinity of the 1980s was a university in transition.” The small intimate college was being replaced by a university rising to meet the expectations of a new generation for higher education and Ireland’s expectations for economic and social development. As an undergraduate, I was part of a great wave of expansion in university education.

Well, thirty years on, in the 2010s, higher education is again in transition. In many countries, including Ireland, public sector funding is reducing, yet universities must again rise to meet the expectations of a new global generation. In Trinity, we are primed to meet expectations for an education that matches with the best in the world, that prioritises creativity and innovation, realises the value of research and scholarship, uses online education technologies to maximum effect, has a fairer and more holistic admissions system, and establishes global collaborative research projects which meet the great social and scientific challenges of our time.

It’s a tremendously exciting time to be Provost. It’s a time of new buildings and the campus expanding within Dublin city; it’s a time of international research consortia and new programmes jointly offered with institutions in the UK, in China, in Singapore; it’s a time of campus companies and masters in creative and cultural entrepreneurship; it’s a time of MOOCs, digital collections, the Book of Kells app, social entrepreneurship, and Trinity’s Science Gallery expanding abroad.

It’s also, of course, a time of challenges. As the role of third-level education expands and universities like Trinity contribute ever more strongly to growing the economy and improving society, a new funding model and new revenue streams are urgently needed, as well as new ways of thinking about education and research. With Ireland and Europe only slowly emerging from recession, these are challenging times, not just for Trinity but for universities all round Europe.

I’m in my third year now as Provost and what’s astonishing to me is just how much gets achieved each academic year. The energy, commitment, and vision of staff and students is remarkable. Opportunities are grasped, plans are laid – all year round the university is a creative and intellectual hive of activity.

→ In Trinity, we are primed to meet expectations for an education that matches with the best in the world.



RIGHT – Provost Dr Patrick Prendergast meets students during Freshers’ Week



In order to mark these achievements – and indeed as a simple aide-mémoire to try and keep track of all that’s accomplished during the year – we have brought into being this Provost’s Annual Review. It’s the first such publication, but it’s a necessary one. It has been both instructive and enjoyable to collate some of this year’s most memorable events and achievements. This Review will now become an annual fixture; it will be valuable as a record of the university’s activities, as well, I hope, as a stimulating read.

This year in figures: Trinity awarded 2,754 bachelor degrees, 1,271 masters, and 423 doctorates, bringing our total alumni to over 100,000 based in 130 countries worldwide. New students were enrolled from every county in Ireland, and from 74 countries around the world. Some 52 new academic staff and 103 new administrative staff joined us. The story behind these figures is a story of expansion: Trinity is growing in terms of students, staff, internationalism, diversity, and functionality – we now have need of new positions, such as a Director of Communications and Marketing and a Director of Commercialisation not envisaged previously.

The core of our mission remains of course the education of students. We recognise that high-quality higher education is built on excellent teaching, and this year five staff members received prestigious Provost’s Teaching Awards, following student nominations. Established in 2001, the selection process for these Awards is rigorous. There are only a handful of

winners each year, but being nominated is, in itself, a significant achievement. I would like to thank all among our staff who help maintain Trinity’s world-wide reputation for teaching.

Excellence in research is the foundation of research-led teaching. Our interdisciplinary teams of researchers are combining expertise to meet some pressing global challenges. This Review does not of course cover all our research achievements – it would need to be ten times as long. We’ve chosen to focus on certain representative individuals from different Schools and faculties. We hope to get across the sheer diversity of research in Trinity and the excellent connectivity between different disciplines. Most of all, we hope to get across the excitement of research, because that’s what it’s all about: professors and students engaged alongside each other in ground-breaking discoveries, be they in nanoscience, tissue engineering, sign language, or 17th century land-grabs.

College activities are so diverse and manifold that, again, we just don’t have space in this Review to cover all of them. Instead I have asked relevant Officers and Deans to focus on a number of areas including infrastructure, innovation, public engagement, student experience, benefactions, global relations, and visits. The aim is to give readers an idea of the different ways in which Trinity engages – through teaching, commercialising research, organising public lectures, volunteering, digitising our collections, enabling student and staff exchanges.

**LEFT** – Among the contributors and representatives of areas included in the first Provost’s Review are, standing (L–R) Sinead Ryan, Director of Internationalisation; Ruth Kearney, TCD-UCD Innovation Academy Facilitator-Business Development Manager; Orlagh Ennis, Provost’s Office; Eoin O’Liathain, Shoutout; Sally-Anne Fisher, Communications Officer; Prof Pete Humphries, Professor of Medical Molecular Genetics; Prof Michael Gill, Director, Wellcome Trust-HRB Clinical Research Facility; Prof Vincent Wade, Professor of Intelligent Systems and Director of CNGI; Prof Richard Carson, Professor of Cognitive Neuroscience of Ageing; Bernard Mallee, Director of Communications and Marketing; Prof Balz Kamber, Professor of Geology and Mineralogy; Dr Marco Ruffini, Assistant Professor in Optical Network Architecture and PI with CTVR; Prof Mark Little, Professor of Nephrology; Dr Tony Robinson, Assistant Professor in Mechanical Engineering; Dr Britta Stordal, Senior Research Fellow, School of Medicine; Prof Jonathan Coleman, Professor of Chemical Physics and PI with CRANN; Iseult Ward, FoodCloud. Seated (L-R), Prof Blanaid Clarke, McCann FitzGerald Professor of Corporate Law; Prof Vinny Cahill, Dean of Research; Dr Patrick Prendergast, Provost; and Prof Linda Hogan, Vice-Provost/Chief Academic Officer

Not included in this review – because they will be developed more fully in the coming academic year – are two initiatives which we’re greatly excited by. This year Trinity made its first endeavour in online education – we are currently assessing viability but we expect to shortly offer MOOCs, thereby enabling the rest of the world to connect with Trinity’s inspiring professors. And the Dean of Undergraduate Studies has led the way nationally in a feasibility scheme for holistic admissions which will run in 2014 and will inform college strategy in seeking alternative methods of entry to the university.

These, and other, initiatives could not happen without the support of government, student contributions and commercial revenue. We are also particularly thankful to the friends who make a real difference to the College. This was a significant year for commemorating philanthropy – in June, we proudly unveiled our ‘Benefactors through the Centuries’ roll of honour as a lasting tribute to those who have made substantial gifts to Trinity. *Semper Honos Nomenque Tuum Laudesque Manebunt* – now adorns the entrance of the Dining Hall, followed by the names of extraordinary benefactors, beginning with Queen Elizabeth I through to our most recent major supporter, Google.

In its simple and stylish way, this roll-call enshrines the importance of philanthropy to the university since its very foundation. On the occasion of the unveiling, I noted that I wanted “students and other young people from all over Ireland and the world to feel inspired by the concept of giving.” In this Review, we detail some of the great initiatives which have been enabled by donors. Major philanthropists and generous alumni can feel proud of their contributions to infrastructure, education, and social programmes.

At the heart of every institution are the staff and Trinity College is no different. I’d like to thank all of those who keep the university running and who contribute to our success. Special thanks is due to the university’s officers, deans, heads of school and discipline, and heads of administration and support services, who are continuing to manage the affairs of the university despite the economic challenges of the last number of years.

In a speech this year, I set out Trinity’s goal as “innovation within tradition”. We have set ourselves this challenge: to adhere closely to the values which have defined us for over four centuries – values like multidisciplinary, original research, small tutorials and seminars, extracurricular activities, social and public engagement, civic consciousness – but at the same time to be unafraid of change and development and to embrace the radical opportunities available to us.



**ABOVE** – Provost’s Teaching Awards 2013 (L-R) Dr Patrick Prendergast, Provost; Ms Jade Concannon, Administrator, Provost’s Teaching Awards; Dr Christopher Nicholas; Dr Robert Armstrong; Dr Zuleika Rodgers; Dr Nicholas Johnson; Professor Luke O’Neill; and Professor Veronica Campbell, Chair of the Selection Committee.

Because Trinity is distinctive in its traditions, we are distinctive in our innovation. The way we engage with online education and free open access digitised collections; with commercialisation and entrepreneurship; with global relations and joint degree courses – all these new activities draw strength from, and reference, our traditions. We innovate from a place of strength, solidity, and continuity. Trinity staff and students are conscious that, paradoxically, to uphold Trinity’s tradition, they have to “make it new”.

Or, to quote, Brendan Kennelly, Trinity’s unofficial ‘poet laureate’: “*Something that will not acknowledge conclusion / Insists that we forever begin*”.

In Trinity, we certainly don’t acknowledge, and can’t imagine, conclusion – so I look forward to beginning each academic year with this Review, detailing recent achievements and future directions.

I hope you enjoy reading.

**Dr Patrick Prendergast**  
Provost & President

## 02

# TRINITY AT A GLANCE

Trinity College Dublin, A 420 years old University in the heart of Dublin City Centre



# 02 World University Rankings

## TRINITY IS RANKED



NO. **01**

UNIVERSITY IN IRELAND\*

**09**

RESEARCH PERFORMANCE

9th in Europe<sup>3</sup>

**18**

ACROSS ALL INDICATORS

18th in Europe<sup>1</sup>

**22**

INTERNATIONAL OUTLOOK

22nd in the World<sup>2</sup>

**46**

INTERNATIONAL FACULTY

46th in the World<sup>1</sup>

**48**

RESEARCH PERFORMANCE

48th in the World<sup>3</sup>

**61**

ACROSS ALL INDICATORS

61st in the World<sup>1</sup>

**Statistics Sources**

\* QS World University Ranking, THE World University Ranking, Academic Ranking of World Universities (Shanghai)

<sup>1</sup> QS World University Ranking 2013

<sup>2</sup> Times Higher Education World University Ranking 2013

<sup>3</sup> Leiden University Ranking of World Universities, May 2013

# World Subject Rankings

## TRINITY IS RANKED

**28**

ENGLISH LANGUAGE AND LITERATURE

28th in the world\*

**31**

POLITICS AND INTERNATIONAL STUDIES

31st in the world\*

**33**

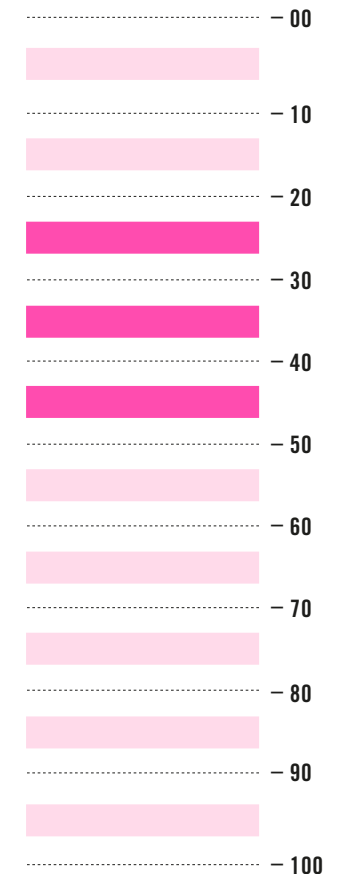
HISTORY

33rd in the world\*

**42**

MODERN LANGUAGES

42nd in the world\*



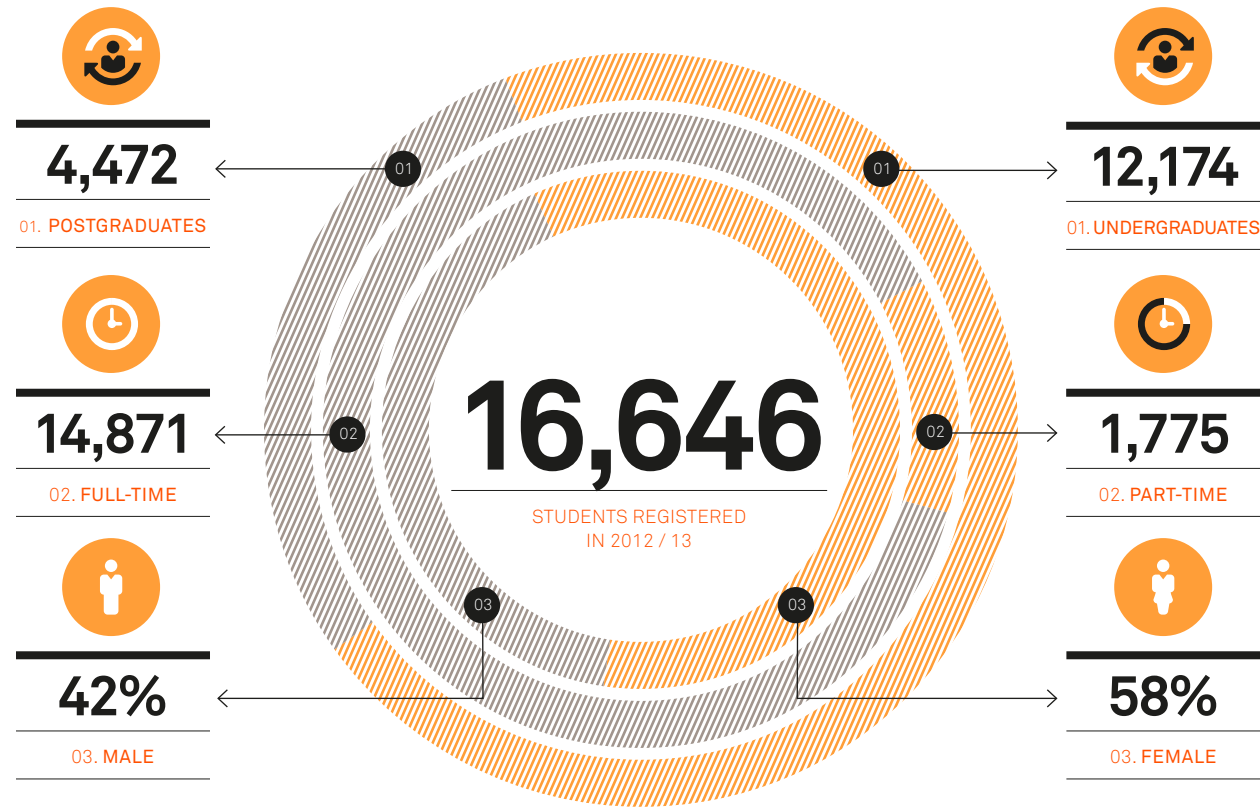
## TRINITY IS IN THE WORLD TOP 100 IN

- Accounting & Finance
- Biological Sciences
- Chemistry
- Computer Sciences & Information Systems
- Economics & Econometrics
- Geography
- Law
- Medicine
- Pharmacy & Pharmacology
- Psychology
- Sociology

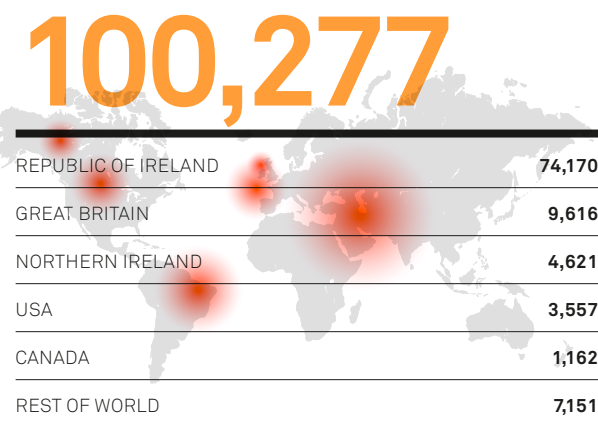
**Statistics Sources**

\* QS Subject Rankings 2013

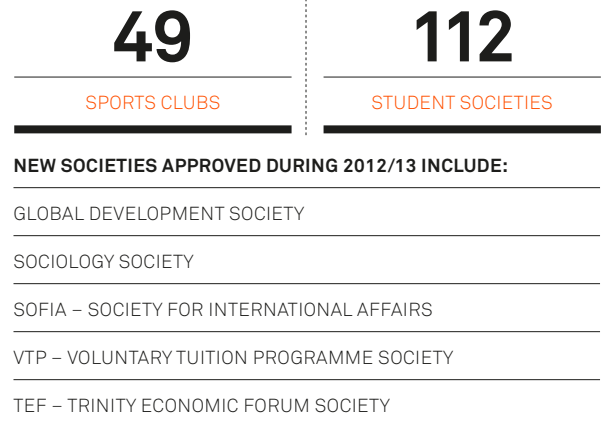
# 02 Student Statistics



## ALUMNI

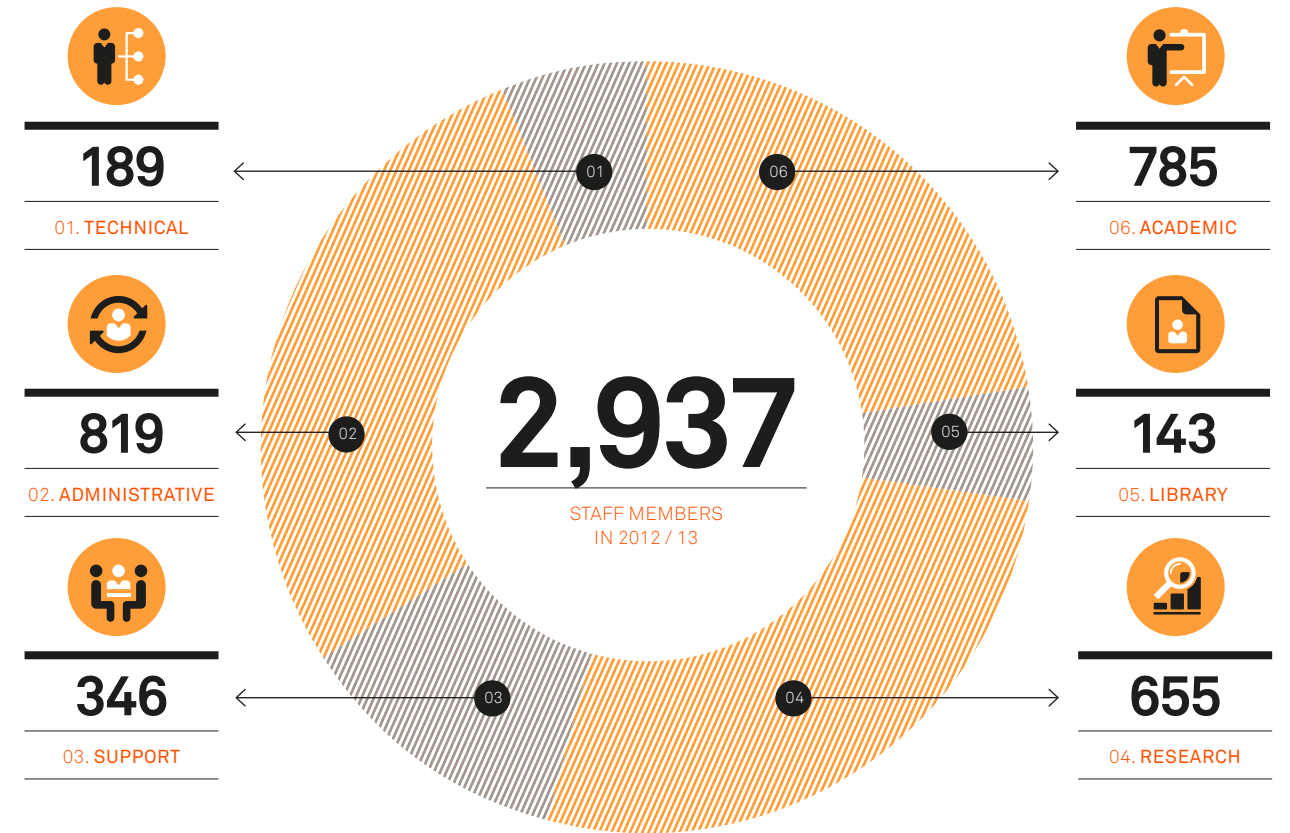


## CLUBS AND SOCIETIES

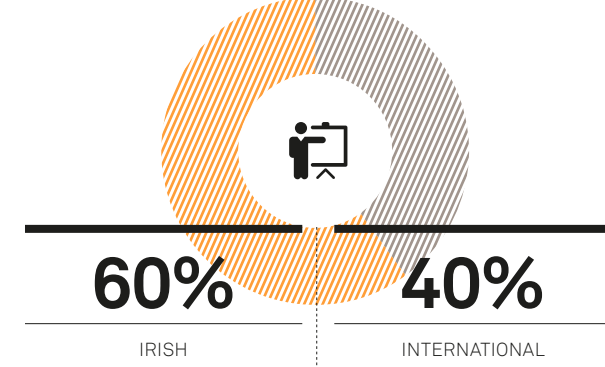


— The largest societies are the vincent de paul society, the philosophical society (the phil), du players and the college historical society (the hist).  
 — The college historical society (the hist) is the oldest student society in the world, founded in 1770

# Staff Statistics



## ACADEMIC STAFF

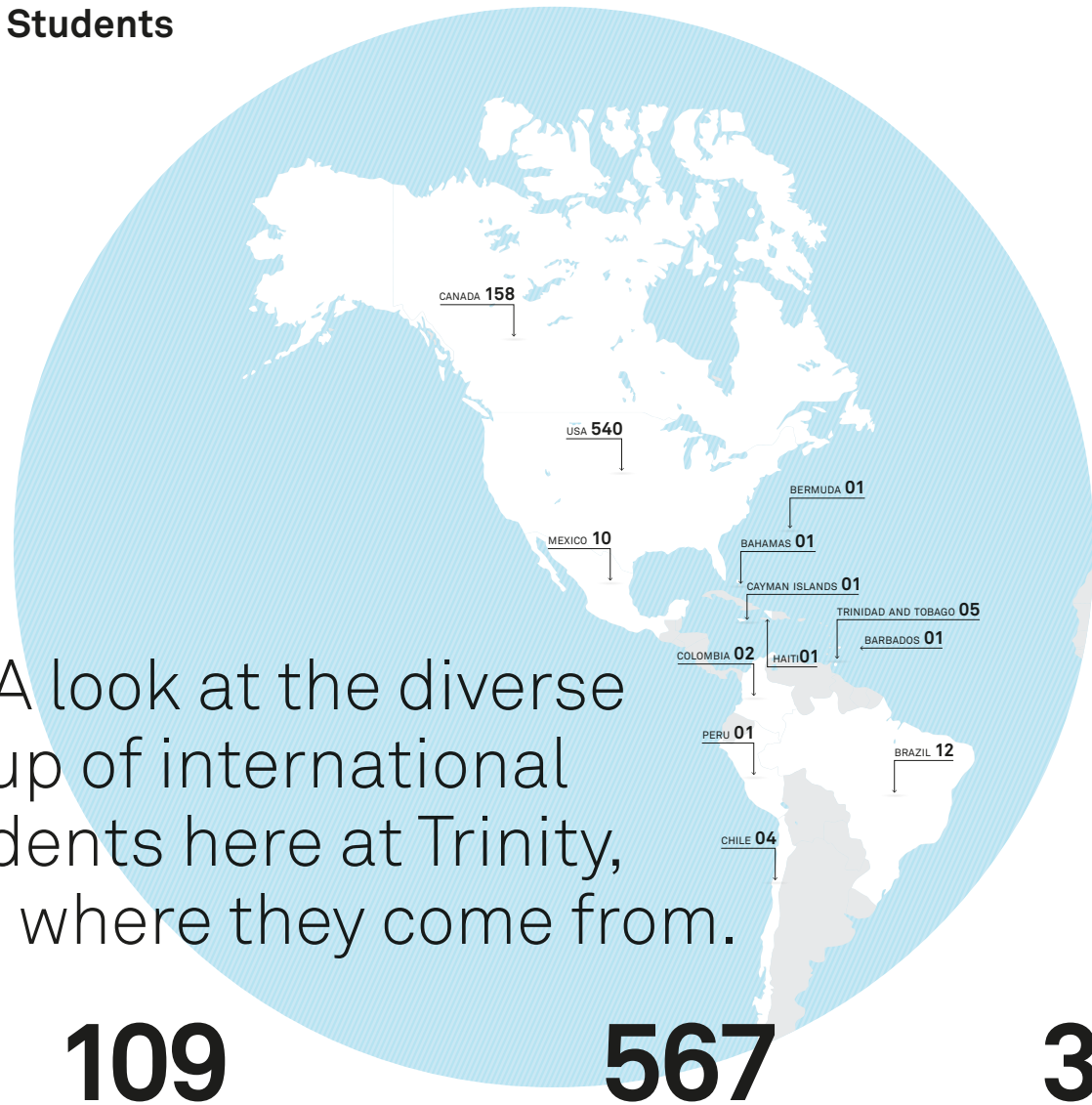


## FACULTIES



# 02 International Students

→ A look at the diverse group of international students here at Trinity, and where they come from.



**109**

**567**

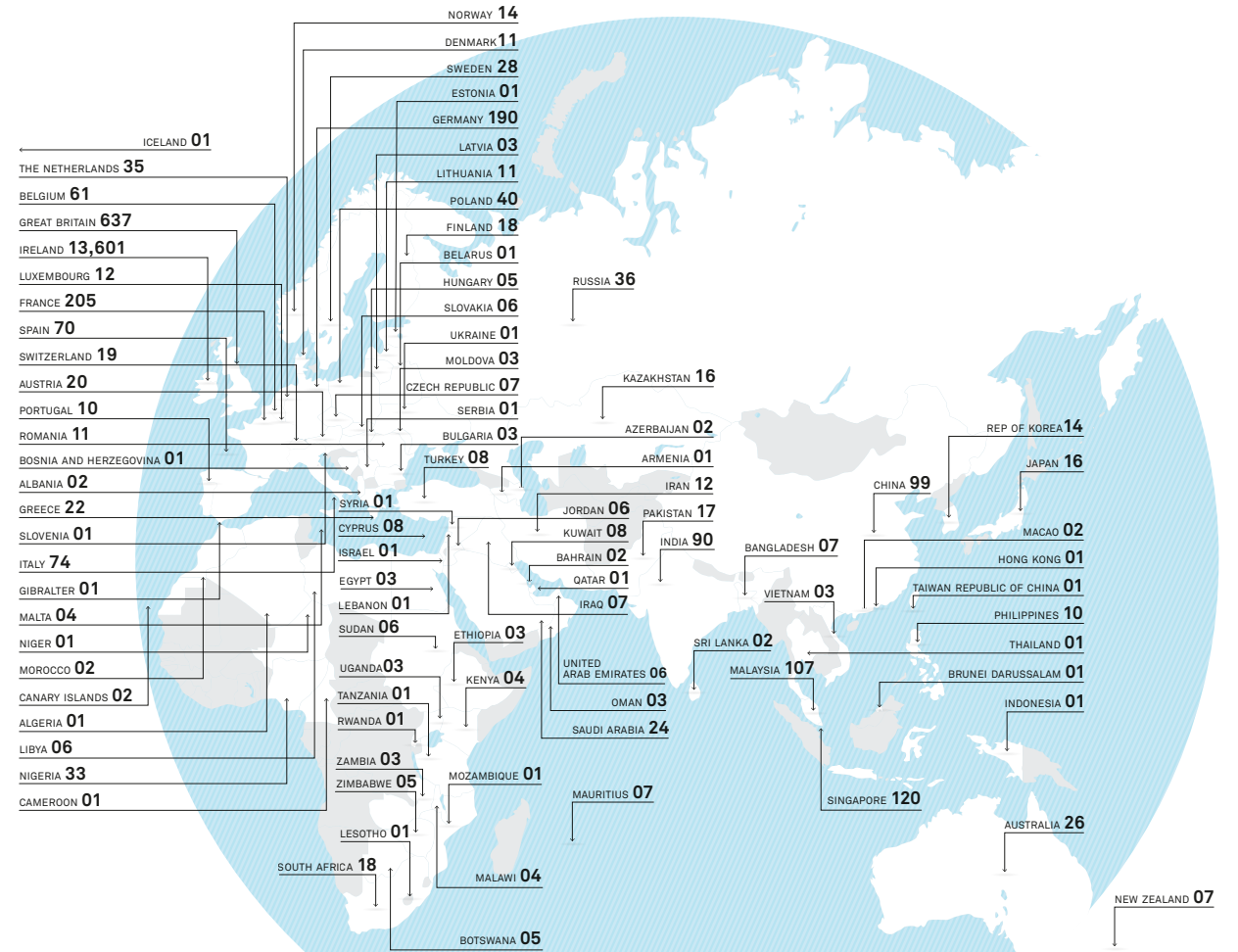
**33**

| AFRICA                 |                |
|------------------------|----------------|
| ALGERIA                | 1              |
| BOTSWANA               | 5              |
| CAMEROON               | 1              |
| EGYPT                  | 2   1          |
| ETHIOPIA               | 2   1          |
| KENYA                  | 3   1          |
| LIBYAN ARAB JAMAHIRIYA | 6              |
| LESOTHO                | 1              |
| MALAWI                 | 3   1          |
| MAURITIUS              | 7              |
| MOROCCO                | 2              |
| <b>TOTAL</b>           | <b>85   24</b> |

| ASIA                     |                 |
|--------------------------|-----------------|
| ARMENIA                  | 1               |
| AZERBAIJAN               | 2               |
| BAHRAIN                  | 2               |
| BANGLADESH               | 6   1           |
| BRUNEI DARUSSALAM        | 1               |
| CHINA                    | 93   6          |
| HONG KONG                | 1               |
| INDIA                    | 57   33         |
| INDONESIA                | 1               |
| IRAN ISLAMIC REPUBLIC OF | 12              |
| IRAQ                     | 7               |
| ISRAEL                   | 1               |
| JAPAN                    | 15   1          |
| JORDAN                   | 4   2           |
| KUWAIT                   | 8               |
| LEBANON                  | 1               |
| MACAO                    | 2               |
| MALAYSIA                 | 106   1         |
| OMAN                     | 3               |
| PAKISTAN                 | 11   6          |
| PHILIPPINES              | 8   2           |
| QATAR                    | 1               |
| REP OF KOREA             | 11   3          |
| SAUDI ARABIA             | 20   4          |
| SINGAPORE                | 119   1         |
| SRI LANKA                | 1   1           |
| SYRIAN ARAB REPUBLIC     | 1               |
| TAIWAN REPUBLIC OF CHINA | 1               |
| THAILAND                 | 1               |
| UNITED ARAB EMIRATES     | 3   3           |
| VIETNAM                  | 3               |
| <b>TOTAL</b>             | <b>503   64</b> |

| AUSTRALASIA  |               |
|--------------|---------------|
| AUSTRALIA    | 22   4        |
| NEW ZEALAND  | 4   3         |
| <b>TOTAL</b> | <b>26   7</b> |

FULLTIME | PARTTIME



**15,062**

**106**

**718**

**19**

| EUROPE         |                       |
|----------------|-----------------------|
| AUSTRIA        | 19   1                |
| BELGIUM        | 60   1                |
| BULGARIA       | 3                     |
| CYPRUS         | 6   2                 |
| CZECH REPUBLIC | 7                     |
| DENMARK        | 10   1                |
| ESTONIA        | 1                     |
| FINLAND        | 18                    |
| FRANCE         | 203   2               |
| GERMANY        | 182   8               |
| GREAT BRITAIN  | 605   32              |
| GREECE         | 18   4                |
| HUNGARY        | 4   1                 |
| IRELAND        | 12,020   1,581        |
| <b>TOTAL</b>   | <b>13,439   1,623</b> |

| EUROPE NON EU        |                |
|----------------------|----------------|
| ALBANIA              | 2              |
| BELARUS              | 1              |
| BOSNIA & HERZEGOVINA | 1              |
| CANARY ISLANDS       | 2              |
| GIBRALTAR            | 1              |
| ICELAND              | 1              |
| KAZAKHSTAN           | 16             |
| MOLDOVA              | 3              |
| NORWAY               | 14             |
| RUSSIAN FEDERATION   | 35   1         |
| SERBIA               | 1              |
| SWITZERLAND          | 18   1         |
| TURKEY               | 8              |
| UKRAINE              | 1              |
| <b>TOTAL</b>         | <b>104   2</b> |

| NORTH/CENTRAL AMERICA |                 |
|-----------------------|-----------------|
| BAHAMAS               | 1               |
| BARBADOS              | 1               |
| BERMUDA               | 1               |
| CANADA                | 152   6         |
| CAYMAN ISLANDS        | 1               |
| HAITI                 | 1               |
| MEXICO                | 9   1           |
| TRINIDAD & TOBAGO     | 4   1           |
| USA                   | 526   14        |
| <b>TOTAL</b>          | <b>696   22</b> |

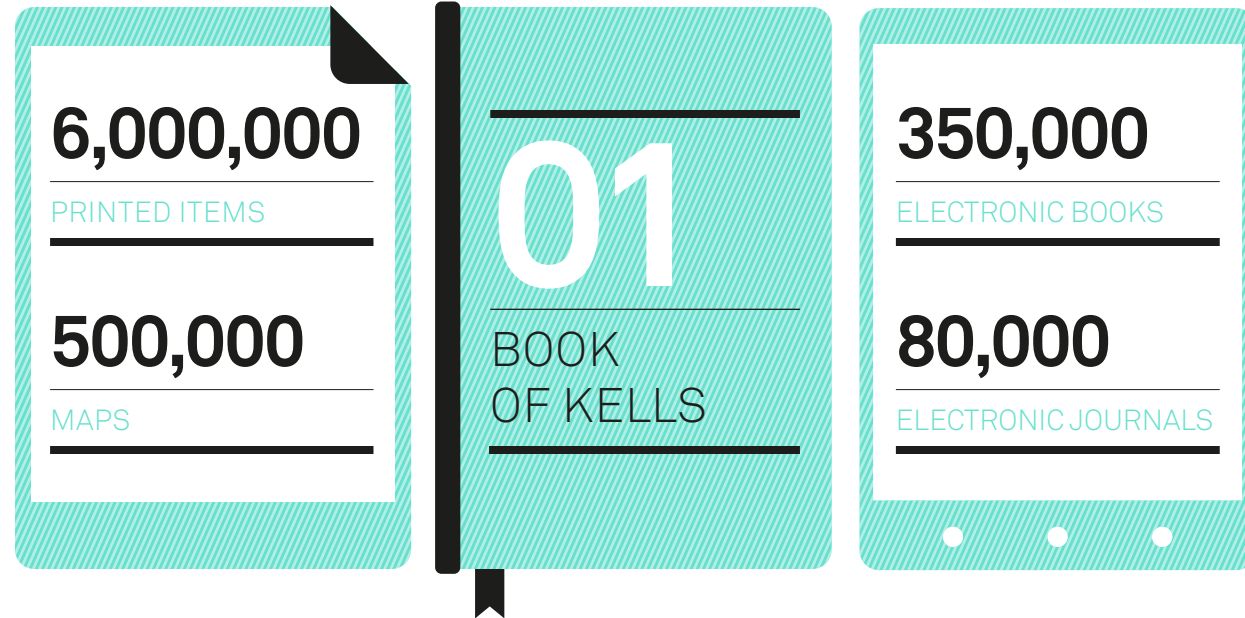
| SOUTH AMERICA |               |
|---------------|---------------|
| BRAZIL        | 11   1        |
| CHILE         | 4             |
| COLOMBIA      | 2             |
| PERU          | 1             |
| <b>TOTAL</b>  | <b>18   1</b> |

FULL-TIME | PART-TIME



## 02 Library

### LIBRARY COLLECTION HAS



### TRINITY'S RESEARCH THEMES

|                                |  |                                   |
|--------------------------------|--|-----------------------------------|
| — AGEING                       | — IMMUNOLOGY, INFLAMMATION & INFECTION | — NEUROSCIENCE                    |
| — CANCER                       | — INCLUSIVE SOCIETY                    | — NEXT GENERATION MEDICAL DEVICES |
| — CREATIVE ARTS PRACTICE       | — INTELLIGENT CONTENT & COMMUNICATIONS | — SMART & SUSTAINABLE CITIES      |
| — CREATIVE TECHNOLOGIES        | — INTERNATIONAL DEVELOPMENT            | — SUSTAINABLE ENVIRONMENT         |
| — GENES AND SOCIETY            | — INTERNATIONAL INTEGRATION            | — TELECOMMUNICATIONS              |
| — DIGITAL HUMANITIES           | — MATHEMATICS OF COMPLEXITY            | — MAKING IRELAND                  |
| — IDENTITIES IN TRANSFORMATION | — NANOSCIENCE                          |                                   |

### LEADING FLAGSHIP RESEARCH INSTITUTES

# 05

- TRINITY BIOMEDICAL SCIENCES INSTITUTE
- CENTRE FOR RESEARCH ON ADAPTIVE NANOSTRUCTURES AND NANODEVICES (CRANN)
- INSTITUTE FOR INTERNATIONAL INTEGRATION STUDIES (IIIS)
- TRINITY COLLEGE INSTITUTE OF NEUROSCIENCE (NATIONAL NEUROSCIENCE NETWORK)
- TRINITY LONG ROOM HUB, ARTS AND HUMANITIES RESEARCH INSTITUTE

## Commercialisation of Research

### IN THE PERIOD 2008–2013 TRINITY HAS

# 290

DISCLOSURES OF NOVEL INVENTIONS RECEIVED

# 69

LICENCES TO INDUSTRY GRANTED

# 38

TRINITY CAMPUS COMPANIES

### IN THE YEAR ENDED SEPTEMBER 2013

# 46

DISCLOSURES OF NOVEL INTELLECTUAL PROPERTY RECEIVED

# 09

COMMERCIALISATION LICENCES WERE ISSUED

# 05

TRINITY CAMPUS COMPANIES

# 15

NEW PATENT APPLICATIONS FILED

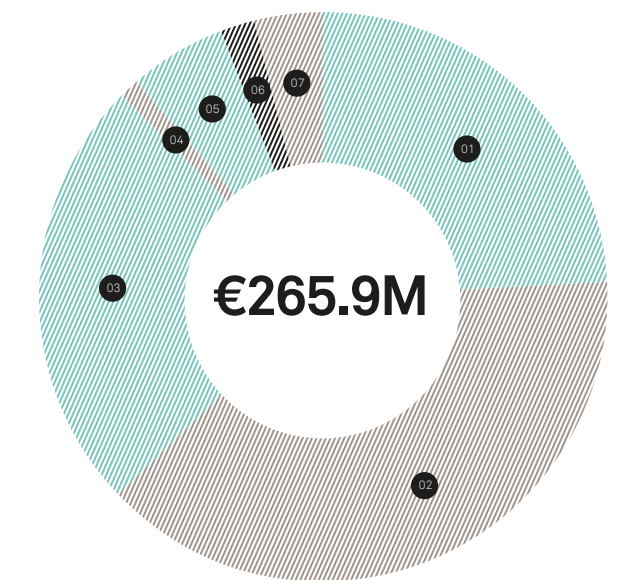
### INCOME

# €265.9M →

#### TOTAL INCOME FOR YEAR ENDED 2012

|   |         |
|---|---------|
| 01. STATE GRANT                             | €64.7M  |
| 02. STUDENT FEES                            | €102.8M |
| 03. RESEARCH INCOME                         | €65.2M  |
| 04. FUNDED POSTS AND DONATIONS              | €3.1M   |
| 05. RESEARCH GRANTS & PROJECTS CONTRIBUTION | €15M    |
| 06. NON EU FEES                             | €4.8M   |
| 07. OTHER INCOME                            | €10.3M  |

**TOTAL NET ASSETS OF THE COLLEGE** €696.5M



# BUILDING AND RESTORATION: EXTENDING THE CAMPUS

In early 2013, restorers working on Trinity's well-loved Museum Building got a wonderful surprise: hidden behind the darkened carbon-encrusted stonework they found a panel dedicated to Darwin and the evolution of the species. No one had seen it in living memory and no one even knew it was there.

The Museum Building, which now houses the School of Engineering and disciplines of Geography and Geology, was built between 1853 and 1857. The panels must have been carved and decorated over the next few years, since Darwin's *Origin of the Species* was published in 1859. Today the building stands revealed as an early, indeed contemporary, monument to one of the world's greatest scientific breakthroughs.

Restoration was a delicate process: the dirt and soiling needed to be removed without damaging the surface of the stone and without stripping all the attractive patina of age.

Fortunately, most of the gypsum/carbon soiling could be removed using a gentle water misting technique, with minimal use of aggressive chemical methods. Soiling has been ignored in areas where removal might damage the stone.

Darwin wasn't the only surprise – other newly revealed panels show Aesop's fables, while hidden in the foliage of the main string course can now be seen a variety of birds, some with their young in nests. These show all the hallmarks of the work of 19th century carvers John and James O'Shea, who were known to gather fresh flowers to use as models for their stonework.

Finally, careful cleaning of the Caen stone panel over the entrance door revealed a detailed carving of the Trinity crest. On the capital to the left there is a bird being threatened by a lizard. The phenomenally successful restoration was made possible through government funding.

The year's other significant building project was the Wellcome Trust-HRB Clinical Research Facility at St James's Hospital. At 1,300 square metres, the facility has 10 beds in inpatient isolation rooms, a research pharmacy, a sample processing laboratory, and a neuropsychology suite for cognition studies. The facility complements Trinity's activities in St James's Hospital and is adjacent to the Trinity Institute of Cardiovascular Sciences.

The clinical research facility at St James's represents a further phase in Trinity's strategy to extend beyond the campus. The college's two most significant recent buildings, The Lir National Academy of Dramatic Art and the Trinity Biomedical Sciences Institute (TBSI), both opened in 2011 as remarkable examples of purpose-designed architecture, and were both part of Trinity's Pearse Corridor Development. This corridor now extends from the Science Gallery at Pearse Street to the Lir Academy at Grand Canal Dock.



## 04

# RESEARCH CASE STUDIES

01 Ailbhe Ní Chasaide

02 Jonathan Coleman

03 Pete Humphries

04 Michael Gill

05 Daniel Kelly

06 Lorraine Leeson

07 Cliona O'Farrelly

08 Micheál Ó Siochrú

09 Tony Robinson

10 Marco Ruffini

11 Britta Stordal

12 Vincent Wade



## 04 Understanding the Voice, Building Irish Voices

Ailbhe Ní Chasaide

'It's not what you say, it's the way that you say it!' Our voice shapes not only *what* we say – the sounds and words of the *linguistic* message – but also, through tone-of-voice, conveys *how* we feel and our attitude to the listener – the *paralinguistic* message. The strands of information in the voice work in synergy – like a Trinity Knot. Unravelling these strands is essential to understanding how human communication works, and how it can fail, whether due to cross language differences or to underlying conditions such as autism or Parkinson's. It also provides the key to making speech technology (e.g. speech synthesis) more human, and more adapted to the needs of its users.

For over twenty years Professor Ailbhe Ní Chasaide and Professor Christer Gobl have led an interdisciplinary research group exploring the voice, at the Phonetics and Speech Lab in the School of Linguistic, Speech and Communication Sciences. This research encompasses the development of advanced techniques for analysing the voice (e.g. the GLóRí system) as well as explorations of how the voice encodes emotion, and how languages differ in this respect. Parallel research on the

intonation of Irish, targeting a gap in our understanding of Irish linguistic structure, has shown major differences between northern and southern dialects, and striking micro-variations in closely related varieties.

This research is being exploited in the *ABAIR* initiative, which is building synthetic voices for the Irish language, and working with the School's ITUT Network to provide linguistic resources to underpin Irish speech and language technology. Text-to-speech systems for the Donegal and Connemara dialects are provided at [www.abair.ie](http://www.abair.ie) (a Kerry voice is under way): eventually provision for even the most endangered dialects is envisaged, contributing to the preservation of our linguistic heritage.

### Ailbhe, what are the possible applications of the research?

The research on the voice will enable better speech technology, for instance synthetic speech tailored to what the user likes, voices capable of producing human-like, expressive qualities. Further applications include the assessment of vocal fatigue, voice disorders, or indeed, the effectiveness of communication.

### Who is using the [www.abair.ie](http://www.abair.ie) website?

The site is accessed from around the globe, from Brazil to Mongolia, and particularly from the US, Britain and Ireland. Being able to 'hear' how texts are pronounced can be very useful, especially as the written form of Irish is remote from its pronunciation. For those who don't have access to human native speakers, *ABAIR* provides a virtual native speaker.

### What are *ABAIR*'s education and disability related applications?

Screen-reading facilities with dialect-appropriate voices are being developed to allow full participation of the visually impaired in Irish language education and activities. We are using *ABAIR* voices for *DAISYBooks*, i.e., audio books with text highlighting, in collaboration with Childvision. Prototype interactive educational games are being developed: for example *DIGICHAINT* exploits the *ABAIR* voices and the *Language Trap* game environment, developed in Trinity's School of Computer Science. A literacy training tool, *CabairE*, is being developed for those with dyslexia.

✎ **AILBHE NÍ CHASAIDE** graduated from the Universities of Galway (BA), Bordeaux (Maîtrise) and Bangor, Wales (MA, PhD). Appointed in 1979, she founded the Phonetics & Speech Laboratory and is currently Professor of Phonetics and Director of Research at the School of Linguistic, Speech & Communication Sciences. She has directed over 20 funded research projects, on voice in communication, prosody of Irish, and speech technology for Irish. Awards, such as Fullbright and Government of Ireland Senior Research Fellowships have funded extended research periods in MIT, Haskins (Yale) KTH, Stockholm, Oxford.

**BELOW** – *Digichaint* is a dialogue based interactive language learning game produced as a collaboration of *ABAIR* and *CNGL* projects. It is based on the *Language trap* game environment, developed by the Knowledge & Data Engineering Group at Trinity, and uses the *ABAIR* voices.

### What support have you received?

Our research has been supported by Science Foundation Ireland, the Department of Arts, Heritage and the Gaeltacht, An Chomhairle um Oideachas Gaeltachta & Gaelscolaíochta, the Irish Research Council (IRCSET, IRCHSS), Foras na Gaeilge, the EU's ESPRIT/BRA, INTERREG and FP6 Programmes, the European Space Agency, and Hitachi Ltd, Japan.



→ Our voice shapes not only what we say but also, through tone-of-voice conveys how we feel and our attitude to the listener – the paralinguistic message.

# 04 Tiny sheets make big advances

## Jonathan Coleman

If small is beautiful, then nano is miraculous. Just a decade ago, in 2004, two scientists in Manchester, Andre Geim and Kostya Novoselov, achieved what was considered impossible: by paring down the mineral graphite, they were able to isolate the first truly two-dimensional material, a sheet of carbon atoms just one layer thick – one million times thinner than paper.

Graphene, as the new nano-material was called, is not only thin, but immensely flexible and conductive, and so strong that 'it would take an elephant balanced on a pencil to break through one sheet' as Columbia University professor, James Hone, puts it. Its potential use is stupendous – everything from lightweight plastics to advanced electronics.

Geim and Novoselov won the Nobel Prize for their discovery but the quantities of graphene they produced were too small for most applications. In 2008 a team of Trinity researchers, led by Professors Jonathan Coleman and Valeria Nicolosi, demonstrated a scalable method to produce graphene, which opened the way to large-scale graphene production, an area where Trinity leads the world.

It didn't stop there. Coleman and Nicolosi realised that graphite is just one of hundreds of layered materials. Applying the de-layering method to materials such as sulphur, boron, molybdenum and nitrogen could result in other nanosheets with their own exciting properties. This work was reported in *Science* in 2011 and it forms the basis of current research projects in the Schools of Physics and Chemistry and in CRANN, Trinity's nanoscience centre.

### Jonathan, what are some of the potential applications for nanosheets?

We're currently pursuing research along a broad front. Over the last year, we've demonstrated that nanosheets can be used to harvest sunlight as components in solar cells, store energy as electrodes in batteries and supercapacitors, generate fuel as hydrogen evolution catalysts, increase the strength and stiffness of both plastics and metals, monitor light levels in photodetectors and fabricate position and motion sensors sensitive enough to detect human breathing and pulse rate. Applications vary according to the material – for instance, sheets made from molybdenum and sulphur can be formed into nano-electronic devices, while sheets made from boron and nitrogen can be used to make strong, lightweight materials.

### Is there much interest from funding bodies and from industry?

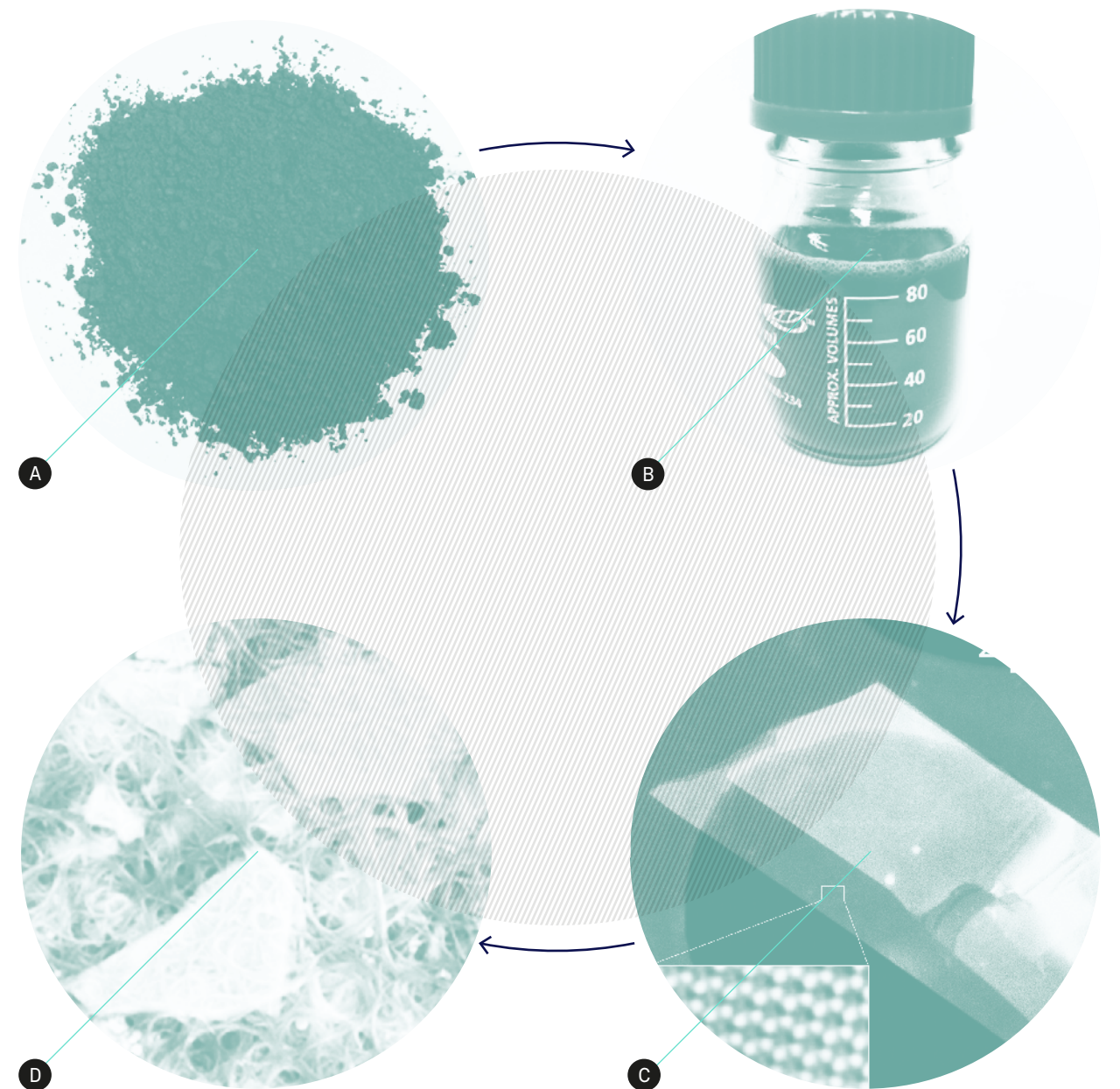
Yes, interest is very high because this is such an innovative area with such enormous potential. We're funded by Science Foundation Ireland and the European Research Council (ERC), and by a number of companies. The British chemical firm, Thomas Swan, is collaborating to scale-up and ultimately commercialise the production of graphene. And we have another industry project with SAB Miller to develop lightweight beer bottles.

### How important is this for Trinity and for Ireland?

It's widely believed nanosheets will be commercialised in a range of products over the coming decade, in critically important areas such as energy and medical devices. So the societal and economic impact is potentially huge. Commercial success will be enabled by the ability to produce these materials cheaply and in large quantities. Developing such technologies in an Irish university can only have positive impact on our economy and our academic reputation.

▼ JONATHAN COLEMAN received his BSc and PhD from Trinity and joined the School of Physics as a lecturer in 2001. He is now Professor of Chemical Physics and a principal investigator with CRANN, Trinity's Centre for Nanotechnology. The recipient of a prestigious European Research Council (ERC) Starter Grant, he was winner of SFI's Researcher of the Year 2011, and has published almost 200 articles in peer-reviewed journals. His research focuses on producing atomically thin "nanosheets" for potential application in electronic and energy storage technologies.

**BELOW** – The Trinity team has developed methods to separate layered crystals such as MoS<sub>2</sub> (A) to give liquid suspensions (B) of 2-dimensional nanosheets (C). These can then be processed into a range of structures, for example hybrids of nanosheets embedded in a network of carbon nanotubes (D).



# 04 Safely overcoming the impenetrability of the blood-brain and blood-retina barriers

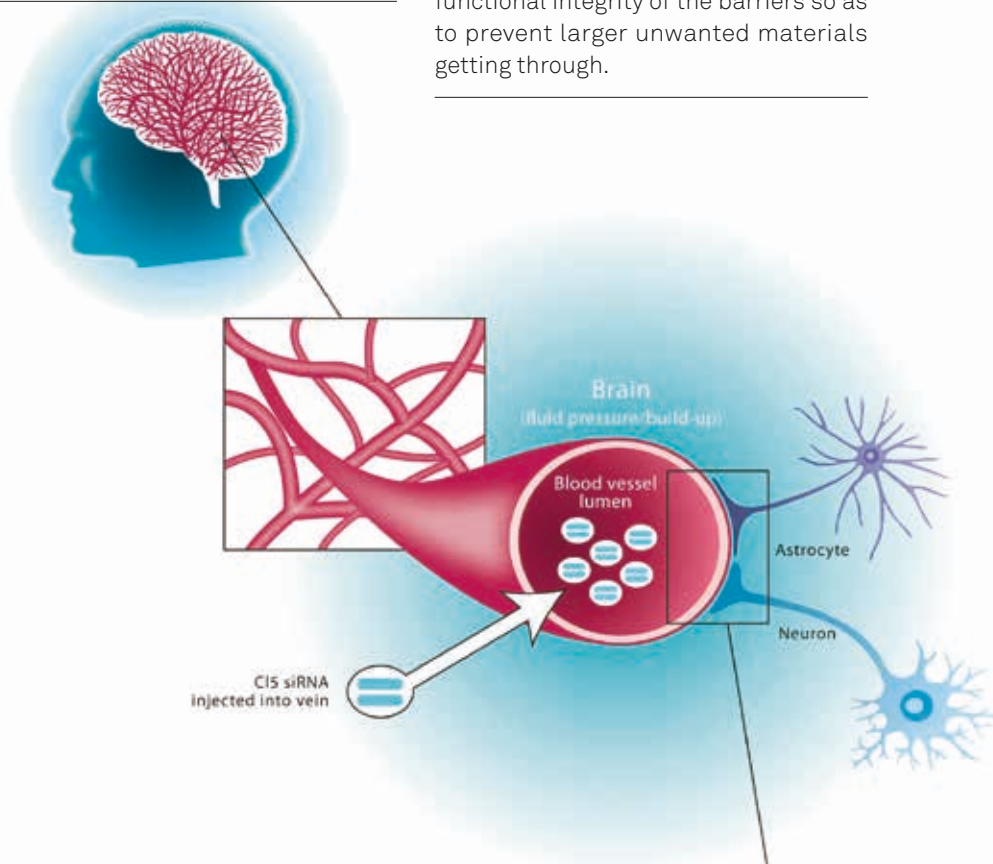
Pete Humphries

Globally up to 200 million people are visually impaired. Much of this is due to defects of the eye itself – glaucoma, diabetic retinopathy, and age-related macular degeneration are three of the most common causes of blindness in the developed world. Vision can also be compromised by damage to the visual centres of the brain through stroke, traumatic brain injury, or brain tumours.

Therapeutic drugs directed towards treatment of retinal disease and to the visual centres of the brain face a significant barrier. The brain and the inner retina (which is part of the brain) are suffused with fine blood vessels – in fact no brain or retinal neuron is more than one hundredth of a millimetre away from such a vessel. These vessels have evolved so-called ‘tight junctions’, which, as the name suggests, provide a very tight seal between the blood supply and neural compartments.

Such tight barriers evolved because the neurons of the brain and retina are the most delicate of all cells of our bodies and adverse substances that may be present in the bloodstream – antibodies or pathogens for example – must be prevented from entering such sensitive tissues. However, these same barriers also effectively prevent drug access to the brain or retina and prevent fluid from leaving these tissues in cases of cerebral or retinal edema.

Only a tiny fraction of all potentially therapeutic drugs can make it through the ‘tight junctions’. For Pete Humphries, Professor of Medical Molecular Genetics at the Smurfit Institute of Genetics, and his colleagues, the challenge has been to develop a means of genetically manipulating these barriers in such a way as to marginally increase their permeability for the purposes of enhancing systemic drug access, or for the alleviation of cerebral or retinal edema, while maintaining the functional integrity of the barriers so as to prevent larger unwanted materials getting through.



▼ PETE HUMPHRIES – After receiving his BA and PhD from Trinity, Pete Humphries joined the University Louis Pasteur in Strasbourg in 1974. Returning to Trinity, he was appointed Professor of Medical Molecular Genetics in 1991, the year he received the Alcon Prize for Outstanding Contributions to Vision Research. The author of over 200 articles in peer-reviewed journals and a former member of the Wellcome Trust’s Vision Research Working Party, his current research interests include age-related macular degeneration and glaucoma (work supported by the European Research Council).

**Pete, how close are you to enhancing drug access to the brain and retina? What’s the next step?**

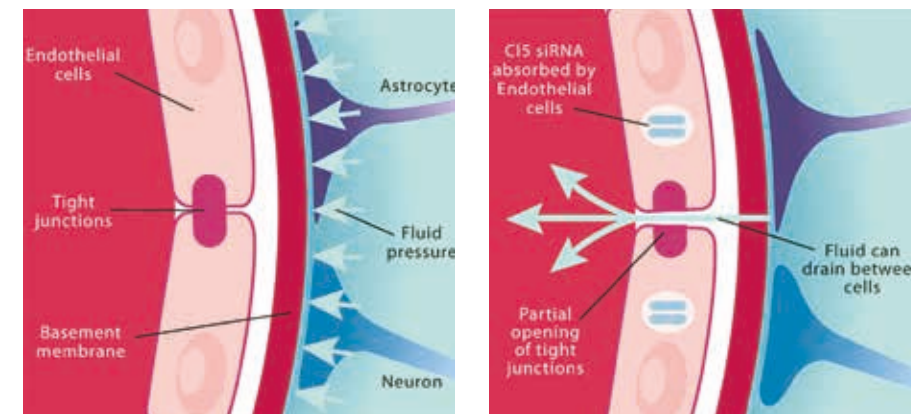
We’ve undertaken detailed functional validation studies and have obtained very favourable safety and tolerability data, which were mandatory requirements to enable us to make the appropriate applications to enter Phase 1 studies in humans, designed to establish that no harm comes from new medications. And beyond that to more extensive phase II and III studies.

**What support and funding have you been able to count on?**

During the last twelve months, approximately €3 million in overseas support has been made available for further work on modulation of blood-brain and ocular barriers. This has included €2.5 million from the European Research Council (ERC). We’ve also had support over the last three years from the US Department of Defense and from Enterprise Ireland and the Health Research Board for further development of the technologies.

**How revolutionary might this treatment be compared to current treatments?**

Treatments for cerebral edema induced by traumatic brain injury and for certain forms of brain tumour are currently limiting – average life expectancy following diagnosis of grade IV glioblastoma, for example, is 12 months, in spite of surgery, radiation and chemotherapy. A major reason is that cytotoxic drugs have difficulty entering tumours because of the barriers our technologies target. In regard to visual handicap, current treatments for age-related macular degeneration (AMD), for example, are invasive and only target established disease. Our technologies may assist in preventing the progression of ‘dry’ AMD – currently untreatable and representing 80% of cases – from developing into the more severe, ‘wet’ form.



→ Our technologies may assist in preventing the progression of ‘dry’ AMD – currently untreatable and representing 80% of cases – from developing into the more severe, ‘wet’ form.

# 04 The Wellcome Trust–HRB Clinical Research Facility (CRF) at St James’s Hospital

Michael Gill

Teaching and research drive excellence in clinical care: health services are dependent on academia for professional training and research that leads to the practice of evidence-based medicine. Excellent health care provision means recognising the interdependence between universities and hospitals, and integrating the healthcare agenda with teaching, research and innovation. To this end, the academic medical centre concept is now a component of health policy in Ireland. At the interface between health services and the university are dedicated facilities to conduct high quality clinical research.

The new Wellcome Trust–HRB Clinical Research Facility (CRF) at St James’s Hospital was opened in May 2013. The facility is a joint initiative between Trinity College Dublin and St James’s Hospital, and is funded by a partnership between the Wellcome Trust and the Health Research Board.

The facility is located in the heart of St James’s Hospital, a Trinity teaching and research hospital and is under the directorship of Michael Gill, Professor of Psychiatry in Trinity’s School of Medicine.

### Michael, what are some of the features of the new CRF?

The CRF has high technology features that are unique in Ireland, and will enable cutting edge studies and early and late phase clinical trials. We have a research pharmacy capable of safely compounding cancer drugs and handling novel gene therapies and vaccines; also inpatient isolation rooms to nurse patients with infections or compromised immune systems; plus a neuropsychology suite that will permit high quality brain activity and cognition studies, and a sample processing laboratory for rapid preparation and storage of biological samples. The CRF is also novel in having established a joint governance model with the hospital to recognise that patients and research subjects participating in clinical studies are also patients of the hospital.

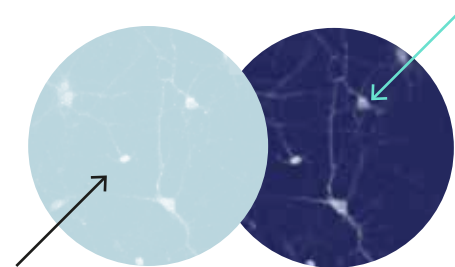
### And what are some of the clinical studies that the CRF is currently working on?

We have a rapidly developing study pipeline with, to date, thirty translational research projects planned or underway.

Examples include the EU-funded PEACHI project to develop a simple, affordable vaccine against hepatitis C in HIV positive patients; and a clinical trial of radiotherapy versus chemotherapy for patients with oesophageal cancer.

### How will the CRF contribute to Ireland’s biomedical research infrastructure, and to greater integration between health services and teaching and research?

The CRF is a crucial piece of the jigsaw and will contribute to positioning Ireland on the European and global stage. The CRF links Trinity researchers to institutions round the country and abroad – one of our key projects, for subjects with severe Hemophilia B, is being undertaken in collaboration with the Children’s Hospital of Philadelphia. And the CRF is a component of the Dublin Centre for Clinical Research, a joint initiative between Trinity, UCD, RCSI and Molecular Medicine Ireland to conduct collaborative research studies across the country. Examples of such studies include improving the way asthma patients use their inhalers, and personalising the surgical approach to prostate cancer.



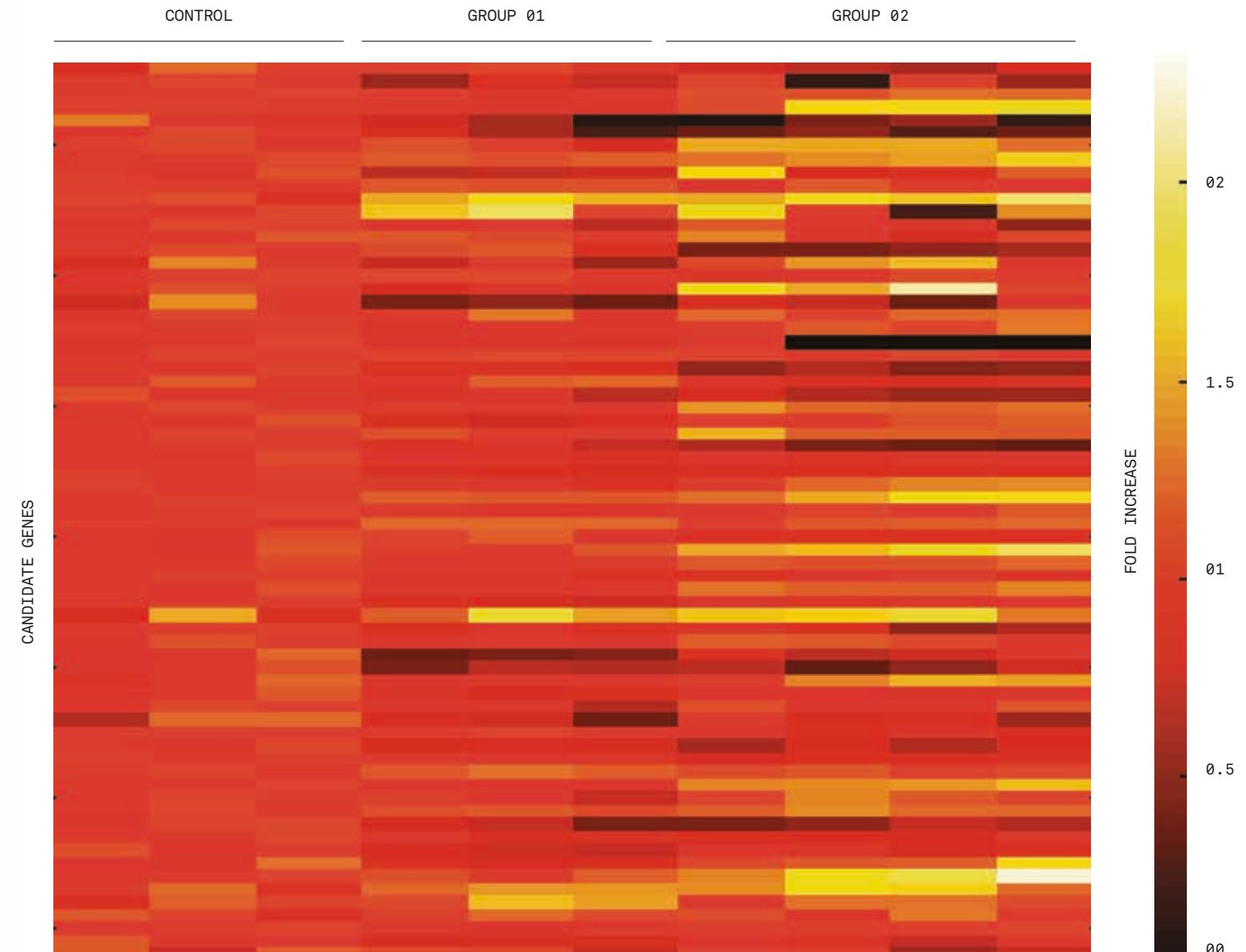
▼ MICHAEL GILL obtained his MB, BCh, BAO and MD from Trinity and trained in psychiatry and genetics in Dublin and London, where he was a Wellcome Trust junior and senior fellow. He rejoined Trinity in 1995 and was appointed Professor of Psychiatry in 2005, and director of the new Clinical Research Facility at St James’s Hospital in 2013. He leads the Neuropsychiatric Genetics Group, whose recent significant contributions to international genomics studies have been published in *Nature* and *Nature Genetics*.

BELOW – Measuring gene expression in different conditions

The St James’s campus will of course be home to the new National Children’s Hospital. Trinity is already involved with a large number of research facilities on the hospital campus, including the Institute of Molecular Medicine, the Mercer’s Institute for Successful Ageing, the Centre for Advanced Medical Imaging, and the Cardiovascular Institute.

The new CRF complements a range of existing Trinity academic activities on the St James’s campus. The CRF will also be a resource to other Trinity teaching hospitals, such as Tallaght, and it’s an early example of Trinity and a partner teaching hospital working together as an academic medical centre under Trinity Health Ireland.

Knowledge economies in health are centred around academic medical centres – this has been shown in the US and in other countries which have long-established centres. So the new CRF at St James’s is part of the ongoing development of the knowledge economy in Ireland.



## 04 Tissue Engineering – regenerating damaged and diseased joints

### Daniel Kelly

Every year millions of people suffer due to damage or disease of the articular cartilage that covers the ends of our bones. In the case of diseases like osteoarthritis (OA), where extensive degeneration of the articular cartilage occurs, the only treatment currently available is surgical replacement of the damaged joint with a metal and polymer prosthesis. The relatively short lifespan of these implants can make them unsuitable for the growing population of younger and more active patients requiring treatment for damaged cartilage. So we need to develop novel therapies to either prevent the progression of diseases like OA, or – following complete joint degeneration – to regenerate the affected tissues.

The relatively new field of Tissue Engineering aims to use a combination of cells, materials and appropriate biochemical and/or physical signals to restore function to damaged or diseased tissues. Professor Daniel Kelly of the School of Engineering leads a multidisciplinary orthopaedic tissue engineering and mechano-biology research group, which is based in the Trinity Centre for Bioengineering, and collaborates closely with PIs from the Trinity Biomedical Sciences Institute (TBSI) and the new Advanced Materials and Bioengineering Research Centre (AMBER).

Professor Kelly's pioneering research comes out of strong engagement with clinical colleagues in Dublin's teaching hospitals, and builds on over twenty years of research in the area of Bioengineering in Trinity. His lab is particularly interested in using adult stem cells to regenerate damaged and diseased orthopaedic tissues such as articular cartilage and bone.

#### Daniel, what's the role of adult stem cells in Tissue Engineering?

Stem cells have the capacity to differentiate or turn into specialised cell types that produce specific tissues like bone, cartilage and muscle. Our team has spent the past five years exploring how environmental factors regulate the fate of adult stem cells. We recently discovered that the mechanical environment to which a stem cell is subjected determines the type of cell it will become – for example either a cartilage-forming cell or a muscle-forming cell. This knowledge has enabled us to grow or 'tissue engineer' grafts using adult stem cells with properties that mimic key aspects of normal articular cartilage. Importantly, we have also shown that such grafts can be tissue engineered using cells retrieved from patients with diseases like OA. So we're now looking to develop novel tissue engineering strategies to potentially treat the many patients suffering from musculoskeletal diseases.

#### What has been the most exciting recent development?

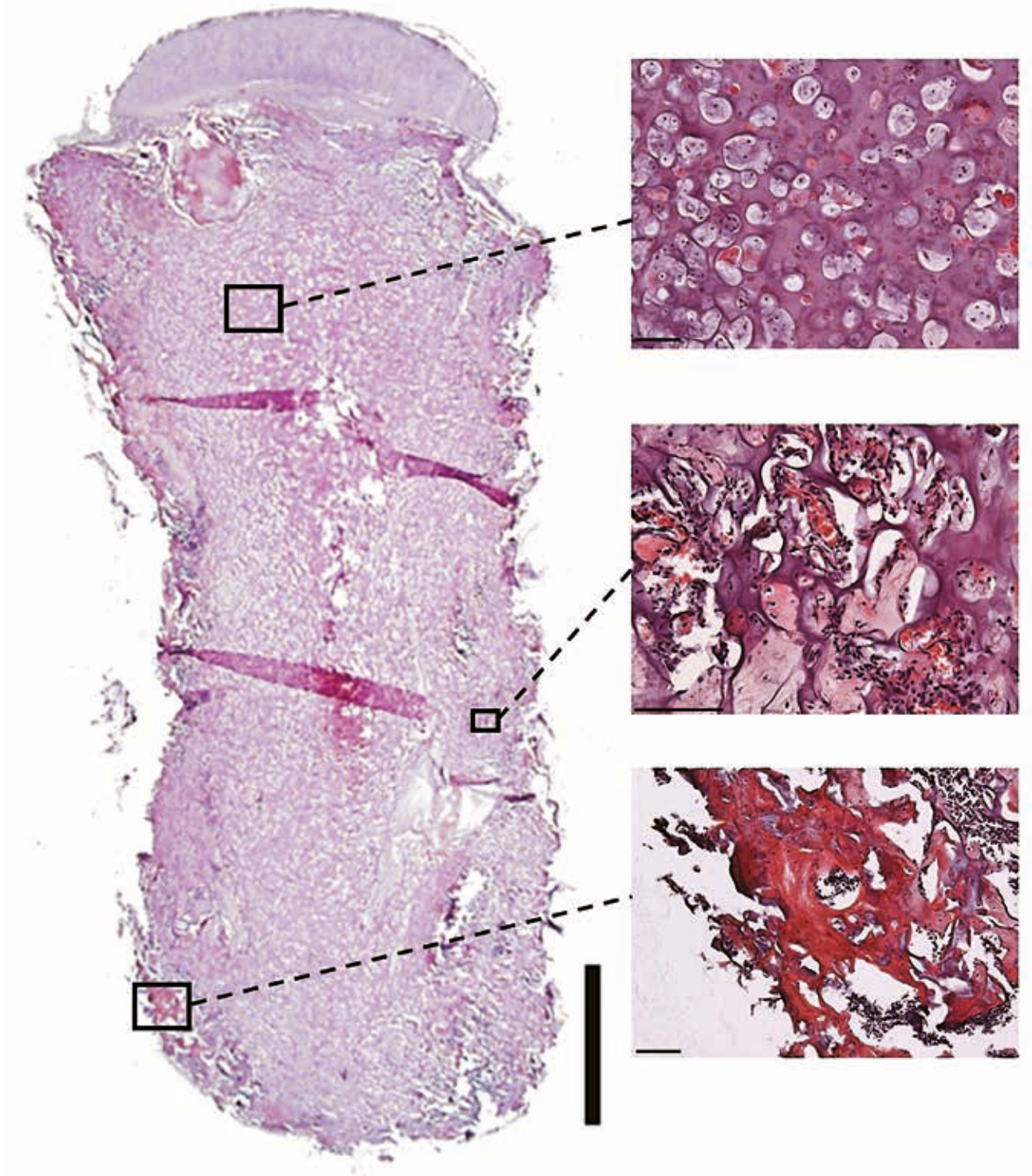
In diseases like OA, not only is the cartilage tissue affected, but so is the underlying bone. Repairing multiple tissues in a damaged or diseased joint has to date proven extremely challenging. Recently, our lab has demonstrated that both cartilage and bone can be regenerated by developing engineering strategies that recapitulate aspects of how our bones normally develop. This has enabled us to tissue engineer entire new bones. So we're now looking at extending this strategy to tissue engineer a whole new knee using adult stem cells. If successful, this could form the basis of a novel therapy for treating degenerative joint diseases such as OA and potentially delay or prevent the need for total joint replacement prostheses.

#### What is the support like from funding bodies and from industry?

Fortunately we've been well supported by both national and EU funding bodies. In 2008 I was awarded a President of Ireland Young Researcher Award (PIYRA), funded by Science Foundation Ireland. I also received a European Research Council (ERC) starter grant and, beginning this year, we starting working on a new Science Foundation Ireland Investigator grant to further our goal to tissue engineer entire new joints. In the future, we believe that such technologies will be at the heart of new companies that bring cell and tissue engineering based therapies onto the marketplace.

▷ DANIEL KELLY received his BA, BAI and PhD from Trinity and joined the School of Engineering as a lecturer in 2005. He is now associate professor and director of the Trinity Centre for Bioengineering. The recipient of a prestigious Science Foundation Ireland award and a European Research Council Starter Grant, he has published over 75 articles in peer-reviewed journals. His research focuses on developing novel approaches to regenerating damaged and diseased musculoskeletal tissues such as articular cartilage and bone.

BELOW – Engineering whole bones through endochondral ossification. Tissue engineered anatomically accurate phalanx constructs, consisting of a self-assembled chondrocyte layer attached to a mesenchymal stem cell-seeded alginate hydrogel, were chondrogenically primed and implanted subcutaneously. H&E stain showing cartilage (top inset), blood vessel structures (middle inset) and bone (bottom inset).





# 04 Signs of Ireland Corpus (SOI)

Lorraine Leeson

Irish Sign Language (ISL) is the main sign language used in Ireland. Its grammar and syntax are very different to spoken/written Irish or English, and it is more closely related to French sign language than to British.

ISL is at least 170 years old, but until recently linguistic descriptions of it were minimal. This was problematic because a robust description of a language is a prerequisite for developing curricula for language teaching and for identifying clinical language issues resulting from language disorder or disease.

In linguistics, a 'corpus' is a large, structured set of texts, often computerized, that help to define and analyse a language. In 2004, inspired by working on the Irish strand of the International Corpus of English (ICE) and excited by new developments for digitally capturing and coding extended video content (ELAN), Trinity's Centre for Deaf Studies began work on a corpus for ISL, under Professor Lorraine Leeson.

The Signs of Ireland Corpus is one of the world's first digital, searchable corpora of a signed language, and it is also one of the world's largest and most richly annotated corpora. It facilitated the publication, in 2012, of the world's first corpus-based description of a signed language.

## Lorraine, what were some of the questions you had about ISL when you initiated the Signs of Ireland Corpus?

We wanted to know about gendered linguistic variation in ISL: when the schools for the deaf were established in the 19th century, girls and boys were educated separately and this led to the emergence of two distinct gender-associated variants. One of our questions was whether, and to what degree, gendered variation still exists in contemporary ISL. We found that some variants remain, but much vocabulary has been "bleached" of gender associations. Today young male ISL signers often unknowingly use what were traditionally female signs. However some signs have remained gender-specific, and gay deaf men, for instance, will sometimes deliberately use traditional female signs.

We were also interested in the effects of 'oralism', an educational policy introduced here in the 1940s and '50s, adopted from Europe, which aimed to develop deaf children's spoken proficiency, but at the expense of signing. The approach entailed segregating children who had potential for 'good speech' from those considered 'oral failures'. Children caught signing were punished, sent to confession, and encouraged to give up signing for Lent. We wanted to know the linguistic and social consequences of this. Our corpus included people who had been educated before and during the period, allowing us to explore the impact of oralism on aspects of ISL grammar.

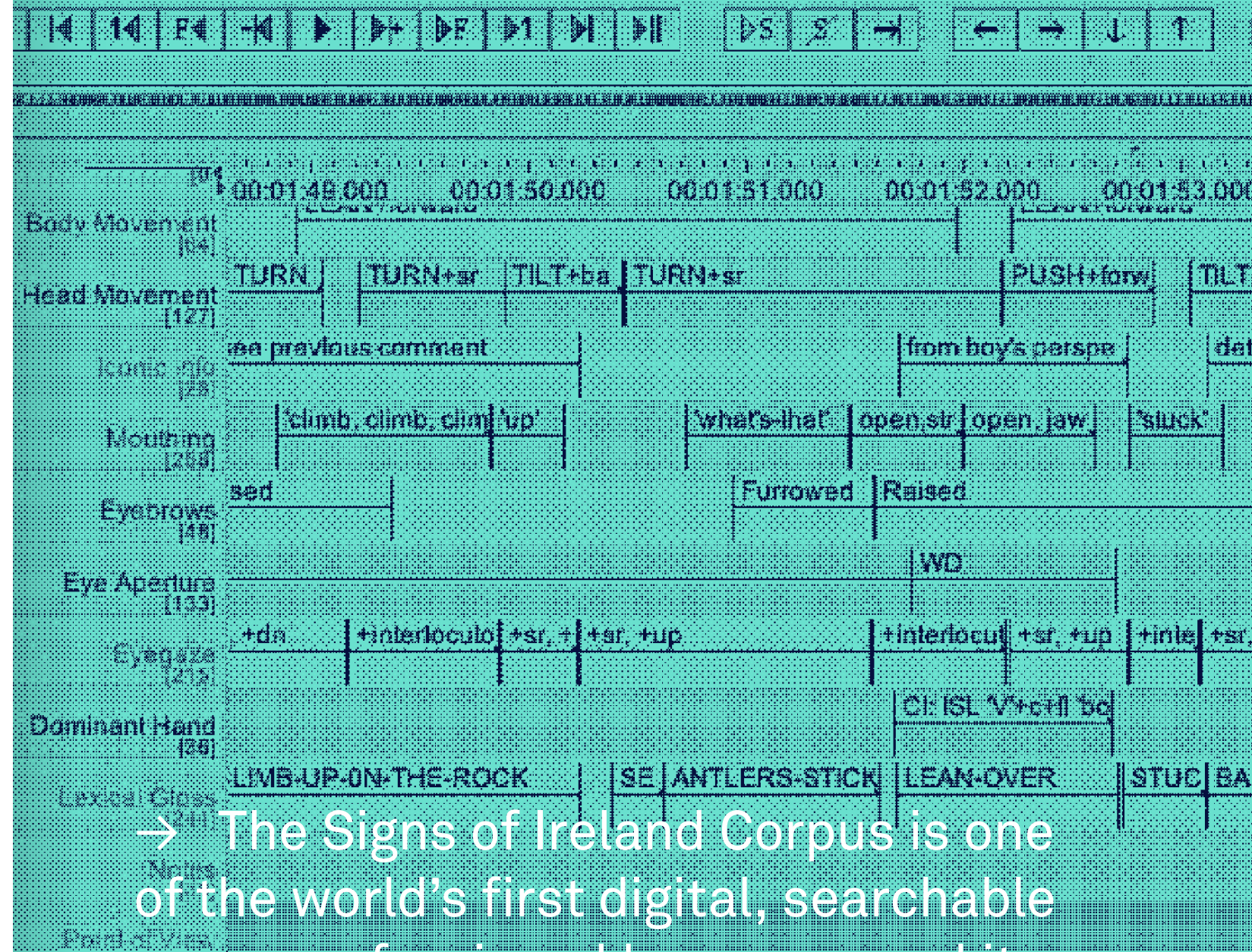
## Who uses the Signs of Ireland Corpus?

The corpus has wide applications for linguistics, for teaching and learning, and for access and equality issues generally. It is used not just in the Centre for Deaf Studies but in courses offered across Trinity, and is also rolled out to professionals and parent groups, nationally and internationally. Researchers around the world use it to compare related and unrelated signed languages.

It has underpinned advice offered to State institutions where issues arise relating to language rights or to interpreting provision as a mechanism for access. And knowledge gleaned from the corpus has even been used to support the development of an app, 'ISL Everywhere', which is aimed at parents of deaf children.



BELOW – Screenshot of SOI example in ELAN. Fiona (36) Frog Story (Waterford)



→ The Signs of Ireland Corpus is one of the world's first digital, searchable corpora of a signed language, and it is also one of the world's largest and most richly annotated corpora.

↳ LORRAINE LEESON – After graduating in Deaf Studies and Interpreting from the University of Bristol, Lorraine Leeson received her PhD from Trinity and became director of the Centre for Deaf Studies on its establishment in 2001. Now Ireland's inaugural professor of Deaf Studies, she was awarded the European Commission's Language Ambassador Award in 2008 for her work on signed languages. Her current research includes a European Commission funded project, Justisigns, looking at deaf peoples' access to justice. For the academic year 2013-14, she is the Cornell Visiting Professor at Swarthmore College, USA.

# 04 Hepatitis C Virus (HCV): how understanding viral resistance leads to new vaccines

Cliona O'Farrelly

The Hepatitis C Virus (HCV) has infected over 1% of the human population worldwide. The virus, which is adept at evolving mechanisms for avoiding immunity, targets the liver, often leading to cirrhosis, liver cancer, and increased mortality. Liver failure caused by such infection is one of the main reasons for liver transplantation in the developed world. But intriguingly some people are resistant to HCV.

Cliona O'Farrelly, Professor of Comparative Immunology, leads the team in the Trinity Biomedical Sciences Institute (TBSI) that is currently working with four hospitals (St Vincent's, St James's, Mater University Hospital and Cork University Hospital) and with the National Disease Surveillance Group to gain a better understanding of HCV resistance, infection, and immune evasion, with a view to developing new therapies and successful vaccines.

**Cliona, how does HCV avoid being cleared by people's immune systems and go on to cause chronic infection?**

To avoid its own destruction so it can reproduce and spread infection, HCV has several ways of successfully targeting specific components of the immune system. We recently found that one of the ways HCV does this is by mimicking a human enzyme and so blocking a signalling pathway normally responsible for destroying the virus and restoring health.

This research, which we're carrying out with Nigel Stevenson, also based in TBSI, has just been published in *FEBS Letters*.

**How do some people avoid HCV infection and manage to clear the virus without getting ill?**

Having discovered the mechanism by which HCV avoids our normal immune response, we think that in some highly-resistant individuals, this pathway is not destroyed by HCV. In 1977 in Ireland, several thousand rhesus-negative women received HCV-contaminated anti-D, and some resisted infection. We are hoping to define the specific molecular mechanisms underpinning the 'super' immune systems of these women that confer resistance to infection with HCV and perhaps other viruses.

**And why is the liver particularly targeted by HCV? How will learning more about the liver's immune system help you develop liver-specific vaccines?**

In collaboration with the National Liver Transplant Centre, we've been studying tissues and cells from donor and explant liver, and have found that human liver has a unique immunological environment with many mixed populations of immune cells, some of which are particularly susceptible to viral infection.

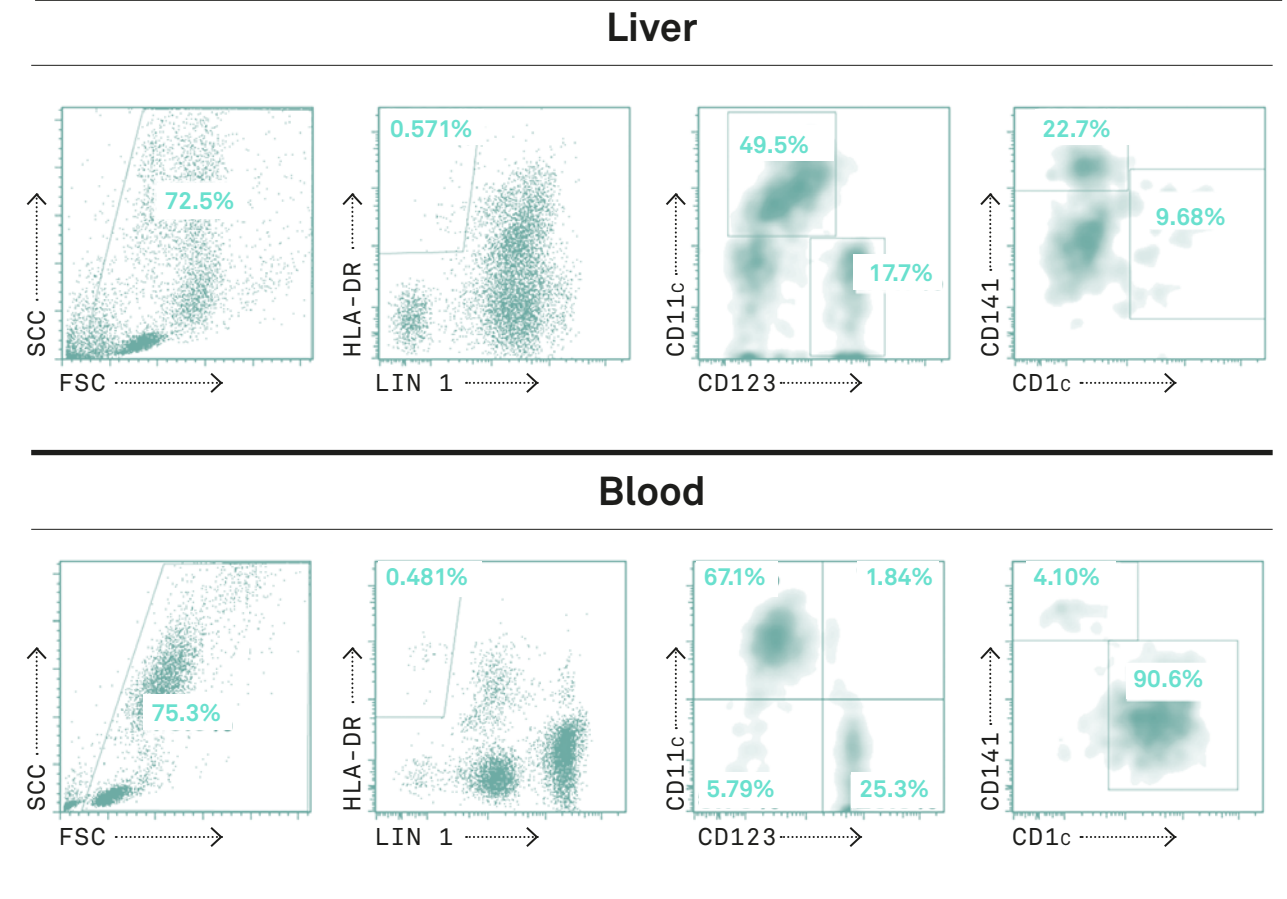
Our most exciting discovery is of a particularly potent population of immune cells in the liver called DCs (dendritic cells) that can prime the adaptive immune response. By targeting this population, we might be able to immunise specifically against liver-specific pathogens. This discovery has recently been published in the leading *Journal of Hepatology*.

**What funding have you been able to count on, and how close are you to defeating HCV through new therapies and vaccines?**

We're funded by the Health Research Board, and our work on 'super' immune systems had just been awarded a Science Foundation of Ireland Private Investigator award. It takes a long time to devise a new vaccine and even longer to develop effective new anti-viral therapies, but we are really excited by how the global HCV research community is working so successfully together. We are hopeful that HCV will cease to be a major clinical problem within two decades. Our work will also put us in a better position to tackle any virus that targets the liver.

➤ **CLIONA O'FARRELLY** – After receiving her PhD in Immunology from Trinity in 1982 and post-doctoring in Dublin and the UK, Cliona O'Farrelly was appointed lecturer in biology in Harvard University. From 1993–2007, while Director of the Research Laboratories at St. Vincent's University Hospital, Dublin she helped develop one of the world's first research programmes into human liver immunology. Now Professor of Comparative Immunology at Trinity, she has published over 180 papers and reviews, has raised more than €10m in grant funding and was recently awarded an SFI PI award to study resistance to HCV infection.

**BELOW** – Cells from human liver and blood, analyzed, phenotyped and quantified using flow cytometry. The right hand panels demonstrate the specialised dendritic cell population (CD141+) expanded in the liver (22.7%) and barely detectable in blood (4%). We found that these cells could activate T lymphocytes and may therefore be key for developing vaccines against pathogens that target the liver, like hepatitis C.



➔ We are hopeful that HCV will cease to be a major clinical problem within two decades. Our work will also put us in a better position to tackle any virus that targets the liver.

# 04 The Down Survey of Ireland

## Micheál Ó Siochrú

In the 1650s, in the wake of the Cromwellian conquest, Ireland suffered the largest single transfer of land anywhere in early modern Europe. To measure the land forfeited from the Catholic Irish and facilitate its redistribution to English Protestants, the government in Ireland commissioned a land survey. Taken in the years 1656–1658, the Down Survey of Ireland is the world’s first ever detailed land survey on a national scale.

The original maps perished in two fires (1711 and 1922) but contemporaneous copies survived in dozens of libraries and archives scattered throughout Ireland, Britain, and France. The Down Survey of Ireland Project, headed by Dr Micheál Ó Siochrú in the History Department and funded by the Irish Research Council, has brought together 2,500 of these maps for the first time in over 300 years, and digitised them, working together with industry leaders, IBM and Google. The maps are now available as a free online resource at <http://downsurvey.tcd.ie>.

The website was launched in the Trinity Long Room Hub on 13th May by the historical geographer, Professor William Smyth of University College Cork, and Ed Parsons, chief geospatial technologist at Google. The event received huge media coverage in Ireland and round the world, and in the first few days the website attracted over 100,000 visitors.

### Micheál, what can we expect to find on the website?

There are two main components – the ‘Down Survey Maps’ section comprises digital images of the maps at parish, barony and county level. These provide an extraordinary level of detail on the topography of 17th century Ireland, on land usage and value, and on settlement infrastructure, such as the long-disappeared road network. We also include the written descriptions (terriers) of each barony and parish that accompanied the original maps.

The second section, entitled ‘Historical GIS’, brings together the maps and related contemporaneous sources – the Books of Survey and Distribution, the 1641 Depositions, the 1659 Census – in a Geographical Information System (GIS). This allows us, among other things, to map the major shift in land ownership from Catholics to Protestants.

### What kind of technology is involved?

The project is a unique interaction between historical manuscripts and modern technology. All the historical sources have been overlaid onto 19th century Ordnance Survey maps, and also onto Google Maps and satellite imagery, while the GIS section contains a series of highly detailed new maps on landholding and the changing religious composition of landholders. This project builds on existing collaborative work between the departments of History and Computer Science, alongside IBM and Google, as well as creating a template for further research in a number of disciplines.

### Who do you think will be most interested in visiting the website?

The Down Survey website transforms our understanding of 17th century Ireland, allowing us to reconstruct the period in new and exciting ways. The website will of course appeal to historians, but also to geographers, genealogists, cartographers, sociologists, engineers – or indeed anyone with an interest in maps or in Ireland, its past and its people.

↳ MICHEÁL Ó SIOCHRÚ received his BA, MA, and PhD from Trinity and then lectured in the University of Aberdeen before returning to Trinity in 2007. Now associate professor in the School of History and Humanities, he is author and editor of numerous books on 17th-century Ireland, including *God’s Executioner: Oliver Cromwell and the conquest of Ireland* (2009). He was a principal investigator on the 1641 Depositions project and is currently working on a new five-volume edition of Cromwell’s letters and papers for Oxford University Press.

BELOW – Barony map with Trinity College Dublin



# 04 $\mu$ -Power Stove Generator — Electricity for the Developing World

## Tony Robinson

According to the World Health Organisation, over 2.7 billion people worldwide rely on the traditional use of biomass (fuel from organic materials) for cooking. Around half of them lack access to grid electricity. Instead, for those who can afford it, lighting is typically derived from sources such as kerosene, diesel, propane lamps, and candles.

Technologies that 'burn' to create light can put a significant economic burden on those who use them – it's been estimated that \$40 billion is spent annually on off-grid lighting in the developing world.

In response to this environmental challenge, four Trinity mechanical engineers – Dr Tony Robinson, Dr Séamus O'Shaughnessy, Chloe Kinsella and Maurice Deasy – have developed a clay cooking stove which generates off-grid electricity by using thermo-electric generators (TEGs) to convert heat into electricity.

In December 2011, five such generators were sent to a village in the Balaka district of Malawi.

### Tony, how does the stove generator work?

The generator is specifically designed to integrate with locally-produced improved cooking stoves which reduce fuel consumption and smoke generation. A small portion of 'waste' heat from the cooking stove is converted into electricity by means of the thermoelectric effect. The generated power is then stored in a rechargeable battery. The generator comes equipped with charge control circuitry and a USB output which allows the users to connect and charge rechargeable LED lights, mobile phones and even portable radios.

Experiments performed in our School of Engineering showed that over three one-hour long cooking periods, the stove was capable of generating and storing eight Watt-hours of electricity. This was sufficient to fully charge a mobile phone and still have some energy remaining to charge an LED lantern.

### What's the reaction been by users so far?

Households in Malawi tested the new technology for three months with very positive results. The results of this field trial informed a redesign of the generator, and ten version 2 generators were deployed in the Ntcheu district for a second field trial in July 2012. The next stage of this project will scale up to over 100 generators which will be assembled by local craftsmen.

### What support have you been able to count on?

This project would not be possible without the continued support of Irish Aid, Concern Universal, The Irish Research Council and Intel. The generator is intentionally not being patented and all intellectual property is open-access.

Link to 'Off the Grid in Malawi': [www.youtube.com/watch?v=3OU2ruj-fKQ](http://www.youtube.com/watch?v=3OU2ruj-fKQ)

▼ **TONY ROBINSON** received his BSc and PhD from McMaster University in Canada, and joined Trinity's School of Engineering in 2004. He is now an assistant professor in Thermodynamics and runs a team of researchers in the Fluids and Heat Transfer Laboratory. He has published over 100 articles in peer-reviewed journals and conference proceedings. His research focuses on basic and applied thermal fluid science ranging from precision thermal measurement systems to the rational use of energy in developed and undeveloped countries.

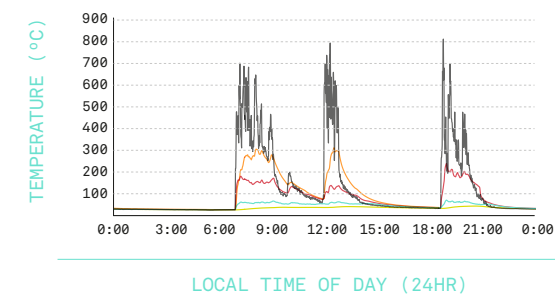
BELOW – Deployment of the version 1 generators.

A – Stove and TEG temperature profiles for one day of use in the live field trial in Malawi.

B – Battery charging/discharging profile for one day of use in the live field trial in Malawi

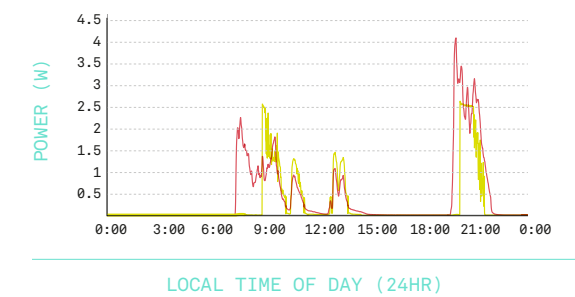


Stove 1 Temperatures on Thursday 15 Dec 2011



A

Stove 1 Power Profiles on Thursday 15 Dec 2011



B

# 04 The DISCUS Project and high-speed broadband

Marco Ruffini

High-speed broadband is a prerequisite for growing the economy. But in many countries a 'digital divide' persists between urban and rural areas, with some rural areas almost completely cut off from the online world. And even in towns and cities, broadband can be frustratingly slow – according to a 2010 survey, less than one percent of broadband lines in Europe had access speed in excess of 100Mb/s.

The idea of deploying fibre optics to the home for ultra-fast broadband access has been around for decades. However, due to high installation costs, its implementation has progressed very slowly. Now DISCUS, a major European telecommunications research project, is exploring novel network solutions that use fibre optics to provide high-speed broadband to all citizens, regardless of where they live. The DISCUS consortium consists of thirteen partners from eight European countries, and is led by Professors Marco Ruffini and David Payne of Trinity's telecommunication research centre, CTVR.

**Marco, what are some of the solutions DISCUS is working on to increase high-speed broadband coverage?**

We're aiming at re-designing the network infrastructure to meet targets of low capital and maintenance costs as well as reduced energy consumption. The core ideas driving DISCUS' innovative force are simple and intuitive: support sharing of network infrastructure among a larger number of users and services; reducing those inefficiencies which are due to the duplication of functionalities; developing novel low-cost and adaptable optical components; and creating compelling business and regulatory models to emphasize the practical viability of the proposed DISCUS network architecture.

**And how close are you to these goals?**

Starting in November 2012, DISCUS has already delivered revolutionary network design proposals, built credible cost-analysis tools, and developed new optical transmission technologies.

We're working with properties of optical fibre that have been known for decades – i.e. low signal attenuation and large capacity – but which haven't been fully exploited in the network access (e.g. the side that connects to user premises).

Today's network is still using intermediate electronic nodes, which are expensive and energy-consuming. We can avoid using these through optical links which have longer reach. In addition, the high capacity of fibre allows sharing of each connection among a large number of users, and this in turn enables significant sharing of cost. So we are making a fundamental contribution to building faster, cheaper, and greener broadband networks.

**What support can you count on?**

DISCUS has an €11.7m budget, funded by the European Commission, and the project consortium includes leading research institutions such as Bell Labs Alcatel-Lucent, Nokia-Siemens Network, Telefonica, Telecom Italia and many others.

**What targets are you working towards?**

The European Commission has set targets for the development of broadband in Europe – the 2020 broadband targets from the EU digital agenda. Such targets are particularly important for Ireland, which has promoted itself as an innovation and knowledge economy. DISCUS technology will help Ireland and other European countries meet and outdo the targets.

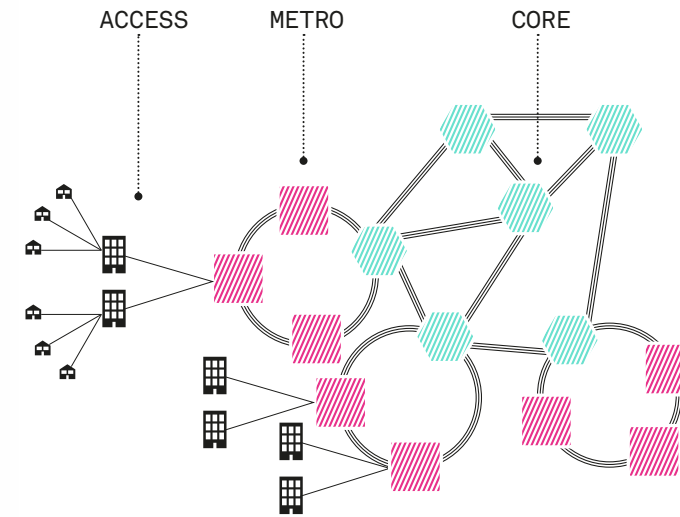
➤ **MARCO RUFFINI** received his BEng and MEng in telecommunications from Marche Polytechnic University, Italy in 2002, and after working as research scientist for Philips in Germany, joined Trinity, where he received his PhD in 2007. He is now assistant professor in optical network architectures and Principal Investigator with CTVR, the telecommunications research centre. He has published forty articles in top-tier conference and journals, and is author of eight patents. His research focuses on designing novel, flexible, high-capacity fibre broadband architectures.

DISCUS smart architecture will reduce the amount of expensive and power hungry electronic devices in the network, making it faster, cheaper and greener.

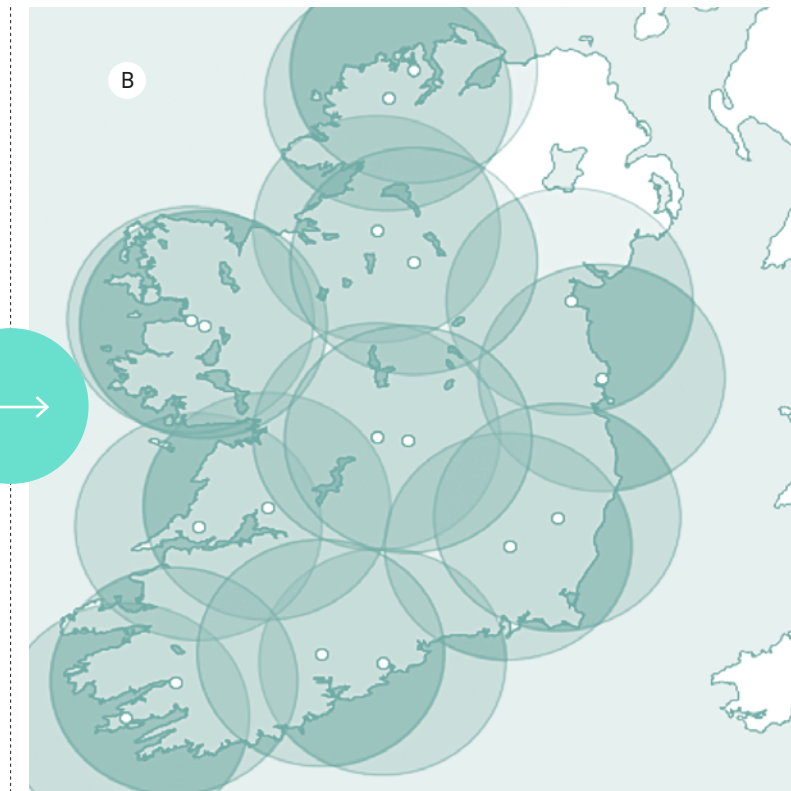
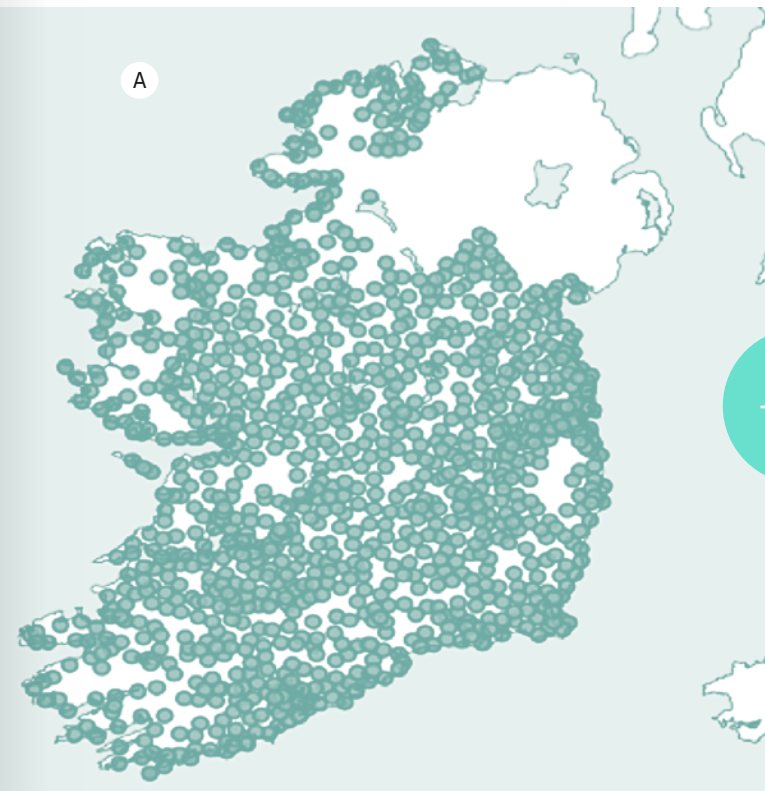
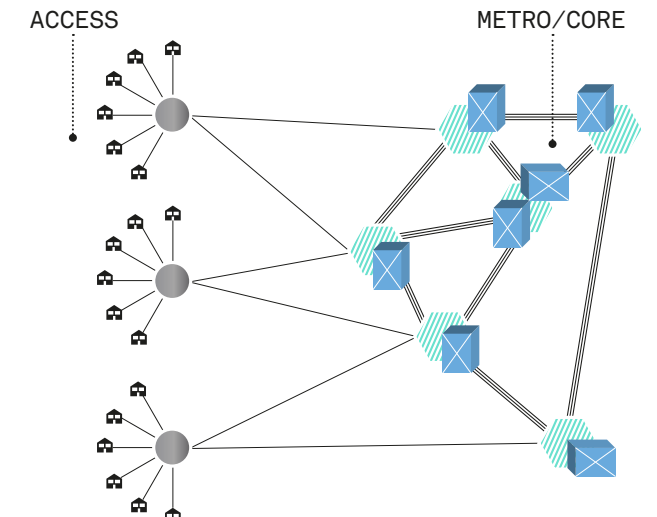
A. 1,100 Local Exchanges

B. 18 Metro / Core Nodes

### Current network architecture



### DISCUS smart architecture



## 04 Biomarkers for Drug-Resistant Ovarian Cancer

Britta Stordal

With over 204,000 new cases reported worldwide each year, ovarian cancer accounts for around 4% of all cancers diagnosed in women. As with many cancers, chemotherapy remains the only treatment option. Among ovarian cancer patients, response rates to the chemotherapeutic drug, cisplatin, are initially high, but many patients relapse after treatment – often because they have developed platinum-resistant disease.

Chemotherapy that fails to cure cancer is bad for patients and is a significant financial drain on healthcare systems. The key lies in personalising treatment by subdividing patients into different resistance categories. Breast cancer is now routinely divided into four major subtypes, and different treatments are given for each group. This kind of personalised approach has greatly improved both response rates and long-term survival for breast cancer patients. A similar approach is needed for ovarian cancer which currently has a very high mortality rate.

This year, Dr Britta Stordal, senior research fellow in Histopathology in the School of Medicine, discovered approaches to help determine different resistance categories and eventually develop personalised treatments.

### Britta, what are you discovering from studying ovarian cancer cell lines?

Platinums are one of the most commonly used anti-cancer agents for solid tumours including ovarian cancer. The mechanisms of platinum resistance that a cancer cell can develop are multifactorial. The drug can be removed from the cancer cell by transporters, it can be deactivated through detoxification and the cancer cell can learn to repair the damage the drug causes. The multifactorial nature of platinum resistance makes it challenging to identify a biomarker that will be useful in all patients.

To emulate what a cancer patient receives in the clinic, we treat the cancer cells in the lab with cycles of chemotherapy. By studying cancer cell lines that are resistant or sensitive to cisplatin we gain an insight into how cisplatin resistance is caused. We study changes in gene and protein expression to understand how resistance develops.

Using cell lines, we have discovered a panel of six genes that are predictive of platinum resistance in ovarian cancer. The genes have been validated in publicly available ovarian cancer data and in a pilot study in samples from the St James's Hospital Ovarian Cancer Biobank.

This suggests that the genes have the potential to be diagnostic biomarkers to determine if patients will respond to platinum chemotherapy.

### What funding sources can you draw on?

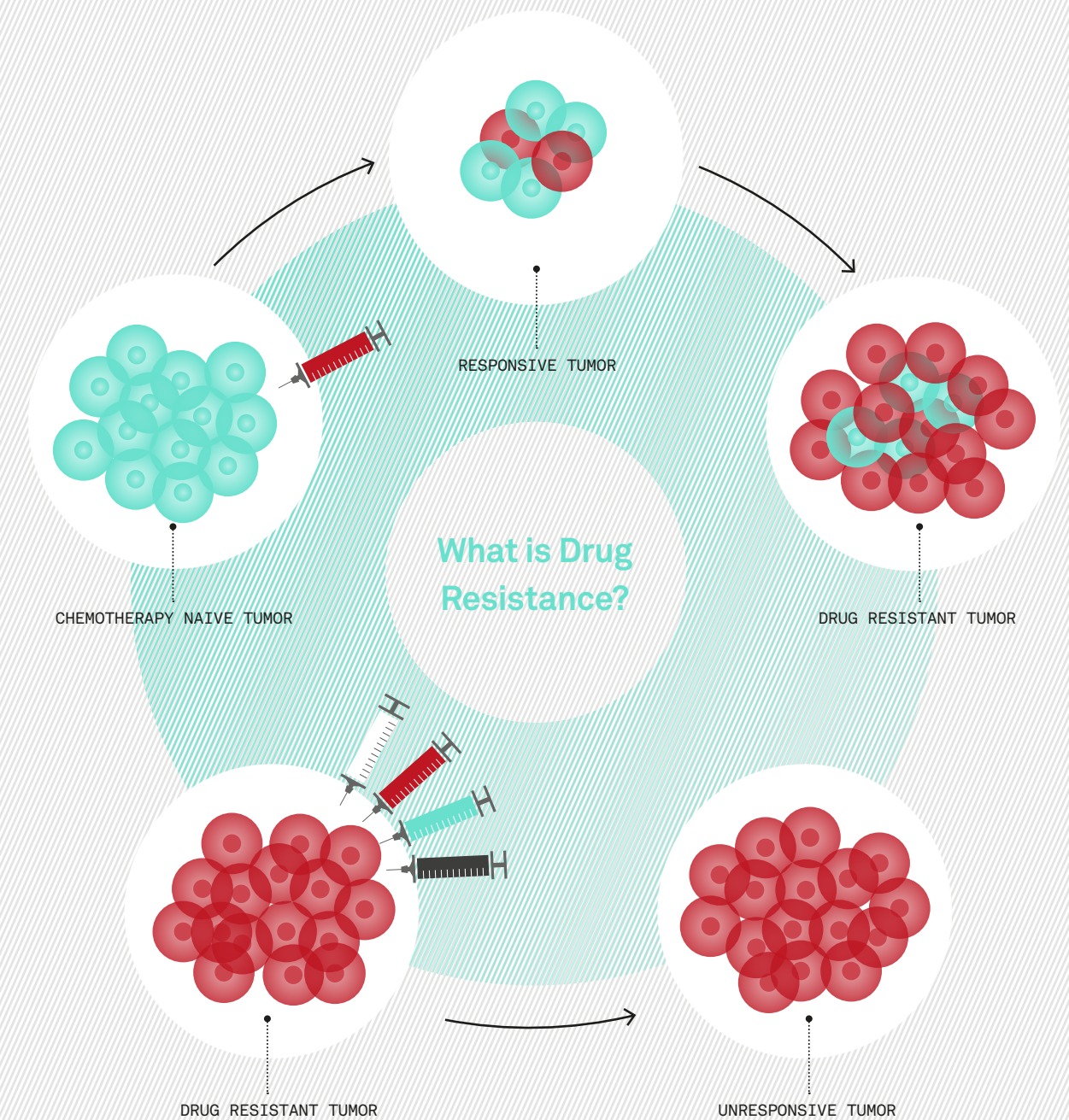
Our research is supported by an Irish Cancer Society Postdoctoral Fellowship and a MarieCurie Reintegration Grant. As part of the Discovery consortium, our laboratory is also supported by the Emer Casey Foundation.

### How close are you to patenting and clinical trials?

Current on-going research aims to establish the mechanistic relationship between the biomarkers and platinum resistance, so that people can have confidence in using biomarkers in diagnostic tests. Once we have patented the biomarkers, the next step will be to 'piggy-back' them into an existing clinical trial to see if we can accurately predict how patients will respond to platinum chemotherapy.

## Using cell lines, we have discovered a panel of six genes that are predictive of platinum resistance in ovarian cancer

BRITTA STORDAL received a B.MedSc from the University of Technology in Sydney, Australia and a PhD from the University of Sydney. She joined Trinity's School of Medicine as a research Fellow in 2010 and is now a senior research fellow and group leader. She is the recipient of fellowships from the Irish Cancer Society, Health Research Board and EUFP7. Her research focuses on studying mechanisms of chemoresistance in ovarian cancer with the aim of developing diagnostic biomarkers.



# 04 Global Intelligent Content — Making sense of our Digital World

Vincent Wade

So much content, so little time... The explosion in volume of global online content means that over 400 million tweets are now sent every day and one hundred hours of video are uploaded to YouTube every minute – and counting. And it's not just the volume of content that's exploding, it's also the means of accessing that content via different devices (smartphone, ipad, laptop, desktop) and different media types (text, video, graphics, speech).

Drowning in information? Imagine if your browser could interpret your intent and dynamically retrieve and recompose content to suit your specific needs and context. What if information from social media, corporate content, and even user-generated content could be automatically analysed, sliced, and then recomposed to provide information solutions suited to your particular problem and device, irrespective of the original contents' origin or language? What if communities and organisations could identify potential thought leaders and experts and encourage their greater involvement so as to enrich their communities?

At Trinity's Centre for Global Intelligent Content (CNGL), the research team, led by Professor Vincent Wade of the School of Computer Science and Statistics, aims to enable the delivery of the right information to the right person at the right time, in the right format and language, according to the context and preferences of the user.

### Vincent, what advances have you made recently?

We're working in three related areas: first on the delivery of personalised multilingual customer care; second on forensic analysis of content to identify its provenance; and third on ensuring consistency in corporate communications globally. For the delivery of personalised multilingual customer care, we've been working with Symantec Inc to develop a ground-breaking adaptive technology. Called Emizar, it provides users with a dynamic environment for personalised content retrieval, recomposition, and delivery across openly available web content, social media (blogs, wikis, forums, tweets, messaging) as well as enterprise information. Emizar is capable of dramatically changing the information portals of the future and is currently being trialled in areas such as customer care, elearning, and social apps.

### Symantec Inc is one of your key partners – who else have you been working with?

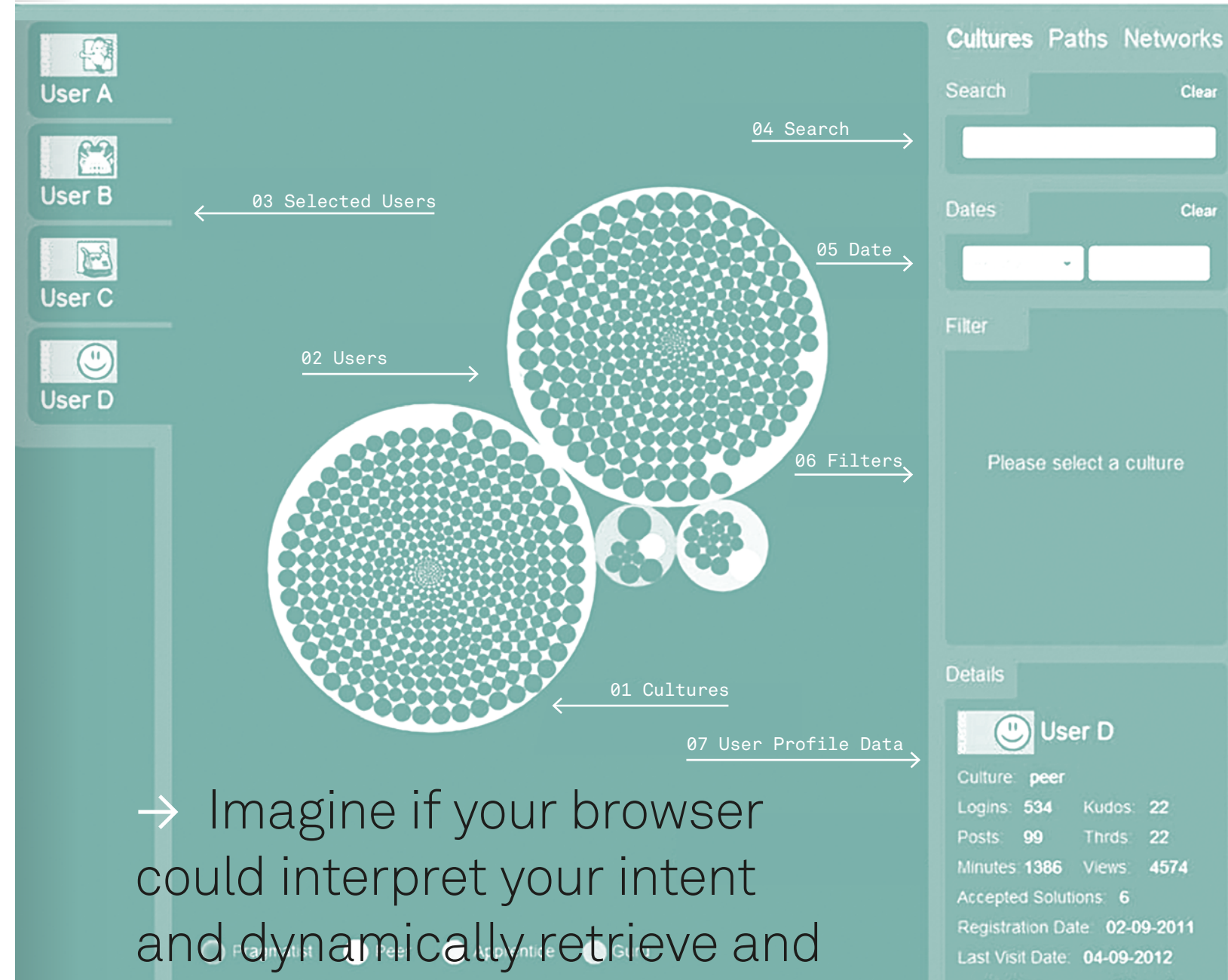
We're engaged with a significant number of industry partners – more than fifty – in Ireland and beyond, including Microsoft, Intel, Cisco, Xanadu, Alchemy, Welocalize, and many more. The industries in which these companies operate are diverse, ranging from language services, e-learning, entertainment and gaming, to publishing, information technology, and media.

### What's the economic and societal impact of your work?

It's substantial – CNGL is helping companies to understand their customers better than ever before, to tailor information and delivery strategies to local markets, to personalise education programmes, and to deliver multilingual customer care. Whatever the industry, intelligent content experiences are user-centred, emotional, pleasurable, and contextual. Global intelligent content is becoming a key enabler of audience and user engagement, and of cost reduction, geographic expansion, customer satisfaction, and brand consistency.

➤ VINCENT WADE obtained his BSc from University College Dublin and MSc and PhD degrees from Trinity College Dublin. He is Professor of Intelligent Systems at Trinity's School of Computer Science and Statistics, Director of the CNGL Centre for Global Intelligent Content, and Academic Director of Learnovate Centre at Trinity. Responsible for fifteen major EU research projects, he has published almost 300 publications in peer-reviewed research journals. His research focuses on Knowledge Engineering, Adaptive web systems, and dynamic personalisation.

BELOW – CNGL – Analysing and Empowering users in WWW Communities



➔ Imagine if your browser could interpret your intent and dynamically retrieve and recompose content to suit your specific needs and context.

# INNOVATION AND PUBLIC ENGAGEMENT

Active locally,  
Networking globally.

The Academic year 2012/2013 was a strong performance for innovation in Trinity. Campus company X Communications created a Book of Kells iPad app; Trinity's nanoscience institute, CRANN, secured large-scale funding and a leading role in a €1 billion EU project; and student entrepreneurs won two major national awards – for an engineering design and for social entrepreneurship.

Successes like these are essential since innovation is intrinsic to Trinity's mission in education, research, and serving the public good. In order to further promote the College's engagement, Trinity has devised a new Innovation and Entrepreneurship Strategy.

Innovation – technological, social, creative, cultural – permeates Trinity's research centres, creative academies, and interdisciplinary institutes. In July, we launched our new research centre, Future Cities, which brings together researchers from disciplines as distinct as engineering, natural sciences, law, and midwifery. It will drive new ways of thinking about smart and sustainable cities.







**Properly harnessed, innovation can be an enabler for sustainable economic growth and new jobs for Ireland**

Innovation is key to campus-wide activities and to the future of Ireland. It is, by its nature, interdisciplinary, applying to all faculties and all sectors of the economy. Properly harnessed, innovation can be an enabler for sustainable economic growth and new jobs for Ireland. Trinity, situated in the city centre, can be at the heart of a new innovation quarter in Dublin, reaching into spin-outs and established companies that are active locally and trading globally.

The new Innovation and Entrepreneurship Strategy will bring together all our innovation pathways to get them working to the single objective of creating a sustainable innovation ecosystem for Dublin. So, for example, postgraduates working alongside entrepreneurial staff in our research institutes will be incentivised by the Innovation Academy to create new products and services with the help of the Technology Transfer Office.

**Staff Innovation**

Technology transfer and commercialisation are among the success stories of recent years. Trinity went from creating less than one campus company a year between 1986 and 2008, to creating an average of seven annually since 2009. One-fifth of all spin-out companies in Ireland now emerge from Trinity.

**PREVIOUS PAGE** – Minister for Communications, Energy and Natural Resources, Pat Rabbitte and the Provost, Dr Patrick Prendergast at the CTVR Communications Showcase

**LEFT** – Professor Mark Ferguson, Director General, Science Foundation Ireland, Mr John Perry TD, Minister of State with responsibility for Small Business at the Department of Jobs, Enterprise and Innovation, and Professor Vincent Wade, Trinity, Director of CNGI Centre for Global Intelligent Content at the CNGI funding announcement

**BELOW** – Trinity College Dublin Students' Union Environmental & Ethical Trading Officer Gwen Duffy and Students' Union President Rory Dunne hold the Green Flag after the College received An Taisce's Green-Campus Award.

Trinity's commitment to innovation has clearly resonated in Europe. Last year, the Provost was appointed to the board of the European Institute of Innovation and Technology, a body of the EU with a mission to increase sustainable growth and competitiveness by reinforcing Europe's innovation capacity. The board comprises individuals from the worlds of education, research and business. Members must have strong reputations in their respective fields, and have demonstrated genuine interest in innovation.

CRANN, Ireland's leading nanoscience institute based in Trinity, has impressed in Europe. In January, the European Commission announced funding of €1 billion for the Future and Emerging Technologies Graphene Research Project to develop the commercial potential of the 'wonder material' graphene. CRANN, a world expert in graphene, has secured a leading role in this flagship project. CRANN secured €8 million in non-exchequer funding in 2012 – an increase of 60% on 2011 – enabling the creation of 50 full-time research jobs.

CRANN has performed well with exchequer funding. Its research centre for Advanced Materials and Bioengineering, AMBER – a co-initiative with the Trinity Centre for Bioengineering – was chosen as one of seven centres nationwide to receive large-scale Science Foundation Ireland/industry co-funding over the next five years (€300 million in total). This will enable AMBER to innovate in its key areas of ICT, medical devices, energy and pharmaceuticals manufacturing.

The CNGI Centre for Global Intelligent Content received Government and industry funding of €13.5 million for ground-breaking research in intelligent content. The funding will leverage a further investment of €6.3 million from 16 industry partners. CNGI's ambitious new research programme will focus on the development of content processing technologies to adapt and personalise digital content and services to meet the distinct needs and preferences of users across global markets. CNGI is led by Trinity and co-hosted by Dublin City University.

CTVR, the national telecommunications research centre in Ireland headquartered in Trinity, held a Communications Showcase in the Lighthouse Cinema, Smithfield in September. Focusing on the vibrant Irish telecoms and communications sector there were over 50 CTVR exhibits, presentations on the key trends and challenges in the communications sector, and solutions being delivered in Ireland with national and international scope.



President Michael D. Higgins launched a major new research theme 'Identities in Transformation' for Trinity at its flagship arts and humanities research institute, the Trinity Long Room Hub in April. This is one of Trinity's 20 strategic multidisciplinary research areas. These are research fields in which Trinity has a critical mass of world-class researchers, and which have the scale, resources and ability to address important research challenges with considerable social, cultural and economic impact.

Campus company success stories this year include biotechnology spin-out Opsona Therapeutics securing €33 million to develop therapeutic/preventative approaches to autoimmune and inflammatory diseases, and Trino Therapeutics, securing €9 million for a new class of drugs for inflammatory diseases.

Trinity's commitment to sustainability and to innovative management of waste disposal and water/energy consumption saw the College win a Green Flag award from the Copenhagen-based Foundation for Environmental Education as part of An Taisce's Green Campus programme.



**LEFT** – Engineering students, Alberto Cañizares and Aoife Considine, winners of the 2013 Irish James Dyson award. (Photo – Clodagh Kilcoyne)

**BOTTOM LEFT** – Dean of Research, Professor Vinny Cahill with WifiGuard team members Oisín O’Sullivan and Guoxian Yang.

→ Innovation – technological, social, creative, cultural – permeates Trinity’s research centres, creative academies, and interdisciplinary institutes.



#### Student Innovation

On 30th April, the first cohort of graduates from the TCD-UCD Innovation Academy were presented with certificates in Innovation and Entrepreneurship. PhD students attending the Academy take a range of specialised modules – including creative thinking, protecting your idea, planning and financing your venture – and work in multidisciplinary groups to solve real-world problems identified by partner organisations.

As examples of such problems, CitiGroup asked students to devise a ‘cashless campus’ and the charity Save Our Seahorses requested a global marketing campaign to influence policy and attitudes towards the endangered species. Students are trained to take an innovative approach towards funding and communication – engineering postgraduate student Joanne MacMahon used online crowd-funding to raise €22,000 for a water disinfection unit in Kenya.

In August, LaunchBox, a new programme aimed at cultivating the next generation of entrepreneurs, saw students pitching for investment in their business ventures. Six teams of students were provided with seed funding, office space, and master classes in marketing and funding, and spent three months incubating business ideas.

The pilot programme, which was the brainchild of the Dean of Research, Professor Vinny Cahill, was supported by the University of Dublin Fund (USA) and by Trinity Angels, business leaders making up a network of Trinity alumni and friends who have invested €100,000 in the student entrepreneurs. The Trinity Angels were also on hand to provide expert advice and mentoring to the students during the programme.

Products incubated under the LaunchBox programme include WifiGuard which uses a household wifi to detect home intruders, and BiteLock, a new type of bicycle lock, designed to immobilise a bicycle in an attempted theft.

Engineering students, Alberto Cañizares and Aoife Considine, won the 2013 Irish James Dyson award for their revolutionary DIY snowboard invention, Boundless. It offers a 360-degree rotational attachment that goes between the snowboard and bindings, and enables manipulation of the bindings without a screwdriver.

Trinity students also engaged strongly with social entrepreneurship. In April, BESS sophister Iseult Ward led the winning project in the Social Entrepreneurs Ireland ‘Minnovation’ award. The project, ‘Food Glorious Food’, subsequently renamed FoodCloud, aims to bridge the gap between food waste and food poverty by creating a ‘virtual food bank’ app, linking restaurants and catering companies to charities. FoodCloud went on to win an Arthur Guinness Project award.

In May, Trinity students established Shoutout, an anti-homophobia and anti-transphobia initiative aimed at establishing workshops around sexual orientation and gender identity in secondary schools, in order to lessen stigma and reinforce a message of equality.

05



**Public Engagement**

Trinity is a city university, located in the heart of Dublin. It is home to Ireland's greatest treasure, the Book of Kells, and the innovative new exhibition space, Science Gallery. We emphasise public engagement as a core activity. We engage not only through welcoming visitors to our permanent treasures and exhibition spaces, but also through organising public lectures and events, and, increasingly, through making our research available online.

The academic year 2012/2013 was significant. In December, the library launched The Digital Collections, a free online resource of its historic collections spanning a millennium. For the first time, access to the library's unique collections does not require a trip to the Long Room, but just a click of a mouse on the other side of the world. In May, Trinity made available key 17th century research on the Down Survey Website. This follows our launch of the Medieval Chancery Letters Website in May 2012, and it is part of an ongoing college strategy to engage the public with our world-leading research.

In December, immunology researchers rolled out an interactive demonstration lecture, Immune Wars: Bugs and Beyond, aimed at introducing primary school children to the microbial world of bacteria and the concept of the protective immune system. The initiative was funded by the RDS, and it is part of Ireland and Trinity's commitment to inspiring enthusiasm for science in school children.

A cornerstone of this strategy is Science Gallery which this year celebrated five years of revolutionary exhibitions. 'Where science and art collide' is the Gallery's slogan, and it has now welcomed over one million visitors to its free exhibitions. It is a magnet for schools, Dubliners, and tourists.

June proved a golden event month with the European Space Expo, whose interactive exhibits brought 30,000 visitors, and NanoArt 2013, celebrating 10 years of CRANN and Nanoweeek 2013. NanoArt included over 100 images, showcasing the beauty of nano-landscapes and structures, as well as the unimaginably small scale – up to 2,000 times smaller than a grain of salt.

**LEFT** – The Space Expo Dome in Trinity's Front Square attracted 30,000 visitors.

**BELOW LEFT** – 6th class pupils of Assumption Primary School, Walkinstown, visit the Space Expo.

**BELOW RIGHT** – GIFT Pep Rally in Trinity.



Other event highlights included the annual Culture Night and Open House Dublin, when Trinity, as in previous years, invited the public to view inside some spectacular buildings, and the 2012 Global Ireland Football Tournament, which saw over 2,000 people – including college football teams, marching bands, and cheerleaders – participate in a colourful Pep Rally in Trinity's Front Square in August. In October, 200 costumed primary school children studying in schools and local community groups that are linked with the Trinity Access Programmes and their parents gathered for a Hallowe'en Bram Stoker evening of arts and crafts, spooky stories, and ghoulish enactments themed around the Dracula author and former Trinity student.

In a joint initiative between the St Patrick's Festival and Tourism Ireland, Trinity's front façade was chosen to launch this year's Festival and the Greening the City initiative. Front façade was illuminated, and people were invited to create their own virtual green doodle to beam onto it. The Dublin Doodle competition resulted in 2,000 entries from round the world.

Among the most significant public lectures of the year was US political activist and theorist Noam Chomsky delivering the inaugural Front Line Defenders' lecture in the RDS – a Trinity-UCD initiative. For the Henry Grattan lecture series, the School

of Social Sciences and Philosophy invited Poland's minister of finance and deputy prime minister, Jan Vincent Rostowski, to speak on 'post-crisis Europe' in April. The following month saw the first ever Henry Grattan lecture outside Dublin – a debate in the Irish Embassy in London on 'British and Irish relations with the EU', with speakers including Pat Cox, former president of the European Parliament.

On the arts front, acclaimed actor, playwright and director Sam Shepard delivered an eclectic high-powered reading of his work in December, while Turkish activist, actress and writer, Pelin Batu, delivered the third Tweedy Lecture – a biennial lecture series addressing alternately peace, gender, human rights, and environmental issues. Public drama staged this year at the Samuel Beckett Theatre included 'Embers' (Pan Pan Theatre, August), 'Carmen' by the Opera Theatre Company, Collapsing Horse Theatre Company's 'Distance from the Event' as part of the Dublin Fringe Festival, Toshiki Okada's 'Ground and Floor' as part of the Dublin Theatre Festival, as well as a 'At The Hawk's Well', a production by our own second-year BA Drama students.

# STUDENT EXPERIENCE

**2013 was the year a Business Economic and Social Studies student on a sports scholarship Natalya Coyle made history when she won Ireland's first ever medal in the Modern Pentathlon World Cup.**

With teammate, Eanna Bailey, she took silver at the inaugural "mixed relay" event. Also remarkable was microbiology PhD student Aisling Miller who represented Ireland in air rifle at three major championships in 2012 and 2013: at the European Championships in Finland (2012), at the London World Cup (2012), and at the 27th World University Games in Kazan, Russia in July 2013.

Trinity was also proud to have students represent Ireland in lawn tennis at the World Masters University Championships in Nice in December 2012.

For our societies, among the highlights of the year was the DU Players' success at the Irish Student Drama Awards: the society won 11 awards, including Best Production, Best Director, and Best Actor. The Cumann Gaelach won Best Irish Language Student Society at the national Glór na Gael Awards for the second year in a row, and Lorcan Clarke, president of the Philosophical Society, won Best Society Individual at the Board of Irish College Society of the Year Awards.



## 06



**LEFT** – Natalya Coyle competing in the swim section of the Modern Pentathlon at the London 2012 Olympic Games

**BELOW LEFT** – Cumann Gaelach, Best Irish Language Student Society winners at the national Glór na Gael Awards 2013

**BELOW RIGHT** – DU Players, winners of 11 Irish Student Drama Awards 2013

→ Students' activities ranged from serving in the Garda reserve and in our outreach programmes, to getting involved in international volunteering, taking on leadership roles in clubs and societies, and offering peer-to-peer support.

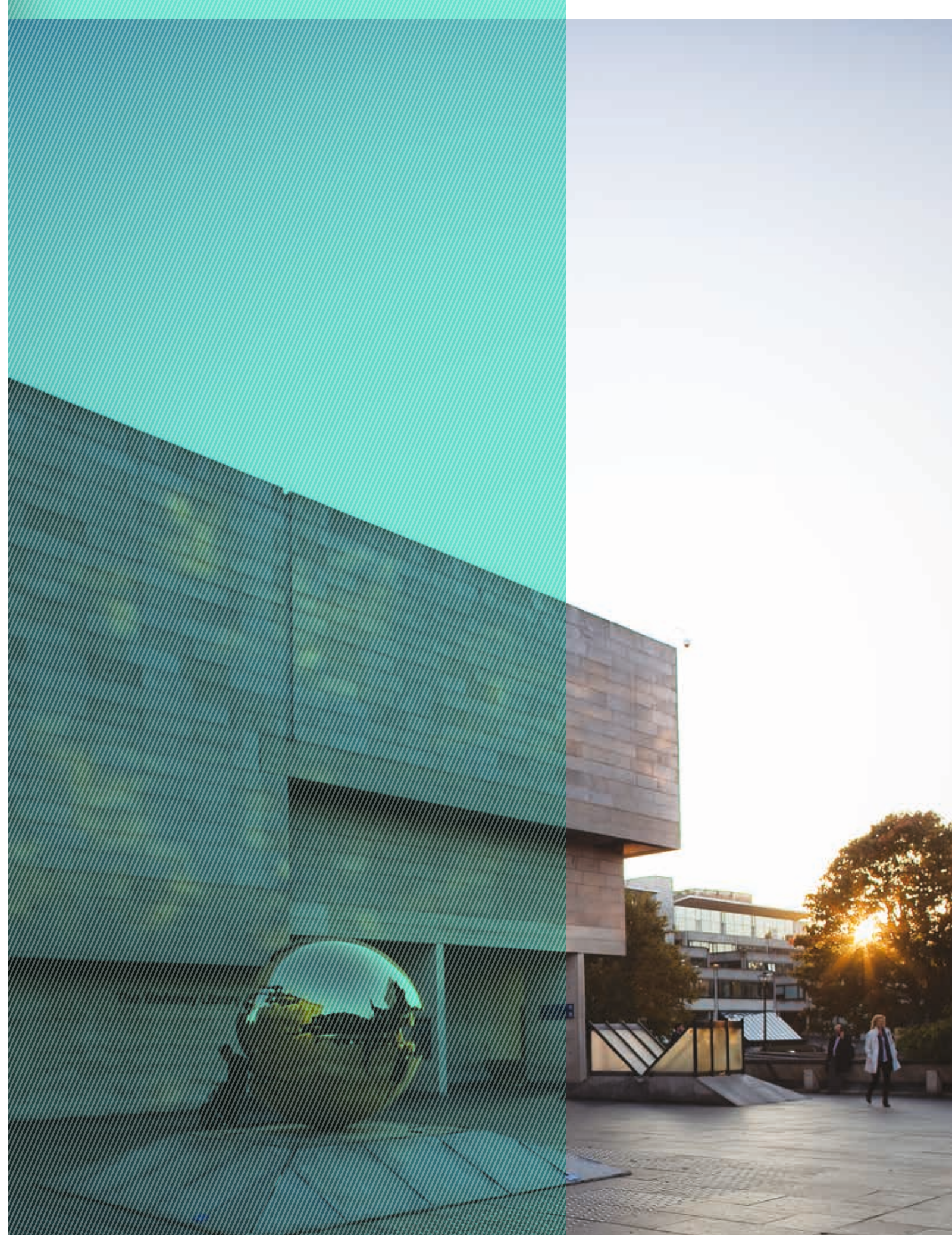
In our clubs and societies, as in all aspects of college life, Trinity celebrates tradition and innovation, continuity and commencements, and 2013 was a year of anniversaries and inaugurations: the golden jubilee of the Rifle Club, the 250th anniversary of the Chapel Choir, the 175th anniversary of the Choral Society, and the opening of the brand-new Seomra na Gaeilge, an informal Irish chat room. Participation in Trinity's 49 clubs and 112 societies develops capacity for self-reflection, responsibility, and initiative, especially when students take on leadership roles.

The Dean of Students' Roll of Honour acknowledges our students' sustained contribution to voluntary activities, both in the College and in the wider community. In 2013, over 600 students (part-time, undergraduate and postgraduate) were named on the Roll of Honour, over 150 more than in the previous year. The students' activities ranged from serving in the Garda reserve, on parents' committees, and in our outreach programmes, to getting involved in international volunteering

for education and building projects, taking on leadership roles in clubs and societies, and offering peer-to-peer support. Service-learning occurs when students, as part of their studies, engage with community partner organisations. The National Strategy for Higher Education to 2030 encourages service-learning, noting its role in smoothing the transition to employment. Accordingly, the College's civic engagement officer, Róisín McGrogan, coordinated the Knowledge Shop Pilot, an initiative which enables community organisations with research questions to link in with students. In its first year, six final-year sociology students undertook guided dissertations in response to research questions proposed by four different community organisations – the Immigrant Council of Ireland, Crosscare, the Integration Centre, and Ballymun Whitehall Area Partnership. For next year, 25 potential student research projects have already been identified across the disciplines of Sociology, Zoology, Nursing, Law, and Occupational Therapy.

# NEW PROFESSOR INTERVIEWS

- 01 Prof Mark Little
- 02 Prof Richard Carson
- 03 Prof Blanaid Clarke
- 04 Prof Balz Kamber
- 05 Prof Declan Walsh



## 07 Professor Mark Little Professor of Nephrology

→ Mark Little, inaugural Fottrell Professor of Nephrology, recalls what persuaded him to leave his post as senior lecturer in University College London in March 2012 to join Trinity College and Tallaght and Beaumont Hospitals.

“I approached a potential move back to Dublin with great trepidation: the Irish economy was in tatters, it wasn’t clear whether the euro would survive, and things were flying at UCL, one of the top ten universities in the world. Trinity was the only institution that would have been a sufficiently big draw to overcome these issues.”

Mark Little, inaugural Fottrell Professor of Nephrology, is recalling what persuaded him to leave his post as senior lecturer in University College London in March 2012 to join Trinity College and Tallaght and Beaumont Hospitals.

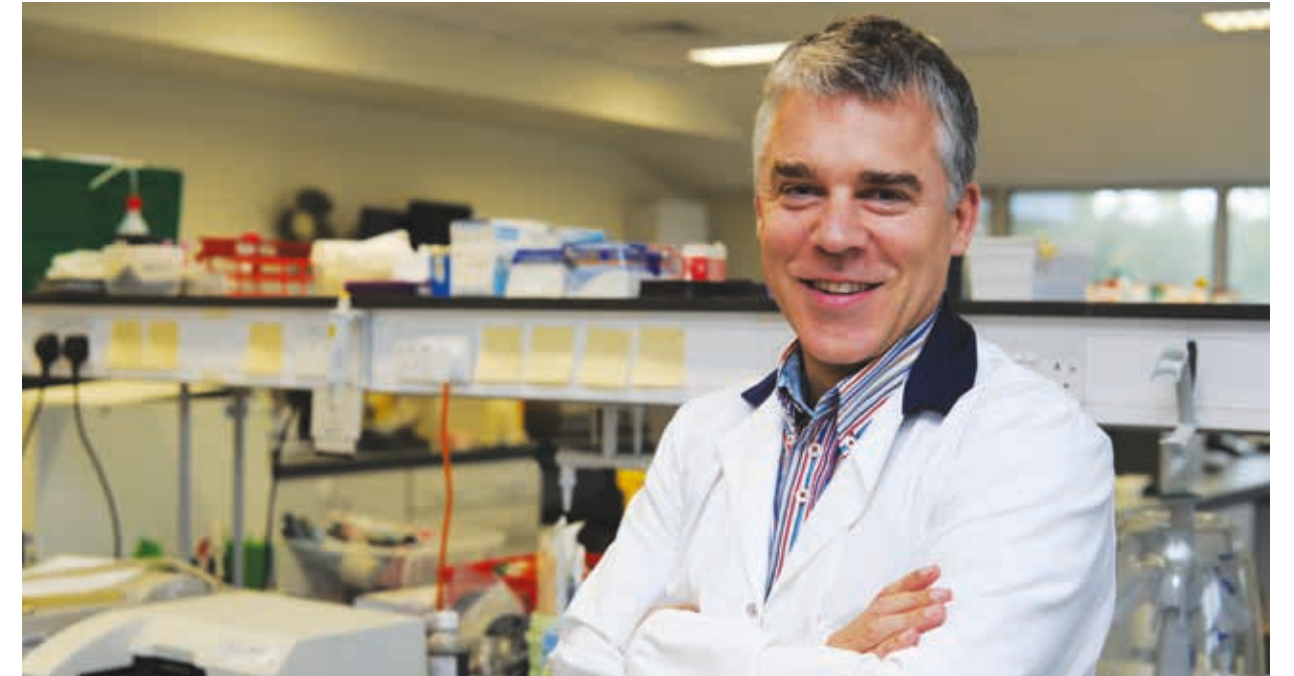
“It was a unique opportunity – the first, and likely to be the only, dedicated Chair of Nephrology in Ireland. And my research is in a field – inflammation and immunity – where Ireland thrives. Indeed, by some measures, Ireland is in the top three in the world, due in large part to heavy hitting researchers in Trinity, specifically in the new Trinity Biomedical Sciences Institute and the Institute of Molecular Medicine on St James’s campus.”

Little knows these two institutes well – in his new role he divides his time between researching in them, and teaching medical and biomedical science students.

Although just eighteen months in the job, he has been quick to pioneer innovation, specifically the Trinity Health Kidney Centre, which opened in March. The result of a strategic alliance between Tallaght and St James’s Hospitals and Trinity College, the Centre will employ an integrated approach to leveraging academic potential, increasing quality and efficiency in patient care and maximising excellence in education.

“The aim is that the translational bridge between the clinic and laboratory is permeable and that ideas go back and forth, breaking down the barriers in both areas,” explains Little, stressing that the Centre has been enthusiastically adopted by his colleagues and made possible through their support.

His own area of research is in the rare but potentially fatal disease, ANCA vasculitis, which occurs when the immune system attacks parts of the patient’s own body that contain the protein, PR3, leading to destruction of blood vessels, kidney failure, and bleeding from the lungs.



Little’s SFI President of Ireland Young Researcher Award (PIYRA) has been crucial in furthering his research in this area: “This really was the game changer” – the €1.3 million grant is supporting a new laboratory at Trinity and a five member research team.

As part of his SFI-funded research, Little has set up the RKD Biobank, an Irish registry of longitudinal clinical data and a biobank of linked biological samples such as blood cells and urine derived from patients with vasculitis and other rare kidney diseases. Six centres nationwide are providing samples and clinical information, which link with the UKIVAS pan-UK registry, which he co-chairs.

“I was gratified at the desire of clinicians around the country to share their ANCA vasculitis patient experience and samples to further the biobank initiative – this spirit of openness and collaboration will go a long way to ensuring its success into the future.”

Using new stem cell technology, Little has been able to mimic the disease, allowing researchers to work out which specific components of the immune system are malfunctioning. This sets the scene for designing and testing potential cures and biomarkers of active disease.

Now approaching two years in his new post, Little is happy he faced down his apprehension about leaving London: “It was the right choice. I’ve seen that Trinity has continued to thrive in the face of economic pressure, particularly in my field of inflammation and immunology. The things that make Trinity such a draw are the collegiate and collaborative scientific working environment, the weight of history, and the numbers of past Trinity scholars upon whose shoulders I stand.”

As a student he played cricket for Trinity – “which makes me a Knight of the Campanile!” – and today he still plays, but most weekends are dedicated to his wife, Maria, and his two young daughters. In general, he finds it “wonderful to be back at my alma mater twenty years after graduating, and to witness and be part of the dramatic developments in medical education and research that have been applied here over the last few years.”

## 07 Professor Richard Carson Professor of Cognitive Neuroscience of Ageing

→ Richard Carson, Professor of Cognitive Neuroscience of Ageing in Trinity's Institute of Neuroscience, explains how his research has come to focus on restoring movement to severely impaired stroke survivors

"When I embarked on my academic career, I was involved in a lot of sports, and was only really thinking about movement in this context. Eventually, I came to appreciate that movement is fundamental to all aspects of human behaviour, and that maintenance of the capacity for movement is critical for brain health, independence, and quality of life."

Richard Carson, Professor of Cognitive Neuroscience of Ageing in Trinity's Institute of Neuroscience, is explaining how his research has come to focus on restoring movement to severely impaired stroke survivors.

He became interested in treating stroke patients during his first academic posting in the University of Queensland, when he and the therapists in the team were faced with the challenge of delivering low-cost rehabilitation in the remotest areas of Australia.

Today, his ambition is no less than to bring the damaged brain back into action: "Worldwide, 15 million people are affected by stroke each year, and more than half of stroke survivors are left with significant loss of upper limb function, which greatly compromises quality of life. My work focuses on human brain plasticity, with a specific emphasis on the exploitation of this capacity as a means of maintaining independent living, especially for people in later life."



This research has led to the development of the SMART Arm, a rehabilitation device that helps stroke survivors with the most severe forms of limb impairment to regain movement. Minimally engineered, it uses electrical impulses to stimulate and assist arm movement and provides real-time performance feedback. The device targets the 90% of stroke survivors who have insufficient limb function to avail of existing therapies, and is designed to be used intensively with minimal intervention by therapists.

After 10 years of development and a series of clinical trials, a spin-out company has been formed to commercially produce the SMART Arm and make this groundbreaking therapy available to stroke survivors worldwide.

Carson's therapeutic goal is threefold: to afford enhanced independence and quality of life to individual stroke survivors; to significantly reduce levels of burden upon families and care givers; and to allow for more effective use of health care funds.

Belfast-born Carson did his primary degree in the University of Bristol and his Masters and PhD in Simon Fraser University in Vancouver. He is still in touch with Canadian colleagues and is currently working with a team in the University of Alberta to explore the use of tele-rehabilitation for stroke

survivors. Initial findings indicate very positive outcomes and it is hoped this new application of technology will dramatically improve access to rehabilitation therapies.

Like many working at the cutting edge of neuroscience, Carson's work is intrinsically multidisciplinary, employing experimental techniques from neuroscience, cognitive science, psychology, genetics, anatomy and biomechanics. Trinity's multidisciplinary approach is part of what tempted him to Ireland to take up the Chair in 2011.

"I am continually impressed by the willingness of colleagues here, who are leaders in their own fields, to engage in collaborative ventures, and by the positive research environment at Trinity generally. Here, it is assumed you have the motivation and capacity to contribute to the endeavours of the university, and you are trusted to get on with it."

He thinks his research is a "good fit" for Trinity, since it "adds a new but complementary facet to formidable existing strengths in the fields of cognitive neuroscience and ageing".

And is he still involved with movement on the sports side? "With two children under two, my recreational activities are diminishing! However I still enjoy running, swimming, and cycling."



## 07 Professor Blanaid Clarke

McCann FitzGerald Professor of Corporate Law

→ The inaugural incumbent of the McCann FitzGerald Chair of Corporate Law brings a broad viewpoint and a multidisciplinary approach on the whole field of corporate law reform.

As a student in the 1980s, Blanaid Clarke decided to study law “because it struck me as fascinating and varied and affecting every part of human life”, so it’s no surprise to hear the inaugural incumbent of the McCann FitzGerald Chair of Corporate Law bringing to bear a broad viewpoint and a multidisciplinary approach on the whole field of corporate law reform.

“In order to understand the errors of judgment which led to the current financial crisis, there is a need to study the political, psychological, social, economic, and historical contexts that shape legal culture.”

This is not a woman who ploughs a narrow furrow, nor one afraid of change: “Resolving the crisis has led to the identification of new legal problems and risks, which require innovative legal solutions.” Her analysis of the market for corporate control in the run up to the crisis (published in the *Seattle Law Review* in 2013 and the *European Business Law Review* in 2011) was sharply critical:

“Takeovers, or the threat of takeover, did not exercise the expected disciplinary effect on managers of credit institutions and seemed in certain cases to have had the opposite effect. This raises questions in general about the effectiveness of existing corporate governance rules based on the presumption of effective control by shareholders.”



This steely approach is resonating at national and EU level. She was one of a small group of experts tasked with addressing current problems in EU company law (the European Commission’s Reflection Group on the Future of EU Company Law), and is a member of the European Corporate Governance Institute and the European Securities and Markets Authority Takeover Bids Network.

Closer to home, she and her Trinity colleague, Dr Deirdre Ahern, have been commissioned by the government to examine the effects of hard and soft law on board diversity reporting in different jurisdictions.

“The crisis underlined the importance of strong independent informed decision-making,” she points out. “Diversity in all its forms can broaden the board’s perspective and contribute to the avoidance of ‘group think.’”

Clarke has devoted her career to understanding corporate governance. After her BCL from UCD, she did a Masters in Business Studies and worked in corporate finance for a few years. But she found that she wanted “to engage at a deeper level with company law and to challenge its principles and underlying assumptions” and realised that “becoming an academic would give me the freedom to do that.”

She joined UCD’s School of Law in 1991, obtained a PhD from the University of Manchester and was subsequently a founding member of UCD’s Centre for Corporate Governance. She has combined academia with family life and uses weekends for “family hikes to tire out the dog and reading non-fiction”.

She joined Trinity last year and feels herself a natural fit in a School of Law that “has established a tradition of learning, scholarship and public engagement, and allows a great autonomy in terms of research focus”.

Clarke enjoys “the sense of collegiality within the Law School and a sense of shared ambition for ourselves and our students”. She advocates a legal education that marries theory and practice, and believes that the generous endowment by McCann FitzGerald of a Chair of Corporate Law will enhance the already significant interaction between the School of Law and the legal profession.

“In my new role I hope to establish the School as an international centre of excellence for corporate law, with a strong focus on research which influences not only academia but which can also be applied to support practitioners and the development of public policy.”

## 07 Professor Balz Kamber Professor of Geology and Mineralogy

→ It was the view from his bedroom window that set Balz Kamber off on his career as a geologist – seeing the Alps from your pillow at first light might just do that to you.

It was the view from his bedroom window that set Balz Kamber off on his career as a geologist – seeing the Alps from your pillow at first light might just do that to you. After studying mineralogy at his local university of Bern, Switzerland, he decided to become an academic for the simplest of reasons: “I couldn’t believe people actually got paid for what they love to do.”

Today Kamber is Professor of Geology and Mineralogy in Trinity’s School of Natural Sciences, and he is recognised internationally as the man who established a now widely accepted model for the formation of the Earth’s crust more than four billion years ago, and for the subsequent establishment of microbial life on Earth.

“Over two-and-a-half billion years ago the atmosphere lacked free oxygen, which was later generated by microbial life, and the build-up of this oxygen completely transformed the planet,” he explains. “Yet, we still don’t know why it built up so quickly or which microbial life was responsible. But we do know that there was no return from that point.”

Kamber’s research reconstructs this history by decoding cryptic clues in sedimentary rocks. This approach plays a significant role in the ongoing search for life in the universe.

“If you know what the Earth looked like four billion years ago, it provides a good model for what we should be looking for in non-solar planets today.”

Kamber came to Trinity the international way – via the UK, Australia and Canada. Just prior to his defending his PhD in Bern, he was offered postdoctoral work in Cambridge and Oxford, and he then took up the post of senior research fellow at the University of Queensland in Brisbane, at the time a global leader in geochemical analysis. Next stop was Laurentian University in Ontario – which is situated on one of the largest metal deposits in the world – where he was a Tier 1 Canada Research Chair in Precambrian Geology.

Kamber says it was “the excellence of the teaching” that attracted him to Trinity in 2011: “At Trinity, geology has retained the purity of the subject. There are few geology departments like this worldwide, where the time-honoured elements of the subject have been preserved in teaching.” Simply put, this means that Trinity students are taught with rocks in intensive field and laboratory work that requires a high staff-to-student ratio, and often hands-on, one-on-one teaching.



Ensnared now for two years, Kamber enjoys “Trinity’s compact size, the collegiate spirit, the appreciation of the students, and the successful combination of tradition and modernism,” but what he “really loves” is “to be joining at a time when we can make big changes”.

Some of these changes are physical and visible to all: a new state-of-the-art geochemical facility opened this year on Trinity’s Technology and Enterprise Campus. This represents a significant development of the geochemistry hub, and the new facility will help coordinate the multidisciplinary platform already established between geologists, physicists, and chemists at Trinity’s Centre for Nanoscience (CRANN).

Kamber’s research is at the centre of this multidisciplinary platform. He is known for his innovative ways of analysing elements in rocks, breaking them down to “ridiculously low concentrations, as few as three drops to an Olympic-size swimming pool”. These minute concentrations are of obvious interest to nanoscientists in the production of pure silicon for conversion into semiconductors.

And thanks to Kamber’s international connections, Trinity geologists are now collaborating with researchers in the University of Melbourne in developing new software for intuitive and fast visual reduction of very large analytical data sets – a project, which is being funded with over €500,000 by Science Foundation Ireland. Another EU-funded collaboration involves a prestigious Initial Training Network, and will allow several of our PhD students to train in Paris, Potsdam, Toulouse and Southampton.

When not rock-gazing, Kamber, like a true Swiss, is interested in “fermentation and its products – be that brewing beer, enjoying cheese, trying to understand the terroir of wine, or making Sauerkraut.” But his favourite food comes straight from the ground: “My wife and I are keen travellers and, wherever we go, we try our luck at foraging for wild edible mushrooms.”

## 07 Professor Declan Walsh Professor of Palliative Medicine

→ Founding director of the pioneering academic palliative medicine centre at the Cleveland Clinic in Ohio, Professor Declan Walsh returned from the US in 2012 to take up the first academic Chair in Palliative Medicine in Ireland.

Founding director of the pioneering academic palliative medicine centre at the Cleveland Clinic in Ohio, Professor Declan Walsh returned from the US in 2012 to take up the first academic Chair in Palliative Medicine in Ireland. The Chair is a joint appointment between Trinity and UCD, and is affiliated with Our Lady's Hospice & Care Services in Harold's Cross, Dublin.

As a clinical researcher in the UK in 1980s, Declan Walsh became increasingly interested by what he calls "the complex physical and psychological complications" experienced by his patients. Understanding the need to go beyond the strictly curative in helping patients manage cancer, in 1987 he set up the academic palliative medicine centre at the Cleveland Clinic, which has served as a model for hundreds of others internationally.

Palliative medicine originally developed in response to cancer, but in recent years it has extended into the management of other serious illnesses such as heart failure and chronic neurological diseases. Nutrition, pain management, and control of symptoms are key challenges in palliative medicine.



Walsh's own research focuses on complications and common problems experienced by cancer patients, including symptom assessment and tying that to the most appropriate form of treatment. He is internationally recognised for the development of cancer symptom profiles (symptom clusters) where groups of symptoms occur together in predictable patterns. The hope is that these profiles will help us better understand the natural history of these difficult illnesses.

The satisfaction in carrying out such research, according to Walsh, is that "as soon as a project is complete, the clinical practice is applied to improve patient care which is absolutely in keeping with the modern sense of translational research".

Walsh received his primary degree from UCD and, after a postgraduate degree from the University of Newcastle-on-Tyne, took up his first academic post as a research fellow in the London and Guy's Hospitals and at St Christopher's Hospice, London.

After so many years in Cleveland, his links with the US remain strong, and he is currently a panelist for the US Food and Drug Administration (FDA) on the management of pain for cancer patients. Internationally, he will continue his research collaborations with organisations such as the European Association of Palliative Care and the Multinational Association for Supportive Care in Cancer.

Walsh is delighted with the multidisciplinary research environment at Trinity. He likes being able to count on "clinical collaborators and a wide spectrum of experts in all areas of health care and information technology", and looks forward to collaborating in some of the College's flagship multidisciplinary research projects, such as The Irish Longitudinal Study on Ageing (TILDA), where his area of expertise is of course particularly relevant.

His colleagues in the School of Medicine are "very entrepreneurial" and have been most "welcoming and supportive", while he finds teaching Trinity undergraduates particularly stimulating: "They are an interesting combination of an international student body who are also very smart. These strengths combined provide a variety of viewpoints, and make teaching very enjoyable. Students are also learning from each other, and not just faculty which is very important."

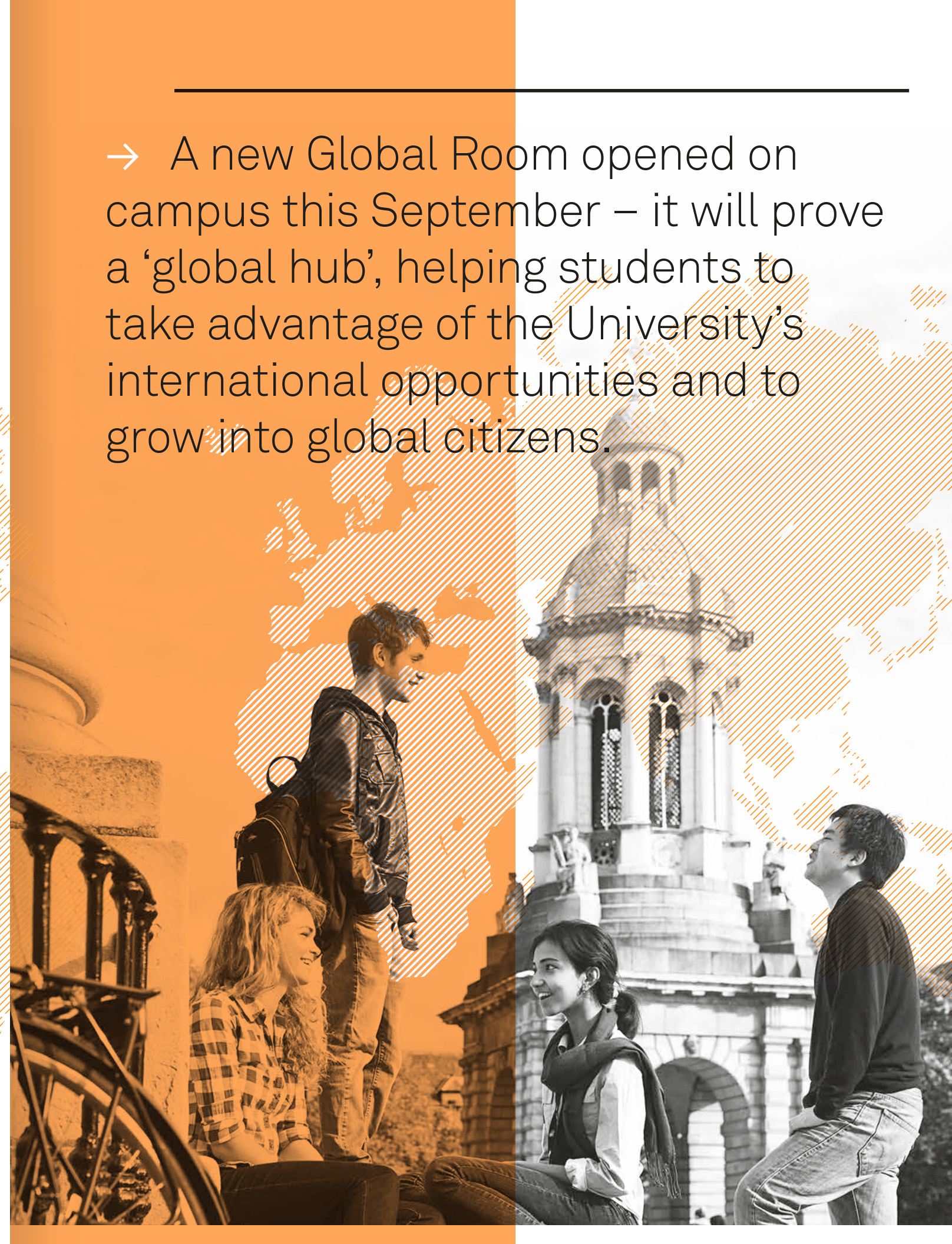
After hours, Walsh is still interested in academic research, but he takes a break from medicine: "My hobby is reading up on military history, particularly the Western Front in World War One and the Eastern Front in World War Two."

# GROWING GLOBALLY

New Trinity offices in Delhi and New York; student exchanges with Peking University in China; courses jointly delivered with Singapore Institute of Technology; further plans for Science Gallery Bangalore; a new Global Room on campus - these are just some of the actions undertaken since the launch of Trinity's Global Relations Strategy in September 2012. This strategy, aimed at further internationalising our university and building partnerships with leading educational institutions worldwide, is helping enhance Trinity's reputation as Ireland's university on the world stage.

In the past year, the Vice-President for Global Relations, Professor Jane Ohlmeyer, has led a series of student recruitment and profile-raising trips to Brazil, Canada, China, India, Kazakhstan, Malaysia, Russia, Singapore, Sri Lanka, Turkey and USA. These visits helped to strengthen established relations with partner universities, and to build new ones through, for instance, memoranda of understanding and student exchange agreements. Priority was given to meeting policy-makers and funders, visiting targeted high schools, and connecting with our alumni abroad. Taking part in government-led trade and education missions allowed us to deepen our contacts with domestic stakeholders.

→ A new Global Room opened on campus this September – it will prove a ‘global hub’, helping students to take advantage of the University’s international opportunities and to grow into global citizens.





TOP – Holi Festival in Trinity

ABOVE – Peking Signing: Vice-President, Li Yansong, Minister for Education & Skills Ruairí Quinn, Vice-President for Global Relations, Professor Jane Ohlmeyer

**Asia** – This year, we highlighted our already long-standing commitment to India by opening a permanent office in Delhi, run by an Indian national. Since February 2012, we have sent five delegations to Delhi, Mumbai, Bangalore, Chennai and Kolkata respectively. These trips had multiple outcomes, including facilitating scholarship opportunities for Indian students, encouraging research partnerships between Trinity and Indian academics, signing collaboration agreements, and organising screenings of the Bollywood blockbuster *Ek Tha Tiger*, which was filmed on Trinity's campus.

Trinity is now connected to many leading Indian institutions including IIT Delhi, the Tata Institute of Fundamental Research, the Indian Institute of Science, Delhi University, Jawaharlal Nehru University, Presidency University in Kolkata, and Lady Shri Ram College for Women in Delhi. We have also developed partnerships with leading corporations such as the Keventer Group and Biocon Limited, Asia's premier biotechnology company. Finally, Trinity's Science Gallery is working with the Karnataka State Government and key stakeholders to potentially develop Science Gallery Bangalore.

In March, Trinity participated in a government trade and education mission to China, led by the Minister for Education and Skills, Ruairí Quinn. The Trinity delegation visited Beijing, Fuzhou, Hong Kong and Shanghai, and signed a student exchange agreement with Peking University, China's highest-ranked university.

BELOW – Brazil Signing. Professor Jane Ohlmeyer, Vice-President for Global Relations at Trinity College Dublin and Rector Joao Grandino Rodas of University of Sao Paulo.

In October 2012, Trinity signed an historic memorandum with the Singapore Institute of Technology, which saw the two institutions agreeing to collaborate on delivering courses. This was a first for Trinity. Eight months later, in June 2013, eighty Singaporean students graduated from Trinity in physiotherapy and occupational therapy. This course model is now being explored as a template for expanding into other markets.

**America** – Trinity consolidated its long-standing relations with North American institutions with the establishment this year of an office in New York, aiming to coordinate Trinity's engagements with the US and Canada.

In April, an academic delegation travelled to New York, Boston, Philadelphia, Washington DC, Atlanta, Toronto, Ottawa, and Ontario, visiting universities, high schools and networking with alumni and friends at seven events across six cities.

In October 2012, Trinity formed part of Enterprise Ireland's trade mission to Brazil which coincided with President Michael D. Higgins' visit to South America. During this visit, Trinity signed a strategic partnership with the University of Sao Paulo. And for Brazilian applicants to their government's 'Science Without Borders' scholarship programme, Trinity proved the Irish institution of choice.

#### Educating Citizens of the World

As part of our Global Relations Strategy, we encourage all students to spend a year, semester or summer abroad to gain greater international experience. The next academic year will see 53 students take up non-EU exchange programmes with partner institutions, and 357 students take up Erasmus exchanges in Europe.

Further to developing an inclusive and multicultural environment on campus, the Global Relations Office has worked with student societies to promote multicultural events, including celebrations of the Chinese New Year, Thanksgiving, and the Indian festivals of Holi and Diwali.

A new Global Room opened on campus this September. It will prove a 'global hub', helping students to take advantage of the university's international opportunities and to grow into global citizens.



# BENEFLECTIONS: MAKING A DIFFERENCE

Visitors to our Dining Hall should look out for the new frieze in the grand entrance – there, permanently embossed alongside words from Virgil: “SEMPER HONOS NOMENQVETVVM LAVDESGVE MANEBVNT” (“Your name, honour and praise shall always remain”), are 61 names, starting with Queen Elizabeth I and Dublin Corporation.

This is the ‘Benefactors’ Wall’, celebrating Trinity’s philanthropic tradition, which goes all the way back to the college’s foundation in 1592. With this Benefactors’ Wall, we publicly honour those individuals and organisations whose remarkably generous gifts through the centuries have helped make our university great.

Trinity is also proud that, nine months before Ireland lost, on 30th August 2013, its great Nobel poet, we had founded the Seamus Heaney Professorship in Irish Writing. This important chair is funded by some of Trinity’s major donors, including Dr Mark Pigott KBE and Dr Martin Naughton, both of whose names are embossed on the Benefactors’ Wall. On the occasion of the launching of the new professorship in December 2012, Seamus Heaney, an Honorary Fellow of Trinity since 1998, said: “I greatly appreciate the generosity of the benefactors which is clearly underpinned by their special interest in poetry.”

→ The Science Gallery has already revolutionised the way secondary school students respond to science; this new initiative complements Trinity’s and Google’s commitment to getting young people in Ireland excited about science.





## Philanthropy empowers Trinity to undertake projects and programmes which strengthen education and research within the College and have impact far beyond its walls.

Philanthropy empowers Trinity to undertake projects which strengthen education and research within the College and have impact far beyond its walls. Trinity Foundation, the fundraising arm of the College, works closely with academic staff and supporters to deliver philanthropic goals. This financial year, the Foundation is well on track to achieving its yearly target of raising €19 million.

### This year's philanthropic highlights include:

→ The request for support to develop a new building for Trinity's Business School evoked an extraordinary response from friends and alumni. The new development will overlook the rugby pitch on the Luce Hall site, helping to consolidate Ireland's competitive position in business education.

→ The Irish Longitudinal Study on Ageing (TILDA) has received an additional €2 million from Atlantic Philanthropies for project implementation. This Trinity-led, all-Ireland study was launched in 2006, with funding of €29 million from Atlantic Philanthropies, the Department of Health and Irish Life. The study, which generates and analyses data on ageing, has helped make Trinity, and Ireland, a global research centre of excellence on ageing.

**LEFT** – Science Gallery celebrated five years of ground-breaking exhibitions in 2013

**BELOW LEFT** – Benefactor, Dr Beate Schuler and the Provost, Dr Patrick Prendergast watch the 'Benefactors Wall' being created.

**BELOW RIGHT** – Google's John Herlihy, Trinity Provost, Dr Patrick Prendergast and transition year students Eoin O'Hara & Niamh Balfe



### Outreach Activities

Science Gallery at Trinity College Dublin has secured €3.3 million in funding from a number of sources, including a strategic award from Wellcome Trust worth €1.8 million to support a partnership with the Trinity Biomedical Sciences Institute (TBSI). The funding comes as the Dublin gallery celebrates over one million visitors and five years of ground-breaking exhibitions. Other Science Gallery benefactors include ICON Plc., Pfizer, NTR Foundation, and Google. Last year, Google committed funding to develop a Global Science Gallery Network, which will see Trinity opening science galleries round the world, in partnership with leading universities in urban centres, including in Bangalore, Moscow, and King's College London, where work on the world's second Science Gallery is well advanced.

Google is also the support behind a collaborative three-year initiative aimed at transforming computer science in Irish schools. A thousand teachers will be enabled to take a certified course in 21st century computer science teaching skills, developed by the Trinity Access 21 network. Strengthening teachers is the key to transforming pupils. The Science Gallery has already revolutionised the way we see science. This new initiative complements Trinity's and Google's commitment to getting young people in Ireland excited about science.

Trinity remains deeply grateful to those who can make large transformational gifts, and to our many alumni and friends who, by their regular giving of more modest amounts, enrich the College in so many ways.

# VISITS TO TRINITY

This year saw the most high-profile visit to Trinity College since Queen Elizabeth's in 2011

This year recorded the most high-profile visit to Trinity College since Queen Elizabeth's in 2011. On 17th June, the US First Lady, Michelle Obama, and her daughters, Sasha and Malia, came to Trinity during a Dublin break as world leaders met in Enniskillen for the 39th G8 Summit. The Obamas came through Front Square and into the Long Room where they learned about the genealogical history of their husband and father, President Barack Obama. Like thousands of other Irish immigrants, President Obama's great-great-great grandfather, Falmouth Kearney, left County Offaly 161 years ago for a better life in the US. Researchers from a Trinity spin-out company, Eneclann, were able to trace President Obama's family story. John Kearney, a distant cousin of President Obama, became Provost of Trinity, and later Church of Ireland Bishop of Ossory. The Obamas viewed the Book of Kells, the illuminated Gospel manuscript which now draws some 600,000 visitors to Trinity each year. The Obamas' visit generated headlines and pictures across the world, including in countries like North America and Australia where Trinity's 100,000-odd graduates are making their mark on the world.







**TOP** – Dr Margaret Mac Curtain, Dr Liisa Kauppinen, President Michael D Higgins, Trinity Provost, Dr Patrick Prendergast, John Sheahan and Chancellor of the University, Mary Robinson at the Honorary Degree ceremony in June 2013.

**ABOVE** – Christine Lagarde, managing director of the IMF with the Director of the Trinity Long Room Hub, Professor Juergen Barkhoff and Dean of Graduate Studies, Professor Veronica Campbell

Trinity was delighted to launch the inaugural Hay Festival Kells in the Long Room on 19th June. The festival team produces 15 festivals each year across Europe, Africa, Asia, Latin America and the Middle East. It was the first time the prestigious literary gathering has come to Ireland.

In the first six months of the year, Trinity received 35 visits to the university, directly associated with the Irish Presidency of the EU. On 9th January, Trinity, in partnership with the Government, launched DISCUS, an €8 million pan-European fibre-optic broadband research project led by the university. Aligned well with Trinity's focus on innovation, the project aims to deliver higher speed broadband to more people, drawing together research and enterprise in the creation of new jobs.

On 29th January, Androulla Vassiliou, Commissioner for Education, Culture, Multilingualism and Youth, met the Provost to discuss rankings, the European Institute of Innovation and Technology, and broadening education to international students.

Christine Lagarde, managing director of the International Monetary Fund, was in Trinity during International Women's Week in March to view the Long Room Hub exhibition, 'Monsters of Creation: Snapshots of Women in Higher Education'. José Manuel Barosso, President of the European Commission, visited in February to address the Historical Society and hold a meeting with the Vice-Provost/Chief Academic Officer, Professor Linda Hogan.

**PREVIOUS PAGE** – First Lady Michelle Obama and her daughters, Sasha and Malia visit Trinity College Dublin.  
**Photo:** Maxwell Photography

**BELOW** – Provost, Dr Patrick Prendergast and Pro-Chancellor, Dr Mary Henry with Aung San Suu Kyi.

**MIDDLE** – President of the European Commission, José Manuel Barosso with the Vice-Provost/Chief Academic Officer, Professor Linda Hogan, Hannah McCarthy, Auditor, The Historical Society and Lorcan Cullen, Debates Convenor, The Historical Society.

**BOTTOM** – Al Gore with University Chancellor, Mary Robinson and Provost, Dr Patrick Prendergast in the Provost's House at the Mary Robinson Foundation's business breakfast to discuss Climate Justice.

Visits this year from three Asian government ministers strengthened Trinity's global relations strategy. Korean minister for education, science and technology, Ju Ho Lee, came in January to discuss with the Provost current and future collaborations. Singapore's second minister for foreign affairs, Grace Fu, visited in May, helping to build on Trinity's links with the Singapore Institute of Technology. In April, Akie Abe, wife of the Japanese prime minister, met Japanese exchange students and toured the Old Library. Asia is a key growth market in international education, and Trinity continues to forge new relationships in countries like India and China as we build a cosmopolitan campus and broaden the reach of our educational experience.

Academic visits build connections with international peers and showcase Trinity's strengths. In October 2012, we welcomed a delegation from Aarhus University in Denmark who were interested in learning about our management structures. In January 2013, representatives from China's Fuzhou Foreign Language School came to explore potential partnerships with Trinity. In October 2013, students from the University of Bonn came to Trinity where they toured our historic campus and took part in a discussion on strategic communications and branding in modern higher education institutions.

Honouring those active in human rights, philanthropy and social engagement is a key part of Trinity's mission. In June 2013, Trinity honoured Michael D. Higgins, elected Ireland's ninth President in 2011, with a Doctor in Laws in recognition of his contribution to poetry, academia, human rights and public life. At the same ceremony, Irish historian, Margaret Mac Curtain, musician John Sheahan from The Dubliners, and the former chief executive of the Finnish Association of the Deaf, Dr Liisa Kauppinen, were conferred with honorary degrees in Trinity in recognition of their outstanding achievements. In June 2012, while Aung Sang Suu Kyi visited Dublin to receive the Freedom of the City and attend the Electric Burma concert, she was awarded an honorary degree by the university.

Finally, visits from globally significant figures in culture and the arts are vital in keeping staff and students in touch with international ideas, and for recognising global artistic endeavour. American playwright, actor and director, Sam Shepard, received an honorary degree from Trinity in December, as well as giving a public reading from his work. Turkish activist, actress and writer, Pelin Batu, spoke about violence against women in April as part of the Tweedy Lecture series hosted by the Centre for Gender and Women's Studies.



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