



Trinity College Dublin

Coláiste na Tríonóide, Baile Átha Cliath

The University of Dublin

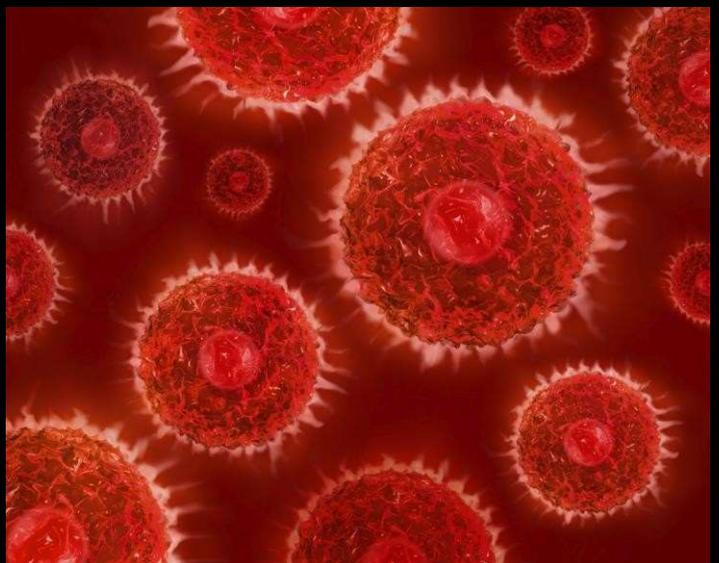
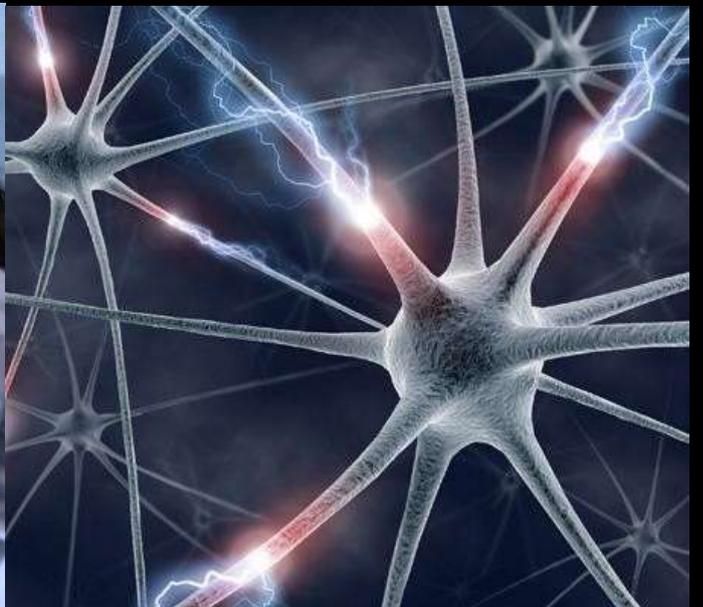
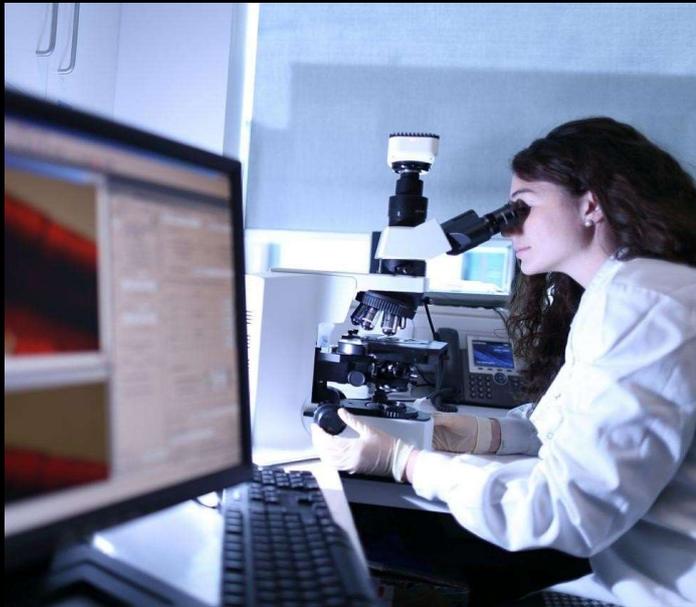
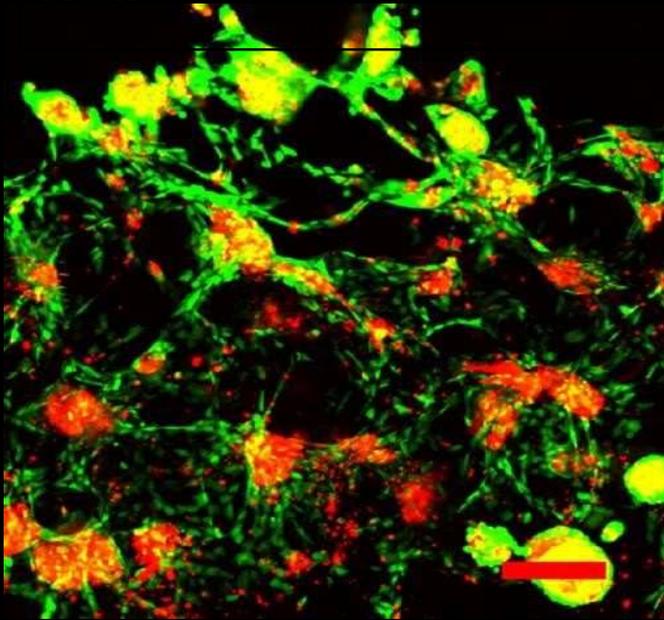


# Trinity Centre for Biomedical Engineering

*Annual Report - Academic Year 2021 - 2022*

Promoting Excellence in Biomedical Engineering Research, Education & Next Generation Medical Devices

Promoting Excellence in Biomedical Engineering Research, Education & Next Generation Medical Devices





Welcome to the 2021/22 annual report of the Trinity Centre for Biomedical Engineering. The report aims to highlight all the key educational and research activities of the Principal Investigators (PIs), postdoctoral researchers, students and staff associated with the Centre. Although the past few years with Covid have been difficult for research, TCBE has continued to grow, welcoming new PIs and researchers to the Trinity Centre for Biomedical Engineering. I have no doubt that they will have a hugely positive impact on the Centre.

The centre has also continued to grow in terms of research funding, exceeding €10 million in income in the past year, including further European Research Council (ERC) grants which are a real metric of success. This reflects the strength of research within the TCBE and highlights Biomedical Engineering as a key national research strength.

Well done to Prof. Daniel Kelly, Prof. Conor Buckley and Dr. Dave Browe as TCBE PIs who set up a new lab spin-out, Altach, to develop off-the-shelf cartilage scaffolds to regenerate damaged knee joints. Prof. Bruce Murphy is also involved in two spinouts from the Trinity Centre for Biomedical Engineering which were in have started their 'first-in-man' and Phase 1 clinical trials.

Dr. Matteo Solazzo from the Monaghan lab won the prize for best Biomedical PhD in Ireland at the national Bioengineering in Ireland conference and Yasmine Guendouz from the Lally lab won first prize at the Bernard Crossland Symposium for earlier stage PhD students.

We celebrated a new cohort of MSc and MAI students graduating from our Biomedical degree programmes and also saw 6 PhD students complete their PhD programmes.

All of these successes are due to all the hard work of the PIs in the Trinity Centre for Biomedical Engineering and I thank them for their enthusiasm and commitment to TCBE. Enjoy reading our 2021/22 Annual Report

A handwritten signature in black ink that reads "Triona Lally".

Director of the Centre for Biomedical Engineering

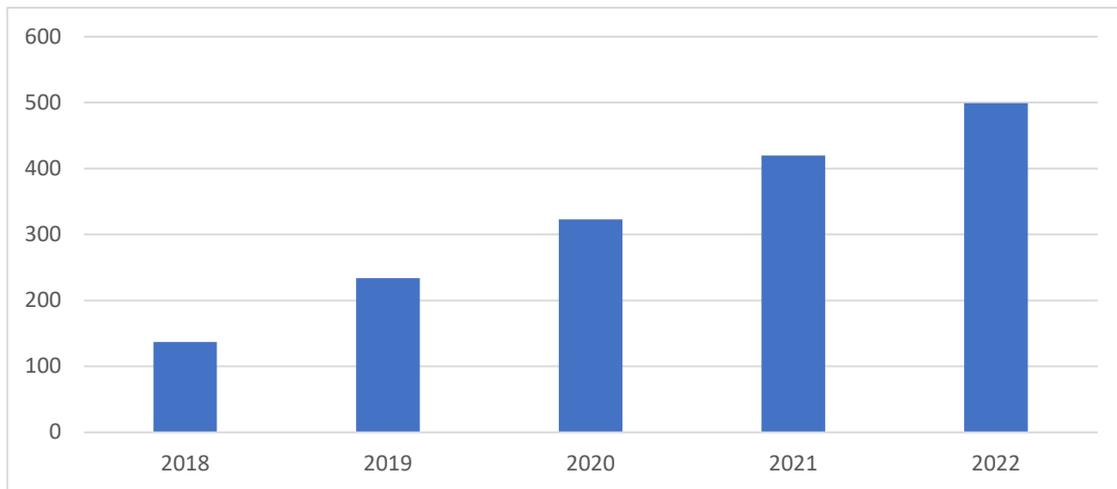
# BIBLIOMETRIC REPORT 2018 - 2022

## TCBE Peer -reviewed Papers 2018 - 2022

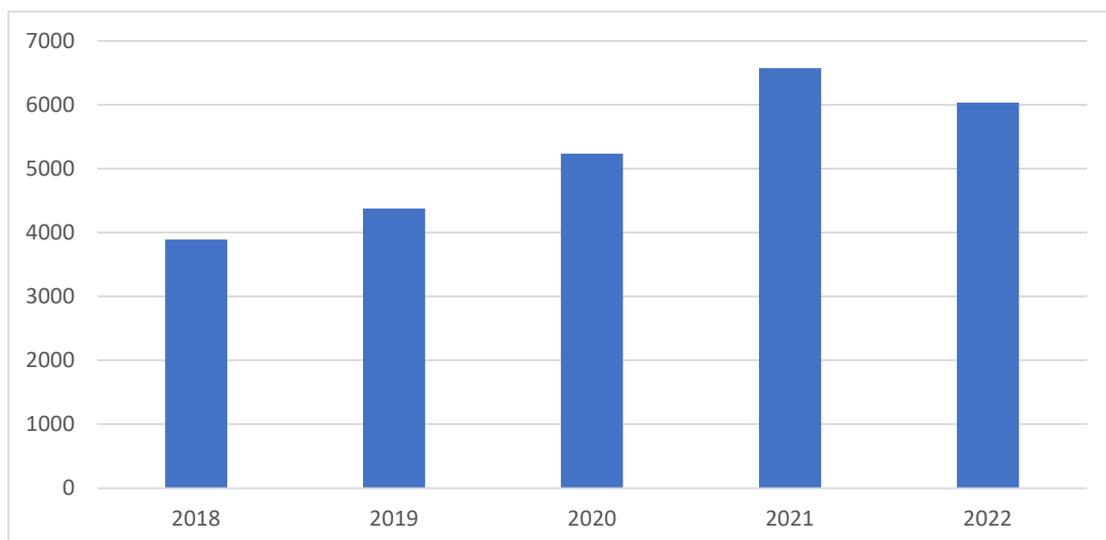
No. of papers:	1016
Number of citations:	13465
Impact (citations per paper):	13.25
H-index:	52

Source: Scopus, accessed December 15, 2022

## Number of Journal Papers by Year 2018 - 2022



## Citations in Each Year



## Countries citing TCBE Papers 2018 - 2022



### Top Citing Countries

COUNTRY	No. Citations
China	1586
United States	1321
Ireland	810
United Kingdom	654
Germany	415
Italy	296
Netherlands	261
Australia	246
India	242
Iran	238
Spain	223
France	208
Canada	178
South Korea	154
Japan	150
Switzerland	139
Portugal	113
Belgium	110
Brazil	106
Russian Federation	105
Poland	104
Singapore	95
Turkey	77
Taiwan	73
Sweden	58
Hong Kong	55
Greece	53
Malaysia	53
Denmark	51

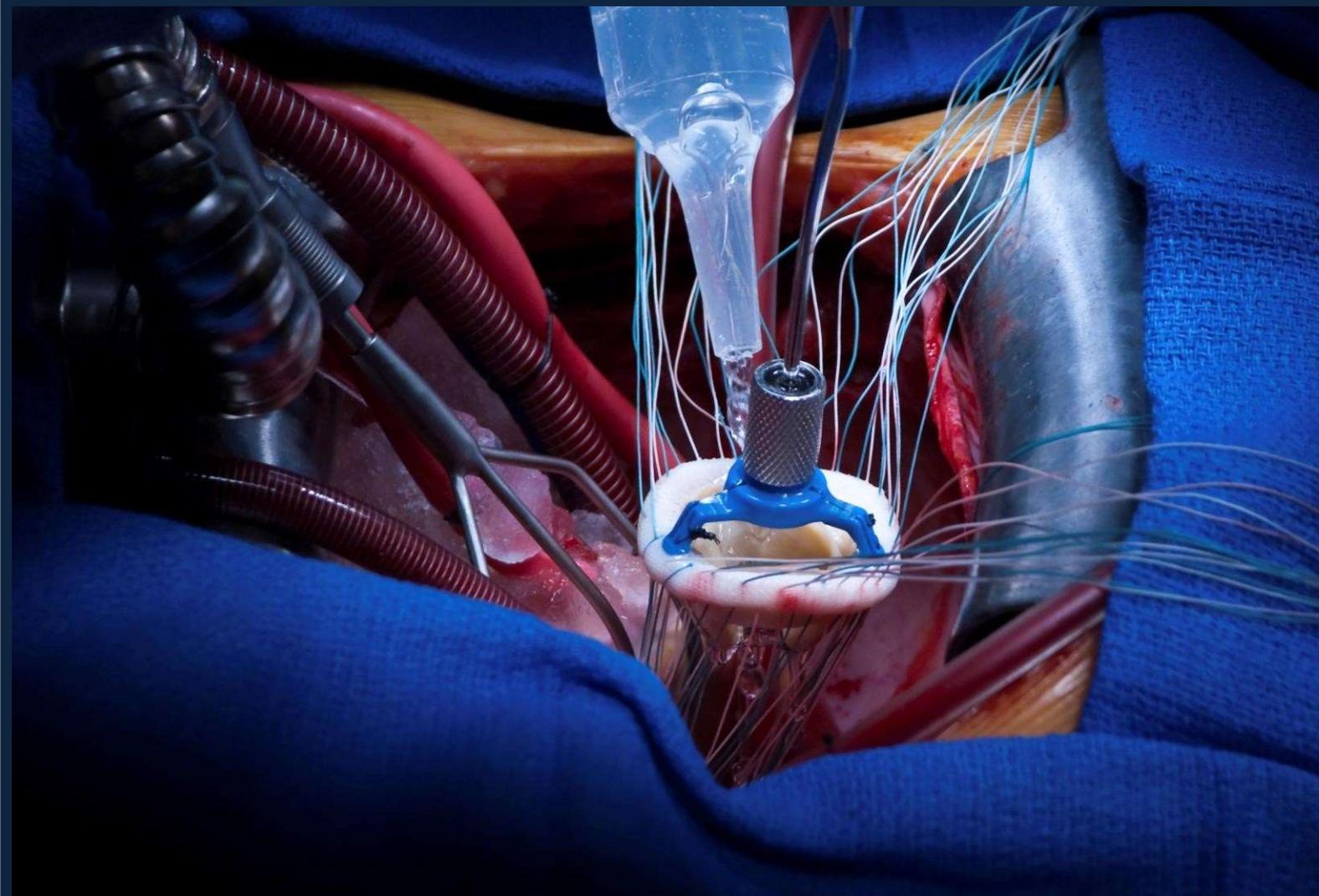
## Collaborating countries (in terms of co-authorship)



## Top Citing Countries

COUNTRY	No. Papers
United States	93
United Kingdom	80
Germany	22
Netherlands	18
France	15
Spain	10
Belgium	8
Italy	7
China	7
Czech Republic	7
Japan	6
Canada	6
India	5
Australia	4
Israel	4
Bahrain	4
Switzerland	3
Austria	1
Cyprus	1
Norway	1
South Korea	1

# 2021-22 HIGHLIGHTS



TRINITY CENTRE FOR BIOMEDICAL  
ENGINEERING

## HIGHLIGHTS OF 2021-22

**Dr. Daniel Kelly** won the Silver Medal of Royal Academy of Medicine in Ireland in 2022 by the Bioengineering Section.

**Prof. Conor McGinn** was awarded €2.4 million from the European Innovation Council (EIC) Accelerator program to expand his company, Akara.

**Dr. Mark Ahearne** was awarded the Irish Research Council Consolidator Laureate Award (2022-2026) to examine the influence of the mechanical environment on ocular cells.

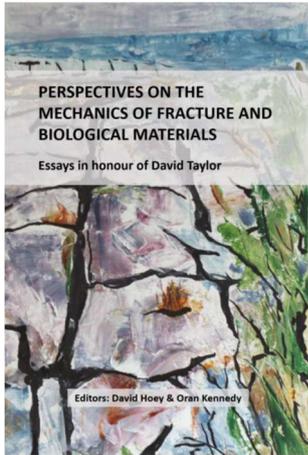
**Dr. Michael Monaghan** won the Horizon Europe (flIMAGIN3D-DN 2023-2026) Doctoral Network for a Shared Excellence of Fluorescent Lifetime Imaging Microscopy in Biomedical Applications (EU Project No. 101073507)

### **Prof. Richard Reilly**

Prof. Richard Reilly was awarded Honorary Fellowship of the Royal College of Physicians of Ireland

He was also been elected the Editor in Chief of The IEEE Journal of Translational Engineering in Health and Medicine for 2022-2025.





## Festschrift in honour of Prof. David Taylor

A Festschrift in honour of Prof. David Taylor entitled “Perspectives on the mechanics of fractures and biological materials” took place on Sept. 1<sup>st</sup> to celebrate his outstanding contribution to the Department of Mechanical Manufacturing & Biomedical Engineering in the last 40 Years. Over 100 staff members were present. A book written by David A. Hoey & Oran D. Kennedy was published in his honour.

### Spin Outs & Patents:

Prof. Daniel Kelly, Prof. Conor Buckley & Dr ,Dave Browe co-founded **Altach** (<https://altach.health>), a campus spin-out company pioneering off-the-shelf cartilage scaffolds to regenerate damaged knee joints. Intellectual property developed in the Kelly lab at Trinity College has been licenced to this spin-out company.

Buckley: Funded collaborative partnership with Integra Life Sciences to develop and commercialise decellularised nerve grafts (March 2017). Technology evaluation license (Jun 2021).

Murphy lab: **Prof. Bruce Murphy** has been involved in four medical device companies that have been spun-out of the Trinity Centre for Biomedical Engineering: **Proverum**, **Croivalve**, **Selio Medical** and **Oneprojects**. The spinouts from his lab have raised over €100M in capital, employ over 100 full time equivalents, and have two devices in clinical trials.

- **OneProjects** secured €14.7 million for ground-breaking heart scans.
- **Proverum** was awarded €4 million from the European Innovation Council (EIC) Accelerator program and announced another fundraising round of €30 M in January 2022.
- **Croivalve** announced an €8M fund raise in February 2022

## **TCBE Researchers:**

### **Meenakshi Suku**

TCBE Researcher Meenakshi Suku in the Monaghan Lab was recently awarded a prestigious travel award from the European Molecular Biology Organisation (EMBO) which supports a key research exchange with the Center for Translational Medicine at the International Clinical Research Center of St. Anne's University Hospital in Brno, Czech Republic at the lab of Professor Giancarlo Forte. This exchange focuses on defining and characterising resident immune cells in human myocardium.

### **Josephine WU**

Principal Investigator – ADMIRE Marie Skłodowska-Curie Action COFUND Postdoctoral Fellowship in Advanced Materials Research (2022-2024) €70,600

Project title: BIOPRINTING-iPSCs: 3D bioprinting of spatially organised human articular cartilage with induced pluripotent stem cell derived spheroids

Description: Osteoarthritis (OA) is the most common joint disease affecting over 500 million people worldwide, with knee OA contributing more than \$27 billion in health care expenditures annually. Current surgical interventions for repair of damaged articular cartilage involve the implantation of immature tissues that do not mimic the zonal nature of normal articular cartilage, leading to poor integration, prolonged recovery, and high risk of failure. Mature osteochondral autografts can be harvested from a low weight bearing region of the patient's joint, but widespread success is limited by availability of appropriate donor tissue and donor site morbidities. Tissue engineering can alleviate the burden of cartilage disease by offering more biologically faithful cartilage derived from autologous

cell sources with minimal invasiveness. However, fabrication methods are labour intensive and low throughput, and resulting tissues currently lack the cellularity, maturity, or organisation of native tissues. The overall aim of BIOPRINTING-iPSCs is to engineer patient-specific and spatially organised cartilage by three

dimensional (3D) bioprinting. A novel bioprinting technique whereby growth factors are spatially patterned alongside cellular spheroids will be established to realise this goal, and human induced pluripotent stem cells (hiPSCs) will serve as an autologous, minimally invasive, and near-infinite cell source. I anticipate that the proposed methodology will enhance the functionality of engineered cartilage tissue, thereby accelerating the clinical translation of such regenerative therapies. Future applications include the use of these tissue engineered constructs as in vitro models for disease modelling and therapeutic testing, with hiPSCs enabling patient-specific studies of sex differences and other genetic determinants in OA.

Collaborators: Dr Daniel Kelly, Trinity College Dublin

## **Matteo Solazzo**

### **Trinity Biomedical Engineering PhD Graduate awarded Engineers Ireland Biomedical Research Medal 2022**

**Galway, 20th May 2022,** 'TCD's School of Engineering Dr. Matteo Solazzo wins the 2022 Engineers Ireland Biomedical Research Medal at the [2022 Annual Conference of the Section of Bioengineering of the Royal Academy of Medicine in Ireland \(BinI 2022\)](#)

*Matteo Solazzo, a recently graduated PhD student in Biomedical Engineering under the supervision of Professor Michael Monaghan at the Department of Mechanical, Manufacturing and Biomedical Engineering, is the 2022 winner of the Engineers Ireland Biomedical Research Medal.*

*Matteo's winning presentation entitled "Piezoresistive Sensors & Platforms in Tissue Engineering" detailed his key advances into engineering the electroconductive polymer PEDOT:PSS into three-dimensional (3D) constructs and adopted toward multiple bioengineering applications spanning from wearable sensors to biomaterial scaffolds, both rapidly emerging fields of research that will play a critical role in future patient treatments. The fundamental insights gained from this research will be used to develop wearable sensors for "Connected Health" and drug screening systems to study cardiac regeneration and is already published in several top-tier journals in the field.*

*The award recipient Dr Matteo Solazzo comments:*

*"I am delighted to be receive this prestigious award while being compared among a high calibre of fellow candidates, that recognises the quality of research and scholarship I have received at TCD. This multidisciplinary PhD thesis has been made possible by the collaborative and engaging research taking place in TCD with international experts in the fields of chemistry, engineering, physics, medicine, electronics and biology. "*

*Prof. Michael Monaghan, Ussher Assistant Professor in Biomedical Engineering at Trinity, adds:*

*"Matteo's research has been built from the ground up here in my group and has benefited from collaboration with local experts and by the surrounding support structures of our administrative, technical and professional services that keep the research running. He is already the recipient of several other accolades which includes an Irish Research Council Postgraduate Fellowship. It is through such funding that internationally competitive and meaningful research can be executed and nurtured by talented individuals at the university. His PhD has made significant advances in electroconductive polymer biomaterial sciences in the applications of sensor technology and tissue engineering with four first author publications in internationally leading journals. We expect to translate one of these technologies to use in the clinic within the coming years'*

*This prestigious award and €1500 honorarium sponsored by DePuy Synthes, is adjudicated based on a research paper and presentation, by an expert panel drawn from academia and industry. It is awarded annually to the best PhD-level biomedical engineering researcher on the Island of Ireland at the Annual Conference of the Section of Bioengineering of the Royal Academy of Medicine in Ireland.*

*This research is funded by the Irish Research Council, and also Science Foundation Ireland and Wellcome Trust.'*



### **Bernard Crossland Symposium:**

Yasmine Guendouz won first prize in the research paper competition and Celia Hughes won second prize in the research poster category (both from Prof. Lally's Lab).

## Paper Highlights:

### Dunne:

- Bombin AD, Dunne N, McCarthy HO. Delivery of a peptide/microRNA blend via electrospun antimicrobial nanofibres for wound repair. *Acta Biomaterialia*. 2022 Nov 3.
- Mulholland EJ, McErlean EM, Dunne N, McCarthy HO. A Peptide/MicroRNA-31 nanomedicine within an electrospun biomaterial designed to regenerate wounds in vivo. *Acta Biomaterialia*. 2022 Jan 15;138:285-300.
- McErlean EM, McCrudden CM, McBride JW, Cole G, Kett VL, Robson T, Dunne NJ, McCarthy HO. Rational design and characterisation of an amphipathic cell penetrating peptide for non-viral gene delivery. *International Journal of Pharmaceutics*. 2021 Mar 1;596:120223.
- McErlean EM, Ziminska M, McCrudden CM, McBride JW, Loughran SP, Cole G, Mulholland EJ, Kett V, Buckley NE, Robson T, Dunne NJ. Rational design and characterisation of a linear cell penetrating peptide for non-viral gene delivery. *Journal of Controlled Release*. 2021 Feb 10;330:1288-99.

### Hoey:

- Eichholz, K., Freeman, F., Pitacco, P., Nulty, J., Ahern, D., Burdis, R., Browe, D., Garcia, O., Hoey D.A., Kelly, D.J., Scaffold microarchitecture regulates angiogenesis and the regeneration of large bone defects *Biofabrication*. 14(4), 045013. 2022
- Eichholz, K., Gonçalves, I., Barceló, X., Federici, A.S., Hoey D.A., Kelly, D.J., How to design, develop and build a fully-integrated melt electrowriting 3D printer *Additive Manufacturing*. 58, 102998. 2022
- Pouikli, A., Parekh, S., Maleszewska, M., Nikopoulou, C., Baghdadi, M., Tripodi, I., Folz-Donahue, K., Hinze, Y., Mesaros, A., Hoey, D.A., Giavalisco, P., Dowell, R., Partridge, L., Tessarz, P.,

Chromatin remodeling due to degradation of citrate carrier impairs osteogenesis of aged mesenchymal stem cells. *Nature Aging*. 1, 810-825. 2021

- Whelan, I., Moeendarbary, E., Hoey D.A., Kelly, D.J., Biofabrication of vasculature in microphysiological models of bone. *Biofabrication*. 13 032004, 2021

## Kelly:

- Burdis R, Chariyev-Prinz F, Browe DC, Freeman FE, Nulty J, McDonnell EE, Eichholz KF, Wang B, Brama P, Kelly DJ. Spatial patterning of phenotypically distinct microtissues to engineer osteochondral grafts for biological joint resurfacing. *Biomaterials*. 2022 Aug 28;289:121750.
- A Dufour, XB Gallostra, C O'Keeffe, K Eichholz, S Von Euw, O Garcia, DJ Kelly. Integrating melt electrowriting and inkjet bioprinting for engineering structurally organized articular cartilage. *Biomaterials* 283, 121405, 2022.
- DC Browe, PJ Díaz-Payno, FE Freeman, R Schipani, R Burdis, DP Ahern, P Brama, C.T. Buckley, DJ Kelly. Bilayered Extracellular Matrix Derived Scaffolds with Anisotropic Pore Architecture Guide Tissue Organization During Osteochondral Defect Repair. *Acta Biomaterialia* (in press).

## Ahearne:

- Treacy MP, Conway MP, Al Hammoud M, Duignan ES, Ahearne M, Ezra E. Direct exchange of Perfluoro-carbon liquid for silicone oil - a surgical technique to control pressure and avoid retinal slippage. *Retina* 2022; [10.1097/iae.0000000000003422](https://doi.org/10.1097/iae.0000000000003422).
- Bhattacharjee P, Ahearne M. Influence of spiral topographies on human limbal-derived immortalized corneal epithelial cells. *Exp Eye Res*. 2022; 225: 109252. [10.1016/j.exer.2022.109252](https://doi.org/10.1016/j.exer.2022.109252).

## Monaghan:

- Nuno G.B. Neto, Sinead A. O'Rourke, Mimi Zhang, Hannah K. Fitzgerald, Aisling Dunne, **Michael G. Monaghan**. Non-Invasive classification of macrophage polarisation by 2P-FLIM and machine learning. *eLife*. 2022. e77373
- Solazzo **M**, **Monaghan MG**. Hydrophilic, conductive and flexible piezoresistive PEDOT:PSS 3D sensors with tunable microarchitecture and crosslinked using a PEGylated crosslinker. *Synthetic Metals* 2022 (Elsevier) 290 (1): 117157
- O'Rourke SA, Neto NGB, Devilly E , Shanley LC, Fitzgerald HK , **Monaghan MG<sup>†</sup>** and **Dunne A<sup>†</sup>**. Cholesterol crystals drive metabolic reprogramming and M1 macrophage polarisation in primary human macrophages. *Atherosclerosis* (Elsevier). 2022. 352 (1): 35-45.

## Buckley:

- McDonnell E.E. and **Buckley C.T.** Two- and three-dimensional in vitro nucleus pulposus cultures: An in silico analysis of local nutrient microenvironments *JOR Spine*, 5(3): e1222, 2022
- Barcellona M., Samuel S., McDonnell E and **Buckley C.T.** Rat tail models for assessment of injectable nucleus pulposus regeneration strategies. *JOR Spine*, 5(3): e1216, 2022
- Browe D.C., Burdis R., Diaz Payno P., Freeman F.E., Nulty J.M., **Buckley C.T.**, Brama P.A.J. and Kelly, D.J. Promoting endogenous articular cartilage regeneration using extracellular matrix scaffolds. *Materials Bio Today*, 16:100343, 2022
- Browe D.C., Díaz-Payno P.J., Freeman F.E., Schipani, R., Burdis R., Ahern D.P, Nulty J.M., Guler S., Randall L.D., **Buckley C.T.**, Brama P.A.J. and Kelly, D.J. Bilayered extracellular matrix derived scaffolds with anisotropic pore architecture guide tissue organization during osteochondral defect repair *Acta Biomaterialia*, 143:266-281, 2022

## Reilly R.B.:

- Wilson F., McHugh C., MacManus C., Baggish A., Tanaayan C., Reddy S, Wasfy M., **Reilly R.B.** “Diagnostic accuracy of a portable ECG device in rowing athletes.” *Diagnostics*, September 2022. Diagnostics - 1894098
- Hernandez B., Scarlet, S.; Moriarty, F.; Ortuno, R.; Kenny, R.; **Reilly, R.**, “Investigation of the role of sleep and physical activity risk for chronic disease prevalence in older Irish adults”, *BMC Public Health BMC Public Health* **22**, 1711 (2022). <https://doi.org/10.1186/s12889-022-14108-6>
- Herings P.M., Dyer A.H., Kennelly S.P., Reid S., Killane I., McKenna L., Bourke N.M., Woods C.P., O'Neill D., Gibney J., **Reilly R.B.**, “Gait Characteristics and Cognitive Function in Middle-Aged Adults With and Without Type 2 Diabetes Mellitus: Using Deep-Learning to Evaluate the Relationship” *Sensors*, 1790456, August 2022

# FUNDING AWARDS



European Research Council



## TRINITY CENTRE FOR BIOMEDICAL ENGINEERING RESEARCH FUNDING

Our role in the scientific and medical communities is exemplified by the significant research funding the Trinity Centre for Biomedical Engineering receives from national and international funding agencies including the European Research Council, Science Foundation Ireland, Enterprise Ireland, Health Research Board, IRC and Wellcome Trust.

## Total Grant Funding Awarded in 2022: > 10M

Funder	Research Project Title	Lead PI	Collaborators	Amount
Irish Research Council Consolidator Laureate Award (2022-2026)	Examination of the effect matrix viscoelasticity and fluid flow have on the regulation of corneal and trabecular meshwork cells (EYEMECH)	Ahearne		€598,792.50
HORIZON-WIDERA-2021-ACCESS-03 (2022-2025)  HORIZON-CSA	Consolidating the Expertise of Necmettin Erbakan University Towards the Development of Biofibers for Wound Healing and Tissue Regeneration (REGENEU)	Buckley	European partners TLC-RT (Germany), TERM (Germany) and AMBER of the University of Dublin, Trinity College Dublin (Ireland)	€173,820
Irish Research Council (IRC)- Government of Ireland Postgraduate Scholarship Scheme (2022-2026)	The Oestrogen-Adipokine Axis and Its Influence on Vertebral Cartilaginous End-Plate Calcification and Porosity Formation in Pre-Menopausal Females	Buckley		€110,000
Irish Research Council (IRC) - Government of Ireland Postdoctoral Scholarship Scheme (2022-2024)	Fabrication of 3D Functional Polymeric Scaffold by Two-Photon Polymerisation for the Real-Time Monitoring of Cell's Environment	Buckley (Co-Investigator)		€113,290
CEMACUBE EIT Master's programme in Biomedical Engineering (2021)  European Institute of Innovation & Technology		Buckley (Co-Applicant)	Co-applicants: RWTH Aachen; Trinity College Dublin; Ghent University; University Medical Center Groningen	€35,260
Department of Enterprise, Trade and Employment / Enterprise Ireland	An instant repair biomimetic treatment for brittle bone fracture for patients with osteoporosis	Dunne		€5'700'000
IRC Enterprise Partnership PDRA project with DEBRA Ireland	A nanoparticle-loaded hydrogel for Epidermolysis Bullosa	Dunne		€119,513

<b>National Science Foundation (US-Ireland Tripartite)</b>	Design of Genetically Engineered Tensile Load-Bearing Soft Tissues Inspired by Embryonic Tendon Development	Dunne (Co-PI)		€1,110,114
<b>National Science Foundation (IRES scheme)</b>	Sensor Information Processing and Machine Learning for Wearable Devices	Dunne (Co-PI)		€252,307
<b>SFI-CRT Machine Learning</b>	Application of Machine Learning to Nanoparticle Synthesis	Dunne (Co-PI)		€166,000
<b>SFI-CRT Artificial Intelligence</b>	Applied Machine Learning Models for Tissue Engineering	Dunne (Co-PI)		€166,000
<b>SFI-CRT Digitally Enhanced Reality</b>	Biomechanics of Traumatic Brain Injury	Dunne (Co-PI)		€166,000
<b>National Science Foundation (CAREER)</b>	Learning to search with structure (LESS), a unifying algorithmic framework for gray box optimization of biomanufacturing systems	Dunne (Co-PI)		€431,000
<b>Trauma &amp; Orthopaedic Research Charity</b>	Biomechanical evaluation of reality-based navigation in total hip replacement	Dunne (Co-PI)		€106,000
<b>SFI-CRT Artificial Intelligence</b>	Combining artificial intelligence and lab-on-a-chip technologies for biomaterials optimisation	Dunne (Co-PI)		€166,000

<b>FI-CRT Machine Learning</b>	Application of artificial intelligence in the development of bioprinted scaffolds for cartilage tissue engineering	Dunne (Co-PI)		€166,000
<b>HEA- DFHERIS N/S Call</b>	RALA nanocomplexes as a platform to mediate oral (Dunne): delivery of peptides using insulin as a prototype	Dunne (Collaborator)		€200,000
<b>Disruptive Technology Innovation Fund (DTIF)</b>		Hameed	Pumpinheart Ltd.	€715,000
<b>Health Research Board 2022</b>	Stromal cell subtypes define distinct pathogenesis in RA and PsA	Hoey (Co-PI)		€358,470
<b>Marie Skłodowska Curie Actions ADMIRE COFUND fellowship (2022)</b>	METABOLic immuno-engineered biomATERIALs	Hoey (Co-PI)		€113,700
<b>SFI-EPSC CDT Advanced Characterisation scholarship</b>	Advanced Characterisation of Materials Based Musculoskeletal Tissue Regeneration	Hoey		€144,800
<b>North-South Research Programme (2022-2024)</b>  <b>Higher Education Authority</b>	CARTREGEN: Modelling and fabrication of microfibre reinforced composite constructs for repair and regeneration of articular cartilage	Kelly	Dr Krishna Manda, Queens University Belfast	€200,000
<b>ADMIRE Marie Skłodowska-Curie Action COFUND Postdoctoral Fellowship in Advanced Materials Research (2022-2024)</b>  <b>European Union's Horizon 2020&amp; Science Foundation Ireland (SFI)</b>	BIOPRINTING-iPSCs: 3D bioprinting of spatially organised human articular cartilage with induced pluripotent stem cell derived spheroids	Kelly (co-applicant)		€70,600
<b>AMBER funded project</b>	Urology device optimisation	Lally	Boston Scientific Clonmel	€400,000

<b>IRC Enterprise Partnership PhD project</b>	Improving heart valve longevity	Lally	Boston Scientific Galway	€140,000
<b>IRC Employment Based PhD</b>	Thrombus composition	Lally	J&J Cerenovus Galway	€166,000
<b>ERC PoC</b>	FibreRemodl	Lally		€150,000
<b>Health Research Board (Ireland)</b>	Polyfunctional-T – stromal cell crosstalk in the joint of patients with inflammatory Arthritis	Monaghan (Co-Applicant)		€ 606,272
<b>Enterprise Ireland (EI Coordination Support Grant)</b>	Doctoral Network for a Shared Excellence of Brillouin microscopy in Biomedical Applications	Monaghan		€ 9,483
<b>Enterprise Ireland (Horizon Support Grant)</b>	Anti-inflammatory therapeutic cardiac patches	Monaghan		€ 14,975
<b>Enterprise Ireland (Commercialisation Feasibility Fund)</b>	Feasibility and scope of PEDOT:PSS dry electrodes for Connected Health: Monitoring Fitness and Wellbeing	Monaghan		€ 15,000
<b>Horizon Europe (fIIMAGIN3D-DN 2023-2026)</b>	Doctoral Network for a Shared Excellence of Fluorescent Lifetime Imaging Microscopy in Biomedical Applications (EU Project No. 101073507)	Monaghan	Tubingen University, Ghent University, Politecnico di Milano, Kings College London, University of Copenhagen, Netherlands Cancer Institute, Leica GmbH, PicoQuant GmbH, Lambert Instruments, MOAB Inc, NMI Reutlingen.	2,743,459
<b>Trinity College Dublin E3 Prendergast Challenge Award (2023-2027)</b>	Resist-AMR Antimicrobial Resistance: Engineering Natural, One- Health, Systems Thinking Solutions	Monaghan (Co-Investigator)	Prof. Trevor Hodkinson, Dr Marta Martins, Dr	€600,000

<b>Trinity College Dublin Alumni Association</b>	to a Manmade Global Disaster		Sinéad Corr, Dr Julie Renwick, (Trinity College Dublin)	
<b>CardiacEire Irish Research Council New Foundations Award</b>	An Ireland-centered approach unifying stakeholders in research to address cardiac disease in young people	Monaghan	Cardiac Risk in the Young (CRY)-Ireland	€13,200
<b>MINECHPS MSCA-DF Horizon Europe</b>	A regenerative intervention for spinal cord injury (EU Project No. 101067283)	Monaghan		€215,534
<b>RCSI Translational Seed Fund co-funded with NuVasive/CHF</b>	<i>Characterising cellular biology in paediatric scoliosis Spine for clinical impact in treatment strategies (2023 – 2025)</i>	Murphy C.		€147,752
<b>ANATOMY PHD PRIZE RESEARCH STUDENTSHIPS 2022/23 - Early Career Investigator from the Anatomical Research Society (2023 – 2026)</b>	Investigating selenium doped collagen-glycosaminoglycan scaffolds as a novel treatment strategy for bone cancer	Murphy C.		€90'000
<b>Part of US-Ireland Tri-partite grant partnered with National Science Foundation</b>	Project title: Design of Genetically Engineered Tensile Load-Bearing Soft Tissues Inspired by Embryonic Tendon Development.	Murphy P.		€452,157
<b>National Institute of Health</b>	Mechanotransduction in Late Embryonic Development to Inform Tendon Tissue Engineering	Murphy P. (Co-Principal Investigator)		€374,000
<b>NorthSouth project (2022)</b>	WoundActiv: Bioactive scaffolds functionalised for the delivery of genetic cargoes for the healing of complex wounds	O'Brien	Prof. Helen McCarthy (Queen University Belfast)	€199,021.00
<b>AMBER Science Foundation Ireland and Integra LifeSciences Industry Partnership, (2022-2025)</b>	Development of a nerve guidance conduit (NGC) incorporating nerve growth factor (NGF) to promote accelerated repair of peripheral nerve defects	O'Brien		€1,422,688

<b>Enterprise Ireland Commercialization Fund (2022-2023)</b>	Non-surgical Repair of Tympanic Membrane Perforations (TympanoColl)	O'Brien	O'Leary C. Da Amaral R, Gleeson J	€250,042
<b>Irish Research Council (IRC) GoI Postdoctoral Fellowship, ElectrophINK (2021-2023)</b>	Multifunctional conductive 3D printed scaffolds for enhanced spinal cord regeneration	O'Brien	Woods A	€103,031.53
<b>AMBER ADMIRE - Marie Sklodowska-Curie actions CoFund (2021-2023)</b>	Gene-Activated Multi-Layered Biomaterials for Superior Bio-lubrication and Enhanced Cartilage Repair	O'Brien	Matheson A	€167,952
<b>ON Foundation, Kick-starter grant(2021-2022)</b>	Gene-activated scaffolds for repair of osteoporosis-associated fractures of long bones	O'Brien	Sadowska J	CHF 10'000
<b>Enterprise Ireland Commercialization Fund</b>	HyAMesh - Improving Outcomes in Glaucoma Surgeries	O'Brien ( Co-applicant)		€499,316.52
<b>RCSI StAR PhD Programme (2023-2027)</b>	Functionalizing Next Generation Nerve Regeneration Biomaterials with Electrical Stimulation and Gene Therap	O'Brien		€167,000
<b>EI Comm Fund (2022-2023)</b>	VideoForce Commercialization – a mobile device exercise, rehabilitation and injury prevention tool	Simms		€333,333
<b>Dogs for Disabled (2023-2024)</b>	An exploration of the effect of mobility assistance dogs on activity levels, gait and quality of life in children with neurological and physical impairments	Simms		€28,800

## TCBE SEMINARS 2022

	<i>Seminar Title</i>	<i>Speaker</i>
January	Motor Neuron Disease and its practical challenge	<p><b>Dr. Deirdre Murray MISCP</b> (PhD) holds the McKeon Assistant Professor in Clinical Measurement post in the Academic unit of Neurology TCD and is the Clinical Specialist Physiotherapist in Motor Neurone Disease in Beaumont Hospital, Dublin. Dr. Murray's current research includes a European multicentre longitudinal study of respiratory function in MND (The REVEALS study), development of technology-based measurement solutions in MND, and development and implementation of a patient remote monitoring system (TiM)</p>
February	Harvesting immune-mechanical interplay in bone regeneration	<p><b>Prof. Georg Duda</b>, Director of Julius Wolff Institute for Biomechanics and Musculoskeletal Regeneration. Prof. Duda is also a Faculty Member of the Wyss Institute at Harvard University. Prof. Duda is the BIH Chair for Engineering Regenerative Therapies as well as an elected Member of the Senate of the German Research Foundation (DFG). Since 2021 he is the Speaker of the BIH Centre for Regenerative Therapies (BCRT). Prof. Duda's research focuses on the interaction between bone and muscles as well as the biomechanical influences and its impacts in both the intact and injured musculoskeletal system.</p>
May	Leveraging mechanobiology to treat cancer	<p><b>Dr. Stephen Thorpe</b>, Ad Astra Fellow and Assistant Professor at University College Dublin.</p> <p>Dr. Thorpe is an Ad Astra Fellow and Assistant Professor in the School of Medicine and Junior Conway Fellow at University College Dublin. A graduate of Mechanical and Manufacturing Engineering. He was awarded a PhD in bioengineering from Trinity College Dublin in 2012. He then</p>

		<p>received a Marie Curie Postdoctoral Fellowship to investigate the biophysical regulation of genome function at Queen Mary University of London where he remained as a part-time lecturer and BBSRC funded researcher until 2020. As a biomedical engineer, Dr. Thorpe is interested in how physical signals impact cell function in health and disease.</p>
June	<p>Skin Biomechanics: From needle insertion to helmet design</p>	<p><b>Dr. Aisling Ní Annaidh</b>, Associate Professor of Mechanical Engineering Design at University College Dublin. She completed a joint PhD at UCD and Universite Sorbonne (UPMC) in the area of Biomechanics. Dr. Ní Annaidh is currently a Principal Investigator of the Tissue Biomechanics group at UCD and Co-Lead investigator on the MSCA Innovative Training Network, HEADS (Head Protection: A European Training Network for Advanced Designs in Safety). Her research interests include tissue biomechanics, medical device design and assistive technologies.</p>
September	<p>Endochondral Ossification in Tissue Engineering and Regenerative Medicine</p>	<p><b>Dr. Eric Farrell</b>, Associate Professor, Erasmus MC, University Medical Centre Rotterdam. In 2012 he established the Bone Tissue Engineering Research group within the Department of Oral and Maxillofacial Surgery. In doing so he initiated one of the world's first research teams focused on the process of endochondral ossification in tissue engineering. With the knowledge that endochondral ossification also plays an important role in multiple diseases he established independent lines exploring these topics, while maintaining a leading position in bone tissue engineering research. One of these has been to develop in vitro and in vivo models of endochondral ossification to study processes such as osteoarthritis and cancer metastasis, for which he has received competitive EU Funding from the Marie</p>

		Curie ITN(Coordinator of CarBon project) and FET Open (PI on B2B project), amongst others. In the coming years he aims to contribute new knowledge through fundamental and applied research to address these topics, focusing both on disease modelling and bone tissue engineering strategies.
October	Multiscale evaluation of bone combining indentation, in situ XCT and digital volume correlation	<b>Dr. Aikaterina Karali</b> , Lecturer at the Faculty of Technology, School of Mechanical & Design Engineering in the University of Portsmouth. Aikaterina Karali has spent her PhD working on a multi-scale evaluation of bone combining indentation, in situ XCT mechanics and digital volume correlation. The research interest of the Biomedical Engineering group at the University of Portsmouth includes the investigation of the mechanical behaviour of healthy and diseased hard and soft tissues as well as the characterisation of the mechanical and morphological properties of different biomaterials for tissue regeneration.
November	Design, fabrication, and utilization of biomaterial for blood contacting biomedical devices and substrates for improved expansion of mesenchymal stem cells.	<b>Dr. Daniel Heath</b> , Associate Professor, ARC Future Fellow, Department of Biomedical Engineering, The University of Melbourne. Daniel Heath received his PhD in Chemical and Biomolecular Engineering in 2010 from The Ohio State University where he worked on the development of novel biomaterials for small diameter vascular graft applications. He then held postdoctoral positions at the Singapore-MIT Alliance for Research and Technology (SMART) Centre and at MIT where he focused on developing micropatterned cell culture substrates for <i>in situ</i> and high throughput clonal analysis of rare cell populations. He began as a Lecturer at University of Melbourne in 2014 where he has continued to focus on themes related to cardiovascular biomaterials and mesenchymal stromal cells.

December	Controlling the assembly of biomaterials and engineered tissue	<p><b>Dr. James Armstrong</b> who is leading a research group in Translational Health Sciences based in Bristol Medical School at the University of Bristol. Since graduating from his PhD in 2015, he has been supported by three personal Fellowship awards: Arthritis Research UK (2015-2018), the Medical Research Council (2018-2021), and now a prestigious UKRI Future Leaders Fellowship (2021-2028). These major funding awards have enabled him to lead a programme of highly interdisciplinary and collaborative research focussed on using biomaterials, nanomaterials, and remote fields to engineer artificial tissues with structural and functional complexity. He is now expanding his research interests into engineering stem-cell-derived organoids while also seeking to translate his technologies for applied biological modelling and regenerative medicine.</p>
----------	--	--

## TCBE AWARDS 2022

Awards	Awardee	Research Group	Location	Year
1 <sup>st</sup> prize in the 'Mechanobiology' section (Early Career)	Morgan Cobban	Hoey Lab	Bioengineering in Ireland Conference	2022
1 <sup>st</sup> prize in the 'Regenerative Medicine' section (Early Career)	Mimma Maggio	Hoey Lab	Bioengineering in Ireland Conference	2022
2 <sup>nd</sup> prize in the 'Mechanobiology'	Stephane Petrousek	Hoey Lab	Bioengineering in Ireland Conference	2022
New Investigator Recognition Award	Dr. Nidal Khatib	Hoey Lab	Orthopaedic Research Society Meeting	2022
Commercialisation Award	Dunne Lab	Dunne Lab	DCU INVENT	2022
Innovation Award	Buckley Lab	Buckley Lab	Trinity College Dublin	2022
ORS PSRS Best Poster Award	Niamh Wilson	Buckley Lab	ORS PSRS 6th International Spine Research Symposium	2022
ORS PSRS Best Podium Award	Tara Ní Neill	Buckley Lab	ORS PSRS 6th International Spine Research Symposium	2022

Medtronic Best Biomaterials Research Oral Presentation, Early Career Researcher award	Tugdual Haffner	Buckley Lab	Section of Bioengineering of the Royal Academy of Medicine in Ireland	2022
Medtronic Best Regenerative Medicine Research Oral Presentation for Early Career Researcher award	Niamh Wilson	Buckley Lab	Section of Bioengineering of the Royal Academy of Medicine in Ireland	2022
Engineers Ireland Biomedical Research Medal	Matteo Solazzo	Monaghan Lab	Section of Bioengineering of the Royal Academy of Medicine in Ireland	2022
First place presentation prize	Yasmine Guendouz	Lally Lab	Sir Bernard Crossland Symposium	2022
Second place poster prize	Celia Hughes	Lally Lab	Sir Bernard Crossland Symposium	2022
Charles S. Kleinman Scholarship Award	Niall Linnane	Lally Lab	PICCS Symposium	2022
Best presentation award	Brooke Tornifoglio	Lally Lab	BIC-ISMRM Meeting	2022
ScD, higher doctoral degree	Richard Reilly			2022

Honorary Fellowship of the Royal College of Physicians of Ireland	Richard Reilly			2022
2 <sup>nd</sup> prize in Best Medical Devices Research Oral Presentation	Andrew Malone		Binl	2022

## PHD VIVA 2022



*Pierluca Pitacco – Kelly Lab – 2022*



*Farhad Chariyev-Prinz – Kelly Lab – 2022*



*Nuno Neto – Monaghan Lab – 2022*



*Matteo Solazzo – Monaghan Lab – 2022*



*Brooke Tornifoglio – Lally Lab – 2022*



*Angelica Federici – Hoey Lab – 2022*

## TCBE PRINCIPAL INVESTIGATORS

	Principal Investigator	Research Group /Affiliation
	Dr. Mark Ahearne	Ahearne
	Prof. Conor Buckley	Buckley
	Dr. David Hoey	Hoey
	Dr. Daniel Kelly	Kelly



Prof. Triona Lally

Lally



Mc Ginn, Conor

Robotics and Innovation Lab (RAIL)



Dr. Michael Monaghan

Monaghan



Dr. Bruce Murphy

Murphy



Dr. Ciara Murphy

RCSI



O'Loughlin, Declan

O'Loughlin



Prof. Richard Reilly

Reilly



Prof. Ciaran Simms

Simms



Dr. Patrick Prendergast

TCBE



Prof. Fergal O'Brien

RCSI



Prof. Veronica Campbell



Prof. Kevin O'Kelly

TCBE



Prof. David Taylor

TCBE /MMBE



Dr. Garry Duffy

University of Galway



Dr. Eoin O'Cearbhaill

UCD



Dr. Paula Murphy

TCD



Prof. Brian O'Connell

TCD



Dr. Alice Witney

TCD



Prof. Sally-Ann Cryan

RCSI



Dr. Kenneth Stanton

UCD

	<p>Prof. Cathal Moran</p>	<p>SSC</p>
	<p>Prof. Nicholas Dunne</p>	<p>DCU</p>
	<p>Dr. Oran Kennedy</p>	<p>RCSI</p>
	<p>Dr. Cathal Kearney</p>	<p>RCSI / University of Massachusetts Amherst</p>
	<p>Dr. Aamir Hameed</p>	<p>RCSI</p>



Dr. Claire Conway

RCSI



Dr. Caroline Curtin

RCSI



Prof. Niamh Nowlan

UCD



Dr. Shane Browne

RCSI



Dr. Stephen Thorpe

UCD



Dr. Alejandro Lopez Valdes

Lopez Valdes

## TCBE LINKED CLINICIANS/RESEARCHERS

	Clinical Principal Investigator	Affiliation
	Professor Pieter Brama	Professor of Veterinary Surgery at University College Dublin
	Dr Joseph Butler	Consultant Spine Surgeon, National Spinal Injuries Unit, Mater Misericordiae University Hospital, Mater Private Hospital & Tallaght Hospital
	Professor Richard Costello	Consultant Physician in Respiratory Medicine at Beaumont Hospital, Dublin, and Associate Professor of Medicine at the Royal College of Surgeons Ireland
	Dr. James Crowley	Consultant Cardiologist at Bon Secours Hospital Galway
	Professor Orla Hardiman	Professor of Neurology/Head of Academic, Clinical Medicine Trinity College Dublin
	Professor Michael Hutchinson	Consultant Neurologist at St Vincent's University Hospital Dublin

	Professor Rose Anne Kenny	Professor of Medical Gerontology at Trinity College Dublin and Director of the Falls and Blackout Unit at St. James's Hospital Dublin
	Dr Damien Kiernan	Clinical Specialist Engineer, Gait Laboratory, Central Remedial Clinic Dublin
	Professor Timothy Lynch	Consultant Neurologist at the Mater Misericordiae University Hospital and Beaumont Hospital Dublin
	Mr Alonso Moreno	Consultant Orthopaedic Surgeon at the Hermitage Clinic, Dublin
	Professor Kevin Mulhall	Consultant Orthopaedic Surgeon at the Sports Surgery Clinic, Mater Misericordiae University Hospital, Mater Private Hospital and Cappagh National Orthopaedic Hospital
	Mr Dylan Murray	Craniofacial, Plastic, and Reconstructive Surgeon at the Children's University Hospital Temple Street and the Mater Hospital in Dublin
	Professor John O'Byrne	Consultant Orthopaedic Surgeon at Cappagh National Orthopaedic Hospital and the Mater Private Hospital



Dr Faisal Sharif

Senior Lecturer School of  
Medicine Clinical Science  
Institute NUI Galway and  
Consultant Interventional  
Cardiologist, Soalta Group



John Tiernan



Professor Niall Tubridy

Clinical Full Professor at  
University College Dublin  
School of Medicine



Dr. Laura Viani

Consultant  
Otolaryngologist/Neurotologist  
Beaumont Hospital, Temple  
Street University Children's  
Hospital



Professor Desmond Winter

Associate Clinical Professor at  
Consultant General Surgeon St  
Vincent's Private Hospital