



Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

Retrospective Review

2011— 2021

DR PATRICK PRENDERGAST
PROVOST & PRESIDENT



Contents

01	Welcome from the Provost	02	07	Opening access to education	64
02	Trinity at a glance	06	08	Supporting the Trinity student experience	68
03	A decade of development – key strategic initiatives	14	09	Innovation, entrepreneurship and industry engagement	72
04	Trinity's Global Relations	18	10	Trinity's thriving flora and fauna	76
05	05.0 Research case studies	22	11	11.0 New professor interviews	80
	05.1 Jean Fletcher	24		11.1 Professor Iris Moeller	82
	05.2 David Hoey	26		11.2 Professor Stephen Thomas	84
	05.3 Kenneth Pearce	28		11.3 Professor Colin Doherty	86
	05.4 Triona Lally	30		11.4 Professor Omar García	88
	05.5 Jeremy (Jay) Piggott	32		11.5 Professor Sylvia Draper	90
	05.6 Mary Rogan	34		11.6 Professor Ortwin Hess	92
	05.7 Lina Zgaga	36		11.7 Professor Aileen Kavanagh	94
	05.8 Catherine Comiskey	38			
	05.9 Helen Sheridan	40	12	Philanthropy & alumni engagement	96
	05.10 Robert Whelan	42			
	05.11 Aidan McDonald	44	13	Developing the campus	100
	05.12 Catherine Hayes	46			
	05.13 Deirdre Madden	48	14	Art of the new – keeping it contemporary	104
	05.14 Rachel McDonnell	50			
	05.15 Adriele Prina-Mello	52	15	Trinity Sport – raising our game and realising potential	108
	05.16 Etain Tannam	54			
	05.17 David Kenny	56	16	Public engagement	112
	05.18 Plamen Stamenov	58	17	Financial review 2011–2021	116
06	Educational milestones – 10 years of growth and development	60			

Welcome from the Provost

2020 and 2021 will go down in history as 'The Covid Years', and one of the many repercussions was that the whole College – staff and students – were so overwhelmed by the demands of transitioning to online working, teaching, learning and research that there was no *Provost's Review* to capture and celebrate the achievements of the academic year 2019/20.

So it's with particular pleasure that I welcome back the *Review*, which also happens to be my last as Provost, since my term of office ends in July 2021. For that reason, this issue has been configured as something of a retrospective of the past decade, although it also showcases recent research successes, and introduces the college community to seven new professors. As they recount in their interviews, many of these professors started working in Trinity either just before, or shortly after, the college went into lockdown so they have yet to experience our university thronged with staff, students and visitors, and busy with events. As I write the college and the city have begun to open up, cautiously. But the delta variant is all over the news, with predictions of yet another wave. While we all look forward to life returning to the classrooms, labs, and libraries, the future is not yet certain.

To make up for missing a year, this issue showcases an increased number of research projects. Unsurprisingly, there is a Covid angle to some of these projects, either directly – see Catherine Comiskey, 'The epidemiology of Covid-19 and addiction', p.38 and David Kenny, 'Keeping track of the law in Ireland during Covid-19', p.56 – or tangentially, in 'Enabling translational nanomedicine', p.52, Adriele Prina-Mello points out that the mRNA Covid vaccines (Pfizer and Moderna) are nanovaccines and in 'Future Technologies for Communication' p.50 Rachel McDonnell looks at ways to use Augmented Reality (AR) to improve natural interaction in video conferencing, something which became particularly pertinent in this last

→ I hope that, like me, you come away with a renewed sense of enthusiasm for all that has been achieved and will be achieved at Trinity, and the difference this makes, not only to our students and staff, but to Dublin and Ireland and to education and research globally.



01



year of working from home. The extent of the ‘Covid factor’ in diverse research projects is evidence of the pervasive impact of pandemic and lockdown on all aspects of our lives and also of the range of Trinity’s multidisciplinary. We are delighted and proud to place our research at the centre of improving people’s lives.

Our university mission is multifaceted and this is reflected across this *Review* with chapters on education, access, sport, innovation and entrepreneurship, the student experience, philanthropy and alumni engagement and capital development projects. Ten years is a long time so it’s amazing to read back over the stand-out initiatives of the decade: the dual degree with Columbia University, piloting Trinity Access in Oxford University’s Lady Margaret Hall, the Student Partnership Agreement, the Trinity Education Project, LaunchBox, the Trinity Business School, the philanthropic campaign *Inspiring Generations*, to name just a few.

The figures at the front of this *Review* comparing 2021 to 2013 or 2015 are revealing and should be a source of pride for all: increased staff numbers, despite a markedly stringent public funding environment; hugely increased numbers of international students; more invention disclosures, licenses, High Performance Start Ups... the figures tell a story

and it’s a story of achievement. So much has been done thanks to the outstanding efforts of staff and our really phenomenal students and alumni.

A university is of course the sum of its education and research activities but it goes deeper than that. A university is also an idea and a place. This past year we have proved that we can teach, learn and research online and that’s really important and something we want to build on for the future. But a university like Trinity cannot be entirely remote or virtual. It’s a physical place and that is showcased beautifully in two chapters here. Chapter 10, Trinity’s thriving flora and fauna looks at the plant life and wildlife that we share our space with and relates the wilding of our campus over the past decade. The photo of Burke at Front Arch surrounded by long grasses and wildflowers instead of a neatly mowed lawn is a striking image for our times: never was it more obvious, to quote the man himself, that ‘change is needed for our own conservation’. Chapter 14, Art of the new – keeping it contemporary, looks at how we adorn our physical space and recounts the addition of 200 new artworks to the college collection over this decade, including securing significant one-off funding to purchase art for student areas, including for Printing House Square, which will open shortly.

LEFT – Dr David McGrath, Director of the College Health Service and his colleague Dr Clare Kelly prepare for the first onsite COVID-19 vaccinations to students and staff with very high risk medical conditions.

TOP – Provost Patrick Prendergast congratulates Provost-elect Prof Linda Doyle in April 2021 using COVID-19 etiquette.

BOTTOM – Wildflower meadows thriving on campus.



I hope you enjoy reading these and other chapters and I hope that, like me, you come away with a renewed sense of enthusiasm for all that has been achieved and will be achieved at Trinity, and the difference this makes, not only to our students and staff, but to Dublin and Ireland and to education and research globally. It has been a huge honour – with never a dull moment – to lead this great university over the past decade. I've had the privilege of working with outstanding people who have helped bring about the many achievements described here in this *Review*. With such staff, students and alumni, Trinity can only go from strength to strength, and I wish Linda Doyle, who comes into office as Provost on August 1st, the very best with realising her ambitions for this great university.

Dr Patrick Prendergast
Provost & President
1 July 2021



Trinity at a glance

Trinity is Ireland's
No. 1 University

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

→ A 429 year old university in the heart of Dublin city centre

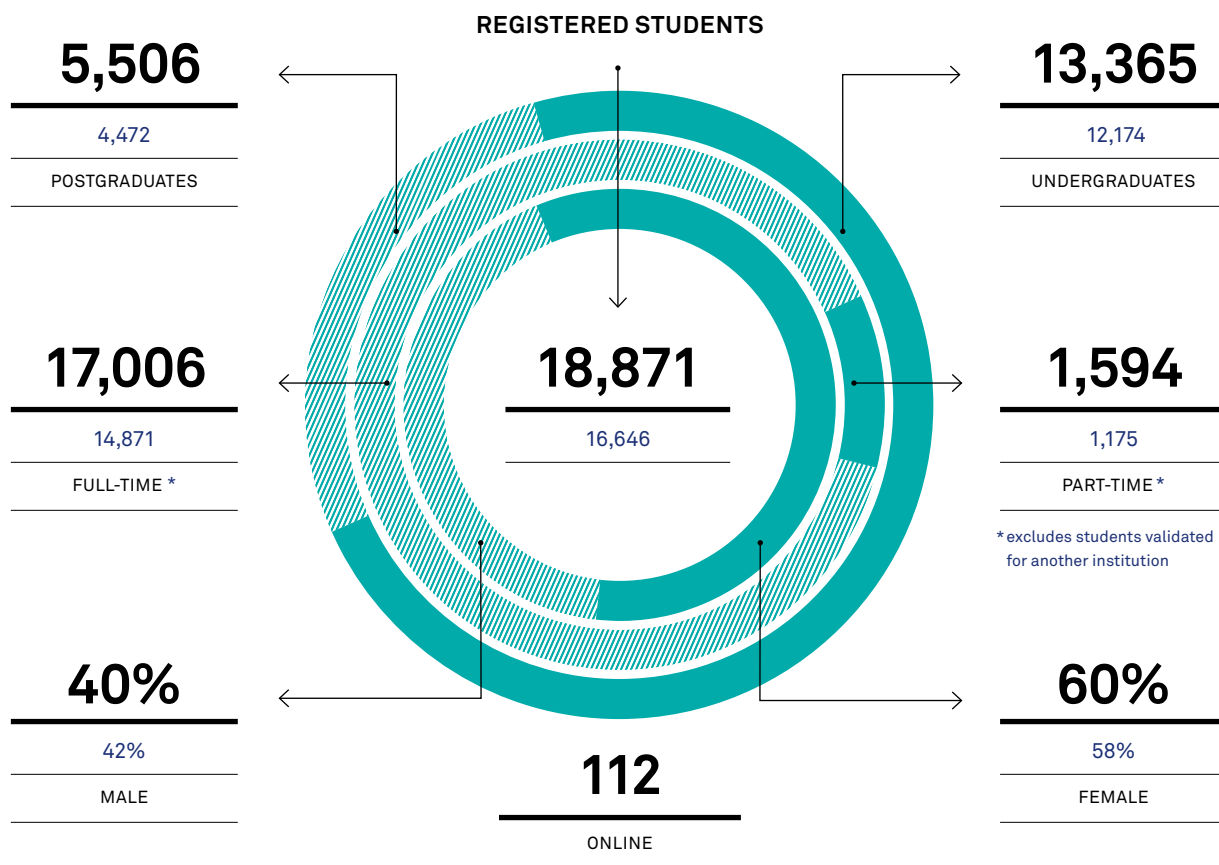


02

Student Statistics

2021 | 2013

(8 year comparisons)



ALUMNI

2021 | 2013

131,007 | 100,277

REPUBLIC OF IRELAND	85,129 74,170
GREAT BRITAIN	11,451 9,616
NORTHERN IRELAND	4,430 4,621
USA	9,283 3,557
CANADA	1,709 1,162
REST OF WORLD	19,005 7,151

CLUBS AND SOCIETIES

50 | 49

SPORTS CLUBS

127 | 112

STUDENT SOCIETIES

THE LARGEST SOCIETIES ARE:

THE VINCENT DE PAUL SOCIETY

THE PHILOSOPHICAL SOCIETY (THE PHIL)

DU PLAYERS

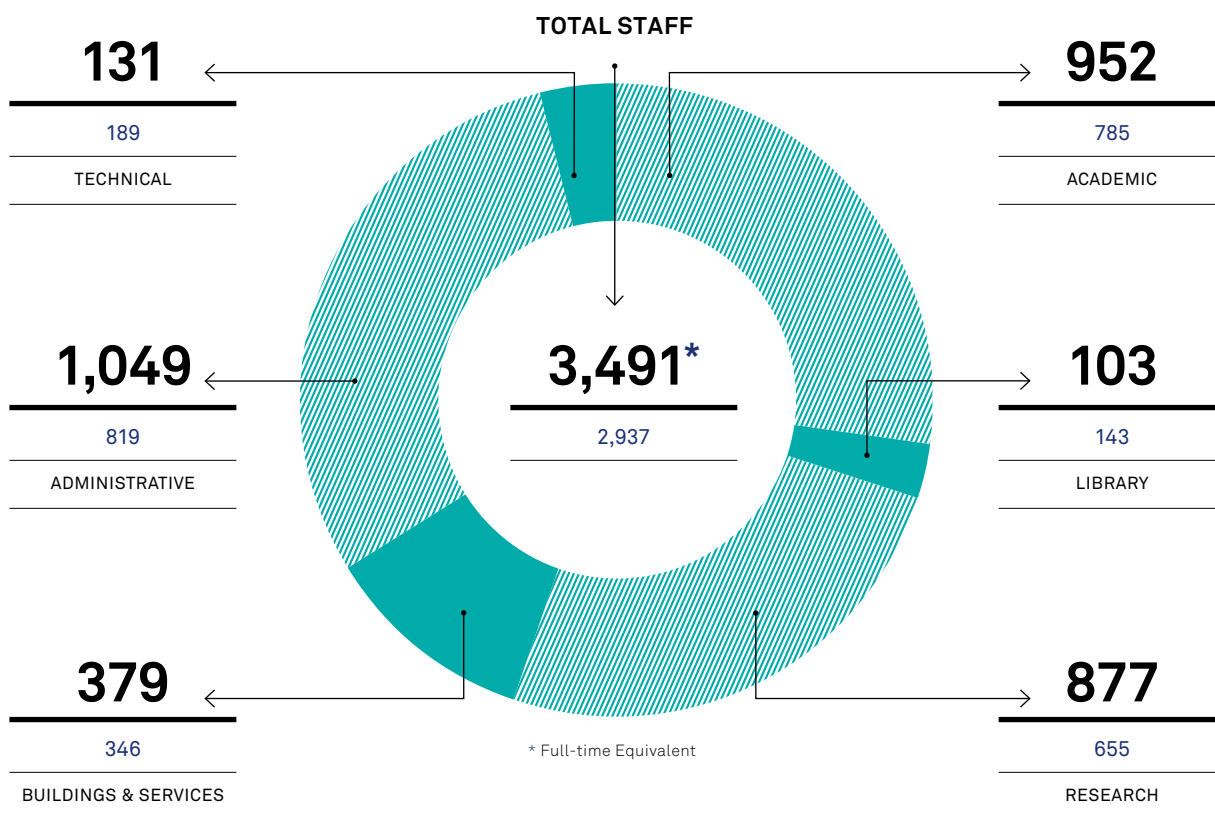
THE COLLEGE HISTORICAL SOCIETY (THE HIST)

— The college historical society (the hist) is the oldest student society in the world, founded in 1770

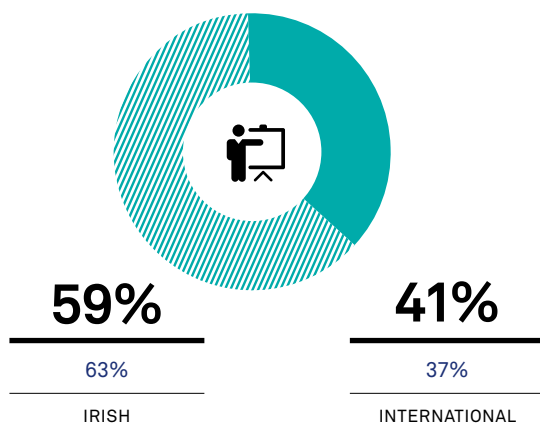
Staff Statistics

2021 | 2013

(8 year comparisons)

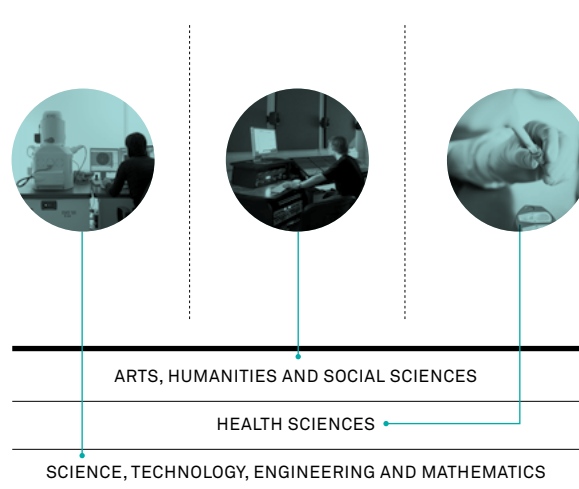


ACADEMIC STAFF*



* Full-time Equivalent

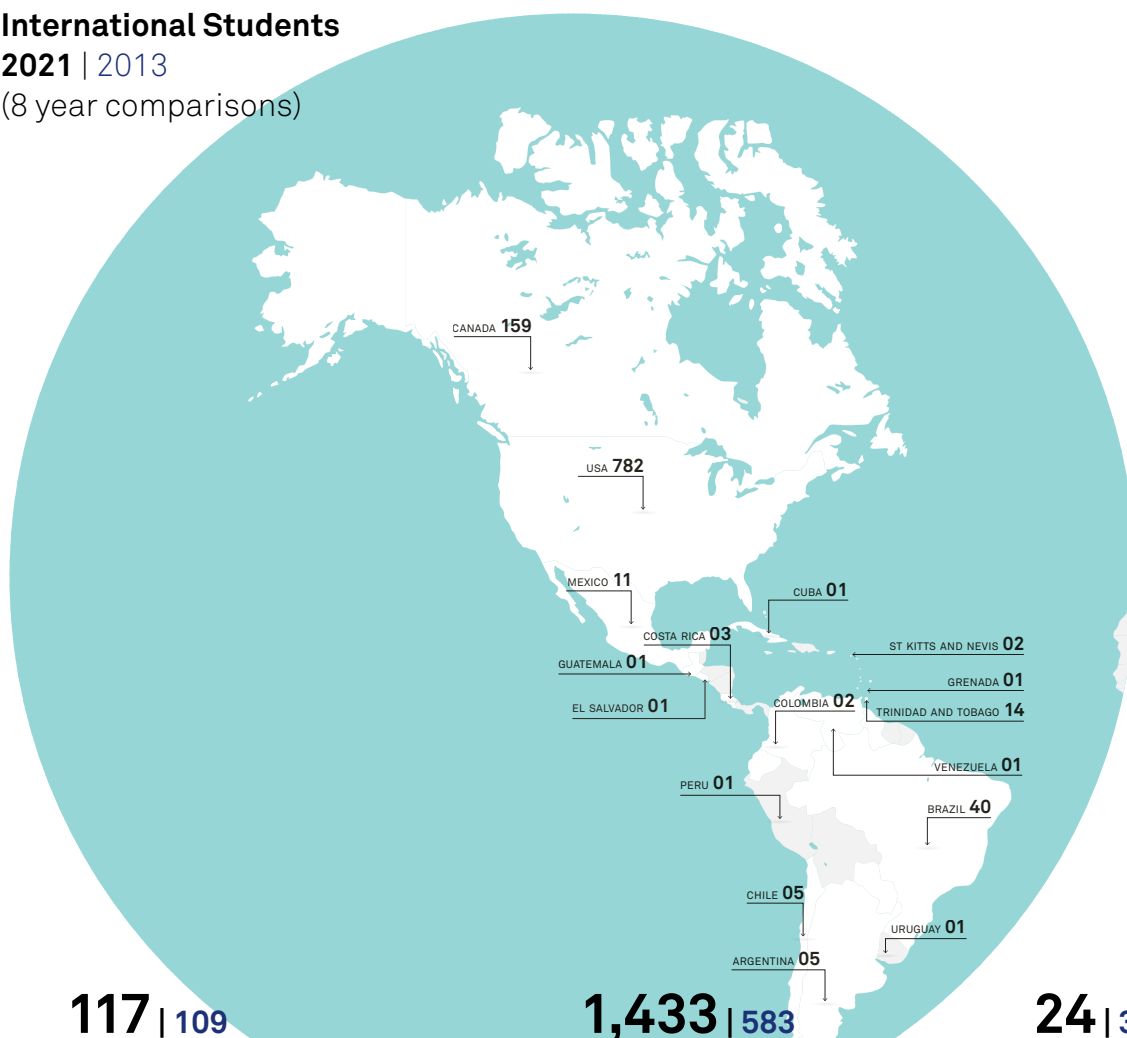
FACULTIES



02 International Students

2021 | 2013

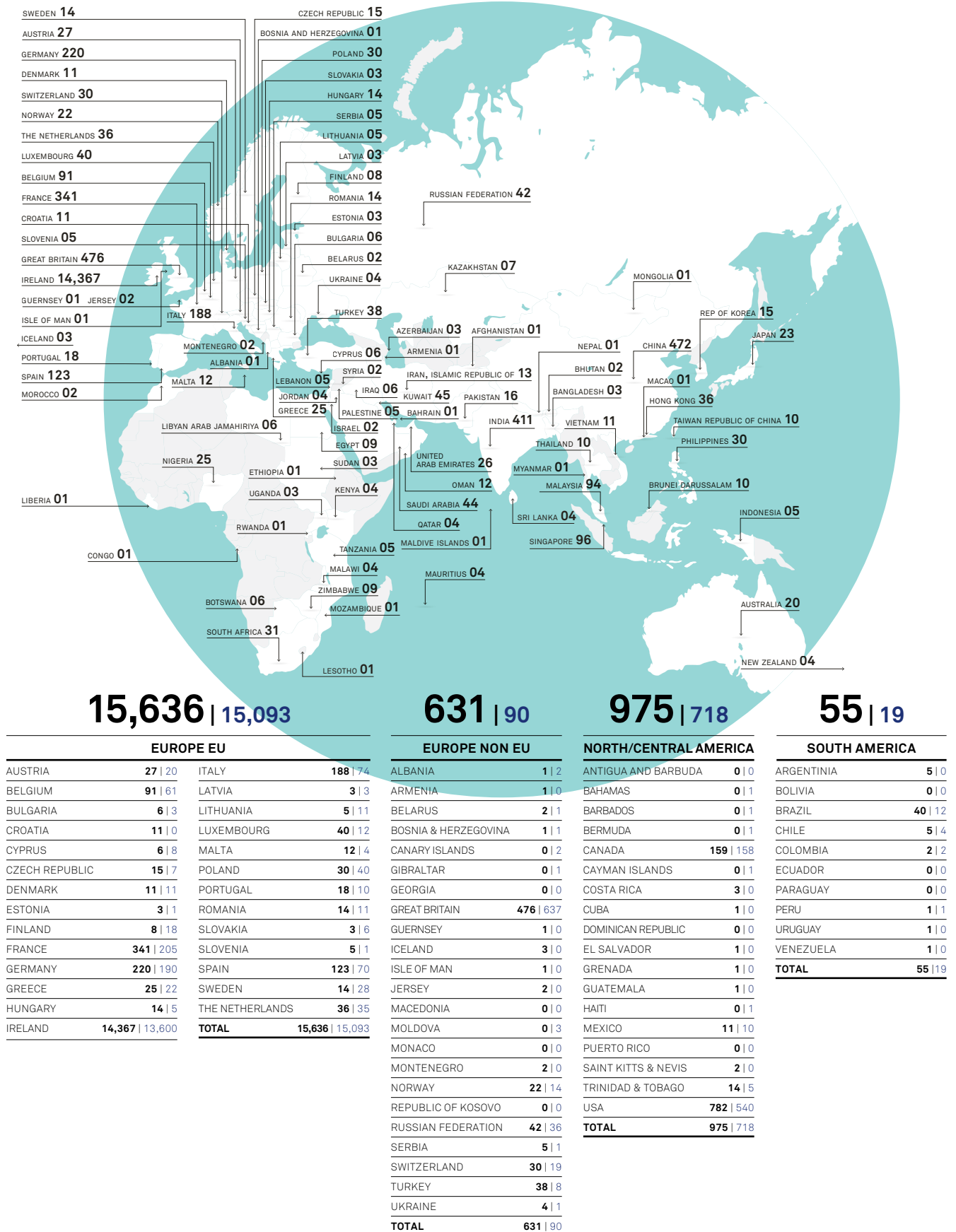
(8 year comparisons)



AFRICA			
ALGERIA	0 1	MOROCCO	2 2
ANGOLA	0 0	MOZAMBIQUE	1 1
BOTSWANA	6 5	NIGER	0 1
BURUNDI	0 0	NIGERIA	25 33
CAMEROON	0 1	RWANDA	1 1
CONGO	1 0	SIERRA LEONE	0 0
EGYPT	9 3	SOMALIA	0 0
ETHIOPIA	1 3	SOUTH AFRICA	31 18
GAMBIA	0 0	SUDAN	3 6
GHANA	0 0	SWAZILAND	0 0
GUINEA	0 0	TANZANIA	5 1
KENYA	4 4	TUNISIA	0 0
LESOTHO	1 1	UGANDA	3 3
LIBYAN ARAB JAMAHIRIYA	6 6	ZAMBIA	0 3
LIBERIA	1 0	ZIMBABWE	9 5
MALAWI	4 4	TOTAL	117 109
MAURITIUS	4 7		

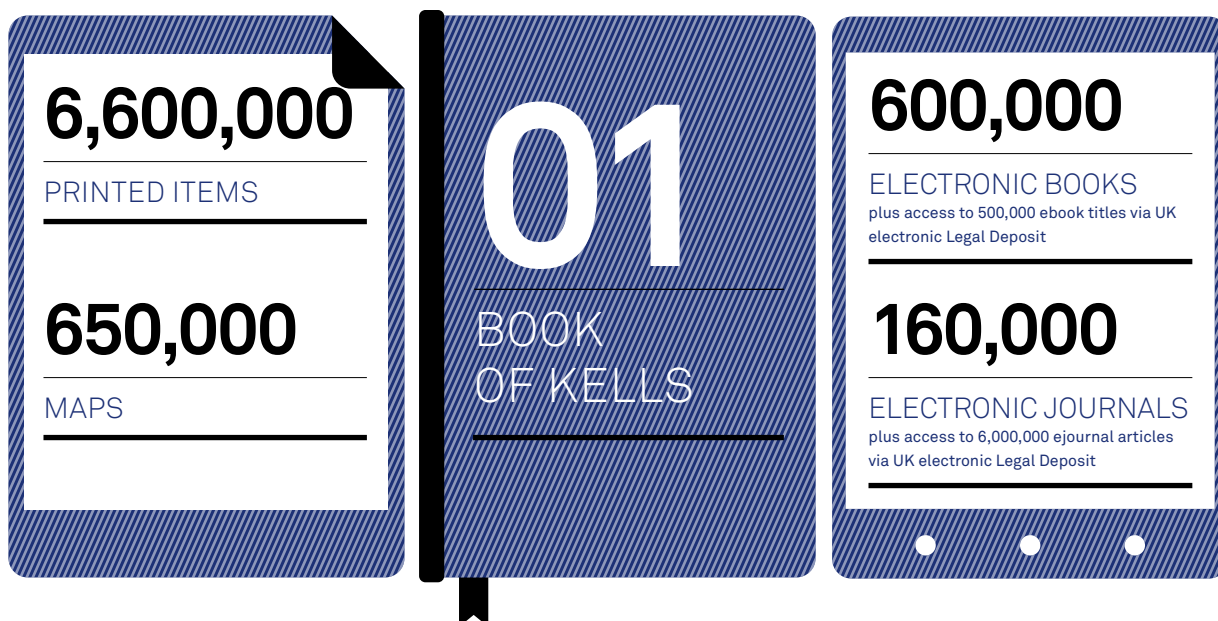
ASIA			
AFGHANISTAN	1 0	MALAYSIA	94 107
AZERBAIJAN	3 2	MALDIVES ISLANDS	1 0
BAHRAIN	1 2	MONGOLIA	1 0
BANGLADESH	3 7	MYANMAR	1 0
BHUTAN	2 0	NEPAL	1 0
BRUNEI DARUSSALAM	10 1	OMAN	12 3
CHINA	472 99	PAKISTAN	16 17
HONG KONG	36 1	PALESTINE	5 0
INDIA	411 90	PHILIPPINES	30 10
INDONESIA	5 1	QATAR	4 1
ISLAMIC REP OF IRAN	13 12	REP OF KOREA	15 14
IRAQ	6 7	SAUDI ARABIA	44 24
ISRAEL	2 1	SINGAPORE	96 120
JAPAN	23 16	SRI LANKA	4 2
JORDAN	4 6	SYRIAN ARAB REPUBLIC	2 1
KAZAKHSTAN	7 16	TAIWAN REP OF CHINA	10 1
KUWAIT	45 8	THAILAND	10 1
LEBANON	5 1	UNITED ARAB EMIRATES	26 6
MACAO	1 2	VIETNAM	11 3
TOTAL		1,433 583	

OCEANIA		
AUSTRALIA	20 26	
FUJI	0 0	
NEW ZEALAND	4 7	
TOTAL	24 33	



02 Library

LIBRARY COLLECTION HAS



TRINITY'S RESEARCH THEMES

— AGEING	— GENES AND SOCIETY	— MANUSCRIPT, BOOK & PRINT CULTURES
— CANCER	— IDENTITIES IN TRANSFORMATION	— NANOSCIENCE
— CREATIVE ARTS PRACTICE	— IMMUNOLOGY, INFLAMMATION & INFECTION	— NEUROSCIENCE
— CREATIVE TECHNOLOGIES	— INTERNATIONAL DEVELOPMENT	— NEXT GENERATION MEDICAL DEVICES
— DIGITAL ENGAGEMENT	— INTERNATIONAL INTEGRATION	— SMART AND SUSTAINABLE PLANET
— DIGITAL HUMANITIES	— MAKING IRELAND	— TELECOMMUNICATIONS

LEADING FLAGSHIP RESEARCH INSTITUTES

05

- TRINITY BIOMEDICAL SCIENCES INSTITUTE (TBSI)
- CENTRE FOR RESEARCH ON ADAPTIVE NANOSTRUCTURES AND NANODEVICES (CRANN)
- TRINITY COLLEGE INSTITUTE OF NEUROSCIENCE (TCIN)
- TRINITY LONG ROOM HUB, ARTS AND HUMANITIES RESEARCH INSTITUTE (TLRH)
- TRINITY TRANSLATIONAL MEDICINE INSTITUTE (TTMI)

Commercialisation of Research

2020 | 2015

(5 year comparisons)

IN THE PERIOD 2015–2020
(2011–16)

371 | 329

INVENTION DISCLOSURES

139 | 125

LICENCES TO INDUSTRY

23 | 26

TRINITY CAMPUS COMPANIES APPROVED

15 | 07

TRINITY CAMPUS COMPANIES APPROVED
AS HIGH PERFORMANCE START UPS

IN THE YEAR ENDED SEPTEMBER 2020

05 | 04

TRINITY CAMPUS COMPANIES

55 | 60

DISCLOSURES OF NOVEL INTELLECTUAL
PROPERTY

26 | 34

COMMERCIALISATION LICENCES
TO INDUSTRY

27 | 15

NEW PATENT APPLICATIONS FILED

38 | 58

COLLABORATIVE RESEARCH
AGREEMENTS WITH INDUSTRY EACH <€25K

63 | 69

COLLABORATIVE RESEARCH
AGREEMENTS WITH INDUSTRY EACH >€25K

CONSOLIDATED FINANCIAL STATEMENTS

€389.1M

TOTAL INCOME FOR
YEAR ENDED 2020
(EXCLUDING GRANT
AMORTISATION)

€396.7M

TOTAL INCOME FOR
YEAR ENDED 2019
(EXCLUDING GRANT
AMORTISATION)

€379.2M

TOTAL INCOME FOR
YEAR ENDED 2018
(EXCLUDING GRANT
AMORTISATION)

€356.2M

TOTAL INCOME FOR
YEAR ENDED 2017
(EXCLUDING GRANT
AMORTISATION)

€335.8M

TOTAL INCOME FOR
YEAR ENDED 2016
(EXCLUDING GRANT
AMORTISATION)

FINANCIAL YEAR	€m 2012	€m 2020
STATE GRANTS	€58.70	€50.5
ACADEMIC FEES	€113.80	€163.7
RESEARCH GRANTS AND CONTRACTS	€75.90	€99.3
COMMERCIAL REVENUE UNIT INCOME	€27.10	€21.4
OTHER INCOME	€22.40	€20.0
ENDOWMENT AND INVESTMENT INCOME	€6.60	€34.2
INCOME (EXCLUDING GRANT AMORTISATION)	€304.50	€389.1

A decade of development – key strategic initiatives

Professor Jürgen Barkhoff,
Vice-Provost/Chief Academic Officer

This has been a truly transformative provostship in a decade of near constant global upheaval – from global recession to Brexit to Covid-19!

RIGHT – Provost Prendergast and Prof Jane Ohlmeyer, former Vice-Provost for Global Relations celebrating the announcement by Prof Kurt Deketelaere, Secretary-General LERU's (on screen) that Trinity had joined LERU.

It's remarkable to look back over this period and see just how much has been achieved across the University – in Global Relations, access and admissions, curricular development, research, innovation and entrepreneurship, philanthropy, sustainability, capital developments... not forgetting the pollinator programme and re-wilding of the campus, a seemingly small innovation with huge implications. The long grasses and wild flowers buzzing with bees and insects, from Burke and Goldsmith at Front Arch to College Park and Lincoln Gate, replacing the previously 'immaculate' yet sterile lawns, are, to me, a metaphor for this provostship: so positive and transformative, and with a constant attention to detail and a focus on enhancements, both small and large. The stand-out initiatives of this decade, its headline achievements, are:

- the Trinity Education Project, the most comprehensive renewal of the undergraduate curricula in a century;
- the expansion of Global Relations, including significant increase in non-EU students and in transformative transnational education and research partnerships;
- the opening of the new Trinity Business School and its subsequent triple accreditation, catapulting it into the 0.6% of business schools worldwide to receive AMBA, EQUIS and AACBS stamps of approval;
- the rollout of the philanthropic campaign, *Inspiring Generations*, and meeting the highly ambitious target of raising €400 million in donations and 150,000 hours in volunteering. This has galvanised and enthused our alumni, succeeded in

→ In January 2017, Trinity became the 23rd member of LERU, Europe's leading network of research-intensive universities, which includes Oxford, Cambridge, the Sorbonne and LMU Munich.



03



‘embedding philanthropy in the DNA of the university’ and means that priority capital development projects – E3, the Old Library Redevelopment, the Trinity St James’s Cancer Institute – are all now green-lighted;

- the prioritising of innovation and entrepreneurship (I&E) in education and research, leading to Trinity become a national and European leader in the formation of campus companies and in undergraduate I&E training (both curricular and co-curricular);
- the international recognition of Trinity Access as best practice following the piloting of its Foundation Year by the Universities of Oxford and Cambridge.

All of these great initiatives have a full chapter, or sections of chapters, to themselves and rightly so. In my ‘retrospective’ I will focus on what has enabled them – the wiring and architecture behind them, so to speak, because none of these could have happened without the well-coordinated strategizing, structured planning, and tight project execution that have been the hallmarks of this provostship from the start.

Administrative reform and project governance

A START Taskforce was established early on in the Provost’s term of office to review, restructure and improve the efficiency of administrative and support services. Key structural changes arising out of this review included the creation of the Academic Registry, the establishment of the Academic Services Division (ASD) and Corporate Services Division (CSD) and the posts of Chief Operating Officer for CSD and Chief Financial Officer for the Financial Services Division (FSD). Equally important was the establishment of comprehensive project management structures for all major initiatives to ensure clear, tight and responsive project governance, with strong controls on reporting lines, budgets, timelines and deliveries.

Strategic Plans

This restructuring and focus on project management was instrumental in delivering the College’s two Strategic Plans developed under this Provostship. The first Plan, 2014–2019, led by then Vice-Provost, Professor Linda Hogan, was structured around nine goals articulating the University’s vision of global connection, innovative learning and excellent research. Bi-annual reviews continuously monitored progress and each School’s strategic plan was, in turn, aligned to these institutional goals – as a result, by 2019, all targets and goals had either been fully achieved or were close to completion.

The second Strategic Plan, 2020–2025 *Community and Connection*, was developed by Professor Chris Morash and myself. Launched on 10 March 2020, two days before Ireland’s first Covid-19 lockdown, it sets out nine overarching goals across the student experience, including next-generation teaching and learning, impactful research, and ‘one Trinity community’. Its more than 100 actions and targets are in key areas, including flexible programme delivery, digital learning, equality, diversity and inclusion (EDI), and reducing the student-staff ratio to 16:1. The ever-increasing pace of change and the disruption caused by the global pandemic means that a connected vision for our community is more important than ever.

These two College Plans have been supported and complemented by strategic plans in different College units, including: Global Relations, Research, Estates and Facilities, the Library, and Innovation and Entrepreneurship. Developing these bespoke strategies for different units has been a key innovation of this decade, which has integrated and reinforced the university’s overall mission and vision.

LEFT – Eilís O’Connell’s sculpture ‘Atoms and Apples’ outside the School of Physics.

BELOW – ‘The Volunteers’ by Joe Caslin, commissioned as part of the Trinity Creative Challenge appeared on the front of Sir William Chambers House Number Two in Trinity’s Front Square in the summer of 2017.



Membership of LERU (League of European Research Universities) – In January 2017, Trinity became the 23rd member of LERU, Europe’s leading network of research-intensive universities, which includes Oxford, Cambridge, the Sorbonne and LMU Munich. Membership of LERU is a benchmark of research excellence – as a condition for joining, Trinity underwent a rigorous evaluation of the breadth, quality and impact of its research. LERU is highly influential in EU higher education policy, with major input into programmes such as Horizon 2020, Open Science, Erasmus+ and Open Innovation. The Provost also spent eight years on the board of the European Institute of Innovation and Technology (EIT), helping to cement Trinity’s influence on EU policy.

The Provost’s Council

In 2016 the Provost convened a Council of high-achieving and deeply committed Trinity alumni and friends to advise him on the direction of the university. Chaired by Fergal Naughton and including members from all sectors and from all over the world who took the time to come to Trinity for annual meetings (until Covid-19, when they zoomed in), the Provost’s Council has been decisive in the planning, launch and success of *Inspiring Generations*. Their great commitment and value is evidenced by the fact that the Council will continue to advise and support the incoming Provost, helping to spearhead future transformative initiatives for the University.

Sustainability

Both Strategic Plans position climate emergency and biodiversity loss as key challenges which universities must confront and lead on. In 2013 Trinity became the first university in a European capital city to join the Green Campus programme and in 2017

we joined the International Sustainable Campuses Network. The Provost’s Advisory Committee on Sustainability has driven sustainability goals and targets over the past four years and a Climate Action Team is now in place to create our first Climate Action Plan. A Sustainable Procurement policy and guidelines, the revised Waste policy, our Green Labs programme and the nine new subcommittees working on sustainability themes are just four of the initiatives implemented over the past few years. In 2020 our rewilding of College Green with wildflower meadows received huge national and international attention.

Trinity Creative Challenge

And finally, a word on the Provost’s championing of creativity. Three rounds of the Trinity Creative Challenge ran between 2015 and 2018. This catalysing initiative funded thirteen creative arts projects across multiple platforms, including performance, visual art, music, film, design, animation, gaming and creative technologies. It was shortlisted for the 2016 Allianz Business to Arts Awards in the Jim McNaughton Perpetual Award for Best Commissioning Practice category.

But perhaps the greatest manifestation of the support for artistic creativity this decade has been the commissioning of new portraits and sculptures to adorn the college walls and walks. The Provost commissioned numerous portraits of women leaders, notably the full-length portrait of our former Chancellor Mary Robinson in the Dining Hall, former Vice-Provost Linda Hogan, and former Registrar and current Pro-Chancellor Shane Allwright, while Eilís O’Connell’s incandescent sculpture outside the School of Physics ‘Atoms and Apples’, commemorating Ernest Walton’s splitting of the atom, inspires with its uplifting fusion of science, nature and art.

Trinity's Global Relations

**Professor Juliette Hussey,
Vice-President for Global Relations**

At the beginning of his term of office, the Provost created a college officer position of Vice-President for Global Relations, tasked with the responsibility of setting up a team and developing the first Global Relations Strategy (GRS1).

Professor Jane Ohlmeyer held this position from 2011–14 and I have held it since 2014. The strategy set the direction of travel with an overall ambition of developing partnerships with leading universities around the world and the global recruitment of excellent students to study in Trinity. Building on a long and strong record of internationalisation in terms of research partnerships, the time was right to consider educational partnerships. There were two main areas of focus: student exchanges and joint educational programmes.

Student exchanges

Student exchanges with leading universities around the world provide opportunities for students to undertake part of their programme overseas; typically in undergraduate programmes this occurs in the third year. Increasingly students select universities, not just on the reputation of a university and programme of study, but on the institutions that it partners with. Overseas experience is often regarded as a differentiator in terms of graduate opportunities. Developing globally aware graduates is key to the global challenges ahead. Working across cultures, countries and languages is important in preparing young people with the skills and experience for their lives ahead. These are articulated in the Trinity Graduate Attributes.

RIGHT – Singaporean students of physiotherapy celebrate graduating in Trinity as part of the Trinity Singapore Institute of Technology programme.



→ Ten years ago there was an absence of international educational partnerships leading to dual and joint degrees. Now Trinity has robust experience in developing a dual degree with a leading university and a joint degree delivered mainly through TNE (transnational education).

04



The number of undergraduate students engaging in some form of mobility during their programme of study has more than doubled from 522 in 2012/13 to 1,101 in 2019/20. In tandem, the growth in those taking a semester/year in a leading university beyond Europe has increased fivefold from 37 in 2012 to 211 in 2019 and interest from students continues to be strong despite the interruptions due to the pandemic.

Global partnerships

The Global Relations Office has focused on deeper engagement with a small number of universities, leading to joint educational programmes such as dual degrees, joint degrees and recruitment pathways in terms of articulation agreements. The development of programmes with Singapore Institute of Technology (SIT) marked the University's first significant engagement with transnational education – after four years of very successful one-year programmes in the allied health sciences, a joint degree in Physiotherapy with SIT was launched and commenced in 2016. The first students on the dual degree with Columbia University commenced their studies in 2018 following the launch of four programmes in the Faculty of Arts, Humanities and Social Sciences.

Ten years ago there was an absence of international educational partnerships leading to dual and joint degrees. Now Trinity has robust experience in developing a dual degree with a leading university and a joint degree delivered mainly through TNE (transnational education). The programmes in the dual degree with Columbia have grown to 11 and extended

to the Faculty of STEM. Over 900 students have completed the allied health programmes delivered in Singapore and there are currently 640 registered on the joint programme in Physiotherapy.

In addition, recruitment pathway programmes were developed with Thapar University in India, Beijing Foreign Studies University (BFSU) and University of Michigan – Shanghai Jiao Tong University Joint Institute (UM-SJTU JI), China.

Attracting students from all over the world and building relationships with government funding bodies was a challenge requiring robust planning and a data driven approach. A year-on-year increase in students from outside the EU was mapped to growth capacity, along with an analysis of applications to programmes with respect to areas of growth internationally and building knowledge of international qualifications particularly in secondary school systems. Growth has been achieved through adopting a holistic approach, including building an excellent recruitment team with wide reach which is supported by local representation, academics, and alumni ambassadors. Promotion and recruitment are intensive, and increasingly driven by online activity, and amplified by a personal approach to applicants and their families. The team in Dublin along with colleagues based in US, Delhi and Beijing have built the reputation and pathways essential for ongoing recruitment. Alumni have been key to achieving the breath of diversity in terms of student recruitment through promoting Trinity; many have acted as ambassadors for the University.

LEFT – Trinity exchange students in Beijing.

BELOW – Provost Patrick Prendergast, Prof Juliette Hussey, Vice-President for Global Relations with international students at the launch of the Global Relations Strategy 3 (GRS3).

Enabling and welcoming initiatives

It became clear at the beginning of the growth strategy that to recruit sufficiently to undergraduate programmes there was a need to consider either development or access to a Foundation Programme. In 2015 the Trinity International Foundation Programme was developed with Marino Institute of Education and launched. The one-year programme focuses on English for Academic Purposes and Mathematics as well as on subjects specifically related to the undergraduate programme of choice. The option of a Foundation programme is critical for engagement with government scholarship bodies, particularly those in the Middle East.

The reputation of the International Foundation Programme has been strong, expanding from 25 in its first year (2016/17) to 91 this year, with continuing growth anticipated as applications rise. Given the huge uptake in online teaching and learning during the pandemic, the possibility of a parallel online programme for those wishing to remain in their home country is now being discussed.

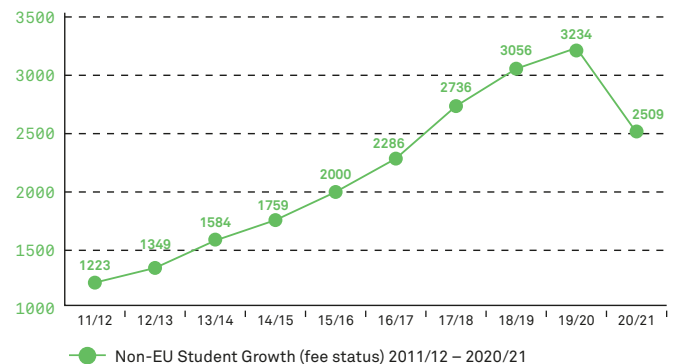
Along with the opportunities sought and created overseas there has been a deep and sustained commitment to the overall student experience from Trinity staff, students and alumni. This has been essential in creating a welcoming and supportive environment where all students are nurtured. Incoming international students are introduced to the Global Room and its student ambassadors and encouraged to join societies and become part of societies organising Thanksgiving, Hannukah, Chinese New Year, Holi and other campus festivals. The Global Room hosts over 300 events per year and is a real epicentre for providing overall support and direction for students new to Ireland.



Driving success

The end of Patrick Prendergast's provostship is a good time to ask if our Global Relations strategies have been successful. A clear measure of success is Trinity being ranking 8th in the world and 1st in Europe for Internationalisation in the Times Higher Education rankings 2021. This indicates that our sustained efforts over ten years have paid dividends. Once the health situation, travel and restrictions permit, we expect a return to pre-pandemic level of activity in global relations.

In 2019/20, 3,234 non-EU students were registered with the university (an increase from 1,223 in 2011/12). This growth has happened across undergraduate and postgraduate programmes and we anticipate that this growth will continue.



Research case studies

01 Jean Fletcher

02 David Hoey

03 Kenneth Pearce

04 Triona Lally

05 Jeremy (Jay) Piggott

06 Mary Rogan

07 Lina Zgaga

08 Catherine Comiskey

09 Helen Sheridan

10 Robert Whelan

11 Aidan McDonald

12 Catherine Hayes

13 Deirdre Madden

14 Rachel McDonnell

15 Adriele Prina-Mello

16 Etain Tannam

17 David Kenny

18 Plamen Stamenov



05 Re-balancing the immune system

Jean Fletcher

The events of the past year have made us all too familiar with the lexicon of immunology and has highlighted the critical importance of our immune system in fighting infection. However, in some individuals genetic and environmental factors conspire to cause the immune system itself to attack their own bodies, resulting in inflammatory diseases such as multiple sclerosis, rheumatoid arthritis, and psoriasis.

In these so-called autoimmune diseases, adaptive immune cells mistakenly recognise antigens (self-antigens) within our own organs, triggering inflammation and tissue damage. Unlike in the case of an infection where our immune system can clear the pathogens and then revert to a resting state, these ever-present self-antigens can perpetuate inflammation and chronic disease. Furthermore, because the same mechanisms that cause autoimmune disease are also required to fight infection, it requires a delicate balancing act to treat the condition without increasing the susceptibility to infection.

Early therapies for autoimmune disease relied on crude, non-specific immune suppression. However, with more detailed knowledge of the role of

the precise immune cells and molecules in these diseases, there are now opportunities for a much more targeted approach, with better results and less adverse effects.

A subset of immune cells known as Th17 cells are highly inflammatory and may be pathological, though these cells are counter-balanced and kept in check by a suppressive cell type called regulatory T (Treg) cells. If we think of inflammation acting as an accelerator, these Treg cells play the role of the brake. In autoimmune diseases the balance between Th17 and Treg cells is frequently off-kilter, allowing Th17 cells to cause uncontrolled inflammation. Understanding how and why the Th17-Treg cell axis becomes dysregulated in autoimmunity, and how it might be manipulated for therapeutic benefit, is the focus of my research. Over the past 10 years my lab in the Trinity Biomedical Sciences Institute has uncovered different ways in which the regulation of Th17 cells goes awry in multiple sclerosis, rheumatoid arthritis, and in skin inflammation.

HS – a debilitating skin condition – More recently, my research has focused on the poorly understood inflammatory skin disease hidradenitis suppurativa (HS). HS is

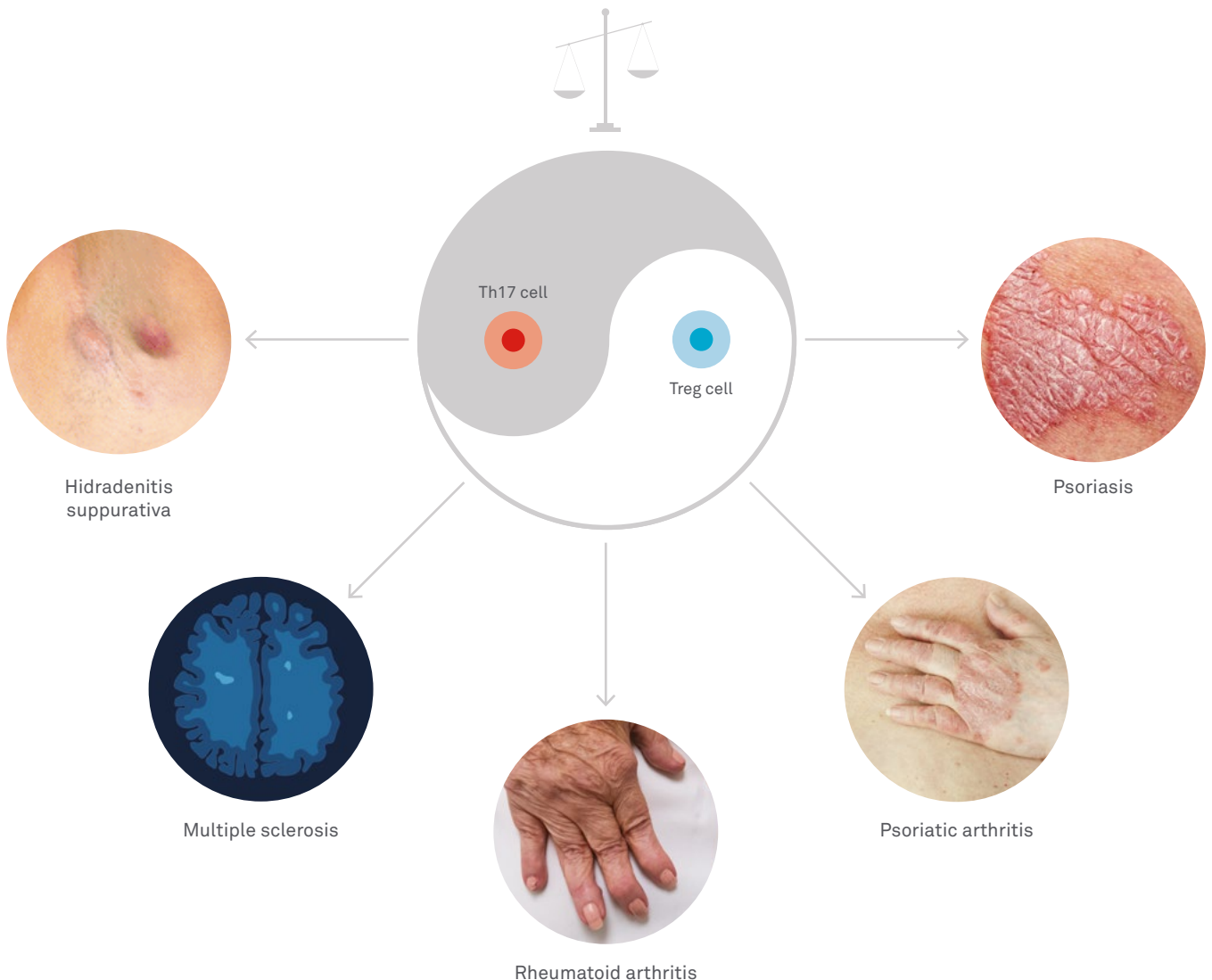
a severe, debilitating condition which can last for decades. Although it may affect up to 1 in 100 people, it is under-diagnosed and current treatments are inadequate. My research into HS, carried out with Dr Barry Moran in collaboration with dermatologists Professors Brian Kirby (St. Vincent's University Hospital) and Anne Marie Tobin (Tallaght University Hospital), has uncovered Th17 cells as key players in the inflamed skin of these patients. Importantly, this provides a rationale for targeting these cells to treat HS and clinical trials for drugs that block Th17 cells, or their effects, are now underway.

Our research is now examining whether blocking other molecules upstream of the Th17 cells, that influence their development or activation, might be another useful therapeutic option. Further, through detailed analysis of the genes irregularly expressed in inflamed HS skin, we are now learning more about the disease, and hope to identify novel therapeutic targets. Ultimately, the goal in my lab is to contribute substantially to the understanding of HS and other inflammatory diseases, leading to better treatment options.

Jean Fletcher received her BSc from the University of Cape Town and a PhD from University College London. In 2012 she took up an Ussher lectureship in Translational Immunology in the School of Biochemistry and Immunology and the School of Medicine at TCD. She is currently Associate Professor and was elected Fellow of Trinity College Dublin in 2021. Her translational research focuses on understanding the immune dysregulation underlying autoimmune and inflammatory disease with the aim of improving therapies. **Contact:** fletcherj@tcd.ie

BELOW – The normal balance between inflammatory Th17 cells and regulatory Treg cells is perturbed in autoimmune diseases including psoriasis, psoriatic arthritis, rheumatoid arthritis, multiple sclerosis and the inflammatory skin disease HS, such that Th17 cells drive uncontrolled inflammation. Therapeutic targeting of the Th17-Treg cell has been very successful in psoriasis and psoriatic arthritis and clinical trials are ongoing for HS.

→ Early therapies for autoimmune disease relied on crude, non-specific immune suppression. However, with more detailed knowledge of the role of the precise immune cells and molecules in these diseases, there are now opportunities for a much more targeted approach, with better results and less adverse effects.



05 Harnessing mechanics to understand biology and treat disease

David Hoey

We all know physical exercise is good for your body. Whether going on a run or lifting weights, your body reacts to physical stimuli with increased muscle mass and strength. Although a little harder to see when looking in the mirror, the same thing is happening to your bones. Your skeleton is exquisitely sensitive to physical or mechanical stimuli. This is first evident in the womb, where muscle twitches in the developing embryo generate forces that contribute to bone and joint shape. The impact of mechanics on the skeleton continues throughout life as bones adapt and remodel in response to changes in physical activity. This is why astronauts who spend long durations in zero gravity need to exercise daily to ensure they do not lose significant bone mass.

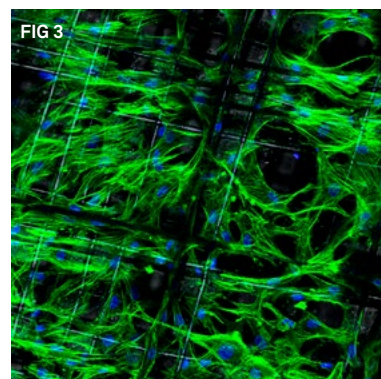
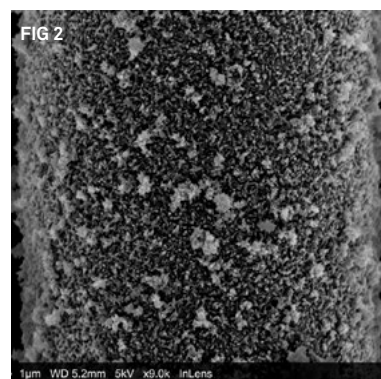
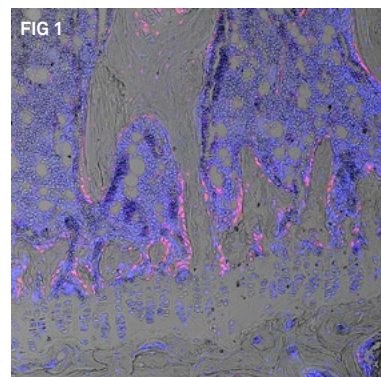
My lab in the SFI Research Centre, AMBER, is studying mechanics as a potent mediator of bone formation with the aim of harnessing this new knowledge to develop novel therapies and materials to treat devastating bone loss diseases such as osteoporosis, and the fractures that ensue.

Osteoporosis is a debilitating bone loss disease associated with an increased risk of fracture. Remarkably, 1 in 3 women and 1 in 5 men over 50 will develop an osteoporotic fracture, which corresponds to a fracture every 3 seconds globally. Moreover, due to the ageing global population, this problem is escalating, with treatment costs predicted to rise to €105 billion by 2050.

Using mechanical stimuli to drive bone forming cells

– My research over the last number of years has explored how mechanical stimuli, such as fluid shear and pressure, can directly drive production of bone forming cells from stem cells resident within the marrow of long bones. Importantly, through an ERC starting grant, we have taken large strides in determining how these stem cells sense these mechanical stimuli (a process called mechanotransduction) and have pioneered research on antenna-like cellular extensions called primary cilia, which we believe are an important tool utilised by cells to sense mechanics. By identifying these processes, we can develop novel therapies, or mechanotherapeutics, that can activate the mechanisms mimicking the beneficial effects of exercise and so promote bone formation to treat osteoporosis.

More recently, through a SFI Frontiers grant, my team is exploring the role of small cargoes released by bone cells called extracellular vesicles which contain regenerative factors that we believe are important in coordinating bone formation. We have shown that mechanical loading of bone cells can enhance the production and potency of these vesicles and we are currently investigating their use as a novel therapy to enhance bone regeneration.



David Hoey is an Associate Professor in Biomedical Engineering in the School of Engineering and Investigator within the SFI Centre AMBER and Trinity Centre for Biomedical Engineering. A Trinity graduate, he was awarded a B.A.I in Mechanical and Manufacturing Engineering in 2005, PhD in 2009, and elected a Fellow of Trinity College Dublin in 2021. Recipient of a prestigious European Research Council (ERC) Starting Grant and SFI Frontiers for the Future grant, his research focuses on musculoskeletal mechanobiology, mechanotransduction, and materials for tissue regeneration. Contact: dahoe@tcd.ie

FIG 1 – A histological section of a tibia bone from a 12-week old transgenic mouse in which the bone marrow stem cell population is labelled with a red fluorescent protein. Blue stain identifies cell nuclei. Image width: 160µm

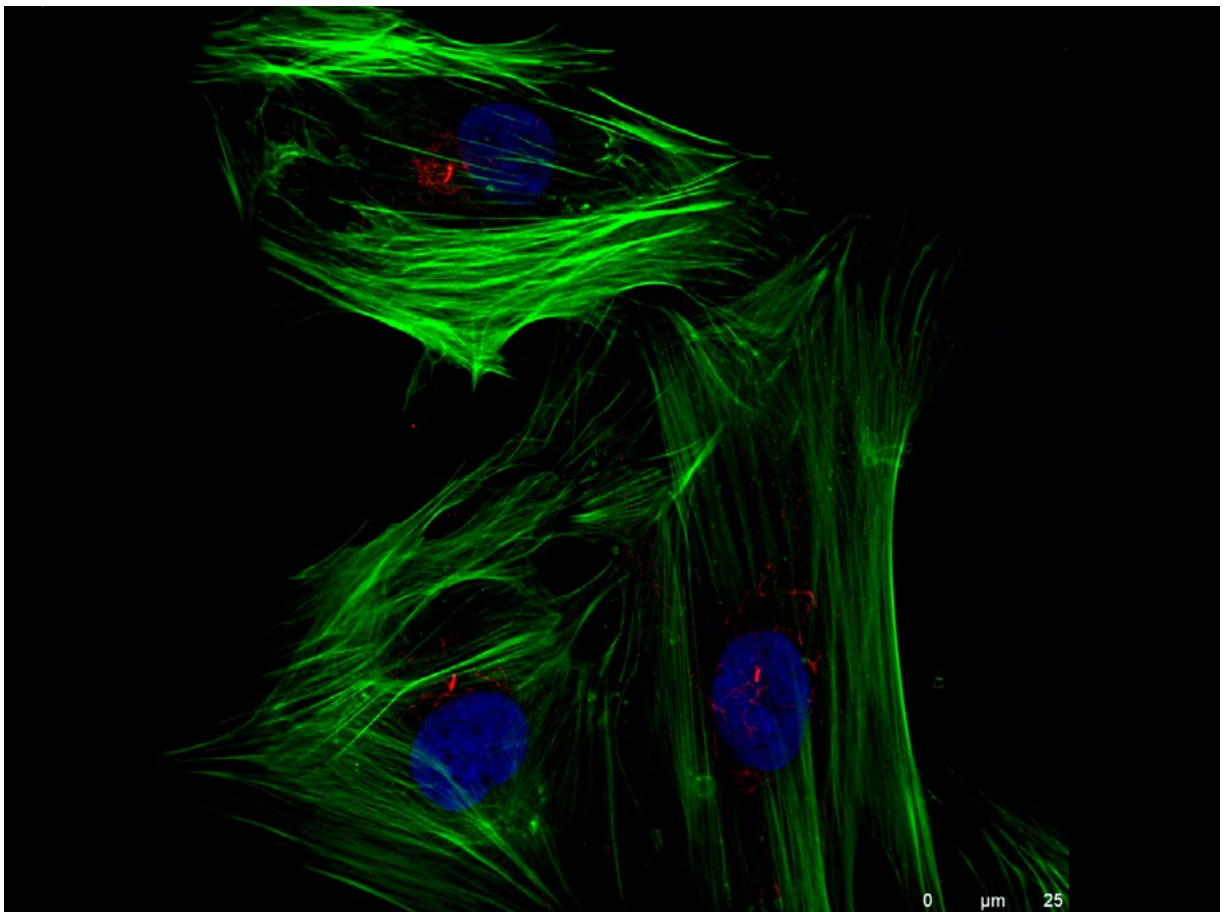
FIG 2 – A single polycaprolactone fibre, 1/10th the width of a human hair, within a scaffold fabricated using melt electrowriting and coated with a novel bone mimetic nano needle hydroxyapatite layer to enhance bone regeneration.

FIG 3 – A melt electrowritten fibrous scaffold, with fibres oriented at 90 degree angles (white lines), seeded with human bone marrow stem cells (green – cytoskeleton; blue – nucleus). Image width: 1mm

→ Inspired by the native architecture of bone, we have utilised advanced 3D printing technologies such as Melt Electrowriting to produce mineral coated fibres similar to that seen in bone.

3D printing aiding bone repair – Inspired by the native architecture of bone, we have also utilised advanced 3D printing technologies such as Melt Electrowriting to produce mineral coated fibres similar to that seen in bone. These fibres, which are a tenth the size of a human hair, can be accurately deposited to produce scaffolds that can be implanted to significantly aid bone repair. Combined with the mechano-therapies and vesicles identified above, these bioactive materials represent an exciting new strategy to treat osteoporotic fractures which are currently undergoing pre-clinical evaluation.

FIG 4 – Human bone marrow stem cells extending a single primary cilium (red linear structure) which we have shown is an important tool used by cells to sense mechanical stimuli. (green – cytoskeleton; blue – nucleus; red – primary cilium)



05 Can we believe what we do not understand?

Kenneth Pearce

In *Christianity Not Mysterious*, the Irish philosopher John Toland (Seán Eoghain) argues that it is not possible to believe what we do not understand. If this is so, Toland maintains, then ‘mysteries’ like the Trinity can form no part of religion.

Shortly after the book’s 1696 publication, it was burnt by the public hangman on College Green. A member of the Irish parliament proposed burning the author. Toland fled the country, never to return.

Four years later, George Berkeley, aged 15, arrived in Trinity College Dublin. Toland had not been forgotten. Indeed, Peter Browne – a reactionary conservative who had made a name for himself with a pamphlet opposing Toland’s book and calling for the author’s arrest – had just been elected provost. The problems raised by Toland occupied a central position in Berkeley’s thought throughout his career, but they have often been ignored by scholars.

A churchgoer who recites the Nicene Creed claims to believe that “Jesus Christ...[is] of one substance with the Father.” Toland, Berkeley, and even Browne agree that none of us has any idea what’s meant by the phrase ‘of one substance’. The question that then arises is: *why* do churchgoers say this phrase? If it does not express an idea, what does it accomplish?

According to Toland, religious mysteries are a tool of ‘priestcraft’. By forcing the laity to repeat nonsense words,

the clergy can prevent them from thinking and convince them to adhere blindly to one sect and persecute all others.

But how could nonsense words do a thing like that? If the sounds have no meaning, how could they do *anything*? This puzzle pushed Berkeley’s thinking about language away from the question *what idea does this word stand for?* and toward the question, *what is this word doing?* Berkeley agrees with Toland that religious words are used to shape the lives of believers, and not to express ideas. From this perspective, the fundamental question between Berkeley and Toland is one that is still with us today: *is this kind of religious talk a force for good or evil in our society?*

This approach to Berkeley is very different from the one found in textbook treatments of early modern philosophy, where Berkeley is one of the three ‘British empiricists’, serving as a bridge between John Locke and David Hume. I’ve previously argued that attention to Berkeley’s local context and his religious concerns can help us better understand his philosophical work. In particular, I believe that this question about how we use words within a community to accomplish practical ends is a driving force throughout Berkeley’s philosophy.

My current book project is further pursuing this contextualization of Berkeley’s thought within early modern Anglicanism. In addition to Toland

and Browne, I am examining other neglected philosophers such as William King, Damaris Masham, Mary Astell, and Anthony Collins. As well as gaining better understanding of Berkeley’s thought, this research will recover forgotten insights into philosophical questions about the nature and rationality of religious belief and its role in religious communities. I hope to complete the book, tentatively entitled *Berkeley’s Religion: A Study in the History of Anglican Philosophy*, by 2023.

BELOW – George Berkeley (1685–1753), Ireland’s most famous philosopher, was librarian and Junior Dean in TCD, and subsequently served as Dean of Derry and Bishop of Cloyne.

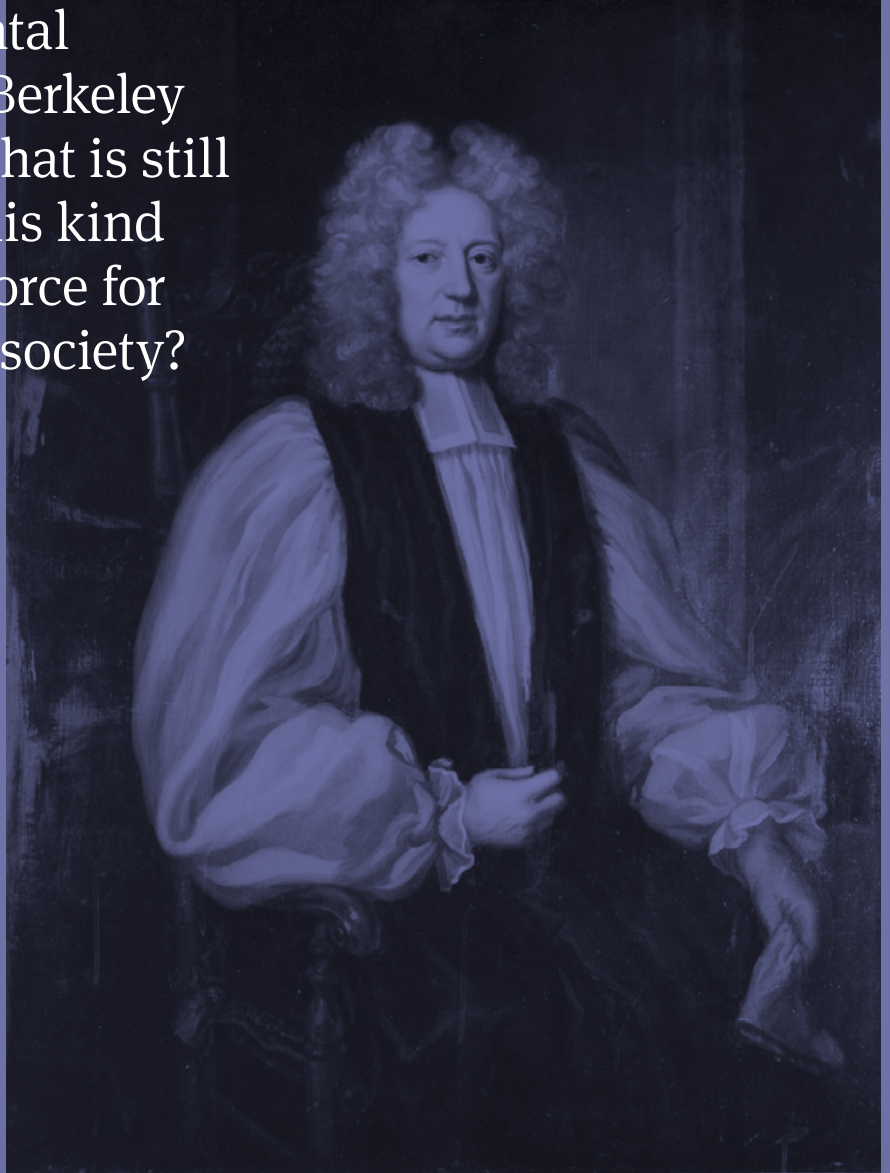


Kenneth L. Pearce received his BA from the University of Pennsylvania and PhD from the University of Southern California. He joined Trinity in 2016 as Ussher Assistant Professor in Berkeley Studies and is now Head of the Department of Philosophy. He was elected to Fellowship in 2021. He is the author of *Language and the Structure of Berkeley’s World* (Oxford, 2017) and co-author (with Graham Oppy) of *Is There a God? A Debate* (Routledge, 2022). His research areas are early modern philosophy and philosophy of religion. Contact: pearcek@tcd.ie

BELOW — John Toland (1670–1722) was born in Inishowen, Co. Donegal. A philosopher and radical Whig pamphleteer, he is credited with (or blamed for) launching the Deist Controversy in Britain and Ireland.

BOTTOM — An early Berkeley manuscript (TCD MS 453) contains extensive discussion of the Toland problem, framed by St Paul's talk of a heavenly reward which "Eye hath not seen nor Ear heard nor hath it enter'd into the Heart of Man to conceive." If we have cannot conceive of this reward, how can St Paul's words be meaningful to us?

→ The fundamental question between Berkeley and Toland is one that is still with us today: is this kind of religious talk a force for good or evil in our society?



05 Biomechanics 'at the heart' of advances in heart valves

Tríona Lally

Heart valve disease involves one or more of the valves in the heart becoming narrowed or leaking and can result in the heart having to work harder to pump blood effectively. There are nearly three million people across Europe aged 65 and over with heart valve disease, and this is set to rise to 20 million within the next two decades due to our ageing population profile. When aortic heart disease is left untreated, about half of sufferers die within two years of developing symptoms.

A common treatment for heart valve disease is to replace the patients' own valve with a bioprosthetic heart valve. These valves are formed from biological tissue derived from animals, where the tissue is treated with chemicals to preserve its structure. The tissue is then cut into leaflets and attached to a metal support, to mimic the function of a native leaflet. Whilst these bioprosthetic valves mimic the function of native heart valves, their success is often limited by the lifespan of the animal tissue used for the leaflets, which can become damaged through prolonged use.

Improving bioprosthetic valves – Our research group in the Trinity Centre for Biomedical Engineering has been working closely with leading medical device manufacturer Boston Scientific, co-funded by the Irish Research Council and the SFI

Advanced Materials and Bioengineering Research Centre (AMBER) to improve the lifespan of these valves. This is being achieved in two ways: (i) by understanding the underlying structure of the biological tissue from which the leaflets are currently manufactured and screening these materials to ensure that the leaflets are mounted on the valves in the optimum way, and (ii) developing new polymers inspired by nature which mimic the natural fibre patterns of native heart valve leaflets.

The animal-derived leaflet tissue has a naturally fibrous structure, where these fibres are responsible for the strength and integrity of the tissue. Within our group, researchers have developed an in-house laser system to non-destructively ascertain the underlying fibre structure of these leaflet tissues (see Figure 1). This information is then used in computational models to investigate the performance of different leaflet fibre patterns, and ultimately identify optimum fibre orientations of the leaflet material, to increase device longevity (see Figure 2).

3D printing – Whilst this laser screening strategy has enabled improvements in existing bioprosthetic valves, we are now advancing these computational models to better inform the development of 3D printed biomimetic leaflet materials, with a view to creating synthetic materials that mimic the underlying structure and

strength of native heart valve leaflets. In the future, these materials are likely to replace the use of animal tissues in bioprosthetic heart valves, and increase the lifespan of replacement heart valve devices.

It is anticipated that by 3D printing novel biocompatible polymers, fibre reinforced valves can be designed and manufactured which are better matched to individual patient's needs and improve outcomes for those suffering from heart valve disease.

There are nearly three million people across Europe aged 65 and over with heart valve disease, and this is set to rise to 20 million within the next two decades due to our ageing population profile.

Tríona Lally received her BEng and MEng from University of Limerick and her PhD from Trinity College. She began her academic career as a lecturer in Dublin City University in 2004 and joined the School of Engineering in Trinity in 2015 where she is currently a Professor in Biomedical Engineering and Director of the Trinity Centre for Biomedical Engineering. Tríona was elected Fellow of Trinity College Dublin in 2021. She is a recipient of an ERC Starting Grant for her research, focused predominantly on understanding the role of mechanics in cardiovascular disease progression. Contact: lallyca@tcd.ie

FIG 1 – Small Angle Light Scattering (SALS) system built in-house for ascertaining the underlying fibre architecture of animal tissue from which bioprosthetic heart valve leaflets are made. By passing a laser beam through the tissue, the resulting scattered light pattern can be used to identify the underlying fibre pattern in that region of the tissue.

FIG 2 – Computational models of leaflets in bioprosthetic heart valves enabling the influence of leaflet fibre orientation on the valve longevity to be fully ascertained based on the strain in the tissue.

→ It is anticipated that by 3D printing novel biocompatible polymers, fibre reinforced valves can be designed and manufactured which are better matched to individual patient's needs and improve outcomes for those suffering from heart valve disease.

FIG 1

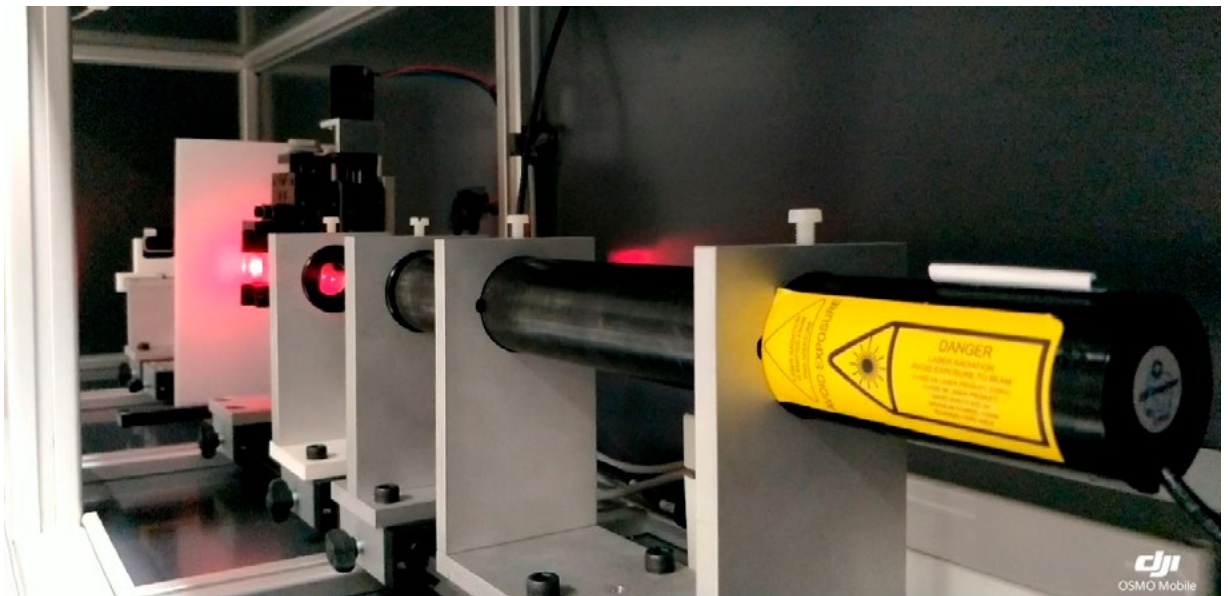
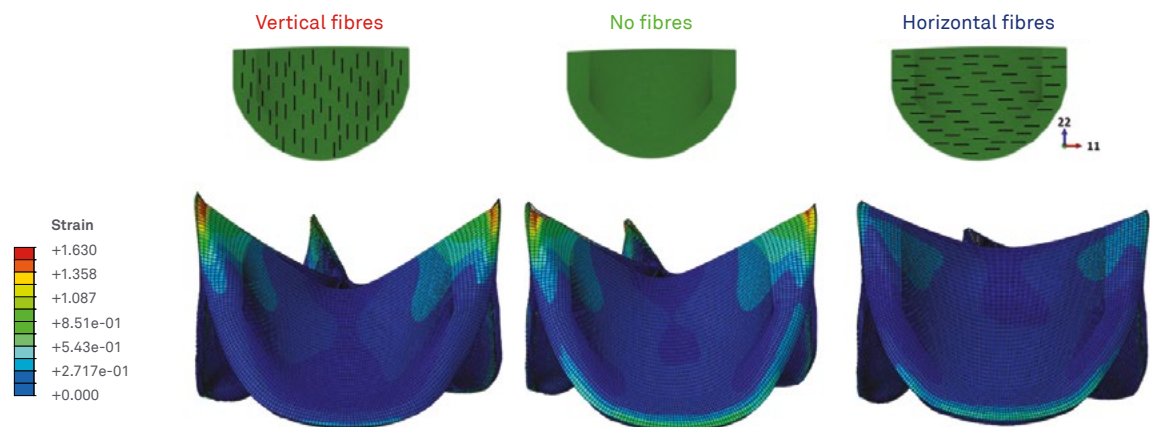


FIG 2



05 Freshwaters under global change

Jeremy (Jay) Piggott

Freshwaters provide essential services to humans but are one of the world's most degraded and threatened ecosystems. Climate change is likely to become the dominant driver of biodiversity loss and changes in ecosystem functioning by the end of this century, but how the drivers of climate change will interact with the multiple stressors that already impact ecosystems remains one of the largest uncertainties in projections of future biodiversity change. By understanding the underlying mechanisms driving these interactions and by connecting science and policy we will be in a better position to be able to manage, conserve, or even restore, damaged ecosystems in the face of global change.

My research focuses on understanding how climate and land-use related stressors interact to affect biodiversity and the function of freshwater ecosystems, and on prioritising management interventions to safeguard these ecosystems.

ExStream Systems – One of my most innovative pieces of research led to the creation of an experimental mesocosm system¹ that enables researchers to disentangle the individual and combined effects of different stressors in running waters (e.g. chemical contaminants, climate warming, elevated CO₂). The ExStream System is a powerful field research facility which allows researchers to strictly control

experimental variables in a highly realistic setting. This work led to a spin-out company (ExStream Systems Ltd) and the installation of ExStream Systems in New Zealand, Germany, Ireland, China, Japan, the UK and Brazil. I am now the sole Irish funded PI on AQUACOSM Plus, a €10m H2020 INFRAIA project for the *Network of Leading Ecosystem Scale Experimental AQUatic MesoCOSM Facilities Connecting Rivers, Lakes, Estuaries and Oceans in Europe and beyond*.

Guiding environmental policy – The societal impact of my research is highlighted by the discovery that fine sediment is a 'master stressor' in stream ecosystems where agricultural stressors and climate change drivers exacerbate its impacts. The management implications of this research have been subsequently recognised in New Zealand's National Policy Statement for Freshwater Management, EPA Ireland's freshwater research and management priorities, and policy recommendations from the UN's Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES).

Currently, my group in Trinity's School of Natural Sciences is working on a range of applied research projects investigating the occurrence and monitoring of contaminants of emerging concern (IMPACT), the management of Ireland's small stream networks for

improved biodiversity and ecosystem services protection (SSNet), integrated modelling of terrestrially derived and climatic impacts on freshwater and marine ecosystems (Land2Sea), and an ecosystem services framework for integrated freshwater resources management (ESDecide). These projects, funded by EPA Ireland, Belmont Forum/BiodivERsA and Water JPI, directly engage community stakeholders, industry representatives and environmental managers to guide environmental management and policy measures at national and EU levels (e.g. Water Framework Directive).

Crossing borders – Funded by an IRC Laureate Award, my group is also addressing fundamental questions and theory at the interface of ecology and evolution, such as the role of rapid adaptation when managing or restoring ecosystems subjected to multiple stressors, and the barriers to interdisciplinary knowledge exchange in rising to this challenge. Division between ecosystem types and disciplines is largely a human creation. Species and stressors cross these borders and so must the scientists who study them.

¹an outdoor experimental system examining the natural environment under controlled conditions.

Jeremy Piggott received his BSc and PhD from the University of Otago and post-doctoral training at the National University of Singapore, Kyoto University, Imperial College London and Peking University before joining Trinity's School of Natural Sciences as Assistant Professor in Aquatic Biology in 2017. He was elected Fellow of Trinity College Dublin in 2021. The recipient of the prestigious Irish Research Council's Starting Laureate Award (2017) and Early-Career Researcher of the Year Award (2019), his research focuses on the science and management of freshwater ecosystems in a rapidly changing world. Contact: jeremy.piggott@tcd.ie

TOP – The 128 mesocosms of the ExStream system under different stressor treatments. Credit: James Orr

BOTTOM – The inflow of the ExStream system that takes water and organisms from the river. Credit: James Orr

→ My research focuses on understanding how climate and land-use related stressors interact to affect biodiversity and the function of freshwater ecosystems, and on prioritising management interventions to safeguard these ecosystems.



05 Protecting human rights in prisons

Mary Rogan

Prisons are places far from public view. Usually hidden behind walls, those who live in prisons can be the subject of some fascination, but little sympathy. People in prison often come from backgrounds characterised by exclusion and are wholly dependent on the state for their protection and for access to basic services. We do not have to look beyond Ireland's shores to understand that this combination can lead to violations of human rights.

The role of oversight in prisons – As Principal Investigator of the *Prisons: the rule of law, accountability, and rights* (PRILA) project, funded by a European Research Council Starting Grant, I lead a team of international researchers including post-doctoral researchers and PhD students based at the School of Law, Trinity College. We examine the role the oversight of prisons can play in promoting compliance with human rights standards. Through research in Ireland, Germany, Norway and Scotland, we examine three main oversight tools found in international human rights law on prisons: prison inspection and monitoring; complaints procedures for prisoners; and access to the courts.

Our research has found that people in prison value the concept of independent oversight of detention, but often feel removed from the actions of those bodies in practice. In Ireland, many people were not aware of the oversight

bodies which exist. People in prison also feel that oversight visits can be inauthentic and unable to see or grasp their day-to-day reality. Among prison staff, senior managers in both Germany and Ireland reported feeling that complaints mechanisms were legitimate and useful managerial tools, but they found the paperwork involved challenging in an already complex role.

International efforts to improve prisons

By conducting the first ever EU+UK survey of prison inspection and monitoring bodies, we found that most countries have created National Preventive Mechanisms (NPMs) – independent bodies established under the United Nations Optional Protocol to the Convention against Torture, with the mandate of visiting places where people are deprived of their liberty. An important exception is, however, Ireland, which has not ratified this Protocol. Our research suggests that, across Europe, there is a need to strengthen the financial independence of NPMs and to improve protections against reprisals for those who work for such bodies or speak to them.

We also undertook the first ever observation of a visit from an international prison monitoring body: the European Committee for the Prevention of Torture. Through spending weeks in prisons, conducting dozens of interviews, we are beginning to see ways to enhance such important international efforts to

improve prisons, including the increased visibility of prison monitors and more effective opportunities for prison staff and people in prison to speak to these bodies.

A central aim of my work is to have an impact on policy and practice. PRILA has contributed to the process for drafting new European Prison Rules by the Council of Europe in an effort to strengthen prison oversight. We have also produced briefing papers for prison staff and people in prison: www.tcd.ie/law/research/PRILA/. In recent months, our work has been published in international journals including the *European Journal of Criminology*; *Punishment and Society*; *Criminology and Criminal Justice*; and *Crime, Law and Social Change*. I feel a responsibility to support the policy-making process through the provision of high-quality evidence. In that spirit, I chair the Implementation and Oversight Group for reforms to penal policy, reporting to the Minister for Justice. www.justice.ie/en/JELR/Pages/Penal_Policy_Review

My research shows that improving legal standards concerning the treatment of people in prison is important, but legal standards are not enough. Through understanding the perspectives of those involved in and affected by oversight, we can help improve the protection of human rights in places where they are vulnerable.

Mary Rogan holds an LLB, PhD and PGDip Statistics from Trinity and a BCL from Oxford. Qualified as a barrister (Honorable Society of King's Inns), Mary is a member of Lincoln's Inn, London. She is an Associate Professor at the School of Law since 2016 and Principal Investigator of PRILA, funded by an ERC Starting Grant. She was elected Fellow of Trinity College Dublin in 2021. Mary has been funded by the European Commission and Irish Research Council. Her research examines human rights and imprisonment and penal policymaking. Contact: mary.rogan@tcd.ie

BELOW — Mountjoy Prison Dublin.
Credit: Irish Prison Service

→ Through understanding the perspectives of those involved in and affected by oversight, we can help improve the protection of human rights in places where they are vulnerable.



05 Shining a new light on understanding the relationship between vitamin D and health

Lina Zgaga

When sunlight reaches human skin, vitamin D production is initiated and this UVB-induced synthesis is a key source of vitamin D for most people. Consequential to the prominent seasonal variation in UVB radiation (Figure 1), vitamin D status fluctuates too – it peaks in late summer and is at its lowest in early Spring. The profound seasonality of vitamin D levels creates a “moving target” issue and many fundamental questions remain unanswered because established methods are unable to address them adequately. My research seeks to develop approaches that can work with the constant and physiological fluctuation in vitamin D status on multiple fronts.

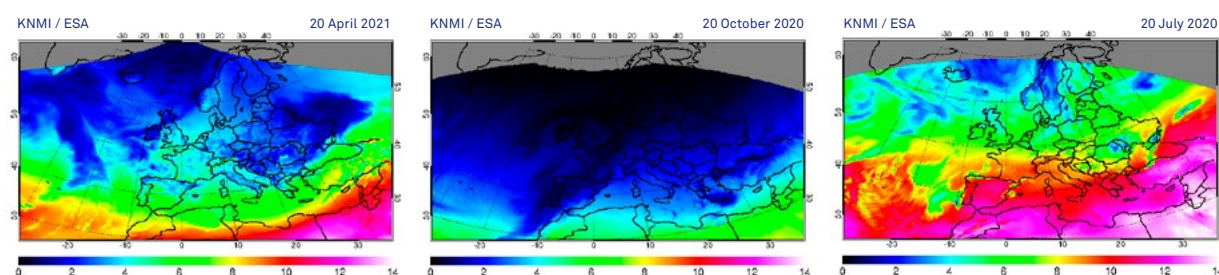
Vitamin D status assessment – Vitamin D status is currently assessed by measuring the concentration of 25-hydroxyvitamin D in the blood. This measurement provides a good approximation of vitamin D status

at the time of sampling; however, a single time-point measurement cannot capture the large seasonal differences. With my colleagues in the School of Medicine, Dr Eamon Laird and Dr Martin Healy, I have demonstrated for the first time that vitamin D can be measured in human hair. Our work could revolutionise the accuracy of assessment, because vitamin D depositions in hair represent a personal record of vitamin D status over a longer period (Figure 2) – similar to carbon deposition in ice used in climate change studies. The testing itself would be much improved too: taking hair is painless, does not require a health professional to take a sample and is not invasive, a noteworthy benefit for some groups, including children. I have been approached by zoologists, as removing the need for blood sampling is a great relief when working with animals; in particular primates that would otherwise need to be sedated.

Vitamin D deficiency as a risk factor for disease – Vitamin D deficiency has been suggested as a risk factor for ~200 diseases, including most recently Covid-19. The suspected disease links have earned vitamin D a lot of attention; however, the absence of a definite proof has been fuelling a heated debate on whether these associations are direct and causal. Alternatively, the associations could be due to confounding. For example, those who are physically active, have normal weight, and are healthier tend to have higher vitamin D levels.

Randomised controlled trials (RCTs) are the corner stone of evidence-based medicine. Despite very convincing evidence from experimental, animal and observational studies, vitamin D RCTs have largely failed to show direct benefit. The specific issue that plagues RCTs with vitamin D is that large differences in vitamin D status

FIG 1



Lina Zgaga received her degree in medicine and PhD from the University of Zagreb (Croatia) and her MSc from the University of Edinburgh. She joined Trinity in 2013 and is now an Associate Professor of Epidemiology in the School of Medicine. She has published over 130 peer-reviewed manuscripts that were cited almost 17,000 times. Her research focuses on vitamin D, gene-environment interactions, and new epidemiological methods and frameworks for determining causal associations. She was elected to fellowship of Trinity College Dublin in 2021. Contact: zgagal@tcd.ie

FIG 1 – The maps show the UV dose reaching the Earth’s surface at wavelengths that can induce vitamin D production in human skin, while considering the reduction of the UV radiation due to clouds. (A) 20th of April 2021, (B) 20th of October 2020 and (C) 20th of July 2020. Copyright © KNMI/ESA; www.temis.nl

FIG 2 – Concentration of 25-hydroxyvitamin D in blood, the best marker of vitamin D status from March to October is shown in the top panel. The corresponding depositions of vitamin D in hair, proportional to the concentration in the blood at the time of hair growth are illustrated in the bottom panel.

→ Vitamin D deficiency has been suggested as a risk factor for ~200 diseases. The suspected disease links have earned vitamin D a lot of attention; however, the absence of a definite proof has been fuelling a heated debate on whether these associations are direct and causal.

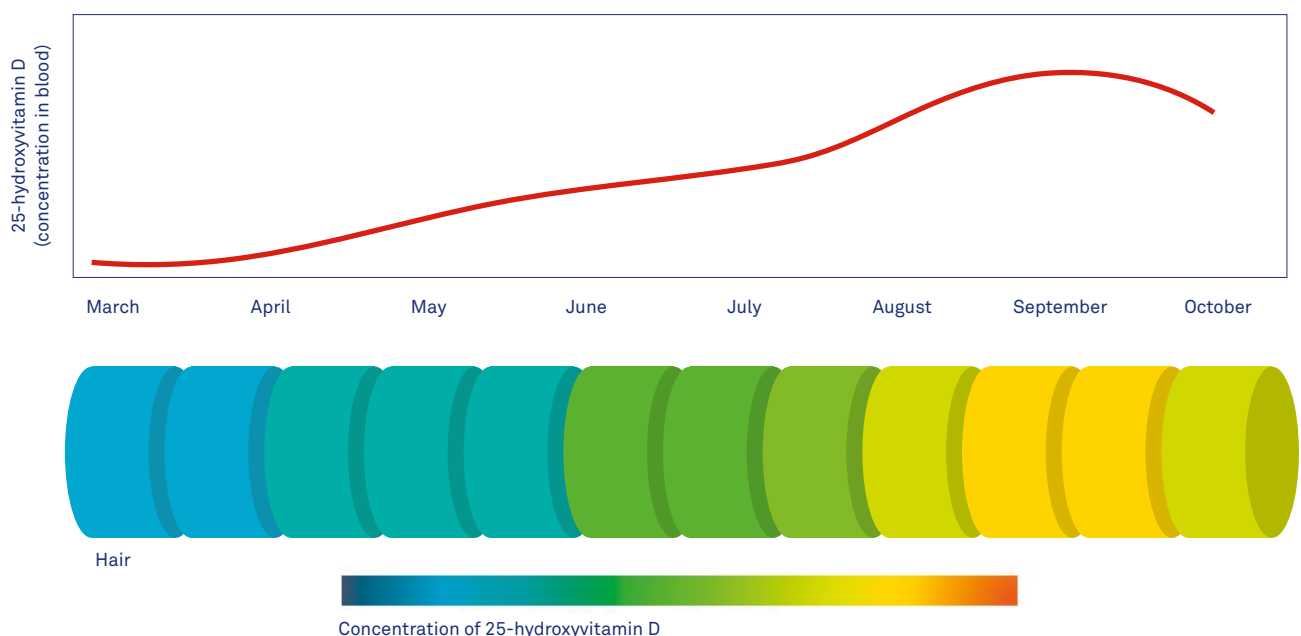
exist between people. This is a problem because the effect of supplementation will differ substantially: those who are severely deficient will benefit more than those whose vitamin D status is merely insufficient; and there will be no benefit among the sufficient.

Through a simulation study I have undertaken with Dr Jason Wyse, School of Computer Science and Statistics,

we have been able to describe the “blind spot” of RCT design for the first time: the between-person differences and seasonally changing vitamin D status sabotaged the ability of RCTs to detect benefit. Retrospective analysis has indicated that many reported findings might be false-negatives, meaning that supplementation was in fact beneficial but that our methods don’t work – a bit like

trying to see a virus with a magnifying glass. The implications of establishing whether null-findings are true or false negatives are major: if associations with vitamin D are causal, enormous public health impact could be achieved by supplementation – an opportunity that should not be missed given that vitamin D supplements are cheap, safe and easily accessible.

FIG 2



05 The epidemiology of COVID-19 and addiction

Catherine Comiskey

In the early stages of a new epidemic, where no vaccine is available, all persons are susceptible. As the epidemic progresses and the number of infectious individuals increases, the number of susceptible individuals will decrease. However, when an epidemic can produce both asymptomatic and symptomatic cases, the identification of the numbers infected becomes more challenging. But without good estimates on the number of infected, it is difficult to take decisions on when a community has reached its critical threshold point and when policy makers and planners can advise on school openings, safety for nursing homes and protection of vulnerable communities.

The research from my group in the Trinity School of Nursing and Midwifery has focused on adapting and developing models to estimate this hidden prevalence. Mathematical and statistical models of back-calculation have been used successfully both internationally and in Ireland to produce estimates of the scale of a hidden infected population within HIV/AIDS, heroin use and more recently bio-terrorism, where the comparatively short incubation periods are particularly applicable to COVID-19.

Working with observed symptomatic cases and the known incubation period, these models predict through the incubation period distribution, the total numbers of infected and asymptomatic cases these observed cases arose from.

Using back-calculation methods with reporting delays, age structure and a range of models for the observable cases, our work provides crucial estimates for planners on the scale of the asymptomatic COVID-19 population within Ireland, across the three waves of the epidemic. To date we have found that on average there are twice as many people infected than was previously thought. We have published these results both as open access online articles with our funder the Health Research Board and in internationally peer reviewed publications.

Enhancing addiction services: the HAT Recovery Model – The research from my team also uses modelling approaches to enhance service delivery among people who use drugs and are in receipt of treatment. We are collaborating with nurses who work in addiction services and we have developed, implemented and evaluated the Healthy Addiction Treatment (HAT) Recovery Model.

The current model of nursing within international addiction services has been described as task orientated and reactive with little or no scope for innovation. Our research identified that a nursing model must address client needs, be adaptable with time, measurable, implementable and must be cognisant of the person, their clinic and their community.

The HAT Recovery Model refocuses services on client's needs and eradicates entrenched practices, and

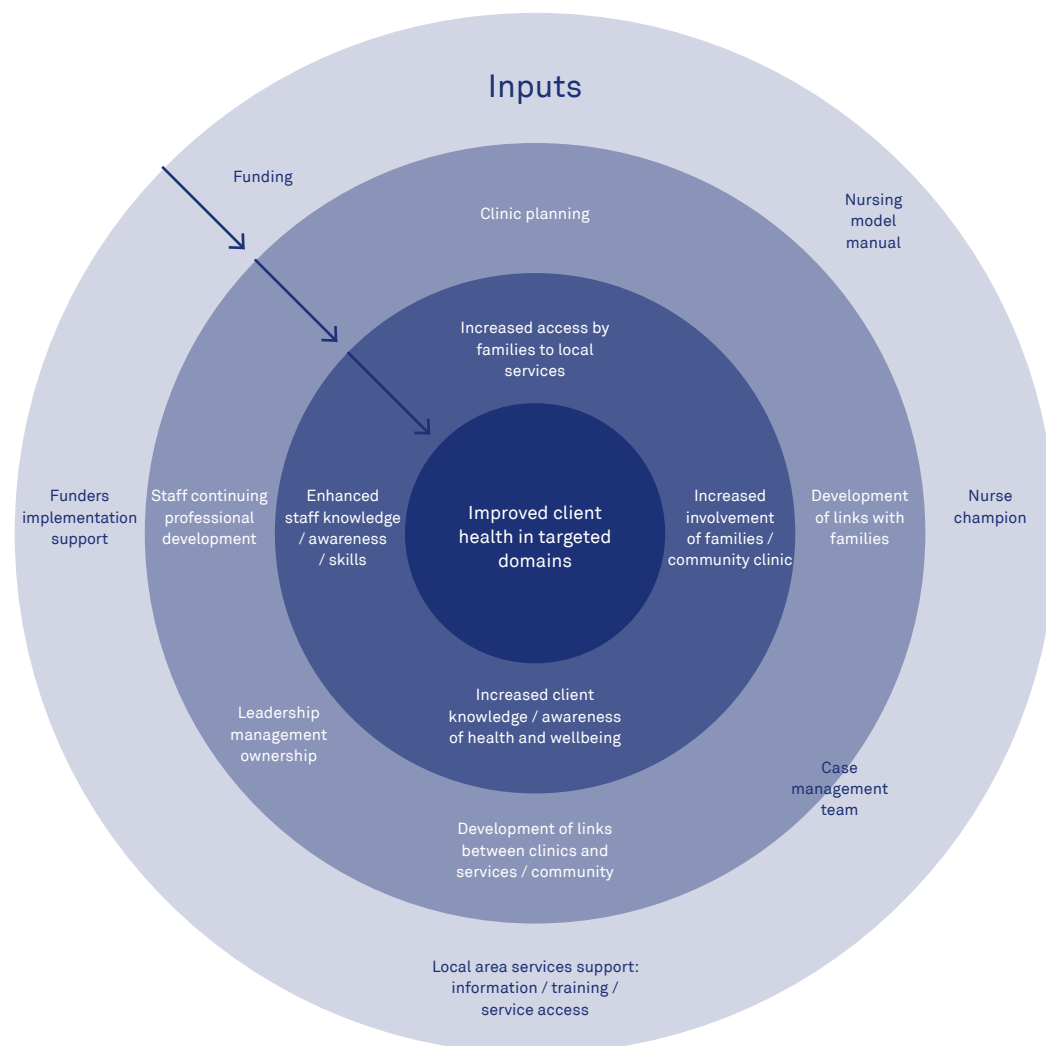
uses a brief intervention approach to target a single measurable behavioural change outcome. It also recognises that many people who use substances have experienced past traumas. Our model has changed the way that nursing services for people who use drugs and alcohol are delivered. Early results from our evaluation of the HAT model implementation has demonstrated that treatment outcomes are improved for people in treatment and this new innovative practice has been welcomed by the addiction nursing profession. We are now developing a free Massive Open Online Course to share the HAT model findings with international healthcare and nursing practitioners.



Catherine Comiskey received her BA (Mod) in Mathematics and Philosophy from Trinity and MSc and PhD in epidemic modelling from Dublin City University. She joined Trinity as a Professor in Healthcare Statistics in 2008 and was elected a Fellow in 2020. In recognition of her work she was elected as the Chair of the Scientific Committee of the European Monitoring Centre for Drugs and Drug Addiction. In 2020 she was appointed as a consultant to the United Nations. She continues to focus her research on making a difference in addiction services. Contact: ccomiske@tcd.ie

BELOW – The Healthy Addiction Treatment (HAT) Recovery Model for Addiction Nursing. The individual client is at the centre, change is measured at the population level. The greatest need is the target outcome for the nurse led innovation.

→ Our model has changed the way that nursing services for people who use drugs and alcohol are delivered. Early results from our evaluation of the HAT model implementation has demonstrated that treatment outcomes are improved for people in treatment and this new innovative practice has been welcomed by the addiction nursing profession.



05 Unlocking the potential of natural products for transformative health and societal gain

Helen Sheridan

Some of the world's most effective medicines are derived from compounds found in plants and fungi, including aspirin, quinine, codeine, and penicillin. We share the earth with nearly 400,000 plant species, of which only about 10 percent have a documented use (for food, medicine, building materials, poison, animal feed etc). As a Natural Product (NP) chemist and 'Medicine Hunter', working with a range of plant species, my research in the Trinity School of Pharmacy and Pharmaceutical Sciences focuses on discovering new NP therapies targeted at unmet clinical need, in addition to addressing key global challenges using innovative NP approaches.

Ethnomedicine to human clinical trials

During my research in ethnomedicine, I successfully identified a novel class of therapeutic molecules. From an initial hypothesis, this work progressed a dimeric indane drug candidate called PH46A, for the treatment of Inflammatory Bowel Disease – from NP discovery, through medicinal chemistry and pre-clinical development, to human clinical trials. This work resulted in numerous publications, and seven patents in the US, EU, and Asia. During this period, I co-founded the campus company, Trino Therapeutics, which gave employment to multiple researchers and created lasting international partnerships. The initial research was funded in the late 1980s by a grant of just £500 from the Royal

Irish Academy. It took approximately 20 years and €13 million (from Enterprise Ireland, venture capital, and a Wellcome Trust Strategic Translation Award) to drive the project from hypothesis to the clinic.

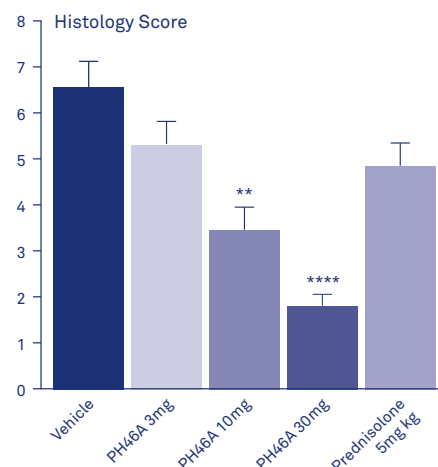
Unlocking nature's pharmacy from bogland species (UNPBS)

– I recently secured €6 million in philanthropic funding through the Irish Immigrant Investor Programme (IIP), overseen by the Department of Justice, to turn the lens of 'Medicine Hunting' on the flora of the Irish boglands. In this project, my group applies historical ethnomedical use, contemporary science, and advanced metabolomics to direct and inform the search for species with therapeutic and commercial potential. This project has extensive civic engagement, outreach, and educational elements. My team works closely with state agencies (e.g. Teagasc), not-for profits (e.g. Irish Peatland Conservation Council, IPPC), SMEs and other stakeholders, focusing on biodiversity and ethnomedicine, to deliver both research and educational outcomes. A recent EU ruling will eliminate the industrial scale exploitation of Irish Peatland by 2030. Comprehensive understanding of the scientific potential of bogland biodiversity could lead to innovative approaches, offering alternative, cross sectoral, opportunities for Irish communities, who have historically relied on the harvesting of turf for fuel for employment and commerce.

The NatPro Centre for Natural Products Research

– The UNPBS project has been pivotal in my recent establishment of NatPro, the Trinity Centre for Natural Products Research. The aim of the Centre is to 'Inspire and Catalyse Transformative Change' in Ireland using NPs to deliver innovation across sectors, from pharmaceuticals to food and cosmetics.

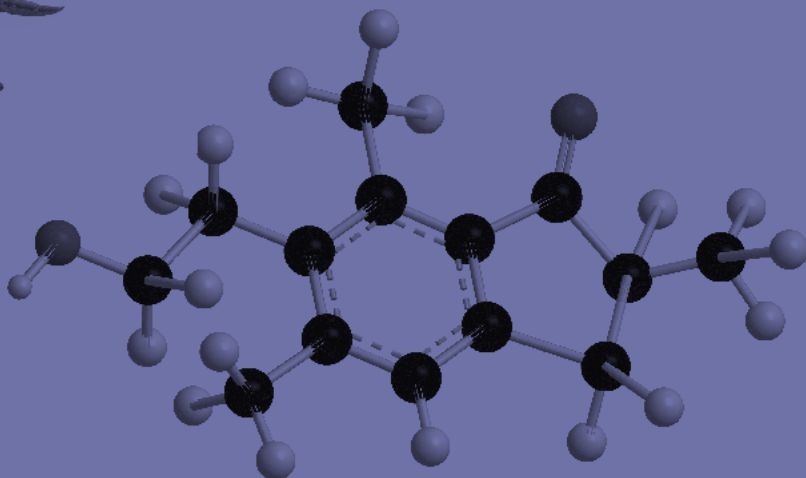
I have a deep understanding of the challenges that line the road from therapeutic drug discovery for a natural product to human clinical trials. Through this invaluable lens of experience-led decision making, my group hunts for novel molecules to identify transformative opportunities, with the potential to eliminate some of the challenges related to health maintenance, treatment, and disease prevention.



Helen Sheridan received her BSc and PhD from University College Dublin. She held research Fellowships in both the CNRS at Gif-Sur-Yvette and Oxford University. Helen is Associate Professor in the School of Pharmacy and Pharmaceutical Sciences, Co-Founder of Trino Therapeutics, and Founder and Director of NatPro, the TCD Centre for Natural Products Research. Helen's innovative research unlocks the potential of Natural Products, from discovery to application. She is a Fellow of both TCD and the Royal Society of Chemistry. Contact: hsheridn@tcd.ie

LEFT – Sheridan & Frankish Trino Therapeutics.
doi.org/10.1021/jm300390f

→ Through the invaluable lens of experience-led decision making, my group hunts for novel molecules to identify transformative opportunities, with the potential to eliminate some of the challenges related to health maintenance, treatment, and disease prevention.



05 A Big Data approach for predicting brain health

Robert Whelan

In recent years, there has been great progress in understanding how the brain works, but there is still a huge gap between laboratory results and their real-world application. My research tries to bridge this gap. The long-term goal is to use brain data to identify psychological disorders or neurodegenerative diseases, in order to predict the future course of the illness, or to ascertain if a particular medication will be effective.

One reason why it is difficult to predict real-world outcomes is because the brain is incredibly complex, with billions of cells. In my laboratory in the Trinity College Institute of Neuroscience, we often use 'Big Data' methods to help overcome these difficulties. Tools developed to help you find the right webpage or to recommend a good movie have proven very useful when applied to neuroscience problems. Big Data approaches require...big data. Therefore, my work is characterized by collaboration, both with Trinity researchers (e.g. The Irish Longitudinal Study on Ageing, TILDA) and further afield in Europe, Asia, Australia and the US.

How old is your brain? – Having a brain that is 'younger' relative to chronological age is associated with many health benefits, but the precise relationship with psychological processes was previously unknown. Using about 1,400 publicly available 3D brain pictures captured using

magnetic resonance imaging (MRI), we first trained an algorithm to predict a person's age using only their brain image. Next, we took hundreds of other brain images – collected in Trinity, and from collaborators in the US and Turkey – and showed that having a younger brain was specifically associated with faster processing speed and cognitive flexibility, both crucially important in the context of ageing.

Brain waves – We have applied the same Big Data approaches to measurement of the brain's electrical activity – a simpler and less costly approach than MRI. This allowed us to identify differences in brain connectivity of adults with a diagnosis of attention deficit hyperactivity disorder (ADHD). In a separate study, we classified young adults with a propensity for risky alcohol use. Identifying such brain signatures could eventually allow us to monitor ADHD symptoms or identify those at risk of alcohol misuse.

Into the wild – My medium-long term goal is to collect data 'in the wild'. In recent work, in conjunction with an industry partner, older adult participants self-administered their own EEG on a near-daily basis. This produced brain data that were very reliable. Multiple days of recording markedly improved the quality of the signal, which could be important for monitoring brain health over time. A more

mobile approach could also be useful for improving access to healthcare in remote or underserved regions.

A key goal of my ongoing research is to study how the brain changes over time and how this relates to clinically relevant outcomes. For example, we are measuring how the brain's 'wiring' (see Figure 1) changes over time in adolescents diagnosed with ADHD and how this relates to their symptoms. Other work examines the antecedents and outcomes of substance use in adolescents and young adults, and functional brain connectivity associated with cognitive performance in older adults. I am currently editing a book on the practical application of Big Data methods to neuroimaging, with the aim of making these methods more accessible.

The long-term goal is to use brain data to identify psychological disorders or neurodegenerative diseases, in order to predict the future course of the illness, or to ascertain if a particular medication will be effective.

Robert Whelan received an Applied Psychology degree from UCC and a PhD from NUI Maynooth. He joined UCD as a lecturer in 2013 and Trinity in 2016 as Associate Professor of Psychology at the Global Brain Health Institute and the School of Psychology. Robert was elected a Fellow of Trinity College Dublin in 2020. Current and previous funding sources include the Health Research Board, Science Foundation Ireland, and Brain and Behavior Research Foundation, among others. He has published 180 peer-reviewed articles, primarily in the areas of cognitive neuroscience and neuroimaging methods. Contact: robert.whelan@tcd.ie

FIG 1 – The image shows the key structures and connections of a single participant's limbic lobe, a region important for memory and emotional responses. The image was generated using constrained spherical deconvolution tractography from high angular resonance diffusion-weighted magnetic resonance imaging.

→ Using about 1,400 publicly available 3D brain pictures captured using magnetic resonance imaging (MRI), we first trained an algorithm to predict a person's age using only their brain image.



05 Exploring the trace metals of life

Aidan McDonald

Biological inorganic (bioinorganic) chemistry defines the roles that metals play in biology (Figure 1), including biological chemical reactions involving metals, metalloproteins and metalloenzymes (enzymes are nature's catalysts – species that accelerate a reaction). Bioinorganic chemistry includes investigations into the natural chemistry of metals and metalloproteins/enzymes (e.g. the transport of oxygen in our blood by iron) as well as non-natural phenomena involving metals (e.g. platinum containing anti-cancer drug cis-platin).

Of particular interest is a superfamily of metalloenzymes called oxygenases. Oxygenases employ atmospheric oxygen and a metal (often manganese, iron, or copper) to facilitate oxidation reactions at ambient temperatures and pressures. An example of oxygenases that are critical to life are the cytochromes P450 that are found in the human liver, where they act to oxidise foreign molecules (e.g. medications) and thus cause the elimination (metabolism) of these molecules. Oxygenases also facilitate DNA/RNA synthesis and repair, protein modification, and antibiotic biosynthesis, amongst many other oxidative transformations. We study the chemistry of such oxygen-dependent enzymes to develop a fundamental understanding of their (bio)chemistry and to develop synthetic mimics that perform the same chemistry.

Understanding metalloenzymes – My group in the School of Chemistry studies Ribonucleotide Reductases (RNRs), a family of enzymes that performs oxygenase-like reactivity, and that play a pivotal role in human health. RNRs are involved in DNA synthesis – they perform an oxidation reaction using oxygen that leads to the formation deoxynucleotides, which are the precursors to DNA. We explore the mechanism (the series of elementary chemical conversions that define a reaction) of RNR oxidation reactions. Unfortunately, interrogating enzyme mechanisms is extremely challenging. We develop synthetic analogues of the metal sites of these enzymes (Figure 2, dimanganese RNRs). These compounds display the same properties as the enzyme active site, with added benefits: (i) they are easier to analyse; and (ii) we can probe their reactivity at very low temperatures, thus slowing the elementary chemical conversions. The outcome of these investigations has garnered an understanding of how the RNRs produce deoxynucleotides, providing the first and only experimental insights into certain (bio)chemistries of RNRs.

Synthetic mimics for industrial reactions

Certain oxygenases (similar to the P450s) perform a challenging reaction: the conversion of hydrocarbons (petroleum-derived chemicals) to commodity chemicals for the pharmaceutical and materials industries, such as the conversion of methane (natural gas) to methanol (a biofuel). Current industrial methods for these reactions require high temperatures and consume large quantities of energy. Developing mild, cheap, and efficient biomimetic oxidation of such hydrocarbons is our goal. We have made breakthroughs in the tuning of the reactivity properties of biomimetic iron and nickel oxidants and the identification of an entirely new class of hydrocarbon oxidation (called metal-halide mediated oxidation). This new class of oxidation reactions performs reactions at speeds comparable to the biological parents, providing a promising novel oxidant for the conversion of hydrocarbons to commodity chemicals.

This interdisciplinary research exploits skills from the fields of biochemistry, chemistry, and physics to come to a detailed understanding of biological reactions. Overall, our bioinorganic explorations help to develop novel industrial oxidants, and to provide a deep understanding of oxygenase enzymes, potentially benefiting both environmental and human health.

Aidan McDonald is an Associate Professor in Inorganic Chemistry. He received a B.A.(mod) from Trinity College Dublin (2002) and completed his Ph.D. at Utrecht University (2008). He was elected Fellow in 2020. Aidan was a National Institutes of Health (USA) Kirschstein fellow and a Marie Curie fellow, and currently holds an ERC Starting Grant and a Royal Society/SFI University Research Fellowship. He was recently awarded the Royal Society of Chemistry Sir Edward Frankland Fellowship and the Society of Biological Inorganic Chemistry EuroBIC Medal. Contact: aidan.mcdonald@tcd.ie

FIG 1 – The essential elements of life. C, H, N, O are the four most abundant elements in biological systems, alongside Na, K, Mg, Ca, P, S, and Cl. The trace elements (V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Mo, W) are found in micro- to milli-gram quantities in a 70 kg human body, but are essential for life. Image modified from commons.wikimedia.org/wiki/File:Periodic_table_large.png

→ My group in the School of Chemistry studies Ribonucleotide Reductases (RNRs), a family of enzymes that performs oxygenase-like reactivity, and that play a pivotal role in human health.

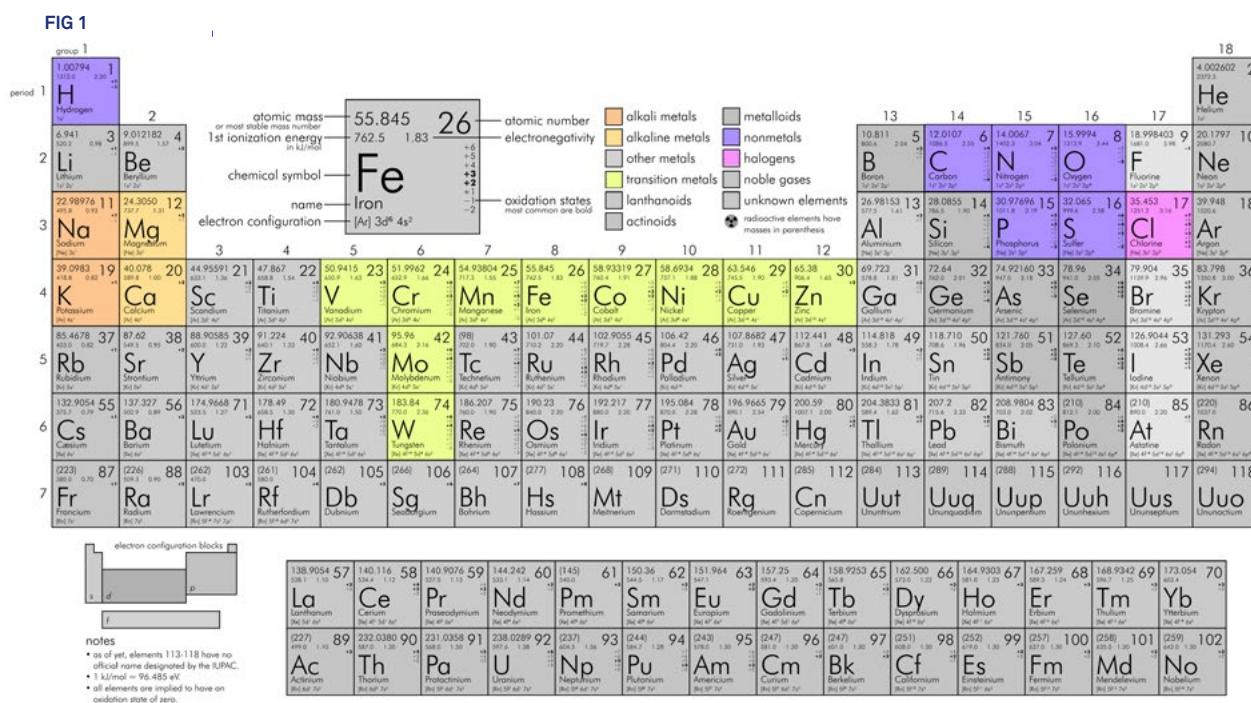
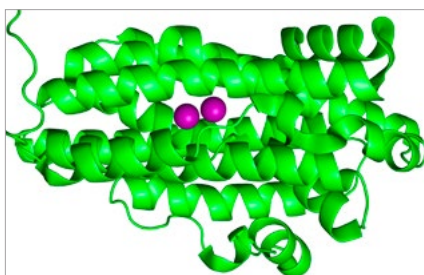
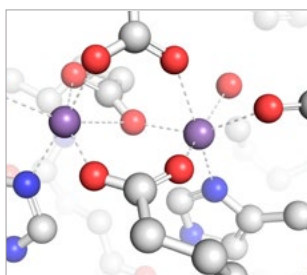


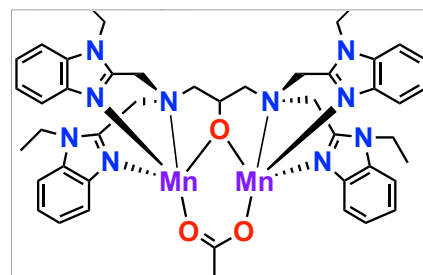
FIG 2 – Left: Representation of dimanganese (Mn₂) RNR from X-ray crystallographically determined structure (PDB: 3n37). The purple spheres are the Mn atoms (highlighted for effect) while the green ribbons represent the protein structure.



Middle: Close-up view of the Mn₂ active site with atoms represented using a ball-and-stick model (Mn = purple; O=red; N=blue; C=grey; H omitted for clarity).



Right: Synthetic model compound used to understand the properties of the RNRs.



05 Preventing cancer in disadvantaged women smokers

Catherine Hayes

Smoking-related lung cancer is now the leading cause of cancer death in Irish women, having overtaken breast cancer. The incidence of new cases is the highest in Europe. The highest rates of smoking are among socio-economically disadvantaged women, who are more likely to smoke to cope with negative emotions and stressful situations, and experience more difficulties in quitting and are more likely to relapse.

My research group at the Institute of Population Health in Tallaght has been piloting a trial of an intervention to prevent cancer in socioeconomically disadvantaged women by helping them to quit smoking.

Tailored smoking cessation programmes

Members of our research team were previously involved in the design of We Can Quit (WCQ), a stop-smoking programme for women living in disadvantaged districts in Ireland. We Can Quit involves 12 weekly group-based smoking cessation support sessions, optional access to nicotine replacement therapy (NRT) without charge, and individual support between sessions. It is delivered by trained lay women (Community Facilitators) in local community facilities.

The We Can Quit Too (WCQ2) pilot study

My research group includes practitioners from the Irish Cancer Society and the Health Service Executive (HSE), public, patient representatives (PPI) and two

universities in Scotland. Our community engagement research aimed to evaluate if it was feasible to recruit women smokers living in eight disadvantaged districts of Dublin and Cork to a randomised controlled trial and to keep them in the trial. We also sought preliminary evidence of effectiveness in terms of smoking abstinence. We interviewed women and Community Facilitators to understand their experiences of being part of a trial and their acceptance of the WCQ intervention. The work is now almost complete.

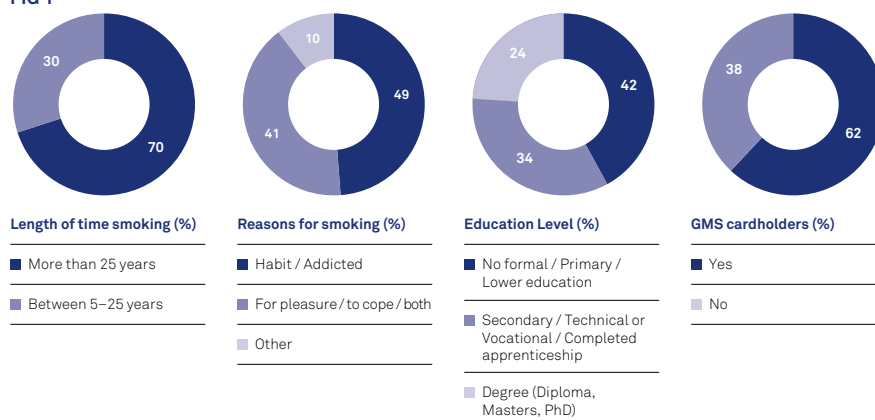
We used community based participatory research to engage community development organisations, GPs, nurses, and local pharmacies in each district to recruit participants. Women were randomised within districts to receive WCQ or a control treatment (one-to-one smoking cessation support delivered by health professionals in HSE).

Most of the 89 women participants were heavily nicotine dependent long-term smokers; over 40% had not progressed to second-level education, and the majority had low incomes as evidenced by their eligibility for the General Medical Services (GMS) scheme (Figure 1).

Women engaged well with both smoking cessation treatments and almost half provided follow-up data at six months. They considered the WCQ group support and free NRT very valuable for smoking cessation. Peer learning and role modelling were important themes:

“...that lady she taught me one thing that I didn’t know and I taught her something that she wouldn’t have known so that’s the way that it went around in the meetings, we all found out something different to help us and if one fell off the wagon we’d turn around and say ‘don’t worry about it’” – Participant.

FIG 1



Catherine Hayes is Associate Professor in Public Health and Specialist in Public Health Medicine in the School of Medicine in a joint academic service post with the Health Service Executive. She received her MPH and MD from University College Dublin and was elected Fellow of Trinity College Dublin in 2021. She has obtained over €2.2m in Health Research Board and Enterprise Ireland funding and has authored over 100 publications. Her research addresses development, implementation and evaluation of targeted lifestyle interventions to prevent cancer and chronic diseases particularly in disadvantaged groups. Contact: hayesc9@tcd.ie

FIG 1 – Key characteristics of trial participants.

BELOW – Women celebrating their achievement on completion of 'We Can Quit'.

"It was great [free NRT], yeah, yeah, I found it fantastic. It was great to get it" – Participant.

Low literacy was a factor that influenced women's participation in the trial: "We Can Quit itself is for more marginalised people who probably will have literacy issues. So I think you need to think about how to have the same information but make it accessible to all of the people" – Community Facilitator.

More women who received WCQ were abstinent from smoking than those who received the control treatment at the end of programme delivery.

An integrated system of care – Expansion of this work will potentially have a major impact in reversing the rise in lung cancer incidence and deaths, by providing an alternative model to deliver stop-smoking services for disadvantaged women smokers and other difficult to reach groups. It has potential for global application in low-middle income countries. Specific strategies to address literacy issues will be important to promote sustained participation and smoking abstinence.

The participatory action research approach has resulted in stronger connections between the statutory and

voluntary sectors and has paved the way for integrating WCQ into the HSE national tobacco control programme, in line with the Sláintecare national programme to create an integrated system of care.

In the coming year a focus for my research will be on implementation of the national Make Every Contact Count programme by the HSE. This applied research will determine how best to scale up the implementation of brief interventions addressing a range of lifestyle determinants, including tobacco, delivered routinely by health professionals in many different settings.



05 Using creative arts practice to help children

Deirdre Madden

Like more traditional forms of research, fiction extends our knowledge of ourselves and society. It has been noticeable during the Covid-19 Pandemic how many people have had recourse to the arts, including literature, to help them process and assimilate the situation.

I am currently working on a book for children about serious illness. I have several aims in writing this novel. I believe it is helpful for children to see their own experience reflected in fiction, and that that in itself is reassuring and validating, even when the outcome is not what one would wish for. I am trying to keep the terms of reference as open as possible, so that the novel will accommodate the different values of different readers, and in this way might serve as a template to talk to children about these subjects, including children who are themselves seriously ill. I also, of course, very much hope that children will simply find the novel engaging and enjoyable, and to that end have used a strong narrative line and as much humour as I can manage. I believe strongly in the resilience and wisdom of children and that it necessary to respect this when writing for them.

This book, and its concern with the medical humanities, will form a new strand to the work I have already produced – eight novels for adults and three for children, all published by Faber and Faber. My novels explore themes including memory, the visual arts, and the perception of time.

In the past ten years I have published two books. *Time Present and Time Past* (2013) is a novel, a family story which is concerned with early colour photography and how it can be an imaginative portal to the past. In 2015 I was commissioned by Faber and Faber to edit 'All Over Ireland' an anthology of new Irish short stories. This book included work by established writers, such as Colm Tóibín and Frank McGuinness, and also new and emerging writers, including Andrew Fox and Eileen Casey, both of whom were students of mine on the MPhil in Creative Writing in the Oscar Wilde Centre.

As a writer working in the School of English, I have for many years found myself in the position of both

teaching and having my work taught at undergraduate and postgraduate level in Trinity, as colleagues have included some of my novels on the curriculum.

Although Creative Writing has been taught in Trinity since 1997, the idea that the writing of fiction might be considered as research is a relatively recent idea in the College. Creative Arts Practice is now a recognised research theme, and is closely intermeshed with more traditional critical practice in the university. This fusion of the critical and the artistic is evidenced in undergraduates in the School of English now being able to present creative writing for their Capstone project, and in the School's new PhD in Literary Practice.

My novels explore themes including memory, the visual arts, and the perception of time



Deirdre Madden studied English at Trinity College Dublin and has an MA in Creative Writing from the University of East Anglia. In 1997 she was Writer Fellow in Trinity and she is a member of Aosdána. She has won many awards for her work including the Rooney Prize, the Somerset Maugham award and a Hennessy Lifetime Achievement Award. Since 2004 she has been teaching in Trinity, both at undergraduate level and on the MPhil in Creative Writing in the Oscar Wilde Centre. Deirdre was elected Fellow of Trinity College Dublin in 2021. Contact: dmadden@tcd.ie



→ I believe strongly in the resilience and wisdom of children and that it necessary to respect this when writing for them.

05 Future technologies for communication

Rachel McDonnell

Over the past year, we have been forced to spend prolonged periods of time working remotely and experiencing much of our lives online, distancing ourselves from 'real' human contact. Video conferencing and virtual reality simulations allow us to maintain interactions with friends, family or business associates. The key challenge in remote connection is to hide the gap of physical distance, and allow natural interaction, which can be difficult with the current video-based technologies such as Zoom, Teams, etc.

Recently, there have been huge technological advances in real-time computer graphics, providing sophisticated interactions between people, using highly realistic avatars and virtual and augmented reality (AR/VR). These AR/VR devices allow for content to be truly 3D and immersive where people can cohabit a room with a digital representation of their friend, partner, or relative and be able to interact, talk and even touch, while being in different parts of the world in real-life.

These systems are no longer science fiction – however, the current state-of-the-art is still lacking in terms of avatar realism and their ability to reproduce subtle human motions and emotions. This means that even though we can coexist in a virtual space, our avatars might not have the necessary

capabilities for conversation with other virtual humans. Maybe they don't look enough like us, or their appearances are too cartoon-like to have a serious conversation, or they can't reproduce our face and body emotions sufficiently, resulting in information loss during communication.

Mimicking our unique expressions –

My research at the School of Computer Science and Statistics focuses on computer graphics and aims to make the appearance and motion of these types of virtual avatars more realistic, through perceptual experiments and developing new algorithms based on real human movement. As an example, my group recently ran experiments to test the use of personalised avatars in video-conferencing for effective communication. We found that using virtual representations in video-conferencing proved a positive experience for most users and reduced 'zoom-fatigue', allowing people to be less focused on their appearance while on-call. We also developed new algorithms for creating virtual characters which mimic our unique expressions (e.g., the smile looks like our unique smile, not a generic smiling expression), thus improving communication. This work was funded by Science Foundation Ireland's Frontiers for the Future Programme and published at top conferences and journals for computer graphics and virtual reality.

Speech to gesture – My work as a Principal Investigator in the SFI ADAPT Research Centre has led me to investigate photorealistic embodied conversational agents, which are basically virtual humans that look real and can converse with you using artificial intelligence. These agents can be used in a range of scenarios – for example to improve training in healthcare, education, and sales. However, humans are very effective communicators and can notice small irregularities in motion or behaviours of virtual humans, making the task of automating their behaviours difficult. My group has developed new algorithms for automating the gesture behaviours for these characters, so that they can produce appropriate hand gestures during conversation, which is a surprisingly difficult task to automate. Our work in this area has been published at the top venues for intelligent virtual agents, and we have begun investigating the commercial feasibility of such a system.

My group also recently published the *Trinity Speech-Gesture database*, a high-quality motion capture and speech of spontaneous natural conversation. The dataset has become the de facto standard for evaluating speech-to-gesture systems in the community, as it is the largest dataset of its kind that is freely available for researchers worldwide.

Rachel McDonnell received her BA(Mod) and PhD from Trinity and joined the School of Computer Science and Statistics as a lecturer in 2011. She is now Associate Professor of Creative Technologies and a principal investigator with ADAPT, Trinity's Centre for AI-driven Digital Content Technology and was elected a Fellow of Trinity College Dublin in 2020. The recipient of a prestigious SFI Career Development Award, and a recent Frontiers for the Future grant, she has published almost 100 articles in peer-reviewed conferences and journals. Her research focuses on building plausible and appealing virtual humans.

Contact: ramcdonn@tcd.ie

BELOW – Virtual humans are becoming so realistic they are close to appearing like real humans (image rendered in real-time in Unreal Engine 4). My research involves improving virtual human appearances, animations, and interactions.

→ We have developed new algorithms for creating virtual characters which mimic our unique expressions, thus improving communication.



05 Enabling translational nanomedicine and nanoMedical technology to overcome the valley of death in innovation

Adriele Prina-Mello

The translation of Nano-medicines or nano-medical-technologies, into clinically approved products is a complex and challenging process but one with unquestionable patient benefits and relatively minimal side effects. The improved survival prolongation and quality of life that these nanotechnology-enabled products contribute to justify the long and complex development from bench to bedside.

This development includes the 'valley of death', which in technology transfer is the metaphor often used to describe the gap between academic-based

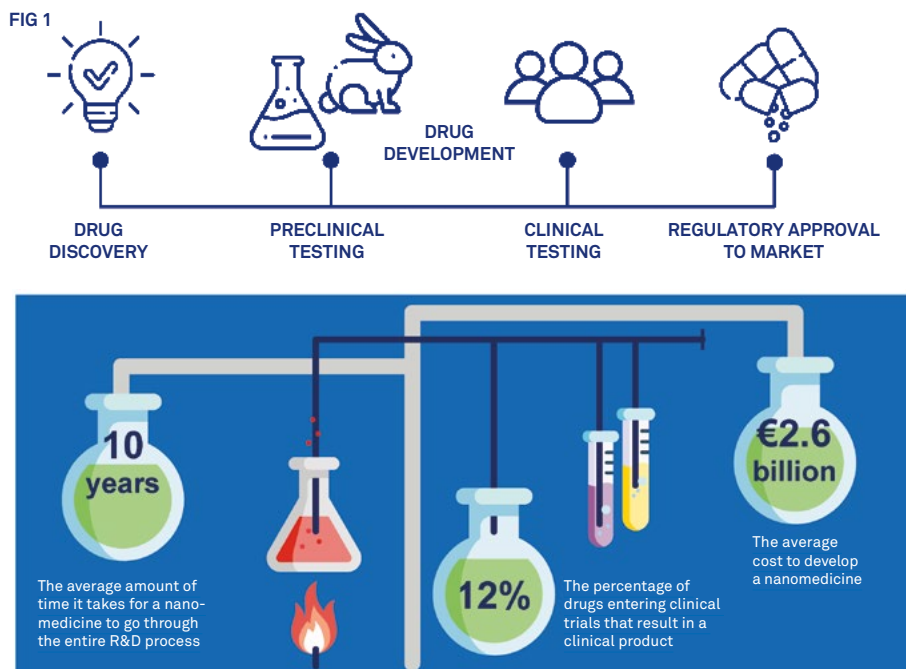
innovations and their commercial application in the marketplace (see Figure 1).

The most recent global success is the COVID-19 nanovaccine which is made of a lipid nanoparticle encapsulating the messenger RNA vaccine against SARS-CoV-2. These vaccines came about thanks to decades of nanotechnology-enabled drug development in cancer nanomedicine which have seen the approval of several very successful clinical products including: Ambisome®, Doxil®, Abraxane®, Onyvide®, Myocet®, and most recently the nucleic acid-based drug Onpattro®. Further contribution from nanotechnology,

in the rapid testing against SARS-CoV-2 is evidenced by the development of rapid antigen based diagnostic assays, based on gold nanoparticles in a lateral flow assay.

My work over the past decade has contributed to the development of several methodologies such as standard operating procedures (SOPs) and quantitative techniques, aimed at understanding and quantifying the key "nano" properties of several potentially breakthrough nanomedicines or medical technologies. These methodologies are applied primarily to cancer, but also inflammatory and infectious diseases such as COVID-19.

FIG 1



Adriele Prina-Mello is Ussher Assistant Professor in Translational Nanomedicine at the Department of Clinical Medicine, A Polytechnic of Turin graduate, MSc in Bioengineering, he completed his PhD and postdoctoral training at Trinity College Dublin where he was elected to fellowship of Trinity College Dublin in 2021. He is the Director of the LBCAM at the Trinity Translational Medicine Institute (TTMI), Principal investigator at CRANN/AMBER Centre since 2006 and Associate Director of Research in the School of Medicine since 2019. His research focuses in nanomedicine, nanomaterials and nanotechnology-enabled medical technologies for cancer, inflammatory and infectious diseases. Contact: prinamea@tcd.ie

FIG 1 – Translational Nanomedicine, schematic description of drug discovery from idea to regulatory approval, cost, attrition, and main reasons for translational failure. The valley of death in innovation is when the “idea” is not reaching sufficient scientific and financial support to make it into advanced clinical investigation or trials. (image courtesy of D. Movia, LBCAM, TCD)

Tackling the fingerprinting of the critical quality properties, or attributes, conferred to a nano-pharmaceutical or medical device, is one of the steps required during the translational process towards the clinical investigation. Building up reproducible, repeatable and transparent pre-clinical dataset is therefore a fundamental step towards the regulatory approval for a product.

For the past five years, I have been part of a large joint effort between the European Nanomedicine Characterisation Laboratory (EUNCL) and the U.S. Nanotechnology Characterisation Laboratory (USNCL) which established a preclinical testing cascade with validated SOPs supporting the preclinical assessment of promising nanotechnology-enabled products. Such effort has been recently expanded in the medical technology research area, in a very large collaborative effort, supported by the European Union programme Horizon2020, under the creation of an Open Innovation Test Beds (OITB) aimed at supporting early developing or high-risk high-gain nano-medical technologies.

Bridging the valley of death – Within the Trinity Translational Medicine Institute (TTMI), I am leading the academic and industrial research in the Laboratory for Biological Characterisation of Advanced Materials (LBCAM), providing pre-clinical characterisation, translational and regulatory guidance to national and international collaborators and customers. This involves assisting both SMEs and multinationals as technical R&D infrastructure or OITB.

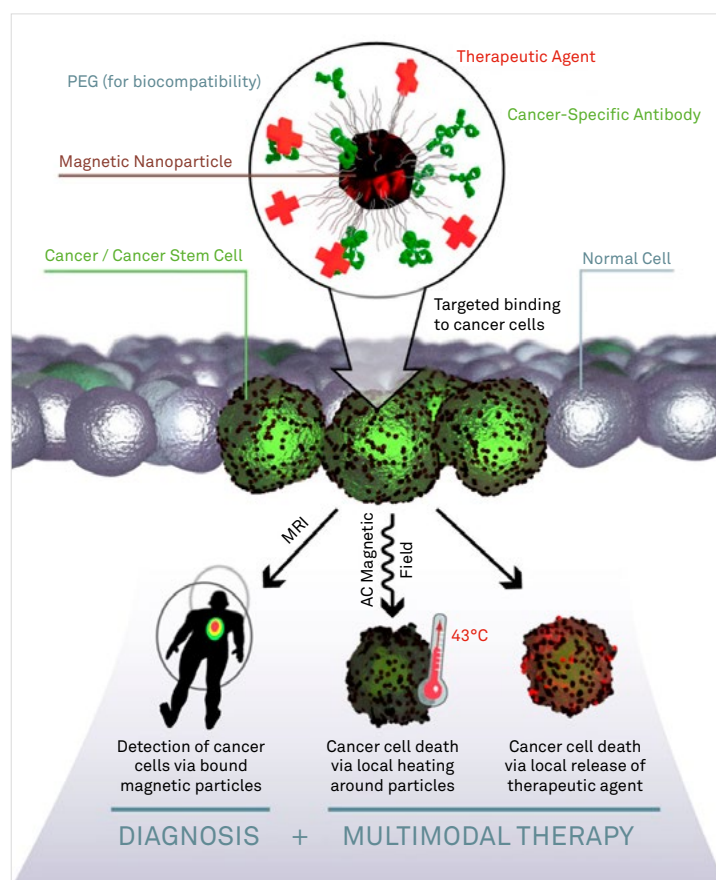
Such exposure has brought me to the conceptualisation of a preclinical toolbox for the assessment of complex nanotechnology-enable medicine and medical technology. The development

of orthogonal physicochemical characterisation techniques and 3-dimensional in vitro models has brought my research to be widely recognised and followed in bridging, the so-called translational valley of death in innovation.

My lab has recently assisted, after a nine-year pan-European fruitful collaborative work under two EU programme projects, the translation of first clinical investigation for superparamagnetic nanoparticles used for hyperthermia treatment against pancreatic cancer (see Figure 2). More recently, we are assisting the development of new therapeutics based on extracellular vesicles.

FIG 2 – Schematic description of minimally invasive multimodal treatment approach using nanoparticles and therapeutic agent for the treatment of advanced pancreatic cancer. Magnetic nanoparticles are injected in the tumor (also acting as diagnostics probes), followed by the application of an alternating magnetic field to enhance the therapeutic effect of the existing agents. The locally increased temperature combined with the action of the therapeutic agent will lead to the selective cancer cell death. (image courtesy of D. Crotty, LBCAM, TCD)

FIG 2



05 Brexit and British-Irish relations

Etain Tannam

The visit of Queen Elizabeth to Ireland in 2011, the first by a British monarch in 100 years, marked a high point in the British-Irish relationship and cooperation seemed embedded. However, the result of the Brexit referendum on 23 June 2016 precipitated a sharp deterioration in British-Irish intergovernmental relations that continues to date. Sinn Féin called for a referendum on unification, highlighting the issue of EU membership, and the DUP sought a hard Brexit and opposed any referendum. The British-Irish relationship did little to de-escalate rhetoric in Northern Ireland. In fact, the opposite occurred: in the ensuing four and half years the British-Irish relationship deteriorated to levels not seen since the early 1980s.

My research aims to explain why cooperation has waned and emphasises that Brexit is not simply a cause of tensions, but that its deep impact reflects underlying weaknesses that preceded the Brexit period. In particular, the Good Friday Agreement in all its parts was not implemented robustly. Strand Three of the Good Friday Agreement provides institutions to foster intergovernmental cooperation, but their potential has not been maximised.

The Three Strands approach, developed by the late John Hume, former leader of the Social Democratic and Labour Party (SDLP), emphasised that conflict resolution in Northern Ireland rested on the 'totality of relations' – meaning relations on the island of Ireland, relations in Northern Ireland and relations between the two islands. The EU was admired by Hume as a model of post-war reconciliation and he believed strongly that its dense institutional network was central to its success. Many features of the Good Friday Agreement emulate the EU's institutional framework. However, unlike with the EU institutions, these features have been lacklustre. The key institutions of Strand Three, the British-Irish Council and the British-Irish Intergovernmental Conference (Strand Three) have been under-utilised. The key problem however in using these institutions robustly is that the UK government has not always shared the political will to formalise relations and the current UK government led by Boris Johnson is particularly slow to engage with the Irish government systematically.

My research shows that Brexit is not the sole or fundamental cause of a weak British-Irish relationship, but that it has exposed that relationship's fragility.

My recent work for UCL's Working Group on Referendums on the Island of Ireland, with Trinity Law School colleagues, Professor Oran Doyle and Dr David Kenny, (who examine legal aspects of a referendum), examines the Irish government's role if there was a referendum on unification and how best to manage British-Irish relations in that context. My article for the ARINS project, led by the Royal Irish Academy and Notre Dame University, examines from an international relations perspective but also from an analysis of the peace process, why institutional cooperation is so important and also examines why the BIIGC met less frequently from 2007. My forthcoming book with Oxford University Press examines all economic and political aspects of British-Irish and Irish/Northern Irish cross-border relations since 1998.

All my research shows that whether there is a referendum on unification or not, an enhanced and rigorous role for the Good Friday Agreement is necessary to help facilitate stability. I have submitted evidence about this topic to the House of Commons Select Committee for Northern Ireland and to the European Parliament. With the UCL team, I also recently presented to the Oireachtas Committee on the Implementation of the Good Friday Agreement.

Etain Tannam holds a BA (Trinity College Dublin), MA (University of Essex) and PhD (London School of Economics). She worked in UCD and NUI Galway and is now Associate Professor, International Peace Studies and a Fellow of Trinity. As well as publishing widely, she has presented evidence to the House of Commons and the European Parliament. She is a member of UCL's working group on referendums on the island of Ireland and ARINS, a Notre Dame University and RIA research project on Irish unification and on the Union in the UK. Contact: tannam@tcd.ie

BELOW – Taoiseach Micháel Martin TD with Boris Johnson, Prime Minister of the United Kingdom.



→ My research shows that Brexit is not the sole or fundamental cause of a weak British-Irish relationship, but that it has exposed that relationship's fragility.

05 Keeping track of the law in Ireland during the COVID-19 Pandemic

David Kenny

COVID-19 changed the world and the Irish State. To respond to the pandemic, Ireland gave unprecedented power to the government to impose the most sweeping restrictions on personal freedom in the history of the State. Though this was essential, the vast scope of these powers gave similarly vast potential for misuse. With the support of the College's COVID Response Fund, I set up the COVID-19 Law and Human Rights Observatory, together with colleagues in the Trinity Law School, to keep track of the (constantly changing) law. We started a blog and prepared research reports to highlight major legal issues.

The Observatory raised concerns about parliamentary oversight, and insufficient democratic review of both the use of the power to make COVID regulations and the extension of the extraordinary legal powers given to government. We also highlighted significant issues around the rule of law: there was severe lack of clarity in government communication regarding what was law and what was merely public advice. This came into sharp relief in the enforcement of a criminal prohibition on holding religious services, when, in our view, no such prohibition actually existed in law. Far from mere technicalities, these basic issues of accountability and rule of law

compliance go to the heart of a just legal system. Even if we agree that the measures adopted were necessary, the manner in which they were adopted and enforced leaves much to be desired.

As well as raising these matters in blog posts and the media, I gave evidence to the Special Oireachtas Committee on COVID-19 Response, and many of the Observatory's recommendations were adopted in that Committee's final report. Three Observatory colleagues and I wrote a comprehensive report about the human rights and equality implications of the pandemic measures for the Irish Human Rights and Equality Commissions. Published in early 2021, this Report makes detailed recommendations about how better legal measures – with increased accountability, oversight, and care for rights compliance – could be adopted in future.

The role of legal advisors in governance

Alongside this, I have undertaken novel research on the role of government legal advisors in constitutional law. These advisors – such as the Attorney General in Ireland, and the US Office of Legal Council – are massively influential in our system of governance, but underexplored in comparative constitutional law. They often operate in a highly opaque manner, and it is hard to know their true influence on our systems of government. In a series of articles in the leading international journals in my field, I have begun to explore this question with comparative analysis of legal advisors in the US, the UK, Ireland, Canada and Japan. I consider how these legal advisors affect constitutionalism, politics, and the separation of powers, and argue for the much greater academic and political scrutiny of these bodies.



David Kenny is a graduate of Trinity College Dublin, Harvard Law School, and the King's Inns. He joined Trinity as an Assistant Professor of Law in 2012, and is now an Associate Professor and Fellow. He is an alumnus of the US State Department's Fulbright programme, and a recipient of the Provost's Award for Excellence in Teaching in 2015. His research focuses on comparative constitutional law, and he has recent publications in the *International Journal of Constitutional Law* (ICON), *Public Law*, and the *American Journal of Comparative Law*. Contact: david.kenny@tcd.ie

BELOW – *Ireland's Emergency Powers During the Covid-19 Pandemic* – Conor Casey, Oran Doyle, David Kenny and Donna Lyons.

→ Far from mere technicalities, these basic issues of accountability and rule of law compliance go to the heart of a just legal system. Even if we agree that the measures adopted were necessary, the manner in which they were adopted and enforced leaves much to be desired.



05 Enabling the future of Big Data using materials with unique magnetic properties

Plamen Stamenov

Magnetic materials have underpinned the evolution of digital data storage technologies for over six decades and are still relied upon in ultra-large capacity long-term tape archival systems, and in the too many to enumerate armies of spinning hard drives humming along tirelessly in the rapidly growing strategic data centres worldwide. Systematic performance improvements have been dusted with a couple of little revolutions, introducing new ways of building both the magnetic storage media and the heads, which are used to read and write the data. Synergies with optical and microwave technologies are poised to allow for even higher density recording, pushing the boundaries of density and speed.

In all of these success stories ferromagnetic and ferrimagnetic materials (where the moments are aligned essentially parallel) with high net magnetization have been the main players, with secondary roles being played by antiferromagnets with anti-aligned moments or more complicated order. For the last decade the support players have been trying to come from

behind the curtain and claim the centre stage, with promises of speed, efficiency and robustness. To make this transition a reality, a few paragons are needed to break the performance limits and drive a paradigm shift.

One unique combination of properties, that has been predicted to exist for over 20 years, but only recently been given a real experimental prototype, is the near-zero net moment and high conduction electron polarization. The Magnetism and Spin Electronics Group at Trinity's School of Physics and the CRANN institute has been at the forefront of this research, demonstrating, understanding and engineering the properties of the Zero-Moment Half-Metal (ZMHM) Mn_2RuGa (MRG for short) and related materials.

Two inequivalent crystal and magnetic sub-lattices are needed to build MRG, both comprised of manganese, and essentially anti-aligned, as illustrated in Fig 1. Because of the difference in symmetry of the local environment of the two types of manganese, the net magnetic moment can be brought to near-perfect

compensation (at least in a chosen range of temperatures), while the electronic current, which is predominantly affected by only one of the two sub-lattices is indeed, highly spin-polarized. While the optimization of the application of MRG in thin film devices requires precise control over its composition, lattice constants and surface roughness, demonstrations of useful functionality have already been achieved, with appreciable tunneling magnetoresistance which is persistent through its compensation temperature region. The very high ferromagnetic resonance frequencies (over 270 GHz have been demonstrated with the help of collaborators in Ireland's first EC FET Open project TRANSPIRE) offer a strong motivation for the design and prototyping of tunable low-power microwave oscillators, relying on the passage of highly polarized current in micro and nano-pillars incorporating thin film stacks, featuring MRG.

More recently, exploration involving the Photonics Laboratory of CRANN, revealed that the unique microwave properties of the MRG family of

FIG 1

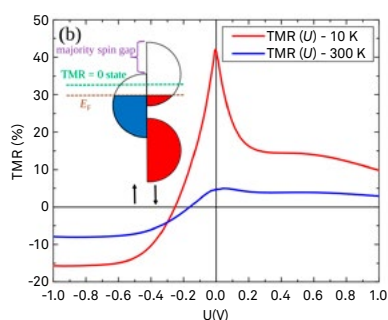
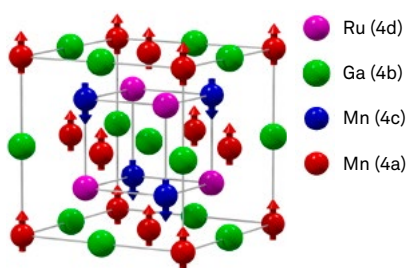


FIG 1 – Left: Crystal and spin structure of Mn_2RuGa . Right: Adapted from K. Borisov, et al. Appl. Phys. Lett. 108, 192407 (2016) TMR (U) scans at 300 K and 10 K for a chip annealed at 350 °C. The top left inset represents the spin split density of states of MRG for $x = 1.0$.

Plamen Stamenov received a BSc in Experimental and Theoretical Physics from the University of Sofia, Bulgaria and PhD in Experimental Magnetism from Trinity. He became a lecturer in the School of Physics and a principal investigator with CRANN in 2009 and was elected Fellow of Trinity College Dublin in 2020. His research interests are in the area of nanomagnetism, spin electronic devices and the development of novel measurement techniques and methodologies. He has authored and co-authored 100+ peer-reviewed publications and patents, and his work has been supported by the European Commission, Science Foundation Ireland, the Irish Research Council and Enterprise Ireland. Contact: stamenov.plamen@tcd.ie

FIG 2 – [Adapted from, C. Banerjee et al. Nature Com. 11, 4444 (2020)] Toggling of the magnetization in Mn₂Ru₁Ga. Magnetization patterns are shown as a function of the number of applied pulses. Pulse energy was 11.6 mJ cm⁻². The scale bar represents a length of 50 μ m.

materials also translate to unique optical functionality, courtesy of the spin-polarized conduction close to the Fermi level and the controllable exchange coupling within and between sub-lattices. For only the second time (and the first in a material devoid of rare-earths), ultra-fast optical toggling of the magnetization, using single femtosecond laser pulses, has been demonstrated, as visualized in Fig. 2. This opens a realm of possibilities for the incorporation of magnetic functionality,

with all the benefits of long-term memory and radiation hardness (just to mention a couple), into optical control and memory devices and laser-driven upper microwave and THz-region tunable generators (see Fig. 3), harnessing more of the special properties of MRG. Devices incorporating the technology could open previously nonexistent ways to the densification of the fibre-optic communication networks' information traffic and extend the useful life of existing infrastructure for another

generation, in a green and cost-effective manner.

In a final twist, the MRG-type ZMM materials may offer yet more functionality for the control of the magnetic state of memory, logic and optical interfacing components on-chip, using in-plane electronic currents and spin-orbit torques (see Fig. 3), ensuring that magnetism will still have a role to play in the data society of tomorrow.

FIG 2

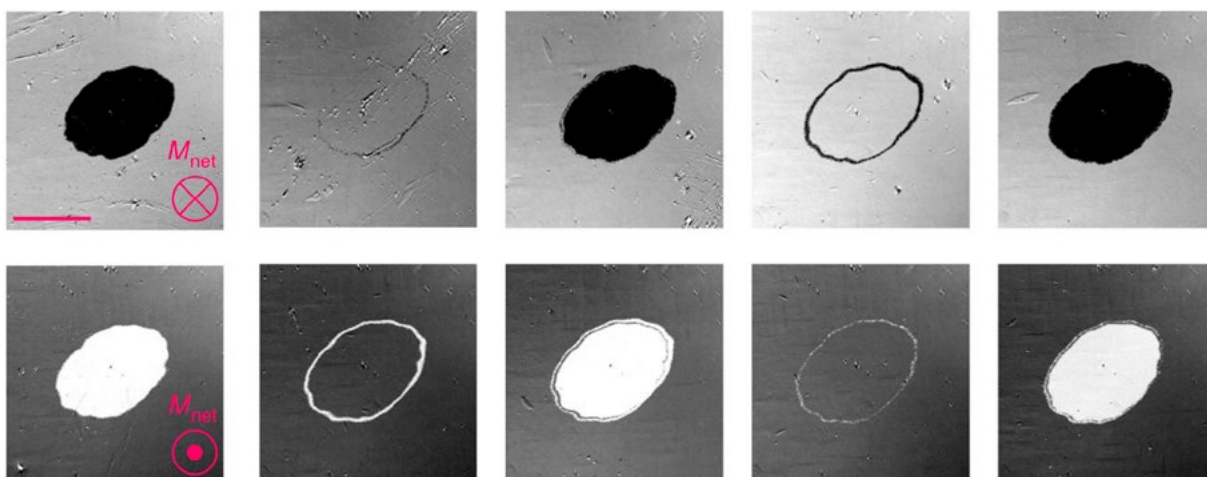


FIG 3

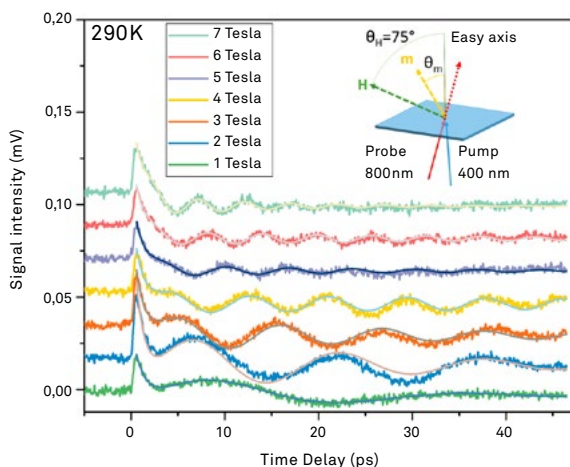
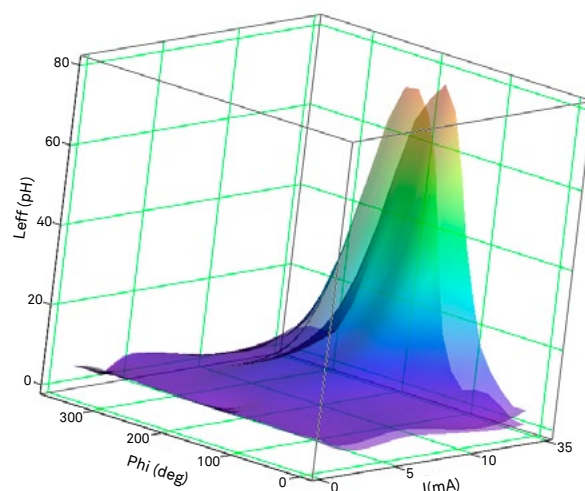


FIG 3 – Left: [Adapted from, G. Bonfiglio, et al. Phys. Rev. B 100, 104438 (2019)] Time resolved Faraday effect recorded at $T = 290$ K in applied fields ranging from 1 T to 7 T. After the initial demagnetisation seen as a sharp increase in the signal at $t = 0$ ps, magnetisation is recovered and followed by precession around the effective field until fully damped. The lines are fits to the data. Right: Effective SO inductance for a Hall bar of MRG.



Educational milestones – 10 years of growth and development

**Professor Kevin Mitchell, Senior Lecturer/
Dean of Undergraduate Studies and Professor
Martine Smith, Dean of Graduate Studies**

The undergraduate space

In October 2020 Trinity unveiled a new curriculum for undergraduate students which emphasises critical thinking, global citizenship, engagement with employers, flexible learning and integrating co- and extra-curricular learning opportunities.

It was launched by the EU Commissioner for Innovation, Research, Culture, Education and Youth, Mariya Gabriel with the Minister for Further and Higher Education, Research, Innovation and Science, Simon Harris, TD.

The most ambitious renewal of the undergraduate curriculum in a century, the Trinity Education Project (TEP), planned and implemented over seven years, 2013 to 2020, began by asking what a Trinity Education should be, what attributes we want our graduates to have, and what approaches we should take to ensure we cultivate those attributes through our curricula.

The project strengthened our emphasis on research-led teaching and disciplinary excellence and rigour, through the capstone research project for all students, and enabled

more choice through flexible curriculum pathways and the opening up of space and time for students to take modules outside their own disciplines, Trinity Electives, thus exposing them to diverse perspectives and broadening their intellectual horizons. TEP also involved rethinking and diversifying modes of student engagement and assessment, and recognizing and supporting the extra-curricular activities that form a crucial part of any student's education at Trinity. The work of TEP, underpinned by many changes in policies, processes, and systems, has reinvigorated Trinity's undergraduate experience and laid the groundwork for continuing creative developments over coming years.

Reform of the undergraduate science programmes

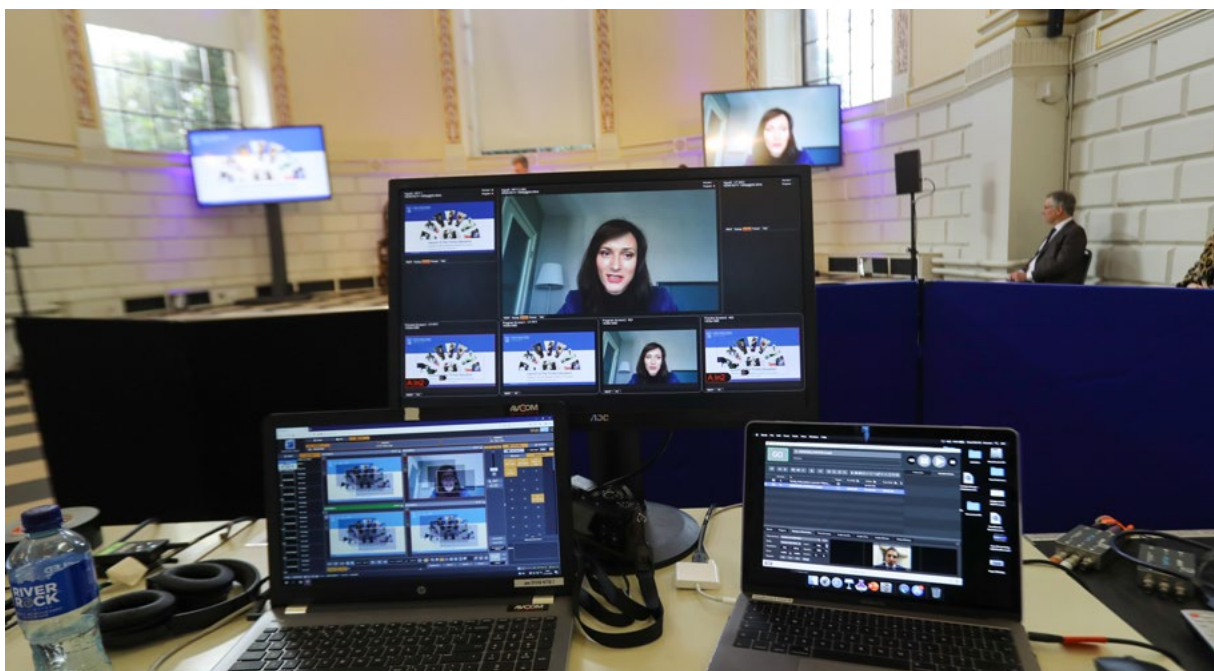
TEP led a reform of the undergraduate science programmes, which began with an external review in 2014. At that time, there was one general Science course, 15 possible sophister specialisations or moderatorships, ranging widely from astrophysics to zoology, and five smaller courses with direct entry, which overlapped in structure and curriculum with the main Science programme. These programmes have now been restructured and rationalised, resulting in four entry streams reflecting broad areas of science: Biological and Biomedical Sciences, Chemical Sciences, Geography and Geoscience, and Physical Sciences.

RIGHT – Students enjoying the sun outside the Arts Building.



→ The Trinity Education Project (TEP), planned and implemented over seven years, 2013 to 2020, began by asking what a Trinity Education should be, what attributes we want our graduates to have, and what approaches we should take to ensure we cultivate those attributes through our curricula.

06



Each stream leads to multiple moderatorship options, including the previous direct entry specialties. A common structure and timetabling approach ensures the availability of modules across streams and students can choose between additional breadth components, including modules from across the University. The response to these changes has been hugely positive, with increasing demand from students, and new activity from the Schools involved, including development of new curricula and moderatorships.

Trinity Joint Honours

The option to take two subjects to degree level has always been a defining aspect of the Trinity education, especially in the Arts, Humanities, and Social Sciences. Under TEP, the structures enabling this were reviewed and reorganised into a more integrative curricular structure. The development of a fixed timetabling system enables students to progress along flexible pathways and provides access to additional breadth elements – e.g. students who enter in joint honours may choose to keep both subjects going or concentrate exclusively on one of the subjects as they progress. Conversely, students who enter in single honours may take up a new subject in second year and carry it through to get a minor degree award. These options are underpinned by the new Undergraduate Common Architecture, which enables breadth components – Trinity Electives and Open Modules. In 2021, six additional subjects will formally enter this architecture: Business, Law, Computer Science, Political Science, Linguistics, and Social Policy.

The structure and systems underpinning the Undergraduate Common Architecture provide a solid footing that will open up creative opportunities, including the introduction of new subjects and combinations, as well as the continuing reinvention of the shared curriculum.

Postgraduate Education and Research

In the academic year 2011–12, when Professor Patrick Prendergast stepped into the role of Provost, there were approximately 7,000 applications online for postgraduate admission, both taught and research. Out of a total student population of 16,646, 29% (4,863) were postgraduate students, with almost half of these on the research register, accounting for 11.5% of the total student body.

A decade later, applications have increased to close to 10,500, with most of this growth happening in the past five years as Ireland emerged from economic crisis. While the overall proportion of postgraduates within the student body has remained relatively stable at around 28–29%, there has been a significant increase in postgraduate taught (PGT) applications and registrations. In 2019–20, almost 5,500 postgraduate students registered, with 70% of these PGT.

The Postgraduate Research Landscape

Ten years ago, the default option for research students was to register for a research Masters, and transfer to the PhD register after a probation of 12 months. The expectation that a PhD would be completed within three years meant that most funding

LEFT – EU Commissioner for Innovation, Research, Culture, Education and Youth, Mariya Gabriel, launching the Trinity Education remotely due to COVID-19.

BELOW – Inaugural Provost's PhD Project Award recipients with (seated centre) the Provost, Dr Patrick Prendergast, the Dean of Graduate Studies, Prof Neville Cox and Dean of Research, Prof Linda Doyle in 2018.

schemes provided fees for three years only. The concept of a Structured PhD was emerging in 2011, but had only begun to be embedded within the University. An apprenticeship/mentor model was common across many disciplines, with students engaging primarily with a single supervisor.

Now, much has changed. In line with our partner universities in Coimbra and LERU, the concept of a Structured PhD has been developed and expanded and all PhD students now follow this pathway. The proportion of taught elements varies, but all students take between 10–30 ECTS of taught modules. These learning opportunities have offered scope to formalize internship arrangements and support international mobility, as well as extending discipline-specific and transversal skills, such as career planning, teaching excellence, research integrity and open scholarship. Formal progression processes have been put in place, including the introduction of thesis committees, in line with international developments. There is now a clear roadmap for PhD students, giving them visibility over their progress, aligned with the National Framework for Doctoral Education, and Trinity has continued to contribute to policy development through the Irish Universities Association.¹

The year 2018–19 saw the launch of a new scheme of competitive internal funding for PhD students, the Provost's Project Award Scheme. Through generous philanthropic donations, it was possible to fund 40 PhD studentships linked to outstanding research projects led by Principal Investigators. Uniquely, these studentships cover fees for EU and Non-EU students as well as a generous stipend for four years. This scheme has been transformative, attracting approximately 145–160 applications each year from all Faculties. To date, funding has been awarded for 130 projects, driving developments at the frontiers of knowledge and offering career-changing opportunities for early-stage researchers, many taking on their first PhD student as a principal supervisor.

Developments in Taught Postgraduate Programmes

Growth and internationalisation – Taught postgraduate programmes have seen similar transformations. The growth in numbers of taught postgraduate (PGT) students has been spearheaded by ambitious strategies driven by the Vice-President for Global Relations and her team. In 2019–20, PGT students came from 95 different countries and Irish nationals accounted for only 55% of the postgraduate student population, with North America, India and China accounting for a further 25%. The ambitions of the strategic plans over the course of the



decade highlighted Trinity's global position, made concrete through formal agreements with prestigious universities to build new and creative postgraduate opportunities.

The most recent innovation is CHARM-EU (www.charm-eu.eu/alliance), a collaboration with the Universities of Barcelona, Utrecht, Eötvös Lorand (ELTE) and Montpellier to deliver a Master's in Global Challenges for Sustainability. This ground-breaking initiative is a testing ground for new models of university collaborations within Europe, to develop a blueprint for future directions.

New structures and new challenges – Exciting new opportunities are on the horizon. Flexible pathways of learning are increasingly important and there is ever more potential of micro-credentials to both disrupt and enhance our approach to postgraduate education. The existential crisis of climate change looms large. Of the 13 new course proposals approved so far this academic year, six reference sustainability or innovation as a focus. It is increasingly clear that this challenge is one that affects us all and that identifying solutions requires our brightest minds and greatest collaborative efforts. These challenges have motivated new ways of teaching, learning and assessment. The potential (and the cost) of digital technologies have come to the fore as we seek new and better ways to work together.

¹ For example, Irish Universities Association, Irish Universities' Statement on PhD Graduate Skills Statement (2nd edition 2015).

Opening access to education

Patricia Callaghan,
Academic Secretary

The opportunity to lead a rewarding life, fulfil your potential and contribute to society starts with the opportunity to participate in higher education. Equality of access to higher education is a global issue and in the last two decades Trinity has taken a leading role in shaping national access policies that support access to and participation of groups underrepresented in higher education.

RIGHT – Students chatting in the Arts Building foyer.

Alternative admissions routes are available for applicants from socio-economically disadvantaged backgrounds, those with disabilities, and mature students, through the HEAR (Higher Education Access Route), DARE (Disability Access Route to Education), and Mature Student Dispensation schemes. A Widening Participation Group was established as a subcommittee of the Undergraduate Studies Committee (USC) in 2018/19 to support the creation of a diverse and inclusive undergraduate student body and college community.

Trinity developed key innovative initiatives to further test alternative admissions routes to its undergraduate programmes, namely:

— The Trinity Admissions' Feasibility Study (TAFS), established in 2014, explored an alternative approach to the CAO points system, using a combination of Leaving Certificate results and supplementary assessments. Three courses, Law, History, and Ancient and Medieval History and Culture, provide 25 places annually through TAFS, and to date progression rates of students on these courses are on par with their peers. The study has been extended until 2022/23 but scalability and mainstreaming require further consideration.

— The Northern Ireland Feasibility Study, launched in 2014, sets aside a number of places for students from Northern Ireland to access any course, except Medicine, with 3 A-Levels, instead of the 4 A-Levels formally required by the CAO. It contributed to a 60% rise in the number of applications from NI



→ On his election in 2011, the Provost made clear that it was a priority to diversify Trinity to talented students from all backgrounds nationwide. In 2021, Trinity Access is an international leader in adapting, scaling and disseminating educational outreach and alternative entry routes to higher education.

The Robert

07



from 2014/15 to 2017/18. The overall conversion of offers to acceptances increased to 57% in 2019/20 (54% in 2018/19). The Study has been extended to 2022/23.

— The expansion of FET (Further Education and Training) entry routes to over 100 places on undergraduate programmes addresses the national priority of enabling progression from further education to third level. FET entry routes to twelve undergraduate programmes are in place for entry in 2020/21.

— The Asylum Seekers Access Provision Scholarship was established in April 2019 to support the entry of four students from Direct Provision Centres to Trinity.

Entrance Exhibitions

First established in 1870, Entrance Exhibition awards go to first year students with the highest points among Trinity entrants from their secondary schools. Over the ten years to 2019/20, Entrance Exhibitionerships were awarded to 4,880 students, an average of 488 each year. A new model for the awards was launched in 2018/19, rewarding students who get the highest points in each individual school – provided the student has achieved 500 points or over in the Leaving Certificate, or its equivalent. Under the previous system, a small number of schools tended to shine – in 2017 for instance, 21 Entrance Exhibitioners came from just one school. The new model saw a 50 percent increase in the number of schools from which Exhibitioners come, and a much greater geographic diversity.

Trinity Access Programmes 2011–21

Trinity Access was set up in 1993 to widen access to under-represented socio-economic groups at the University. It partners

with schools, higher education institutions, NGOs, community groups and businesses to develop educational outreach and encourage new admissions. Over 3,000 students have entered Trinity via Trinity Access Programmes entry routes, and each year more than 10,000 students engage in a school- and university-based outreach programme.

On his election in 2011, the Provost made clear that it was a priority to diversify Trinity to talented students from all backgrounds nationwide. In 2021, Trinity Access is an international leader in adapting, scaling and disseminating educational outreach and alternative entry routes to higher education. These are some highlights from the last decade:

Growth in numbers

At the end of the last College Strategic Plan, 22% of incoming students to Trinity were from under-represented groups. The current target is 25%. Students who entered via Trinity Access routes have had an average 89% completion rate, 97% progression rate and a 99% retention (to the end of Junior Fresh) rate over the last decade.

The nationwide scaling of the Higher Education Access Route – Trinity played a leading role in the strategic development of HEAR, the nationwide admissions scheme for students from under-represented groups. The scheme grew from an eight-institution collaboration to a 24-institution online programme, integrated within the CAO. Through this key phase of national development, 2010–14, the scheme was based within Trinity. HEAR and DARE have enabled over 40,000 students nationwide to progress into participating institutions.

LEFT – Students participating in the TAP Pathways to Law programme.

BELOW LEFT – Students enjoying Trinity Access Programme activities.

BELOW RIGHT – Chloe Pearson of St Mary's Secondary School, Tullamore, Co Offaly celebrates being an Entrance Exhibition Award Recipient with the Provost and her parents Shirley & Andrew.



Pathways to the Professions

With a growing group of legal and corporate partners, Trinity Access launched the Pathways to the Professions programmes in 2012, to expose students to Law, Engineering and Business in second level, further to making available career development opportunities in third level. The programmes also support students to develop key graduate attributes and enable them to focus more closely on their own development, by providing financial support.

College Awareness Week

In 2014, Trinity initiated a College Awareness Week in partnership with the National Association of Principals and Deputy Principals, the HEA and SOLAS, with sponsorship from AIB and Perrigo. This campaign has grown from 363 events involving 35,000 participants in 2014 to 1,373 events involving 125,000 participants in 2020. Organisations devise, implement and share their own ideas for encouraging greater college awareness.

Trinity Access 21 (TA21)

TA21 was established with support from Google Ireland as a collaboration between Trinity Access, Bridge21, the School of Computer Science and Trinity's School of Education in 2014.

It focuses on raising educational aspirations among students and teachers at Trinity's 20 linked DEIS schools in the greater Dublin area and its network of Schools of Distinction throughout Ireland. Backed by *Rethink Ireland: the Social Innovation Fund of Ireland*, since 2017, TA21 is on course to reach 30,000 students nationwide, helping to upskill over 2,000 teachers and delivering activities in over 100 schools by 2023.

Creating blueprints for educational equality in the UK

– In 2015, the Provost met Alan Rusbridger, former editor of the *Guardian* and recently appointed Principal of the Oxford University college, Lady Margaret Hall (LMH), and apprised him of the Trinity Access Foundation Course, which has a 17-year evidence base of successful student progression. Oxford had long experienced difficulties in recruiting academically qualified applicants from diverse backgrounds. In 2016, LMH approved a pilot Foundation Year, adapted from the Trinity Access model. Dr Cliona Hannon, Director of TAP, joined LMH as a Visiting Fellow. By 2019, three student groups had successfully completed the programme and progressed to higher education, over 80% to Oxford. In 2020 both Oxford and Cambridge universities announced ambitious plans to develop university-wide Foundation Year programmes.

Internal and external support for Trinity Access

Trinity Access has continued to build new relationships for support and funding with individual philanthropists and businesses. This diverse portfolio of state funding from the HEA and Department of Education and Skills to maintain core programmes, and philanthropic investment to enable innovation, are essential to its success.

Academic and professional staff, students and external partners have been instrumental in the growth of the programmes over the last ten years and the institutional leadership of the Provost has made the crucial difference between stasis in an economic crisis, and the catalytic impact of Trinity Access, both in Trinity and beyond.

Supporting the Trinity student experience

Professor Catherine McCabe,
Dean of Students

Trinity provides an environment for our students to not only to excel academically but also to develop an awareness of the community and society in which they live. We expect our students to seek out opportunities to develop themselves, and become active citizens in local, national and international communities.

This vision for them is at the core of the Trinity Student Experience – delivered through both academic programmes, and through experiences and networks developed in co- and extra-curricular activities.

The most far-reaching renewal of the undergraduate curricula in a century, the *Trinity Education Project* (see chapter 6) links the Trinity Student Experience directly to the development of the Graduate Attributes – to think independently, communicate effectively, develop continuously and act responsibly. [The Trinity Online Reflection Tool](#), launched in 2020, helps students consider their personal and professional growth through participation in co- and extra-curricular activities.

Key initiatives over the past 10 years such as the establishment of the Student Life Committee in 2013, and the Student Partnership Agreement in 2016, keep students at the centre of college life.

The *Student Life Committee's* (SLC) principal function is to consider, advise, and make recommendations on policy relating to student life and student well-being. The SLC currently has four working groups – Consent Education, Orientation & Transition, Postgraduate Experience, and Zón MacLeinn/Student Spaces – which have worked on enhancing induction and orientation and significantly increased the number of students spaces on campus among other initiatives.

RIGHT – Freshers' Week
in Front Square.



⇒ Supportive, engaging and forward-thinking, Trinity wants the student experience to be the best it can be.



08



The *Student Partnership Agreement* annually presents the work being done to improve the student experience in partnership between the Dean of Students and the TCD Students' Union (SU)/Graduate Students' Union (GSU). The Dean of Students identifies student priorities annually and updated agreements are brought to Board and signed by the Provost, Vice-Provost/CAO, SU and GSU officers.

The *National Student Survey* was introduced in 2012/13 and is a partnership between the Higher Education Authority, the Irish Universities Association, the Technological Higher Education Association and the Union of Students in Ireland. Feedback from the surveys is followed up through the School Action Plans, introduced for the first time in 2018/19.

Healthy Trinity is a cross-university initiative involving over a hundred student partners, academic and professional services. One of its milestones in 2019 was the introduction of a tobacco-free policy which removed tobacco use from the entire campus, with three minor exceptions. The policy was introduced in partnership with the SU and GSU and supported by student-led campaigns.

The student-led *Plastic Solutions* group presented to the Provost's Advisory Committee on Sustainability and Low Carbon Living on the growing desire among the student population to eliminate disposable plastics across campus. This led to a plan to reduce and eliminate where possible, disposable plastics across campus.

Student Services

Trinity's Student Services include pastoral and academic supports and services that support the learning environment. Some, such as the Tutorial Service, are longstanding; others like Orientation and the Global Room have been developed more recently. A Director of Student Services role introduced in 2017 provides an integrated approach to delivering and developing student services.

Disability Services

Since its 10th anniversary in 2010 the Disability Service (DS) has grown exponentially, as numbers of students with disabilities rose from 818 in 2010/11 (5.4% of the total student population) to 1,722 in 2019/20 (9.4%). Noteworthy developments include: the launch of the Unilink Service in 2010 to support students with mental health difficulties (renamed Occupational Therapy Supports in 2016); the establishment in 2015 of the Disability Service Student Ambassador Programme, now the Trinity Ability Co-op, a student-led move towards radical inclusion; the adoption of the Reasonable Accommodation Policy in 2018; and a variety of access works including accessible pathways on Front Square, wheelchairs lifts and enabled toilets.

Student Counselling

Over the past 10 years Trinity has supported the mental health of students via the Student Counselling Services (SCS),

LEFT – Using the accessible pathways installed on Front Square.

LEFT TOP – Students using their laptops in the Arts Building booths.

LEFT BOTTOM – Enticing new members to societies during Freshers' Week.

Student2Student (S2S), and Student Learning Development in the following ways:

- services have seen 16,634 individual clients and offered 110,762 appointments in the last ten years.
- instrumental in setting up the student partnership Consent framework.
- Student Learning Development has set up an Academic writing centre, reaching 7,500 students in the past year.
- The S2S Mentor programme extended from a pilot to a programme reaching all incoming undergraduate and visiting students (c.4,500 students annually). Volunteer recruitment and training has increased from c.120 to over 700 volunteers each year, and the programme is now intrinsic to Trinity's undergraduate orientation. Peer Support has also increased, offering over 100 hours annually.

College Health Service

This service continues to grow and will move into a new purpose-built accommodation in Printing House Square in 2021, together with the Disability Service.

Student Accommodation

Student Accommodation has been a challenge over the past 10 years with rising rents and fewer places available. In 2017 Trinity provided an additional 761 rooms in Kavanagh Court and Binary Hub; a further 250 will become available this year in Printing House Square and a further 16 in 2022 (Rubrics & Chief Stewards House).

Global Room

The student experience has been a key focus of the Global Room since its establishment in 2013, and a core element of Trinity's first Global Relations Strategy (2012). The team offers specialist advice to support the international student journey. An essential element is the inclusion of student voices through its Global Ambassador programme.

Careers Service

The Careers Service is responsible for delivering on the College's strategic objective of embedding employability and career development skills in the curriculum. A new Director of Careers started in September 2017 to lead on shaping the new strategic direction. Key initiatives introduced since then include a new College-wide online careers management portal (My Career), the Trinity Employability Award and the Laidlaw Undergraduate Leadership and Research Programme.

Student participation

Clubs and societies – There are over 50 sports clubs and over 120 societies, all student-led and managed. This year, even with Covid-19 restrictions, societies ran a host of daily activities. An incredible 9,100 individual students joined societies this year, cumulatively representing 26,704 unique society memberships.

Sustainability and civic engagement – Student participation in sustainability and civic engagement activities is encouraged and supported through committee membership, awards, bursaries and research. In the past three years, engagement has expanded significantly, with a record 235 environmentally themed events taking place in 2019 alone. Programmes include:

- *OneStepCloser* voting platform: to date, 27,960 votes have been cast in ten voting campaigns on decisions impacting the campus.
- *Recycling Ambassadors* training programme launched in Trinity Hall in 2018 has seen over 700 students participate.
- *Residents Sustainability Champions* programme teaches campus residents about climate change, the biodiversity crisis and how their choices can make positive impacts.
- Eight new subcommittees were established within the *Green Campus Committee*, to recruit students keen to participate in driving Trinity sustainability initiatives. Just under 100 have signed up.
- *Sustainability Fund* – overseen by the Provost's Advisory Committee on Sustainability – has received 35 applications for funding in the past two years and funded 14.
- *Collaboration with S2S mentors* – S2S mentors receive the monthly Green Campus e-zine and are encouraged to send it to their mentees.

Civic Engagement in Trinity includes both curricular and co- and extra-curricular activities. In 2021 Trinity became a member of *University of Sanctuary* and will use this network to work towards increasing the number of scholarships for people who are refugees and asylum seekers living in Ireland.

The *Dean of Students Awards for Volunteering* are annual awards that acknowledge the contribution of student volunteers. In recognition of the wide range of volunteering and the commitments made by students over the past 10 years, there are now three categories of award, the Dean's List for Volunteering, the Dean's Leadership Award for Volunteering and the Trinity Legacy Award for Volunteering.

Supportive, engaging and forward-thinking, Trinity wants the student experience to be the best it can be.

Innovation, entrepreneurship and industry engagement

**Dr Diarmuid O'Brien, Chief
Innovation and Enterprise Officer**

Trinity College Dublin is a university with innovation at its centre. Our academics have always understood the value of not just doing great research but translating that research to achieve impact that improves lives.

RIGHT – Aoibheann O'Brien and Iseult Ward, co-founders of social enterprise Foodcloud, participants in LaunchBox, Tangent's Student Accelerator programme in 2013. (Photo credit: Patrick Bolger)

Over the decades, Trinity has supported innovations that led to the nicotine patch and to the use of folic acid to support healthier pregnancies. We have helped create globally leading businesses – think Iona Technologies which was the fifth largest IPO in the history of the NASDAQ in 1997.

However, in the last decade Trinity has expanded its ambitions and demonstrated that we can deliver even more impact. We have shown how a university can respond to both the challenges of society and the ambitions and talents of students and how research can lead, at scale, to innovation enabled businesses.

This has not happened by accident. At the start of the decade, Trinity's first innovation strategy was developed, launching initiatives which have helped make Trinity a European leader in innovation and entrepreneurship.

Student entrepreneurship

Students today are motivated by making an impact and there is no more direct way to achieve this than to establish your own company.

Trinity has responded to this changing landscape by establishing Tangent, Trinity's Ideas workspace, to provide an opportunity for all students to take their innovative and entrepreneurial ideas and turn them into impact. Tangent runs a range of programmes that have transformed how we support innovation.

A woman with long brown hair, wearing a light-colored top, stands in a warehouse with orange shelving units in the background. The image is overlaid with a semi-transparent orange rectangle and a pattern of various fruits like oranges, kiwis, and strawberries.

→ We have shown how a university can respond to both the challenges of society and the ambitions and talents of students and how research can lead, at scale, to innovation enabled businesses.





LaunchPad, established in 2016, is a campus-based entrepreneurship programme designed to support and mentor students, staff and alumni – regardless of experience or discipline. Throughout the year a series of events, including innovation challenges, hackathons and mentoring sessions are held, with the goal of engaging 10% of the student population each year.

The *LaunchBox* accelerator started in 2013. Originally supported by a group of 'Trinity Angels', in recent years the programme has been supported by Bank of Ireland. It offers ten teams equity-free funding, a structured programme of experts and mentors, and the perfect collaborative environment for early-stage startups to progress.

There have been many successes including Artomatix, founded by Eric Risser, (*LaunchBox* 2013) which in late 2019 was sold for over €60 million. Social enterprise Foodcloud (*LaunchBox* 2013) was profiled in *TIME* magazine and has secured partnership with Tesco, where they have redistributed over 15 million kilograms in food that would otherwise have been wasted. Touchtech Payments, founded by Shekinah Adewumi and Niall Hogan, was acquired by Stripe in 2019.

Startups that began in *LaunchBox* have enjoyed great success: collectively they have raised in excess of €74 million since 2013 and created many hundreds of jobs, and importantly, the programme is a transformative experience, allowing entrepreneurial and innovative students to learn by doing.

Tangent also supports education activity and delivers innovation & entrepreneurship training to 700+ students and professional learners annually. Tangent education courses are

innovative in themselves. The team delivered the first blended undergraduate Certificate in Innovation & Entrepreneurship in any university nationally and the first Trinity postgraduate course to be delivered regionally. By delivering courses in 10 counties nationally, Tangent is bringing Trinity expertise to support sustainable employment regionally through entrepreneurship education.

Campus companies and University Bridge Fund

In the last decade, Trinity has transformed how it translates research into new company formation. In 2015, Trinity in partnership with University College Dublin established the University Bridge Fund (UBF), a €60m venture fund exclusively focused on commercialisation of university research.

The European Investment Fund, Enterprise Ireland, Bank of Ireland and AIB invested in UBF and it is ranked fourth globally for scale in collaborative venture funds. Managed by Atlantic Bridge since its formation, the UBF has invested in 22 companies, leveraged >€120 million in investment and established more than 300 jobs.

In 2021 the second university bridge fund was established, and it made its first investment in the most recent Trinity spin-out, Parvalis Ltd. It is anticipated that over the next 10 years the University Bridge Fund will have resulted in investment of more than €300 million in Irish SMEs – all catalysed by our universities.

The UBF has helped Trinity rapidly accelerate its ability to establish venture backed business. In the last decade 45 new campus companies have been launched and Trinity is ranked first in Ireland for generating High Performance Start

LEFT – At the launch of 'Tangent, Trinity's Ideas Workspace' in 2018, were Provost Patrick Prendergast, Co-Founder of Change Donations, Lizzy Hayashida, Co-Founder of SeaPunk, Tommy Torrades, and Trinity's Chief Innovation & Enterprise Officer, Dr Diarmuid O'Brien.

→ We have been re-imagining Dublin as a global location of choice for innovation investment, a place where our entrepreneurial graduates can establish their businesses and where the world's leading companies are choosing to locate their research and innovation activities.

Ups from our research – over 15 in the last five years. This is best represented by the incredible achievement of Professor Luke O'Neill who founded Inflazome, which was acquired by Roche for €380 million, the largest ever acquisition of an Irish campus company.

As evidenced by the successes of our students and faculties, it is no surprise to find that our graduates' entrepreneurial performance has Trinity ranked first in Europe for entrepreneurship. For the past six years, Trinity graduates have founded more venture-backed companies than graduates from any other European university. Between the years 2006 and 2020, Trinity alumni produced 277 entrepreneurs, formed 254 venture-backed companies, and raised capital of approximately US\$ 4.8 billion.

Licensing, patents and industry partnership

Trinity is also delivering huge success in other areas. In the last decade we have generated 600 invention disclosures, leading to 215 patents – a remarkable achievement relative to our research expenditure. The commercialization of our intellectual property through licensing to industry is a validation of the quality of our research and we have completed 188 licenses in the last decade. Half of these licences are to Irish business and this provides a tangible measure of how Trinity research can improve the competitiveness of the Irish companies.

The same positive trend of growth is evident in our industry partnerships. In the last decade our faculty have commenced 880 research collaborations with industry, 613 of these in the last five years. We now sign 130 industry

collaborations each year; at the start of the decade we were doing 40. Collaborators are multisectoral and include globally recognised companies such as AbbVie, AIB, Huawei, Intel, IBM, Johnson & Johnson, and Roche.

Importantly we are also developing multi-faceted relationships with industry. We signed our first industry MOU with Intel Ireland in 2016. Since then Intel's Employability Award has graduated 230 students, financially supported 60+ Master/PhD with bursaries and driven significant collaborative research resulting in over 50 scientific publications. Trinity is playing its part in supporting Intel as they have invested >€10 billion in Ireland in the last decade.

GCID and the platform for the next decade

The success of the last decade has allowed Trinity to plan even more ambitiously. We have been re-imagining Dublin as a global location of choice for innovation investment, a place where our entrepreneurial graduates can establish their businesses and where the world's leading companies are choosing to locate their research and innovation activities.

The next evolution for Trinity and innovation has begun with the establishment of Trinity East and the plans for the Grand Canal Innovation District (GCID). An innovation district attracts additional international venture capital investment, creates a critical mass of SMEs at one location; attracts talent and retains entrepreneurial graduates by giving them a place to succeed. GCID can make Dublin a global innovation city, and with Trinity at its physical centre, it can support our ambition to grow our research and innovation activity for the next decade and beyond.

Trinity's thriving flora and fauna

John Parnell, Professor of Systematic Botany and Collie Ennis, Zoology Research Associate

The collaboration of the Grounds and Gardens Committee with the Provost over the past decade has led to major changes in the landscape of Trinity.

RIGHT – The lawns that surrounded the Burke and Goldsmith statues at Trinity's front entrance have been replaced with wildflower meadows.

Flora – The major drivers of change have been our desire to make the landscape more biodiverse, pollinator-friendly, attractive, user-friendly, easily maintained and sustainable, given the challenges of climate change. We are fortunate in having a highly dedicated and skilled grounds team who are developing policies that ensure that we minimise (effectively eliminate) pesticide and herbicide use, thereby reducing Trinity's environmental footprint. Today, any habitat that requires maintenance is closely surveyed and monitored to protect that habitat and the species present.

In terms of plants, there are many contenders for the most striking change to the landscape. Many would cite the demise, through ill-health, of the iconic Oregon Maples likely planted by the famous Trinity botanist Thomas Coulter about 1840 in Library Square. This sad event, however, opened up the Square and allowed it to be reimagined. We have installed a completely different but every bit as attractive species, *Ginkgo biloba* (Maidenhair Tree) with nearby stone seating (due to the generosity of an alumnus). Ginkgo was chosen for a variety of reasons. It is, in China, sometimes called 'silver apricot' which aptly describes the seed (often mistaken as a fruit) which has a distinctive odour and is used in Chinese, Japanese and Korean cuisine. The species is very resilient, being resistant to disease, air pollution, fire, and to some extent drought; amazingly, individuals growing within 1,500m of the hypocentre of the atomic bomb blast in Hiroshima survived. It is of academic interest to many Schools in College as it has a fossil record



→ The creation of Trinity's wildflower meadows has drastically improved the number of pollinators and other invertebrates on campus. The wildflower meadows are a wonderful example of how a small change can really help biodiversity, even in a city centre.

10



dating back at least 200 million years, with individuals that can live for about 1,000 years; it is of medicinal use, has symbolic meaning for a number of faiths, has exceptional autumn colour, is biologically unique, is an excellent example of conservation being effected through cultivation and is highly attractive to pollinating insects.

Others might point to the planting of new trees – there are now 466 trees in total on Trinity's campus. These mainly deciduous trees range from all over the world and include 12 species of maple, seven species of oak, magnolia, rowan, ash, mulberry, arbutus, alder, birch, wild cherry, holly and hawthorn and a number of palm trees, including one planted by the Indian Ambassador to honour Mahatma Gandhi. At Santry we aim to plant about 2,000 young trees (whips), largely of native species, over the next five years or so. This will, we hope, somewhat mitigate the College's carbon footprint but substantial impact will only come from planting on a bigger scale and this requires space that currently we do not have.

Others might single out the change from manicured, pollinator unfriendly lawns with inherently low biodiversity to areas rich in biodiversity (in total ca. 2,000 m² has been converted). The lawns that surrounded the Burke and Goldsmith statues at the front entrance to the College have been replaced with wildflower meadows, as have lawns near the Lincoln Place entrance, and next to the old Board Room and at Santry. We have also adopted a reduced mowing policy in the renovated Provost's garden (at his instigation). The pollinator resource of Trinity has been hugely increased and we have emphasized

our commitment to tackling the biodiversity crisis; thankfully these areas also look highly attractive.

Others might point to the enhancement of the working environment due to the new courtyard / indoor gardens in the Arts, O'Reilly, Hamilton and Watts buildings and the Smurfit Institute. Together with the ongoing renewal of the courtyard gardens, the landscape of the Trinity Centre at St James's Hospital, the garden surrounding the Chief Steward's House, and the two pioneering living walls at the new Trinity School of Business, this amounts to a significant increase in the biodiversity of the College – and its look has improved too.

Others might point to the development of seating areas on the campus such as in the 'Flat Iron' or in the O'Reilly or to the planting of many of the roofs of the College so that they are green.

Perhaps the development of which one can be most proud is the new square developed between the Fitzgerald and Botany Buildings. It realises many of our aims in the one space; it is highly biodiverse, people and pollinator friendly, offers a huge amount of seating (it is probably the most popular outdoor venue at the East end of College), contains a substantial number of newly-planted trees, is relatively low-maintenance and looks excellent throughout the year.

It is vital that the College continues to invest in developing and maintaining a dynamic landscape, responsive to change and societal needs. The new developments planned for the College (E3, Printing House Square, the Historic Buildings refurbishment project, the Old Library project) will do just that.

LEFT – The planting of one of the new *Ginkgo bilobas* (Maidenhair Tree) in place of the Oregon Maples in Library Square.

BELOW – Sam, the resident Trinity fox playing with one of her cubs.



Fauna – Trinity is home to a surprising array of wildlife considering its location in the heart of Dublin city. Given the expansion of our urban areas over the last few decades Trinity, along with our city centre parks, has become a vital oasis for biodiversity in an otherwise concrete jungle. In 2014 a 24-hour bioblitz (rapid recording of observed flora and fauna in a specific area) of the campus recorded 346 species of plants and animals, a significant number given the time restraints in such an exercise.

Since 2014 the campus has become even more attractive to wildlife, largely because of the implementation of the all-Ireland pollinator plan conceived by Jane Stout, Professor in Botany. This plan aims to improve habitat for pollinators such as solitary bees and bumblebees by improving existing habitats, reducing pesticides and encouraging the growth of native wildflowers on which native pollinators rely.

The creation of Trinity's wildflower meadows has drastically improved the number of pollinators and other invertebrates on campus. This draws in other animals higher on the food chain who feed on them and, in turn, the predators who prey on those creatures. Last summer we recorded pipistrelle bats feeding on moths directly over the wildflower meadows at night; swifts and swallows were doing the same during the day. Thrush, blackbirds, goldfinches and wood pigeon all use the area for feeding and these birds provide food for birds of prey like the sparrowhawk. The wildflower meadows are a wonderful example of how a small change can really help biodiversity, even in a city centre.

As well as the wildflower meadows, the Provost and Chief Steward's gardens have, in recent years, been made incredibly wildlife friendly. A recent survey of the pond in the Chief Steward's garden recorded 20 species of aquatic invertebrates, including dragon and damselflies as well as common frogs. This would not have been possible only for the efforts of the grounds and garden staff who have embraced the new nature friendly approach to managing these areas. Fallen logs are left to rot in the ground along with piles of leaves, providing valuable breeding and feeding areas for numerous insect species. Dublin city centre's only population of frogs also make use of these natural structures, for shelter and hunting.

As well as the many species of invertebrates, amphibians and birds, the campus is also home to a rather charming family of urban foxes who have become somewhat famous over the past year or so, entertaining and enchanting students, staff and visitors to the College. The breeding pair of foxes, affectionately named Prince and Sam, are thriving with Sam having delivered a litter of seven cubs in Spring. The abundance of prey species living on campus allows these beautiful mammals to survive very comfortably without relying on the scraps leftover by humans, as demonstrated over the recent lockdowns. Discarded fast food was off the menu due to the lack of human activity in the city centre so the foxes reverted to hunting woodpigeon and young seagulls as well as feeding on worms and other smaller creatures around campus. This is a testament to the increasing biodiversity on campus which will only improve as more efforts are made by staff and students to enrich our College for nature and make it an even more attractive oasis for wildlife.

New professor interviews

01 Iris Moeller

02 Stephen Thomas

03 Colin Doherty

04 Omar García

05 Sylvia Draper

06 Ortwin Hess

07 Aileen Kavanagh



11 Professor Iris Moeller

Professor of Geography (1966)

→ “The vision around E3 was one of the things that really drew me to Trinity – that idea of bringing together natural scientists, engineers and computer scientists to proactively confront sustainability challenges resonated with me because I’ve always seen my discipline, geography, as really important in solving society’s challenges. Another key factor was Trinity’s emphasis on meeting the UN sustainability goals.”

Professor Iris Moeller, recently appointed to the 1966 Chair of Geography, explains how her research fits with Trinity’s agenda for E3 and sustainability. “I work in coastal geomorphology – where you can look at the action of physical, chemical and biological processes on the coastal landscape over time. I always seek to combine the discovery of fundamental underlying processes with application to key societal problems. Coastal geomorphology has obvious applications for erosion protection and supporting marine ecosystems and now we’re discovering that coastal wetlands are also important for carbon capture – they can store carbon at twice the rate of inland wetlands. I think it’s vital that, as a scientist, I give people insight into how the natural environment functions and how we, as humans, are part of – not apart *from* – the system. Our actions as humans change the way that the natural environment functions.”

Her research is highly international, collaborative and comparative – “I’ve worked with groups in Australia, the US, China, and Europe looking at how research into wetland might help us better understand mangrove and saltmarsh systems. Also, with the Universities of Singapore and Berkeley finding solutions for world cities like San Francisco, London and Singapore that are adapting to sea level rise.” Her research frequently feeds directly into policy – she has helped put together toolkits and handbooks for the UN Environment

Programme, the UK Environment Agency, NGOs and private sector workers, including engineering companies tasked by governments to solve coastal flooding and erosion issues.

Her interest in sustainability goes right back to her teenage years – before that word was even coined. “I recently found my teenage diaries and I’m fascinated to see how concerned I was about acid rain and the degradation of Germany’s forests. My dad, who was a Professor of Fine Arts, was very engaged in environmental activism around the River Elbe where we lived in Hamburg, so I had an early awareness of river pollution and the effect it had on fishing and on coastal systems – which is very related to what I work on now.”

After attending a European School in Mol in Belgium, where her mother moved to teach, and “a gap year” in the Leibniz Kolleg in Tübingen, where she took a number of courses including physics and philosophy, she arrived in Oxford University to study geography in 1989 – “it was the year the [Berlin] Wall came down and shortly before the first Intergovernmental Panel on Climate Change, the IPCC report. I remember buying the hard copy and I still have it. I show it to my students to demonstrate that the scientists got it right – the predictions they made then on global temperature change and sea level rise have by and large proved right. That means that people should listen more to the scientists and take their predictions seriously.”



After graduating, she did a Masters in the University of Wales, Swansea looking at the effect of forest fires in Portuguese eucalyptus forests, which was “interesting but slightly too botanical for me”. She did her PhD, on how coastal saltmarshes act as wave buffers, in Cambridge University and remained there as a Fellow at Fitzwilliam College and lecturer until her appointment to Trinity. The past year has been taken up by online teaching – she has found the students “amazingly resilient, collaborative and constructive in their feedback” – and putting together a proposal for the ‘European Green Deal’ call in Horizon2020, and chairing the E3 Undergraduate Education subgroup.

“We will hopefully be welcoming the first students to the E3 Learning Foundry in September 2023. There is huge potential to move away from the traditional transfer of acquired knowledge and towards curiosity-driven teaching, motivated by the questions we are asking as a society. We are reconfiguring and rethinking our teaching and learning spaces – we will have spaces for experimentation, for testing, analysing, improving and designing technology, and other spaces for students to get together and explore ideas creatively. What we’ve discovered from lockdown is that students really want in-person teaching to be about interaction.”

Her other goal for the next few years is to build up the coastal research profile of Trinity. “Cambridge has a really long history of coastal research which dates back to 1927 when Alfred Steers was appointed the first coastal geomorphologist – I’m his great granddaughter, academically speaking, since he was the supervisor of the supervisor of my supervisor. Now I want to set up a brilliant interdisciplinary research group here in Trinity, which will go beyond even E3 to include Arts and Humanities.”

She and her family, including her teenage son, are looking forward to getting to know Dublin as it opens up. A once avid rower on the Ouse, she is currently replacing rowing with early morning runs along the Dodder, fortunately within her 5k. Her most exciting destination before lockdown and when restrictions were lifted was Bull Island. “I’m fascinated by Bull Island, which really pushes our definition of what is natural. It’s an entirely anthropogenically initiated system, a 200 year old landform which now has an impressive set of ecosystems associated with it. There are many places globally trying to initiate the formation of the types of ecosystems we find on Bull Island and I’m gobsmacked by how little it’s talked about in an international context. That’s just one example of the huge potential here in Ireland for building up research excellence in coastal geomorphology.”

11

Professor Stephen Thomas

Edward Kennedy Professor of Health Policy and Management (2002)

→ “I guess you could describe us as the yeast that ensures that the School of Medicine is policy-facing.” Stephen Thomas, newly appointed Edward Kennedy Professor of Health Policy and Management, finds a great metaphor to describe the Trinity Centre for Health Policy and Management which brings together social scientists, economists, policy analysts, sociologists and health professionals to research, educate and develop policy around improving the performance of health systems, in Ireland and internationally.

He took up his appointment to the Chair – named for the Irish-American senator and pioneer in US public health policy – in April 2020. Naturally, his first year has been “surreal” with “a lot of zooming from my bedroom” but he has spent time in his two offices – at the Centre, located in Foster Place, and in the Institution of Population Health in Tallaght University Hospital.

It is of course, an extraordinary time to be taking up a leadership role in public health. “The past year has been a terrible time for individuals and communities, with so many personal tragedies, but from a health policy research point of view, it’s been a really important time. We’re trying to learn, nationally and internationally, how to get the best from this terrible situation. The changes that we make to our health system to deal with this crisis will have a long-term impact on how we develop in the future.”

He is now leading a large-scale HRB research project, with funding for five years to look at the resilience of the Irish health system and how it responds to shocks. The project is international and multidisciplinary with partners in other Trinity Schools, the University of Toronto, the European Observatory on Health Systems and Policies and the London School of Economics, and links into the government through Sláintecare [Ireland’s national programme to transform health and social care service, launched 2018].

“I designed this research project *before* Covid. I was very involved in setting up Sláintecare and I was aware that, in a sense, it had come out of austerity in that we used the shock of the recession and the changed political environment to do something that is genuinely transformative. So I was interested in researching into the legacy aspects, positive and negative, of major shocks and how you can use that learning to build resilience into a health system. I was designing the project with Brexit in mind, thinking that’s what would deliver the next shock, and then along came the mega shock of Covid.”

He is hopeful that the project can be part of embedding lasting reform: “Crises can be opportunities to drive radical change. The Irish government is doing the smart thing – using this crisis to address structural weaknesses within the system. The 2021 health budget was increased by 20%, with half of that related to the reform agenda, so that shows the level of commitment.”

He came to health policy through his interest in economics and the public sector. After growing up in Yorkshire, he studied PPE (Politics, Philosophy & Economics) at the University of Oxford. “I was interested in understanding the societal perspective. It probably sounds naïve but I always thought ‘why don’t we use what we have to try and make things better?’ As simple as that, really.”



After his BA (1989) he did a Masters in Development Economics and then got a job in Uganda in the Ministry of Health, which set him on his career path in health policy. He worked in Bangladesh as health and economics adviser to the government for a few years, which he loved, but decided to pivot to academia: “I think the best place to influence policy, actually, is from an academic position – when you’re in government there is never enough time. In academia, you get time to collect data and explore and then you can feed the answers back into government. There’s a wonderful quote in Proverbs: ‘It’s the glory of God to hide a matter; the glory of kings to seek it out’ – I was always very taken with the idea of seeking out answers.”

A job came up in the University of Cape Town, where he also completed his PhD on managing different stakeholders in health reform. He loved Cape Town, where he, his wife (children’s author Debbie Thomas) and three daughters were part of “a fantastic cross-cultural church in the townships”. In 2005 he moved to Ireland to take up a lectureship in Trinity’s Centre for Health Policy and Management, of which he became director in 2015.

In his new role, he will continue teaching on the School of Medicine’s PhD and Masters programmes, as well as to 4th year undergraduates. His aim with teaching is to give students a different perspective on health care and an

understanding of how decision-makers deal with issues: “I want them to realise that it’s not just about the individual patient before them; it’s about how society works as whole – because policy decisions will impact how they practice medicine.” He uses role playing to get issues across: “I might ask one of them to role play the Department of Finance, another a local government official or an NGO – that gets them thinking about how different stakeholders approach issues.”

His goals over the next five years are to deliver the HRB project; to support colleagues “to enhance their own research capacity at national and international level”; and to look into developing a new masters course in health economics and health systems, comparing how different countries promote sustainable health and improve access.

For now, he is focused on supporting his family through lockdown – “they’re supporting me too – my daughters have been teaching me things like drawing.” And he runs three times a week, sometimes through the grounds of Castletown House or by the stud farms near where he lives in Celbridge. “I use running to detox and process my thoughts.”

11

Professor Colin Doherty

Ellen Mayston Bates Professor of Epileptology (2016)

→ “Trinity already punches above its weight in epilepsy research and we have the opportunity now to build on that — to maybe create an interdisciplinary hub within the university and the partner institutes, like the FutureNeuro [the SFI centre for chronic and rare neurological diseases, hosted by RCSI].”

“Currently I collaborate with Prof Matt Campbell in the School of Genetics and Microbiology on brain injury and Mark Cunningham, professor of epilepsy and neurophysiology on epilepsy, and in FutureNeuro I’m developing projects around eHealth, where there is great potential – Ireland has an electronic record of patients with epilepsy which is unique in the world.”

Colin Doherty, inaugural Ellen Mayston Chair in Epileptology, is enthusiastic about the opportunities for his research in Trinity and Ireland. The Ellen Mayston bequest has enabled two new chairs in epilepsy in Trinity in recent years which are accelerating and accentuating epilepsy research across the university.

A graduate of UCD (MD 1991), he says he “always wanted to study medicine.” As a junior undergraduate, he was excited by the idea of surgery but he “quickly went off that idea. For me, surgery seemed like a technical exercise whereas I found neurology very intellectually exciting – we know so little about the brain.”

He did professional training in St Vincent’s Hospital, where leading neurologist Michael Hutchinson “really engaged me with the mystery of the mind” and in Beaumont, where his mentor was Hugh Staunton. In 1998 he left for Boston to do the Harvard training programme in neurology. “I worked in two big

hospitals in Massachusetts. For the first year I hardly saw my wife and newborn son but it was a brilliant training. In the third year, I was appointed chief resident in the programme and I stayed on in Boston for another two years with a fellowship in epilepsy and cognition.”

In 2003 he returned to Ireland and soon took up his consultancy in St James’s Hospital where he balanced a demanding consultancy practice with teaching Trinity students and with family life: “I have four sons and I have a lot of interests outside medicine. I run marathons. My reading is eclectic – currently it’s Hubert Butler’s essays, Neil Jordan’s novel about Edward Fitzgerald and Nose Dive, Harold McGee’s map of the world’s smells which feeds into one of my research projects on anosmia in Covid-19. I also love listening to music and I like to draw.”

In 2010 he was appointed National Clinical Lead for Epilepsy in Ireland – “the role focuses on developing services for patients. We organised a big conference for medics, patients, carers and families, where we mapped out, together, what an excellent service would look like – we’ve spent the past decade trying to deliver on that! The key is asking people not only what they want, but what they are prepared to put up with, because everything you deliver means something else is not done. It’s that mantra of ‘nothing about me, without me.’”



He found the experience really rewarding and it has led to his developing secondary research interests and expertise in the delivery of health services. “Improving services within a complex system like the HSE is challenging. An ongoing project I’m involved in is delivering services to homeless patients. The homeless population suffer more from epilepsy than the housed population but they don’t submit themselves to hospital care in the same way, in terms of turning up for tests or appointments. So we’ve developed a pathway whereby we deliver care through GPs. We give GPs tools to help them recognise epilepsy and give us a full picture of the patient’s condition – we then deliver care via the GP, instead of through hospitals.”

The project was carried out through Sláintecare and he hopes that it will become a funded pathway: “We’ve brought a lot of academic rigour to the project and we’ve shown that it’s replicable.” Health services research is, he believes, as vital and rigorous as clinical translational research “but it’s very much the poor relation. It doesn’t have the prestige or the big grants.” On the plus side, the translation into policy is much quicker: “If Matt [Campbell] and I discover something relating to brain injury, it will take at least 15 years before it’s translated into patient care, whereas if you make a breakthrough in delivery of services to vulnerable patients, you can translate that into policy very quickly.”

One of his ambitions for the next five years, as he develops his role in Trinity, is to help the university be a driver of social change in the city. “Trinity does a lot of great work with access and is involved with local communities through various initiatives. I think there’s scope for the Faculty of Health Sciences to be drivers and advocates of free health clinics and services to local communities.”

His other ambition is around teaching. “I’ve always enjoyed teaching, and was delighted to win a teaching prize from Harvard Medical School in 2000. But I’m coming to the realisation that we need to overhaul and update our whole approach. What I find remarkable is how much medicine has changed over the past 20 years – and how little medical teaching has changed! I don’t think the students are being taught what they need to know. They come out of med school with traditional knowledge and are thrown into a completely novel system. They might know how to search for information but they don’t know about digital medicine, for instance – how AI applies to medicine or how to deliver telehealth. We should be preparing them better. There is talk about a new curriculum being developed in the next few years and I want to be part of that.”

11 Professor Omar García

Professor of Spanish (1926)

→ Within a short time of taking up his appointment as 1926 Chair of Spanish in January 2020, Professor Omar García contributed to putting together a tender, led by the Head of School of Languages, Literatures and Cultural Studies, to the government's Human Capital Initiative (HCI) which is centred on providing opportunities for continuous professional development (CPD).

The Trinity proposal – for a Centre for Global Intercultural Communications to deliver programmes, short courses and micro-credentialing modules relating to the Middle East, North Africa, Francophone Africa, Latin America, and Eastern and Central Europe – was successful and has received over €1 million of the €21 million in seed funding allocated to Trinity. The Centre is now hiring staff and developing programmes, to start this coming academic year. The core mission is to provide intercultural training for those seeking to engage with the regions, whether through industry and commerce, education and the arts, or health sciences.

For Professor García, who is a founding director of the new Centre, it has been a fast immersion into Trinity and the national funding process, at a time when, like everyone else, he was grappling with the transition to online teaching and learning. He found it “a great experience. I've got to know colleagues across the School and it's been really exciting participating in these developments. In Trinity, there are so many opportunities if you want to do things.”

He is clearly seizing those opportunities – as well as the HCI-funded Centre, he jumped at the chance of joining the Trinity Centre for Resistance Studies, launched in March, an interdisciplinary and cross-faculty initiative, bringing together history, cultural studies, the social sciences, languages, literature, law, peace studies and health sciences.

Resistance Studies is his own field of research and he will be co-directing a lecture series in the new Centre. “I focus on cultural resistance, working at the intersection of politics, history, law and cultural production, and interrogating how culture negotiates with power. If you have an authoritarian system, either right or left, how does that change the dynamic of cultural production?” His focus is Latin America but he works “comparatively, especially across the Spanish-speaking world” and Resistance Studies is interdisciplinary and cross-regional: “The region determines the research angle – in Kurdistan, for instance, colleagues are asking why it never became a country.” Ireland is an obvious focus for the new Trinity Centre – his students have brought the mother and baby homes to his attention. “The whole idea of witnessing but not speaking about your experience is at the core of Resistance Studies.”

His route to the Humanities was unusual. Born in Cuba, he emigrated to Florida as a child and went to the University of Miami to study science. “Literature and languages were my hobbies. I took modules in them and then one day the Director of Graduate Studies asked when I was getting my BA – turns out that I had taken so many modules, I had two degrees without realising it!” As a BSc, he was working in a clinical hospital when an opportunity came up to do a postgrad in either Education or Language Studies “so I registered for both.”



He was still torn between two directions when he took up a Fellowship in humanities from the University of Miami to go to then Queen Mary and Westfield College, now Queen Mary University of London (QMUL), in 1991. “I loved London and the university and I realised this was what I wanted to do.” A lectureship came up in 1992 and he progressed to a personal chair in Hispanic Studies and Comparative Poetics in QMUL in 2010. He found Brexit very disappointing – “I was one of those people protesting outside parliament for two years” – and he was excited by the opportunity that Trinity offered. “The Spanish department wants to develop expertise in Latin America so, for the first time, they sent the 1926 Chair to Latin America, so to speak. I’m excited to be part of that expansion and as soon as I arrived, I could see that this is a really robust, vibrant School. We have over 370 students studying Spanish, a really healthy number, and I’m impressed at how many pathways they can take, to combine with other studies. I direct the BSL [Business Studies and a Language] programme in the School. The Trinity Education Project has its challenges but it also enables, encourages and *forces* students to move out of their comfort zone to explore new areas.”

His teaching philosophy is “student-centred, pragmatic and symbiotic. We need each other. I hate lectures – the idea that I’m going to give you sacred knowledge and tell you

what the text means? No – I’m going to help you explore the text on your own terms. We’re going to test it together.”

This inclusivity stretches to his own creative practice. “I’m very interested in what I call ‘fractal poetics’ – poetry that interacts with the audience. I’m acutely aware that my poetry is read very differently by different audiences”. He writes “mainly in Spanish. I think it became a way for me to keep hold of the language when I was living in an anglophone world” and he is delighted that in Trinity “your creative practice is recognized; it’s not seen as a hobby or an extra. That’s exactly how it should be.”

He has just been elected Professorial Fellow and Head of School for the next three years. His ambitions include identifying new opportunities for the School, contributing to the two new Centres and getting involved in outreach programmes: “I notice, to put it frankly, that Trinity is so white, but Dublin city isn’t that white... I have experience in building widening participation pathways and developing relations with secondary schools and that’s something I can share.” He is also looking forward to getting to know Ireland more after lockdown: “I love cultural life obviously, and I’m happy when I’m close to sea and mountains – Dublin is perfect for me in that way.”

11 Professor Sylvia Draper

Professor of Molecular Materials (2018)

→ “More and more, I’m looking at my research through a sustainability lens. As chemists we should be thinking carefully about how and why we do chemical reactions. We need to get under the hood of the processes that chemical industry has followed for years, and start asking the tough questions.”

“How we’re using the world’s resources, what are the potentially harmful side-effects of the materials we’re using, how are we dealing with waste? In a research lab we might synthesise 20mg of a material – but what’s the environmental cost of making it? And how might that multiply on an industrial, 200 tonne, scale?”

“As an Inorganic chemist I work with heavy metals – these can be toxic to the environment and some are rare and scarce. I work a lot with Iridium which is a high-performing metal but it’s in short supply so we shouldn’t be pinning our hopes on it. We need to look at substitution, building new technologies around and from naturally abundant elements.”

Professor Sylvia Draper, Chair of Molecular Materials in the School of Chemistry, is the project sponsor for E3, the new Engineering, Environment and Emerging Technologies initiative. Its mission is to find ‘balanced [e.g. sustainable] solutions for a better world’. The E3 Learning Foundry (to co-educate engineers, natural scientists, and computer scientists and statisticians) will open in 2023, with the E3 Research Institute to follow on the new tech campus at Grand Canal Dock. Driving the E3 agenda has refocused her interest in sustainability in the context of her own research.

“With my research team, I work on materials that absorb and emit light. These find applications in biological media, in solar cells or as emitting layers in OLEDs. We create materials that can absorb near infra-red light and turn it into a high-energy source with which can kill a cancer cell or generate electricity. Solar panels are part of delivering on the sustainable agenda, but I’m realising that at every step of the process we can add an environmental challenge – for instance, can we look at making these materials in a way that is less energy intensive, creates less waste, uses less solvents? I’m excited about asking these questions because, as a scientist, I start out on a journey in which the destinations are unknown.”

Her science journey began in school in Bromley in south-east London where she took Maths, Physics, Chemistry and English for her A Levels – “I would have done Biology but it was a girls’ school and you couldn’t do all three sciences and Maths”. She loved “experimenting with the Bunsen burner” and remembers, at the age of 12, being introduced to the idea of atoms and thinking “how do you get a smooth surface if it is secretly made up of individual particles?” – but she also loved “literature, language, poetry and communication”. She was interviewed for a place to study English in Oxford but then “I suddenly had a complete change of mind. None of my family had been to university so they weren’t in a position to advise me, but at a late stage I reapplied everywhere to do Chemistry.”



She attended the University of Exeter and followed her primary degree with a PhD in the University of Cambridge. There she 'looked at why metal atoms cluster into particular shapes' under the supervision of Catherine Housecroft, one of only two women on the staff. At Cambridge she met her future husband, a law student. When he returned to Dublin to go to the King's Inns, she visited him and "one day I walked into Trinity off the street and got talking to Professor David Cardin. He offered me a postdoc for a year and from there I got a contract position and became an assistant professor in 1993."

"There are", she says, "three sides to being an academic: teaching, research and administration", and in her now 30-year career in Trinity, "I've singled out one of these for particular attention at different times". As a teacher, she is highly aware that "people are different and have different ways of learning – some are highly visual, some prefer a structured approach, others want the opposite". Her success in catering for difference is evidenced by her winning a Provost's Teaching Award in 2008. She is now bringing her experience to bear on the teaching and learning approach of the E3 Learning Foundry.

Her impetus to get involved in strategic leadership was initially "to help give Chemistry a voice. Applications from students were falling off and I felt this is so wrong, they don't know how exciting it is, so I took to the media – I did a lot with RTE, Brainstorm and with Newstalk, Sean O'Rourke

and Pat Kenny. Eventually, with support from others in the School, I got a Chemistry Education Officer appointed, who works with 450 secondary schools and does a lot advocacy. Chemistry as an open science should be open to all." She is now Dean of the Faculty of Science, Technology, Engineering and Mathematics, a demanding role, particularly in the past year, while managing the human and material consequences of the pandemic.

Her time off is family-oriented: "I have four children and I like to cook from scratch – with various degrees of success! – and to spend as much time as I can outdoors, gardening or walking".

Her goals for the next few years are "to elevate STEM-led research and to redefine its teaching across disciplines". Within E3, this involves designing curricula flexible enough to enable students to create "a personalised and tailored programme of study, pulling out different elements that interest them". In her own research, she wants to explore "a really neat material that allows us to form polymers, like polystyrene, using visible light. Polymers degrade but I have a feeling that this material has the potential to catalyse their repair using sunlight. I want to test this hypothesis. Making products that are compostable is one thing, but if they were self-repairing, perhaps we wouldn't need to make so many."

11 Professor Ortwin Hess

Professor of Quantum Nanophotonics

→ “The unique element in Trinity is that it has long tradition of photonics which is now combined with recent expertise in nanomaterials physics and chemistry – when you get these two together, you can design materials appropriately to do targeted photonics research and that’s very exciting.”

Ortwin Hess, recently appointed Chair of Quantum Nanophotonics, is talking about Trinity’s quantum tradition, which goes back to Erwin Schrodinger’s work in Dublin and his seminal public lectures in Trinity in 1943 ‘What is Life?’, and now incorporates the university’s expertise in nanotechnology through CRANN (Centre for Research of Adaptive Nanostructures and Nanodevices) and in materials through the SFI Centre AMBER (Advanced Materials and Bioengineering Research), which Trinity hosts.

These three elements – light, nano and new materials – are instrumental to Professor Hess’ pioneering research into quantum photonics at room temperature. Usually, he explains “quantum effects only work at very low cryogenic temperatures because the greatest enemy of quantum processes is noise – fluctuations can derail the coherence in a system – and at room temperature things are much noisier. Google has built a quantum computer to work at cryogenic temperatures and so has IBM, but my position is that quantum processes are too important to limit to quantum computers. If we can get quantum processes to happen at room temperatures, in realistic conditions, then we can explore further, with much greater potential for real-world applications.”

This is where CRANN and AMBER come in: by working with particular metals on the nano-scale, you can “create a special kind of light which moves on the surface of tiny metallic

structures – and suddenly you can use light at the nanoscale.” This results in better understanding and potential control of quantum processes, which is a goal in itself, and also in potential real-world applications: “You could dramatically enhance sensitivity in a sensing process – for example, currently in immunoassay, you need a minimum concentration of antigens to be present in order to measure them; through quantum sensing, you would only need a single molecule.” This has obvious applications in test and trace for Covid-19 and other pandemics.

Another potential application is “to harness quantum fluctuations to have a quantum generator of random numbers. You need random numbers for encryptions but currently all random number generators are based on algorithms, and can be cracked with a powerful computer. If you have a quantum physical generation of random numbers, then the numbers are genuinely random and that delivers heightened security.” Again, this has obvious applications in the light of the recent hack and ransom of HSE data.

As well as his appointment to the Chair in the School of Physics, Professor Hess has an SFI research professorship which comes with significant funding for his research – the METAQUANT project is centred in CRANN but collaborates with teams in the universities of Cambridge, Singapore, Würzburg and Yale. He took up his appointment in Trinity in December 2019 but, due to Covid delays, it was only in March 2021 that he



finished assembling his team and setting up their workspace. As theoreticians, he and his team “work a bit like architects – based on our ideas and quantum theory we perform simulations on the computer and then we interact very closely with experimentalists who ‘build’ what we design on the nano-scale.”

His father was also a Professor of Physics but he initially considered studying medicine or engineering – what finally decided him on physics was that “it’s a subject where you constantly and continually learn – this is the most important bit. If I stopped learning, I think I would stop working.” After his BSc in the University of Erlangen in Franconia, he did his PhD in Edinburgh but “as part of an EU arrangement where you present your thesis at a different place from where you researched, the award was presented in Berlin.” After postdoc and lecturing jobs in Stuttgart, Finland and Stanford, he got a full professorship in the University of Surrey, and then proceeded to Imperial College London where he held a chair in metamaterials.

His route to Trinity and SFI funding came when he was awarded the Royal Society 2016 Rumford Medal [awarded since 1800 for outstanding research in physics; notable previous recipients include Michael Faraday, James Clerk Maxwell, John Tyndall, William Henry Bragg and Peter Debye]. “At the presentation ceremony I got talking to some people from SFI and like so many I was worrying about Brexit because my research team is very international and I can’t do what I do

without open collaboration. I said that maybe I have to think about alternatives, and the SFI people said, maybe there is an opportunity... so that was the start of it. I felt at home at Imperial but sometimes a fresh change, a new perspective, is what you need. A move like this allows you to bring new ideas to a place, and take ideas from it.”

Since his appointment, he has helped develop a new masters in quantum science and technology to start in September, as part of the government’s human capital initiative (HCI) for continuous professional development. He is looking forward to spending more time on the Trinity campus, which he loved in the brief time he got to know it before lockdown, and to exploring Dublin and Ireland. “I love baroque music and Dublin has a great baroque tradition. And last summer I cycled the Wild Atlantic Way around Clare with my younger son and it’s so beautiful. In Dublin, it’s great that you don’t have to go far to get to sea and mountains.”

In Trinity, his goal over the next few years is “to set up a cross-faculty initiative on quantum science and technology, drawing on Trinity’s strengths in quantum and interdisciplinarity. Typically, it’s physicists and computer scientists who partner for quantum research but I’m keen to bridge further into the living sciences, biology and medicine. That’s in keeping with Schrodinger – ‘What is Life?’ set the foundations of what we now know as DNA.”

11 Professor Aileen Kavanagh

Professor of Constitutional Governance (2018)

→ “When we think of the branches of government – legislature, executive and judiciary – we think of the separation of powers and of the three working in isolation, or being actively competitive with each other, but I argue that in well-functioning democracies, the branches of government work *collaboratively*. I identify collaboration as a value that has been overlooked but which offers a relational understanding of constitutional dynamics and illustrates how the relations operate in practice.”

Professor Aileen Kavanagh, recently appointed to Trinity's first ever Chair of Constitutional Governance in the School of Law, is explaining her forthcoming book *The Collaborative Constitution*, to be published later this year by Cambridge University Press. She started work on this book a number of years ago “before Trump and before Boris Johnson attempted to prorogue parliament, and before democratic disintegration in Hungary and Poland” but all of these events have fed into her research and make her book particularly timely.

“Trump didn't violate written laws; he violated unwritten norms of how a president should behave and that put the US constitution into crisis. The norms of engagement between the three branches are the hidden wiring, the connective tissue, if you like, that is vital to any constitution's functioning. Lots of countries, including Turkey, Brazil and Poland have constitutions which are exemplary on paper but in practice they aren't delivering because that wiring isn't working; the connectivity is ruptured.”

She hopes that by putting focus on the unwritten norms and emphasizing that collaboration between the three branches is at least as important as competition, “I can draw attention to the foundational nature of these dynamics and call for scholarly attention to them and for care from the various political and legal actors. In order to learn from crises, you have to understand what went wrong. What went wrong in the US

was that Trump flouted the norms of expected Presidential behaviour. This is more about constitutional culture than constitutional text.”

A native of Dublin, she studied law in UCD and was on Erasmus in Germany in 1989 when the Berlin Wall came down. She remembers the early 1990s “as a time of huge optimism, particularly in constitutional law. Very prestigious American lawyers would arrive to draft constitutions for Poland and other Eastern European countries. There was all this confidence in the broadening out of democratic values; whereas now we're in a period of democratic regression, sometimes called backsliding.”

She did a Masters in Politics before doing her doctorate in the University of Oxford in constitutional theory. After ten years lecturing in the University of Leicester, she returned to Oxford as Professor of Constitutional Law. She sees the new Trinity Chair in Constitutional Governance as a unique opportunity: “In creating this Chair in constitutional *governance* rather than just constitutional *law*, Trinity is signalling a commitment to support broader contextual understandings about how the law functions within the political system and society as a whole. Ireland is an excellent place in which to do this broader, interdisciplinary work because the Irish constitution is amended by referendum. This means that constitutional development aligns to some extent with developments in society.”



She took up her new role in December 2019 and had a few months to get to know the campus before it went into lockdown. “I absolutely loved it. Even though Oxford is a beautiful University town, there is nothing quite like Trinity’s Front Square, which is the centre of the whole university. The Trinity Long Room Hub is an exciting addition to College and I’m excited about it reopening in-person and exploring opportunities for interdisciplinary research with other Schools. I’m also aware that I’m joining the Law School at a time when it is growing and expanding its ambitions and horizons. It’s exciting to be part of that. In my field, Constitutional Law, Trinity has the largest concentration of constitutional lawyers of any University in Ireland. It is an honour to be part of that scholarly community, to contribute to it, but also to learn from it. Having worked outside of Ireland for 20 years, I’m catching up on some of the Irish developments. Trinity is an excellent place to do this.”

She is Director of the new Trinity Centre of Constitutional Governance, or TriCon. “We just managed to set up TriCon before lockdown and we want it to put Trinity and Ireland on the global map in terms of research excellence in the field. We’ve opened up some research strands including, for instance, on the status of Northern Ireland post-Brexit and the possibility and implications of a united Ireland. We’re forging links with Queen’s University Belfast and other UK universities around the world.” TriCon has now joined with the School of Politics to become a Jean Monnet Centre of

Excellence on Constitutional Governance in Europe, funded for the next three years by the Erasmus+ programme to focus on “norms of democracy across Europe”.

She loves “cinema, theatre, art galleries, dinner with friends” and is looking forward to getting back to all that post-lockdown, and to introducing her children, aged 10 and 15, to the richness of Dublin’s social and cultural life.

Her mission in Trinity for the next few years is to establish TriCon as a centre of excellence and to build further research links with Europe. “Since Brexit, Ireland is the only English-speaking and only common law system left in the EU. The Irish experience with amending the constitution through referendum, supplemented by Citizens’ Assemblies and constitutional conventions, is attracting international attention as a successful model of democratic constitutional engagement. We are the only country in the world that legalised gay marriage by a popular referendum. It is easy to take for granted that we have this ongoing popular input into our Constitution, and that social change happens when we vote for it, and that ahead of the vote, there’s a national debate about what kind of country we want to be. But in fact that doesn’t happen elsewhere and it’s something other countries are getting interested in because thus far Ireland is bucking the global trend towards populism, authoritarianism and democratic decay. I think that in terms of constitutional law this is Ireland’s time, and Trinity’s time, and I’m excited to be part of it.”

Philanthropy & alumni engagement

Fergal Naughton,
Chair of the Provost's Council

The launch of the Trinity Business School on 23rd May 2019 was a truly memorable occasion for all present.

This wonderful Scott, Tallon and Walker building, with entrances into the College on one side and onto Pearse Street on the other, is such a stunning addition to the college's great buildings, and with its green walls, near zero-energy, solar panels and recycled water, it's a flagship sustainable building for our times.

It's also flagship for another reason. At the launch, I recall the Provost saying that "what makes the Trinity Business School truly ground-breaking is the extent of donor support. Donors raised €20 million towards the building, a hugely generous sum which enabled us to leverage the later EIB loan. This is the template for how we will fund future strategic growth in the university." This gets across why the event was so special: the college wasn't just launching a great new building but a whole approach to driving academic excellence.

I was lucky enough to be involved with this approach from quite early on. Back in 2013 I helped organise the Trinity Global Graduate Forum, which brought together two hundred high-achieving Trinity graduates from all around the world to strategize around the college's future direction. This was during the lean austerity years, and the issue of how Trinity would continue financing great education and research was a big question, with no easy answers.

RIGHT – Marking the launch of the *Inspiring Generations* philanthropic campaign, Trinity commissioned a mural, 'The youth need to see their greatness reflected in our eyes', by artist Joe Caslin, at the Campanile in Front Square.



→ I think I speak for many graduates when I say that we want to be part of delivering for Trinity, Ireland and the next generation of students. It's as simple as that.

12



The Graduate Forum proved what the Provost and many of us strongly believed – that Trinity has amazing, and amazingly dedicated, alumni who are only waiting to be asked to ‘give back’. As a graduate myself, I have such marvellous memories of my time here as an undergraduate, and as the CEO of a global business, I appreciate the calibre of graduates and research coming out of Trinity and how important this is for the country as a whole. I think I speak for many graduates when I say that we want to be part of delivering for Trinity, Ireland and the next generation of students. It’s as simple as that.

At the Forum, the Provost confidently set an ambition to build a world-class Business School. That was just the start as it became increasingly clear how excited donors and philanthropists were to be involved. In the days right before Christmas 2013 the Provost came out to my Glen Dimplex HQ at Dublin Airport, at short notice, to ask me to work with him in establishing a fundraising drive for Trinity by chairing a leadership group, and after two years of steady preparation we launched the Provost’s Council. A small group of about forty alumni and friends, its purpose is to advise the Provost on the college’s strategic direction. Our priority, from the start, was to work with the great team in Trinity Development and Alumni (TDA) to develop, launch, and succeed in a comprehensive

philanthropic campaign. We were inspired, like so many people round the world, by the example of Chuck Feeney, whose long investment in Trinity, through Atlantic Philanthropies, culminated with the funding of the Global Brain Health Institute as a joint initiative between Trinity and the University of California, San Francisco.

Inspiring Generations was publicly launched on 2nd May 2019 – the largest such campaign ever launched on the island of Ireland. It is framed around key priority projects, including the Redevelopment of the Old Library, the Trinity St James’s Cancer Institute and E3, the Engineering, Environment & Emerging Technologies Learning Foundry and Research Institute, all underpinned by the funding of student scholarships and research fellowships to bring talent to the university.

The aim with *Inspiring Generations* is to deeply engage the wider Trinity global community of alumni, friends and businesses with the university’s mission in education and research, and to connect with each other.

Speaking personally, one of the great highlights of this past decade has been my involvement with Trinity and, in truth, that’s not just for selfless reasons. It’s exhilarating to see major projects take off and to feel you had some part in shaping them. It has been wonderful to play a role in helping

LEFT – Trinity Business School entrance onto Pearse Street with its ‘living’ wall.

BELOW – Provost Prendergast, Prof Aideen Long, Prof Luke O’Neill, Minister Simon Harris, Prof Kingston Mills, and AIB CEO Colin Hunt, at the AIB COVID-19 Research Hub in Trinity.



the campaign meet its ambitious goals of raising €400 million in donations and 150,000 hours in volunteering. When we set these targets we aimed high; our confidence in Trinity’s alumni and friends has been amply justified.

Over the next few years, the priority projects of *Inspiring Generations* are going to transform the campus and beyond: the Old Library Redevelopment project got planning permission in October 2020 – I’ve seen the plans for the new Research Collections Study Centre on the ground floor and it’s going to look stunning. And work has started at the east of the campus on the Martin Naughton E3 Learning Foundry, and again this is going to be transformative: co-educating engineers, computer scientists, natural and environmental scientists, and statisticians to collaborate across the old divide of the natural and the engineered worlds to develop sustainable solutions for a liveable planet. It could hardly be more important.

It has also been exhilarating to connect with other alumni, and with Trinity professors and staff, who all feel the same way about the university as I do. We share a common obsession, which is always a great basis for friendship, and there is excitement and potential in grouping together. Instead of staying isolated in our silos, fretting about the future of the

world that our children will inherit, we get to come together in a great centre of research and educational excellence and to think about solutions to the great challenges of our time – Climate, AI, energy provision – and how to make them happen. This collegiality has been particularly striking in this past challenging year of lockdown and pandemic.

I know from TDA that alumni responded immediately and generously to the call for support to the Student Hardship Fund, helping students whose circumstances had been worsened by the pandemic, and that alumni engagement with webinars and other online events has been brilliant. This demonstrates the instinct within the Trinity community to stay in touch and support each other through crisis, while the foundational gift from AIB to establish the AIB Covid-19 Research Laboratories Hub is such a vote of confidence in the university’s exceptional health sciences research.

The Trinity campus has been closed now for a year but the giving hasn’t stopped. As we start to think about ‘building back better’ the post-pandemic world, it’s more important than ever to stay connected with each other and to support this university which is articulating such a clear vision for outstanding education and research that will help transform Ireland and the world.

Developing the campus

Professor Veronica Campbell, Bursar & Director of Strategic Innovation

The Trinity community is fortunate to study and work in a unique residential campus setting spread over 47 acres in the heart of the city, as well as distinctive satellite sites. Since the foundation of the College in 1592 the campus has evolved continuously to meet the needs of an expanding student and staff body and a developing curriculum.

Trinity's first Estates Strategy, launched in November 2018, placed learning, teaching and research at its heart. This Strategy aims to allow the campus to continue to evolve and support Trinity's academic mission by improving the efficiency and quality of learning space and by introducing adaptive reuse of buildings to meet future requirements.

Over the past ten years, Trinity engaged in a programme of capital projects aimed at renewal of the estate and enhancement of amenities available to students and staff. Recent projects include:

Trinity Business School

The Trinity Business School, a 14,000 sq.m. €80 million project, was opened in May 2019 by the then-Taoiseach, Leo Varadkar. Comprising lecture theatres, a 600-seat auditorium, the Tangent entrepreneurial ideas workspace, public spaces where students can meet and exchange ideas, 'smart' classrooms with the latest digital technology and a new Trinity Boardroom, this award-winning building boasts innovative and high-performing environmental credentials. Fronting onto Pearse Street and the University campus, the near zero-energy building which won the Sustainability Award for a Single Building or Development at the 2021 Building and Architect of the Year Awards also provides another link between the city and the University.

RIGHT – The opening of the new Trinity Business School.



→ The Trinity Business School, a 14,000 sq.m. €80 million project, was opened in May 2019 by the then-Taoiseach, Leo Varadkar. This award-winning building boasts innovative and high-performing environmental credentials.

13



Printing House Square

Trinity's new 250-bedroom student accommodation building on Pearse Street is due for completion in 2021 following a pause on the building works due to Covid-19 restrictions. The building will also have student services space, a new Health Unit and sports facilities, confirming Trinity's commitment to being a residential college with the best student supports we can provide.

Arts Building refresh

The 1978 Arts Building received a two-phase refresh over the summers of 2018 and 2019, adding new furniture, wayfinding signage, increased openness and light in the floor plan layouts, lively new interior designs for student collaboration and a replanted rooftop garden for staff and student use.

Old Library Redevelopment Project

The funding is now in place for a major restoration of the 1712 Old Library building, home to the magnificent Long Room and priceless manuscripts including the Book of Kells. The government has announced €25 million in funding for the project, which received planning permission in 2020. Award-winning architects Heneghan Peng are leading the project, focusing on conservation of the Old Library and its unique collections, as well as the creation of a Research Collections Study Centre that will improve access to academics and members of the public.

Other projects

Refurbishments to the Nassau Street entrance and to Regent House took place to improve the staff, student and visitor experience. A new lift has brought Regent House back into full use for the college community. The octagonal space at Front Arch was refreshed with new noticeboards, renovated stonework, and painting of the vaulted ceiling, and a cobbling to replace tarmac has improved the public realm at Front Gate. Outdoor sports facilities have been enhanced by the provision of additional all-weather sports facilities at Santry and the Iveagh Grounds twenty-five-acre site on the Crumlin Road, were purchased considerably enhancing the assets for sporting activity.

A major refurbishment of 'Stack B' – a building adjacent to CHQ in Georges Dock and purchased by College in 2020 – for the Electronic & Electrical Engineering department and the Graphics Vision and Visualisation (GV2) and Signal Processing Media Applications (SigMedia) research groups is complete. This move to the north Liffey Quays, into a modern collaborative space, brings together these cognate groups to create the Trinity Centre for Creative Technologies & Media Engineering (CHIME).

Other projects include the redecoration of the Public Theatre, the installation of lights in Fellows Square, the refurbishment of the gym, the creation of innovative new space for the Global Brain Health Institute in the Lloyd Building,

LEFT – The Long Room in the Old Library which will undergo a major restoration.

BELOW – Prof Veronica Campbell, Bursar and Director of Strategic Innovation with Provost Patrick Prendergast at the launch of Trinity's first Estates Strategy.

the refurbishment of student accommodation in our older buildings and an inter-professional simulation suite in St James's Hospital.

Trinity's in-house conservation architecture team led on the restoration of the organ in the 1785 Sir William Chambers-designed Public Theatre (Examination Hall). This is the oldest Irish-made organ case, dating from approximately 1680, and it came from the original chapel. The organ was sent to the UK for careful restoration and returned to an altered Examination Hall balcony to once again provide the familiar hair-raising acoustic backdrop to events.

Energy management and sustainability is an important objective of Trinity's Strategic Plan with investments in lighting and heating upgrades to reduce the carbon footprint and energy consumption in the University. Further strategic initiatives are planned to reduce consumption and to improve our sustainability and social responsibility.

A €9 million project to increase the medium voltage electrical import capacity for the University, and to combine multiple existing supplies into one, was completed and is fully operational, with the final connection to Printing House Square due at the end of 2021. Important maintenance projects and energy management initiatives continue around the campus, and more are planned (subject to funding), to ensure the College can provide a safe and healthy environment and to improve and maintain a high level of standards.

A new garden in a newly developed square adjacent to the Botany Department was opened by Her Royal Highness Princess Maha Chakri Sirindhorn of Thailand in 2014. In the Campus Pollination Plan, hives and bee hotels were introduced on campus including on the roof of Parsons building.

Trinity's Future Vision

Martin Naughton E3 Learning Foundry – This €80 million project for Engineering, Environment and Emerging Technologies has commenced and will include a new state of the art 6,086 sq.m. facility based on the main Trinity campus. It will deliver new teaching facilities, maker spaces and interactive learning spaces for students. This project has benefitted from a philanthropic donation by the Naughton family and is also in receipt of funding from the Higher Education Authority. Internationally renowned architects Feildon Clegg Bradley have been appointed to lead the project and planning permission was granted by Dublin City Council in August 2020. The construction will be complete in autumn 2023. The project will also reimagine the East End of campus with new landscaping, outdoor spaces and new pedestrian routes, as well as refurbishment of space within several existing buildings.



Trinity East and the Grand Canal Innovation District – This is Trinity's most ambitious project to date. With Trinity East, a wholly new Trinity campus at its heart, the district will act as a connector for Irish and multinational companies, modelled on innovation districts such as Kendall Square in Boston. It will provide a space for academic researchers from both Irish and international universities, venture capitalists and start-ups as well as members of the local community to meet and interact. Full development of the site will take place over a decade and a Strategic Assessment Report with a funding ask of €150 million from Government has been invited for submission. A €30 million philanthropic donation from Eric and Barbara Kinsella will be used to develop the E3 Research Institute, a major building on the Trinity East campus following the completion of the innovation hub Portal for which planning permission has been granted and financing in place so it can go to tender in 2021.

Other projects

As well as new buildings when needed, Trinity's sustainability practices make us committed to retaining in use many buildings through a programme of refurbishments. For example a significant project is to refurbish the 320-year old Rubrics building, and the Chief Steward's House. The College Board has approved appointing a contractor to bring them fully into use as high-quality residential accommodation and Fellows Emeriti research space. Two further projects on the horizon include the development of the Law School and the creation of a student hub.

Our evolution continues, and, as Trinity's environment adapts to its community's evolving needs and priorities, we look with excitement and confidence to the future.

Art of the new – keeping it contemporary

**Catherine Giltrap, Curator and
Head of the University Art Collections**

These past ten years the Art Collections team has had many adventures. In fact, we have described many of our projects as ‘once-in-a-generation’. Since Dr Patrick Prendergast was elected 44th Provost at the age of 44, we have conserved, collected, commissioned and collaborated on a vast array of programmes throughout the whole campus.

Weaving tradition and innovation between our respective long-standing and relatively new roles and building on key developments by Provosts McConnell and Hegarty, we have aspired to place both the appreciation and care of visual art at the very heart of the campus and its community more coherently, consistently and creatively than was feasible before. Never the same day twice, which is how we like it, and we have learnt to take every challenge as an opportunity for conservation and for creative solutions and innovations. During one particular May–June period – nicknamed affectionately thereafter as ‘May-hem’ – within a six-week time frame we brought to a close at least eight of these ‘once-in-a-generation’ projects of major conservation, commissions and curating new capital projects; one of these was six years in the planning.

An unending tapestry

Whilst much of our focus is on celebrating and protecting our existing visual art collections, we have simultaneously insisted on the importance of the present tense. We cherish our recent and centuries-old heritage whilst creating the future with the imprint and interests of today’s artists, today’s students and staff, today’s national and global concerns, and attempt to weave them into an unending tapestry, filled with a biography of the past, present and future.

RIGHT – Damien Flood ‘Tumble’, 2018, oil on reversed black-primed canvas, purchased from Green on Red Gallery.



→ What is distinctive about our art collections is how they inhabit the whole campus, from the city centre to Tallaght University Hospital, from private to more public locations, with works on display in up to 500 locations at any one time.



14



During the past decade, we have added over 200 artworks to the collections, now totalling in excess of 3,000 items. What is distinctive about our art collections is how they inhabit the whole campus, from the city centre to Tallaght University Hospital, from private to more public locations, with works on display in up to 500 locations at any one time.

One of the most important acts of support for the visual arts that Provost Prendergast has realised at Trinity, is the offer of sustained and consistent financial support for the purchase of contemporary art, acquired directly from living artists and from galleries.

This took the form of 'The Provost's Fund for Contemporary Art', set up towards the end of 2014. This fund has enabled us to collect 44 artworks for the benefit of the students, staff and visitors to our University. In addition to this, the Provost secured significant one-off funding of €100,000 within the parameters of the new student accommodation programme at Printing House Square to purchase art for student areas. This will enable us to further bolster our plans to dynamically re-design the concept of the Picture Hire Scheme so that as many common areas in student residences as possible will feature a modern or contemporary artwork, all year round.

The Committee proposing, discussing and selecting contemporary acquisitions via The Provost's Fund has included the Provost, Dr Yvonne Scott, former Director of the Trinity Irish Art Research Centre, and myself as Curator and

Head of the Art Collections, in the generously hard-working company of student representatives, staff from across the disciplines, alumni, and external visual arts professionals from the education and gallery sectors. The artists whose work we have selected have mainly been new to our collections, some recently graduated, others well established nationally and internationally, including representation of Ireland at the globally-acclaimed Venice Biennale of Contemporary Art.

Since the Modern Art Collections at Trinity were established, some sixty years ago now, each advocate for the Modern and Contemporary Art Collections at Trinity, including George Dawson, Anne Crookshank, David Scott, Peter Cherry and myself, as the first Curator, sought to collect artworks of the moment, in the moment. Many were acquired by donations but a significant number were purchased directly from the artists themselves, not long after their production, at a time when support was much-needed. However, there was never a consistent means to buy other than the minimal, and not very predictable, fees from the Picture Hire Scheme. We should not underestimate the works that this scheme supported though, as they have been significant. The Provost listened and recognised the ongoing struggle to keep up this momentum and the ad hoc nature by which we strove to collect the contemporary and sought to resolve this by regular support and encouragement.

LEFT – Jane Rainey ‘Solo Traveller’, 2017, oil on canvas, purchased from Cross Gallery.

BELOW RIGHT – Amanda Coogan ‘The Fall’, 2009, edition 1 of 3, C-type print, purchased from Kevin Kavanagh Gallery.

BELOW LEFT – Paul Hallahan ‘Aimlessly Pretty III (114)’, 2017, watercolour on HP fabiano paper, purchased from Berlin Opticians Gallery.



New commissions and donations

Over the past ten years, we have marked many firsts and carried out so many worthwhile projects too numerous to mention here in detail. Highlights include the commission of the first new portrait for the Dining Hall in over 150 years, our former Chancellor, Dr Mary Robinson. Also, at the instigation of the Provost, we are commissioning the four portrait busts of women for the Long Room, adorned with sculptures featuring men since the 1740s.

Contemporary art additions include important bodies of work from the Irish and international collections of honorary fellow Patrick J. Murphy, former Director of the Douglas Hyde Gallery John Hutchinson, and individual significant works such as the campus sculpture by Rowan Gillespie from the collection of Eric and Barbara Kinsella, a large-scale piece by Lennon donated by Derek Dockrell in memory of Professor and Fellow Rodney B. Dockrell, and many donations by artists, such as the continued, longstanding generosity of artist Richard Gorman, most recently with the support of fellow alumnus Robert Mahaffy at the Trinity School of Business.

A very special commission/artist-donation of Janet Mullarney’s small-scale sculpture, now on display in The Trinity Long Room Hub, was realised by funds that could be saved over time from the hire scheme due to the sustainable, parallel support for additional contemporary art purchases

by The Provost’s Fund. Recent portrait commissions have included the former Vice-Provost Linda Hogan painted by Miseon Lee, and former Registrar and current Pro-Chancellor Shane Allwright by James Hanley, and, on the cusp of commencing, is the process to paint the portrait of the Bursar and Director of Strategic Innovation, Veronica Campbell.

As a means of acknowledging the artists, galleries and donors with whom we have connected this past decade, we will launch the first in a new series of illustrated catalogues focusing on recent acquisitions, commencing with The Provost’s Fund for Contemporary Art to recognise how he has helped us to stay contemporary.

We aim to create a balance between acquiring emerging and established artists, and, since 2014, we have displayed many of these additions initially at the new exhibition walls in the Arts Building and then distributed them throughout student, staff and open spaces so that visual art is present for those who visit the libraries, the lecture theatres, the cafés, and the grounds. The new Board Room, Trinity School of Business, Trinity Biomedical Sciences Institute, new teaching facilities in Tallaght and many more premises across the campus have new displays of modern and contemporary art to enjoy and more are being planned for our developing campus and community for the future.

Trinity Sport – raising our game and realising potential

Michelle Tanner,
Head of Sport and Recreation

Trinity has a rich and unrivalled sporting heritage, with a strong history of providing extra and co-curricular opportunities and enabling lifelong institutional pride.

The range of sporting facilities and activities available to Trinity's students, staff, and communities is a key part of campus life and integral to the Trinity experience. Trinity Sport has achieved much over the last ten years.

Trinity College Dublin's first integrated *Strategy for Sport* titled '*Raising Our Game*' was officially launched in 2015 and reached its final phase of planning implementation at the end of 2018. Trinity Sport addressed many challenging issues and achieved momentous success in several areas, most notably it:

1. Established a Sport Development Unit which set out a clear pathway from participation to performance, and a host of programmes and supports.
2. Established a new identity of 'Trinity Sport,' which is now recognisable and familiar with the wider Trinity College Dublin community.
3. Implemented an integrated staffing structure which addressed the previous cumbersome structure.

These initiatives led directly to increases in participation levels, success for teams and athletes, and investment in facilities, all of which are key to building the foundations for the future of Trinity Sport. Published results from the '*Raising Our Game*' strategy for sport can be found here www.tcd.ie/Sport/about/raising-our-game/

RIGHT – Trinity Sport Ambassador, Nicole Owens, who is a Dublin Ladies GAA player and Trinity alumna at the launch of the Trinity Sport Ambassador Programme.



→ Everything we do at Trinity Sport is about helping people to participate more and perform better so that together we can reach our potential.



15



Sports facilities investment

Trinity Sport has made significant changes and invested about €6 million in sport facilities within the last ten years including the successful purchase and operation of the Iveagh Sports Grounds and improvements in infrastructure at Santry Sports Grounds, College Park, Islandbridge Boathouse and the Trinity Sport Centre. The completion of the Santry Sports Grounds has had a significant impact on quality and overall usage of Trinity Sport facilities, contributing to a 125% increase in usage since 2015. The Sport Centre reconfiguration project carried out in 2017 includes a new fitness studio, a high-performance gym and the expansion of the main fitness theatre to 420sqm – these enhancements have helped attract more than 500k visits p.a. to the Centre.

Exciting infrastructural projects, including the outdoor sports development at Iveagh Sports Grounds, are in progress while Printing House Square is in the final stages of development and will host a world class standard rifle range and bring squash, handball, and racquet sports back to campus.

Trinity Sport has raised a further €6 million in additional income from sponsorships and other sources during the decade. For seven consecutive years, Trinity Sport has achieved the highest standards in sports facility provision in the annual National Quality Awards and won the 'Third Level Education and Fitness Club of the Year' at the inaugural Nutramino Health and Fitness Awards in 2018.

Celebrating success

A calendar of high-quality sporting events is hosted by Trinity Sport each year, from the annual Trinity Sports Awards and the Trinity Sport Scholarship Awards to the annual rugby and rowing colours events and the Trinity Regatta.

The annual Sports Awards are open to all college clubs and acknowledge the extraordinary commitment made by the Trinity sporting community. A highlight was in 2016 when sporting legend Sonia O'Sullivan presented the awards and competed in the annual campus 5k. In the course of the decade, Trinity Sport has recruited notable graduate sporting ambassadors including Nicole Owens (Dublin Ladies GAA player and Trinity Alumna), Mark Pollock (motivational speaker and author), Ailish Egan (former Irish Rugby international), Ed Joyce (former Cricket international and Head coach of Ireland's women's cricket team) and Hugo MacNeill (former British and Irish Lions Rugby Union international).

In February 2018, Trinity hosted the GAA Higher Education Sigerson Cup Finals weekend at Santry Sports Grounds and showcased the newly refurbished facilities. In February 2020, Trinity Sport hosted the 100th edition of the IUFU Collingwood Cup, the men's soccer intervarsity competition, with eight teams competing in the quarter finals, semi-finals, and finals across three consecutive days. Trinity won the Farquhar Cup on the final day in an exciting penalty shoot-out at College Park.

LEFT – Sport Scholars Max Neville (Cricket), Luke Corcoran (GAA - Hurling), Danielle Semple (Rowing), Kate Doherty (Athletics), Rebecca Stokell (Cricket), Michael Silvester (Rugby) and Luke Hayes Nally (Rowing).

BELOW – Members of Dublin University Boat Club at the Rowing Colours 2019.

Performance by college athletes has improved significantly over the course of the decade – by the end of time period covered by *'Raising Our Game' Strategy for Sport*, athletes had won 29 league, cup, intervarsity, and colour games and twenty national caps. Highlights include the Trinity Rugby Men's team consolidating their position in Division 1A of the All-Ireland League (AIL) by reaching the semi-finals for the first time in its history. In March 2020, Trinity Fencing club was crowned intervarsity champions for the 13th year in a row. Trinity Meteors won the Basketball Ireland women's Division One title and earned promotion to the Super League. Dublin University Harriers Athletics Club (DUHAC) had an impressive season in 2020, dominating the colours cross country by taking home the top three spots in the men's and women's races.

Trinity has supported numerous student athletes to compete on the international, national, intercounty, and interprovincial sporting stages, including Olympians Natalya Coyle (Pentathlon), Scott Flanigan (Sailing), Maeve Phillips (European and World Down Syndrome swimming medallist), Paralympians, Rugby Internationals including Linda Djougang, Kathryn Dane and Ryan Baird and a host of other amazing athletes.

Connecting with college and other communities

Trinity Sport prides itself on its collaborative work within the University and has made some important and lasting connections to enhance the Trinity student experience. Trinity Sport collaborated with Trinity Access (TAP) to increase engagement among potential students through the Sporting Talent with Academic Rewards (STAR) programme. Trinity Sport also takes an active role in supporting local communities through the Trinity Sport Junior Leadership Programme, which offers transition year students from all backgrounds intensive training in areas such as leadership skills, group management protocols, sports coaching, and teamwork-based exercises. Many volunteers have gone on to utilise their newly acquired skills within their own communities through coaching local teams and youth groups as well as managing events for charitable organisations.

A founding member of the Healthy Trinity initiative, Trinity Sport develops, and activates physical activity throughout the campus and beyond. Trinity Sport is the lead partner in the European Union Erasmus+ Sport funded *'Mind Body Boost'* project. After pioneering numerous pilots, Trinity is now responsible for this mental and physical health intervention programme which will benefit third level students across seven campuses in Ireland and Europe.



Trinity Sport is setting standards across several areas: it established the first Sports and Physical Activity Inclusion Officer in any Irish university, as well as a comprehensive sports medicine support programme for student athletes. The Trinity Olympians Project received the European Network of Academic Sports Services Award in 2012.

None of the above would have been achievable without the input of a talented, qualified, and experienced team of staff including graduate interns and experts in fitness, coaching, sports management and operations, many of whom are representatives and leaders in international and national sporting organisations. Most notable was the appointment of Michelle Tanner (Head of Sport and Recreation) as President of the European Network of Academic Sport Services (ENAS) in 2013 – a landmark appointment as Michelle was the first representative from Ireland and the first female to be appointed to the prestigious position. Recently, Matthew Dossett (Deputy Head of Sport and Recreation) was elected to the position of President of Student Sport Ireland, the first representative from Trinity to be elected to this role.

Trinity Sport is currently in the final phase of the development of the Strategy for Sport 2021–2025. Aptly titled *'Realising Potential'*, the strategy sets an ambition for Trinity Sport to enable and develop potential on three levels: as individuals, for the Trinity Sport unit and for the University. Everything we do at Trinity Sport is about helping people to participate more and perform better so that together we can reach our potential.

Public engagement

Trinity engages with the public through a myriad of activities, including public lectures, exhibitions, events and social media to showcase research, and welcoming visitors. Trinity features on all lists of Ireland's Top 10 visitor attractions and pre-Covid over two million people visited the University each year.

RIGHT – Members of the public enjoying Science Gallery Dublin's exhibition PERFECTION.

These include dignitaries on state visits to Dublin; visiting fellows, lecturers and speakers at academic symposia and student societies; tourists and visitors to campus attractions; and the exceptional individuals who are conferred with honorary degrees each year.

Outreach activities

Many of Trinity's outreach activities are organised in partnership with national and international organisations and festivals.

Annual/recurrent events

Each year the public are welcomed to campus for Culture Night in September, Open House Dublin in October while Front façade lights up green to celebrate New Year's Eve and St Patrick's Day and red to welcome in the Chinese New Year. A visible eclipse is not an annual event, but it has become tradition to host stargazers in Front Square when exceptional planetary or solar activity is happening. For ECLIPSE 2015, hundreds of people gathered to use high-tech telescopes and special shades to catch the partial eclipse. The following year, hundreds gathered again on 9 May to use telescopes to witness the Mercury transit – the solar system's smallest planet moving across the sun. The rare event was streamed to a plasma TV from NASA's Solar Dynamics Observatory. This year, due to Covid-19 restrictions, astrophysicists brought June's partial solar eclipse to the public via livestream.

A man with short brown hair, wearing a dark sweater with a light-colored geometric pattern, is looking down at a display. The background is a teal color with a fine, diagonal line pattern.

→ Since opening in 2008, Science Gallery has welcomed more than three million visitors (340,000 annually) to 49 unique exhibitions, ranging from design and violence to light and love, and from contagion and biomimicry to the futures of the human species and play.



16



‘PROBE: Research Uncovered’ is a pop-up festival of talks, experiments, and interactive workshops showcasing the best of Irish research. It takes place annually as part of European Researchers’ Night in September. Some 3,000 visitors annually join live research experiments and workshops on campus. In 2020, it was renamed START (Start Talking about Research Today) and went online due to Covid-19 restrictions.

2014 was the inaugural year of the Trinity Walton Club – a not-for-profit STEM education programme subsidised by Trinity and supporters, including the Bank of Ireland, which invites secondary school students to attend STEM learning environments in Trinity labs on Saturdays and summer camps during school holidays.

Decade of Commemorations

The ‘Decade of Commemorations’ [2012–2022] has been an occasion for remembrance, memorialising and reflection across the country and Trinity has participated fully.

Over 6,000 people attended the World War I roadshow of pop-up talks and activities in 2014, hosted by Trinity in partnership with RTE Radio 1 and the National Library of Ireland. The ‘Family History Collections Day of World War I memorabilia’ invited people to bring in war-related items, letters and mementos for digitisation and archiving by a team of experts.

In March 2016 the college hosted a Proclamation Day Symposium, ‘*The 1916 Proclamation in its national and international context*’ showcasing leading historians and scholars.

Over 10,000 people visited the campus to participate in talks, debates, exhibitions, performances and vintage tennis matches during RTE’s *Reflecting the Rising*, a free family event which took place throughout Dublin city centre on Monday 28 March 2016.

Rare and previously unpublished material held in the Library was made accessible globally, thanks to an online collaboration between Trinity and Google. *Dublin Rising 1916–2016*, an interactive Google street view tour lets visitors virtually explore streets, events and people who shaped history 100 years ago.

Changed Utterly: recording and reflecting on the Rising 1916–2016, an exhibition in the Old Library examined the way the Rising was recorded at the time; how it was commemorated 50 years later; and how it was reassessed in 2016. Key artefacts on display included: the Library’s copy of the Proclamation, torn from the walls of the GPO, along with a WWI recruitment poster pasted to the back; photographs of British troops in Front Square; the scrapbook of Elsie Mahaffy, daughter of the then Trinity Provost; and the casing of a bullet which pierced the roof of the Library during Easter week.

‘Beyond 2022: Ireland’s Virtual Record Treasury’ is an Irish Research Council funded collaboration led by Trinity with four archival partners: The National Archives of Ireland, The National Archives (UK), The Public Record Office of Northern Ireland and The Irish Manuscripts Commission. The project will digitally recreate the building and contents of the Public Record Office of Ireland, destroyed by fire at Dublin’s Four Courts at the outset of the Irish Civil War.

LEFT – Provost Patrick Prendergast views the near-total solar eclipse in Front Square at ECLIPSE 2015.

BELOW – ‘PROBE: Research Uncovered’ saw members of the public enjoying hands on experiments and interactive workshops.

This initiative has potential to transform how we understand Ireland’s past and is of particular interest to those tracing their Irish roots. In December 2019 the project was awarded €2.5 million from the Government under Project Ireland 2040.

Public lectures

Trinity’s research institutes, centres, and schools host regular public lectures. The Trinity Long Room Hub is particularly active, with lectures, exhibitions, seminars, and symposia on cultural, political and social issues. Among its thought-provoking public programmes in recent years are the *Annual Edmund Burke Lecture*, *Behind the Headlines*, *What does it mean to be Human in the 21st Century?*, *Out of the Ashes: Collective Memory*, *Cultural Loss and Recovery*, *Annual Humanities Horizons Lecture*, *Trinity and the Changing City* and *Women’s Stories*.

Co-discoverer of the DNA double helix, James Watson, was the guest, together with five Nobel Prize winners at the symposium, *Schrödinger at 75 – the Future of Biology*, held in Trinity and the National Concert Hall, marking the 75th anniversary since Erwin Schrodinger gave his seminal *What is Life?* lectures in Trinity College in 1943.

The annual Trinity Week is a public programme of lectures, symposia and activities, hosted by the three faculties in turn, with a different theme each year. Recent themes include *Silence*, *Energy and Memory*.

The Library

Visitor numbers to the Old Library and Book of Kells have more than doubled since the Provost started his term of office, from 558,000 in 2011 to 1.14 million in 2019 – an increase of 105%. The Library is a key exhibition space and the exhibitions are online too, some recent examples include:

- *Forever Begin* – commemorating Brendan Kennelly’s life in poetry;
- *Rockaby, baby*: building on Trinity’s collection of Beckett’s literary archives;
- *Illuminating the Middle Ages* – a treasure trove of medieval Latin manuscripts;
- *Drawing Your Attention: Four Centuries of Political Caricature*;
- *Director’s Choice Uncut* – highlights of the collections of the Library of Trinity College Dublin and their fascinating history;
- *From Decadence to Despair*, the first major Irish exhibition on Oscar Wilde.

An ambitious digitisation initiative, *Virtual Trinity Library*, was launched this year. It will conserve, catalogue, curate, digitise and research the Library’s unique collections, making them accessible to a global audience.



The annual *Bookmarks* exhibition displays some 70 handmade books in the Long Room, written and illustrated by Dublin primary schoolchildren over a two-month period with the help of authors, artists and children’s book specialists. This initiative, organised by Trinity Access, the Library and the School of English, aims to inspire children to become the next generation of Irish authors, illustrators and publishers.

Science Gallery

Science Gallery Dublin draws on the expertise of scientists, researchers, students, artists, designers, inventors, creative thinkers and entrepreneurs to develop its programme of exhibitions and events. Since opening in 2008, Science Gallery has welcomed more than three million visitors (340,000 annually) to 49 unique exhibitions, ranging from design and violence to light and love, and from contagion and biomimicry to the futures of the human species and play. A further two million visitors have participated in a Science Gallery exhibition abroad, making Science Gallery Dublin one of the largest non-profit cultural exports of Ireland.

Over the past decade the Science Gallery Network has grown to nine members across four continents: Dublin, London, Melbourne, Bengaluru, Berlin, Venice, Detroit, Rotterdam and Atlanta. Each gallery is known for its innovation and vision.

Financial review 2011–2021: austerity to growth

Introduction

Over the last 10 years the Irish university funding environment has provided significant challenges which have impacted on Trinity's ability to operate and compete effectively on a global basis. The sector has seen significant reduced levels of Exchequer funding for core teaching and research activities and an absence of an agreed framework and funding programme for renewal of critical infrastructure.

There are major challenges in achieving the income required to sustain a globally competitive research university. Additional funding will be required from the Government to address the shortfall in public funding per student which has reduced significantly in recent years and to meet anticipated growth in demographic and participation rates. Exchequer income has declined from 70% of the university's total income in 2008 to 39% in 2020 and the financial outlook for the university will continue to remain uncertain unless the Government commits to long-term funding or lifts the cap on undergraduate student fees. While Government supports for COVID impacts in 2020 were greatly welcomed, significant additional funding will be required to address the shortfall in public funding per student (currently at 40% of 2008 levels) and to meet anticipated growth in demographic and participation rates. Furthermore, a globally competitive research university needs a national R&D funding environment where its academic staff can compete for research contracts: Ireland's public funding of research is very low by international standards and has fallen by 21% since 2008.

Notwithstanding these challenges, Trinity's underlying financial position has been maintained and gradually improved over the last ten years, due mainly to successful strategies for generating non-exchequer revenue. However, these income sources were severely impacted by Covid-19

which, despite the extensive mitigation actions put in place by the University, has created further challenges and uncertainty in relation to the finances of the University and underline the need for a more sustainable funding model going forward.

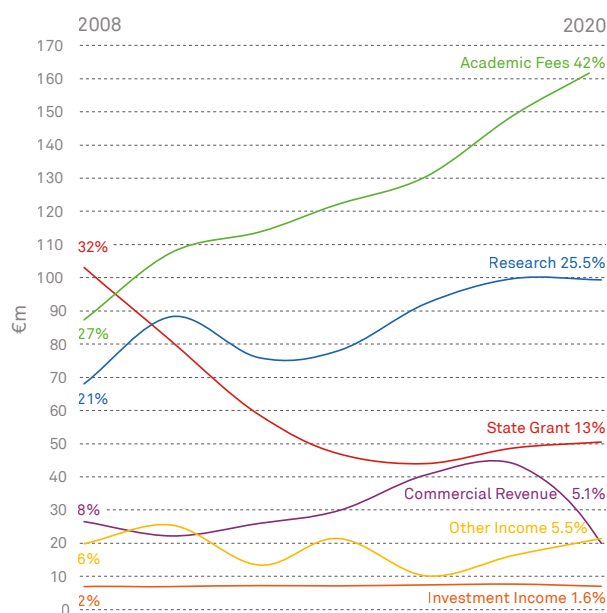
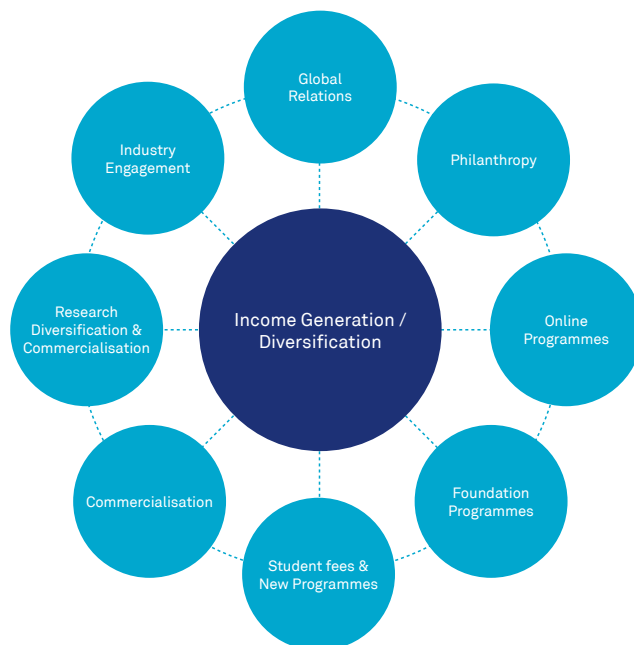
Commitment to investments and growth

Through the last decade we have remained committed to Trinity's mission to deliver research of international impact, and to a student experience underpinned by quality teaching and access to the best student services. We have continued to invest strategically in world class infrastructure and facilities which have underpinned our growth over the last 10 years and will drive future success. We have invested c. €500m in capital programmes over the last ten years and currently have over €300m in capital projects in the pipeline. In addition, we are committed to delivering longer term strategic investments such as the new Trinity East campus at Grand Canal Quay. These investments, funded mainly by philanthropic support and by long-term financing from our banking partners, continue to deliver financial returns in line with carefully planned and managed business cases.

Successful diversification strategies

In response to the decline in public funding levels, Trinity has been successful in securing new sources of income, working towards a financially sustainable position. Over the last 10 years Trinity has grown its non-exchequer income from 30% to 61% of total income and the core state grant now contributes only 15% of total revenues. Over the last 10 years we have focused on growing non-exchequer income across four key engines: research income, global relations, commercial revenues, and philanthropic income. The key changes in the University's income sources are summarised in the following table (Fig 1).

17

FIG 1 – Primary Income Sources
2008–20 (as % of total income).**FIG 2 – Income Generation & Diversification Strategies.**

The key growth and income diversification strategies in which the University has invested over the past 10 years (Fig 2), have progressed extremely well, contributing a meaningful return on the University's investment. After several years of growth on global relations, in September 2019, Trinity launched its Global Relations Strategy 3, which will deliver further revenue generation into the future based on international student recruitment *and* partnerships in joint degrees. Simultaneously with global relations activities the university committed significant new resources to fundraising through its first Philanthropic Campaign which was launched publicly as *Inspiring Generations* in May 2019. It focuses on investment in staff and students through transformative professorships and scholarships, as well as three major projects: GBHL, E3, the Old Library Redevelopment Project, and the Trinity St James's Cancer Institute. Accompanying these strategies was a planned investment in major capital development and research infrastructure projects. The new Trinity Business School opened in May 2019, driving further growth in student numbers, with the Printing House Square student accommodation development due for completion in late 2021. The University is also developing its vision for a new campus and innovation district at Grand Canal Quay – the Trinity East Project, working in partnership with the State and other key stakeholders on this hugely ambitious and transformative project.

We have also focused strongly on improving efficiency in our operations and support functions and reducing operating costs through investment in best-in-class IT systems and processes. At the core of these strategies has been a commitment to improving the quality of the student experience in the university.

Key financial trends

Prudent management of the University's finances, along with the investments outlined above has enabled Trinity to weather the economic downturn and to put in place the building blocks for long-term, financial sustainability. As a result of these investments, along with a provision for asset renewal, Trinity ran a planned deficit over the course of 5 years (FY14 to FY19). The University implemented strategies to facilitate a return to surplus by FY19, achieving a modest surplus in 2018, which increased to 1.2% in 2019.

The financial impact of the Covid-19 pandemic has clearly affected the 2020 results however (see Fig 3 below), and these impacts will continue to be felt over the coming years. Nevertheless, while challenges remain in achieving the level of income required for a globally competitive research university, demand for Trinity education and research is stronger than ever. We are confident that Trinity's resilience and the strategies in place will support our financial recovery and we remain focused on delivering the objectives in our 5-year Strategic Plan.

**FIG 3 – Summary Financial
Position 2014–20.**

**The Consolidated Financial Statements for the year ended 30 September 2020 were approved
by the Board in March 2021 and the summary financial position is set out below.**

	2020 €m	2019 €m	2018 €m	2017 €m	2016 €m	2015 €m	2014 €m
State grants	50.5	50.4	48.7	44.5	44.0	44.5	47.3
Academic fees	163.7	153.1	149.0	137.3	130.5	128.9	122.2
— EU UG	71.6	71.7	72.6	71.4	70.8	71.3	70.6
— EU PG	25.4	23.5	24.0	22.7	22.7	23.1	22.1
— Non EU UG	35.3	31.5	30.6	24.8	23.5	22.7	21
— Non EU PG	25.4	21.3	17.0	13.5	8.9	7.4	6.7
— Other	6.0	5.1	4.8	4.9	4.6	4.4	1.8
Research grants and contracts	99.3	101.4	99.7	100.1	92.2	85.2	78.0
CRU Income	21.4	45.1	44.4	42.1	40.6	34.4	29.8
Other income	20.0	19.2	15.4	11.3	10.0	10.1	21.4
Investment income	6.4	7.0	7.0	6.0	6.8	7.0	7.0
Donations and endowments	27.8	20.5	15.0	14.9	11.7	12.9	–
Income (excluding grant amortisation)	389.1	396.7	379.2	356.2	335.8	323.0	305.7
Staff costs	279.7	271.5	263.0	245.9	234.7	231.1	225.7
Other operating expenses	100.8	111.4	102.5	99.4	92.7	94.5	89.4
Total operating expenses	380.5	382.9	365.5	345.3	327.4	325.6	315.1
Operating surplus/(deficit) before interest costs and net depreciation	8.6	13.8	13.7	10.9	8.4	-2.6	-9.4
Less:							
Depreciation (net of amortisation)	-19.7	-16.8	-15.8	-20.1	-34.4	-19.8	-17.0
Net Interest payable	-5.3	-4.2	-4.0	-3.9	-4.6	-3.6	-3.4
Taxation	-0.0	-0.2	-0.1	–	–	–	–
Deficit before other gains and losses	-16.4	-7.4	-6.2	-13.1	-30.6	-26.0	-29.8

OFFICE OF THE PROVOST

House 1, Trinity College Dublin
Dublin 2, Ireland

–

T + 353 1 896 4362

E provost@tcd.ie

W www.tcd.ie

TRINITY COLLEGE DUBLIN

A 429 year old University in
the heart of Dublin City Centre
